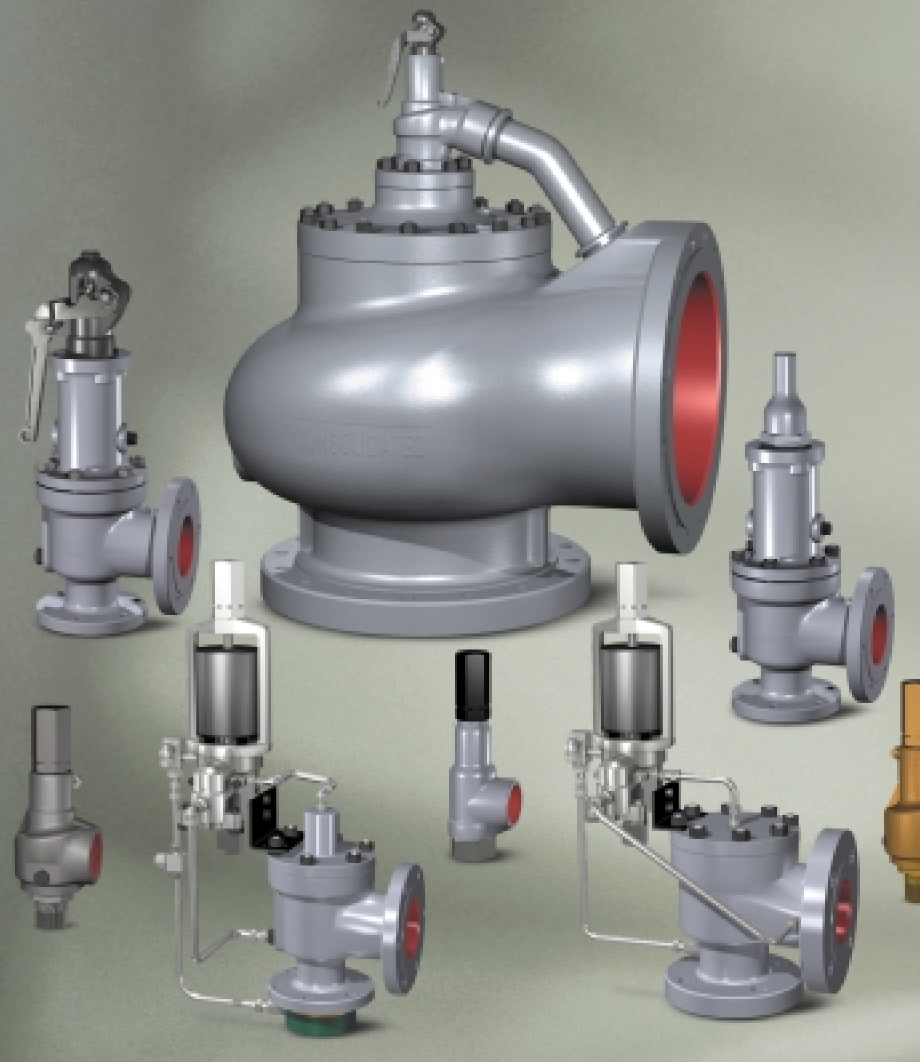
In-house Review

General Information

Safety Relief Valve



Consolidated®

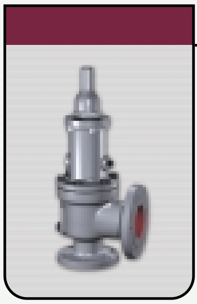
Table of Contents

Protection of personnel and equipment is the paramount concern in selection of Safety Relief Valves for plant operating systems. Only the most reliable Safety Relief Valves should be considered for such a crucial role.

The **Consolidated** valve line has consistently been recognized as a leader in the pressure relief valve field since its introduction over one hundred years ago. Leadership in design, manufacture and product service and support is founded on a reputation for unrelenting dedication to product innovation and improvement. A continuing program to keep abreast of constantly changing requirements of the valve market and a concentrated Research and Development effort assure strong support for customer needs. The resulting high quality of design and workmanship of **Consolidated** Valves gives assurance of maximum protection and longer trouble-free life for the user.

Consolidated provides maximum service to its valve customers through a worldwide factory trained sales force. These personnel are technically trained and available to provide guidance in sizing and selection of proper valves for specific applications as well as assistance in solving valve problems as they arise.

Spring Actuated Pressure Relief Valves

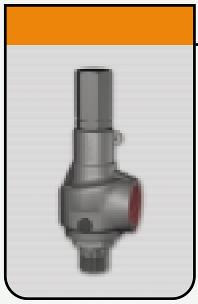


1900

The 1900 Series of pressure relief valves provides a wide scope of design in both pressure and temperature ranges. ASME B & PVC, Section VIII certified for vapor, liquid and steam applications meets most overpressure protection requirements of today's industry.

1900 / P1 & P3

Standard in both types, the patented Thermodisc™ Seat is designed for a high degree of seat tightness. Designed for ASME B & PVC, Section I organic fluids, flashing water and limited steam applications. (The P1 and P3 series designs are not for ASME B & PVC, Section I Boiler Drum, Superheater or Reheater applications.)



1982

ASME B & PVC, Section VIII certified threaded connection pressure relief valve for vapor and steam service applications.

19000

The 19000 Series of pressure relief valves are ASME B & PVC, Section VIII compliant for liquid service applications. Seat tightness, blowdown and capacity on all types of media meets the industry needs for overpressure protection in chemical, petrochemical, refinery, power generation (nuclear and conventional) and other commercial applications.

820000

The 820000 Series of pressure relief valves are ASME B & PVC, Section VIII compliant for liquid service applications. This design provides performance characteristics that meet many of the liquid service applications in today's industrial markets.

NOTE: Colors in the bars above the valves are consistent with tabs throughout this catalog.

A staff of factory trained Field Service Technicians are available for "on-the-job" emergencies, start-ups, and or turn-arounds. Field Service Technicians are strategically located to be available to **Consolidated's** customers both domestic and foreign.

Rigid manufacturing standards controlled by an ASME approved Quality Control Program ensure that each valve will be manufactured in accordance with established design criteria and tested for functional performance.

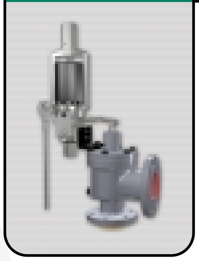
Consolidated is among a select number of U.S. companies holding ISO 9001 Quality System Certification (Registration). Our Quality Management System, Design Control, and Manufacturing Facility maintain compliance to industry standards through various certification and registration agencies. This quality controlled manufacturing and test program assures that each valve manufactured will provide long and reliable service.

Consolidated also holds a Safety Quality License for export of pressure relief valves to the People's Republic of China. The **Consolidated** 1900 spring loaded and 3900 series pilot operated safety relief valve is included among the list of products covered by the Safety Quality License.

A Green Tag® certification is attached to each valve following final test and inspection as evidence of **Consolidated's** emphasis on Quality. Our Green Tag® serves as a reminder that each **Consolidated** valve meets or exceeds the stringent performance and overpressure protection requirements set forth by the ASME Code, and backed by **Consolidated**. The symbol is also used by our Green Tag® Centers located worldwide. These centers are fully certified by us as **Consolidated** valve assembly and repair facilities. In North America, they also meet or exceed ASME and National Board standards for pressure relief valve assemblers and valve repair (VR) shops.

Consolidated spring loaded and pilot operated safety relief valves have been flow tested in accordance with ASME Code rules to establish rated capacities. Capacities specified in this catalog have been certified by the National Board of Boiler and Pressure Vessel Inspectors and are listed in the National Board publication "Pressure Relieving Device Certifications".

Pilot Operated Pressure Relief Valves



2900 PV

**Pop Action, Non-Flowing
Pilot Operated Safety Relief Valve**

The **Consolidated** 2900 PV pop action non-flowing pilot provides excellent performance with full lift at set pressure with minimal blowdown.

2900 MV

**Modulating Action, Non-Flowing
Pilot Operated Safety Relief Valve**

The **Consolidated** 2900 MV Pilot Operated Safety Relief Valve is a non-flowing modulating pilot valve that provides exceptional performance and stable operation.

3900 PV

**Pop Action, Non-Flowing
Pilot Operated Safety Relief Valve**

The **Consolidated** 3900 PV pop action non-flowing pilot provides excellent performance with full lift at set pressure with minimal blowdown.

3900 MV

**Modulating Action, Non-Flowing
Pilot Operated Safety Relief Valve**

The **Consolidated** 3900 MV Pilot Operated Safety Relief Valve is a non-flowing modulating pilot valve that provides exceptional performance and stable operation.

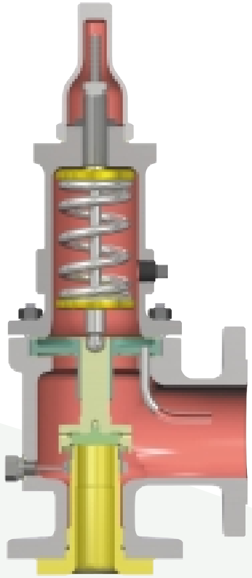
13900

**Pop Action, Flowing
Pilot Operated Safety Relief Valve**

The **Consolidated** 13900 pilot operated safety relief valve series is designed to contribute to the overall efficiency and profitability of plant operations.

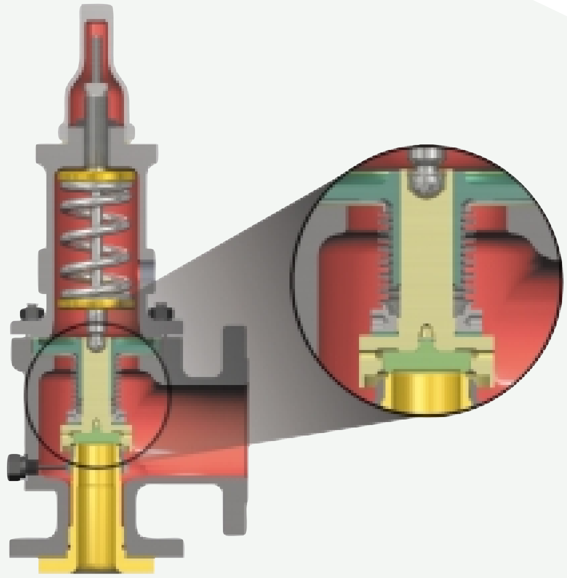
NOTE: All Pilot Operated Relief Valves are ASME B & PVC, Section VIII Code compliant.

Description of Safety Relief Valve Designs



Conventional Safety Relief Valve

Conventional safety relief valves are for applications where excessive variable or built up back pressure is not present in the system into which the valve discharges. The operational characteristics (opening pressure, closing pressure and relieving capacity) are directly affected by changes of the back pressure on the valve.



Balanced Safety Relief Valve

A balanced safety relief valve is a pressure relief valve which incorporates means of minimizing the effect of back pressure on the operational characteristics. (Opening pressure, closing pressure and relieving capacity)

Comment: These design valves are typically equipped with a bellows which balances or eliminates the effect of variable or built up back pressure that may exist in the system into which the safety relief valve discharges.

Pilot Operated Safety Relief Valve

A pilot operated safety relief valve is pressure relief valve in which the major relieving device is combined with and is controlled by a self-actuated auxiliary pressure relief valve.

Comment: Pilot operated relief valves are available in both pop action and modulating action designs. These valves are suitable for applications where it is desired to maintain system operating pressure very close to the valve set point (operating pressure).

Valve Selection Considerations

CONSOLIDATED Pressure Relief Valves Designs

CONSOLIDATED offers a broad range of pressure relief valve solutions, providing reliable protection for plant personnel and equipment. CONSOLIDATED achieves this goal by offering the most efficient solution for any specific pressure relief valve application. In general, most situations can be handled with either a pilot operated or a spring-loaded valve design. CONSOLIDATED offers both of these alternative solutions using world-class designs, and offering unparalleled application expertise and support. The following chart provides some basic guidelines on selecting the right solution for your application. Please consult with your local CONSOLIDATED sales office or local distributor to select the best and most economical solutions for your specific pressure relief applications.

Pilot Valves (POSRV) vs. Spring Loaded Valves (SRV)

If:	2900 POSRV	3900 POSRV	SRV
Temperature is greater than 505°F or less than -40°F*	✓		✓
Design Pressure is greater than 3750 psig			✓
Set Pressure is greater than 3750 psig or less than 15 psig			✓
Viscosity is greater 28 cp			✓
Variable Back Pressure is greater than 80% for liquid applications or 60% for gas or vapor applications	✓	✓	
Operating/Set Pressure gap is less than 7% for gas and vapor applications or 12% for liquid applications	✓	✓	
Inlet Pressure Drop exceeds 3% of set pressure**	✓	✓	
Metal Seats are required (POSRV - Main Valve only)	✓		✓
Soft Seats are required	✓	✓	✓
Multi-Overpressure scenarios***	✓ one POSRV needed	✓ one POSRV needed	✓ multiple SRV's needed
There is high potential for the valve to be subjected to shock or high vibration	✓	✓	
Polymerization will occur			✓
Chemical compatibility with elastomers is a problem			✓
Installation Clearance is a primary issue	✓ POSRV > K orifice ****	✓ POSRV > K orifice	✓

* Heat Exchanger required.
** Remote Sensing required.
*** Modulator required.
**** 2900 has same center-to-face dimensions as 1900.

CONSOLIDATED strives to provide the best available information, data and assistance to its customers in the selection and application of our products. It is impractical, however, for CONSOLIDATED personnel to be trained in all systems and processes in which CONSOLIDATED products might be used. Ultimate responsibility remains with the customer as the process owner or designer.

Applications

Valve Type[1]	Standard End Connections[2]				Materials[3]			ASME Codes[4]				
	Inlet		Outlet		Standard			Sec. I	Sec. III		Sec. VIII	
	Type	Size	Type	Size	Body & Bonnet	Cover Plate	Trim	Steam	Steam & Vapor	Liquid	Steam & Vapor	Liquid
1900	Flanged	1" - 12"	Flanged	2" - 16"	C.S.	N/A	S.S.		X	X	X	X
1900/P	Flanged	1" - 8"	Flanged	2" - 10"	C.S.	N/A	S.S.	X	X		X	
1982	Threaded	1/2" - 2"	Threaded	3/4" - 2-1/2"	C.S.	N/A	S.S.		X	X	X	X
1982	Flanged	1" - 2"	Threaded	1" - 2-1/2"	C.S.	N/A	S.S.		X	X	X	X
19000	Threaded	1/2" - 2"	Threaded	1" - 2-1/2"	C.S.	N/A	S.S.		X	X	X	X
19000	Flanged	1/2" - 2"	Flanged	1" - 2-1/2"	C.S.	N/A	S.S.		X	X	X	X
19000	Socket Weld	1/2" - 2"	Socket Weld	1" - 2-1/2"	C.S.	N/A	S.S.		X	X	X	X
19096MBP	Threaded	1/2" - 1"	Threaded	1"	C.S.	N/A	S.S.		X	X	X	X
19096MBP	Flanged	1/2" - 1"	Flanged	1"	C.S.	N/A	S.S.		X	X	X	X
19096MBP	Socket Weld	1/2" - 1"	Socket Weld	1"	C.S.	N/A	S.S.		X	X	X	X
820000	Threaded	1/2" - 2"	Threaded	1" - 2-1/2"	Bronze	N/A	Bronze					X
820000	Flanged	1" - 2"	Threaded	1" - 2-1/2"	Bronze	N/A	Bronze					X
2900	Flanged	1" - 8"	Flanged	2" - 10"	C.S.	S.S	S.S.				X	X
3900	Flanged	1" - 10"	Flanged	2" - 10"	C.S.	C.S.	S.S.		X	X	X	X
13900	Flanged	16" - 20"	Flanged	18" - 24"	C.S.	C.S.	S.S.				X	

NOTES: 1 For pressure and temperature ratings refer to color coded product sections. Flanged valves are provided with ASME standard flanges.
2 Flanged inlets are available with a selection of ASME facings. Refer to the color coded product sections for description.
3 Refer to the color coded product sections for optional materials that are available. Contact the factory for special material requirements.
4 Pressure relief valves are ASME approved for application of the appropriate code symbol stamp.

Pressure / Temperature Ranges

Valve Type	Type	Set Pressure Range (psig)	Temperature Range		NOTES
			Minimum °F (°C)	Maximum °F (°C)	
1900	Flanged	5-6250	-450 (-267)	1500 (815)	1
1900/P	Flanged	5-6000	90 (32)	850 (454)	1, 2
1982	Threaded	10-500	-20 (-28)	800 (426)	1
1982	Flanged	10-500	-20 (-28)	800 (426)	1
19000	Threaded	5-8000	-450 (-267)	1100 (593)	1
19000	Flanged	5-6250	-450 (-267)	1100 (593)	1
19000	Socket Weld	5-8000	-450 (-267)	1100 (593)	1
19096MBP	Threaded	50-2000	-300 (-184)	600 (315)	1
19096MBP	Flanged	50-2000	-300 (-184)	600 (315)	1
19096MBP	Socket Weld	50-2000	-300 (-184)	600 (315)	1
820000	Threaded	15-500	-20 (-28)	400 (204)	1, 3
820000	Flanged	15-500	-20 (-28)	400 (204)	1, 3
2900	Flanged	15-3750	-450 (-267)	1200 (648)	1
3900	Flanged	15-3750	-40 (-40)	505 (262)	1
13900	Flanged	50-300	250 (121)	550 (288)	1

NOTES: 1 Pressure and temperature ranges are limited by size, media, and materials. Refer to product section for specific pressure temperature ratings by size and material selections.

2 Used for steam and organic vapor applications only.

3 Used for liquid applications only.

How to Select a Spring Loaded or Pilot Operated Safety Relief Valve

The following guidelines should be followed when making a valve selection.

Step 1

Calculate the proper valve orifice area (Ac) requirements. Refer to Valve Sizing Section of this catalog or use **CONSOLIDATED** SRVS.6 Computer Assisted Sizing Program. Utilize the following information:

- Operating pressure
- Set pressure
- Operating temperature
- Relieving temperature
- Design temperature
- Type of fluid
- Required relieving capacity
- Allowable overpressure
  (Choose one)
  - ASME Section VIII, Single Valve (10% overpressure)
  - ASME Section VIII, Multiple Valve (16% overpressure)
  - ASME Section VIII, Fire Sizing (21% overpressure)
  - ASME Section I, Single Valve (3% overpressure) (1900/P1 & P3)
- Back pressure
  - constant
  - variable (built up or super-imposed)
- Gas and vapors
  - compressibility
  - molecular weight
  - density
  - ratio of specific heat
- Liquids
  - specific gravity
  - viscosity

Step 2

Based on calculated orifice size, determine which pressure relief valve will meet the orifice area requirements.

Step 3

For spring loaded valves determine if back pressure limits are exceeded and if a bellows is required.
If a bellows is required, you must select a 1900 flanged valve.

Step 4

For spring loaded valves check the operating pressure requirements against the valve set pressure requirements. If the operating pressure exceeds 90% of the set pressure, or if the differential is less than 25 psig, review the possibilities for need of a soft seat O-Ring. If an O-Ring seat is not acceptable, review the system and valve setting parameters to achieve proper differential pressure.

SRVS.6 Computer Assisted Sizing Program

SRVS.6 is a Windows-based sizing program for safety relief valves that can be used with the Windows operating systems. This software is also network compatible.

This program includes multi-lingual capability, the ability to save files in a standard Windows format, and the ability to print to any printer configured for the Windows system. The printout options for each valve selection include a detailed datasheet, a certified drawing showing dimensions, weight, materials, and the API designation, if applicable, and a calculation sheet showing the applicable formulae used in the area or capacity calculation. Each selected valve is completely configured to match the order entry configuration, as well as the nameplate designation. Other features making this program the easiest and most convenient sizing program available include the capabilities of copying tag numbers, editing the selected valve options, and resizing tag numbers.

This sizing program may be used for the sizing and selection of the 1900, 1982, 2900 MV, 2900 PV, 3900 MV, 3900 PV, 19000, and 820000 valve types. Available sizing methods include single fluid, gas or liquid, sizing at 10% overpressure, multi-fluid sizing at 10% overpressure, and fire-sizing based upon required capacity, vessel dimensions, or vessel area at 21% overpressure. If necessary, multiple valves may be selected for a single application, using the 16% overpressure factor for the low set valve. Diers (two phase flow) sizing per API 520, Part I, Appendix D, October 1999 is also included.

Included in this software are the checks for ASME Sec. VIII compliance, ASME B16.34 pressure temperature limits, API pressure and temperature limits (if applicable), O-Ring and bellows requirements, spring chart limitations, and steam chart correlations. The output will include noise and reaction force calculation values, outline dimensional drawing (installation dimensions), bill of materials for valve component parts, as well as detailed valve selection criteria.

An extensive help file is included with this software. Help text is provided for every field and form. In addition, technical information on Code requirements, applicable industry standards, and general catalog information is included.

The **CONSOLIDATED** SRVS.6 Computer Assisted Sizing Program may be obtained through your local Green Tag Center (GTC®) or from your **CONSOLIDATED** Sales Representative.

How to Order a 1900 Safety Relief Valve

Specification Sheet

Page ____ **of** ____
Requisition No. ______________________
Job No. ______________________
Date ______________________
Revised ______________________
By ______________________

General

1. Item Number:
2. Tag Number:
3. Service, Line or Equipment No:
4. Number Required:

Basis of Selection

5. Code:
☐ ASME Sec. I (1900/P series only)
☐ ASME Sec. III
☐ ASME Sec. VIII
☐ OTHER Specify:
6. Comply with API 526: ☐ YES ☐ NO
7. ☐ Fire ☐ OTHER Specify:
8. Rupture Disk: ☐ YES ☐ NO

Valve Design

9. Type: Safety Relief
10. Design: ☐ Conventional ☐ Bellows
☐ Closed Bonnet ☐ Yoke/Open Bonnet
☐ Metal Seat ☐ Resilient Seat
☐ API 527 Seat Tightness
☐ OTHER Specify:

Connections

11. Inlet Size: Rating: Facing:
Outlet Size: Rating: Facing:
12. ☐ OTHER Specify:

Materials

13. Body/Bonnet:
14. Guide/Rings:
15. Seat Material:
Metal:
Resilient:
16. Bellows:
17. Spring:
18. Comply with NACE MRO 175 ☐ YES ☐ NO
19. OTHER Specify:
20. Cap and Lever Selection
☐ Screwed Cap (Standard) ☐ Bolted Cap
☐ Plain Lever ☐ Packed Lever ☐ Gag
21. ☐ OTHER Specify:

Service Conditions

22. Fluid and State:
23. Required Capacity per Valve & Units:
24. Molecular Weight or Specific Gravity:
25. Viscosity at Flowing Temperature & Units:
26. Operating Pressure & Units:
27. Blowdown: ☐ Standard ☐ Other
28. Latent Heat of Vaporization & Units:
29. Operating Temperature & Units:
30. Relieving Temperature & Units:
31. Built-up Back Pressure & Units:
32. Superimposed Back Pressure & Units:
33. Cold differential Test Pressure & Units:
34. Allowable Overpressure in Percent or Units:
35. Compressibility Factor, Z:
36. Ratio of Specific Heats:

Sizing and Selection

37. Calculated Orifice Area (square inches):
38. Selected Orifice Area (square inches):
39. Orifice Designation (letter):
40. Manufacturer:
41. Model Number:
42. Vendor Calculations Required: ☐ YES ☐ NO

How to Order a 1982 or 19000 Safety Relief Valve

Specification Sheet

Page ______ **of** ______

Requisition No. ____________________

Job No. ____________________

Date ____________________

Revised ____________________

By ____________________

General

1. Item Number:
2. Tag Number:
3. Service, Line or Equipment No:
4. Number Required:

Basis of Selection

5. Code:
   - ☐ ASME Sec. III
   - ☐ ASME Sec. VIII
   - ☐ OTHER Specify:
6. ☐ Fire ☐ OTHER Specify:
7. Rupture Disk: ☐ YES ☐ NO

Valve Design

8. Type: Safety Relief
9. Design:
   - ☐ Metal Seat ☐ Resilient Seat
   - ☐ API 527 Seat Tightness
   - ☐ OTHER Specify:

Connections

10. Flanged
    - Inlet Size: Rating: Facing:
    - Outlet Size: Rating: Facing:
11. Threaded
    - Inlet ☐ MNPT ☐ FNPT
    - Outlet ☐ MNPT ☐ FNPT
12. ☐ OTHER Specify:

Materials

13. Base:
14. Bonnet:
15. Guide/Rings:
16. Seat Material:
    - Metal:
    - Resilient:
17. Spring:
18. Comply with NACE MRO 175 ☐ YES ☐ NO
19. OTHER Specify:
20. Cap and Lever Selection
    - ☐ Screwed Cap (Standard) ☐ Bolted Cap
    - ☐ Plain Lever ☐ Packed Lever ☐ Gag
21. ☐ OTHER Specify:

Service Conditions

22. Fluid and State:
23. Required Capacity per Valve & Units:
24. Molecular Weight or Specific Gravity:
25. Viscosity at Flowing Temperature & Units:
26. Operating Pressure & Units:
27. Blowdown: ☐ Standard ☐ Other
28. Latent Heat of Vaporization & Units:
29. Operating Temperature & Units:
30. Relieving Temperature & Units:
31. Built-up Back Pressure & Units:
32. Superimposed Back Pressure & Units:
33. Cold differential Test Pressure & Units:
34. Allowable Overpressure in Percent or Units:
35. Compressibility Factor, Z:
36. Ratio of Specific Heats:

Sizing and Selection

37. Calculated Orifice Area (square inches):
38. Selected Orifice Area (square inches):
39. Orifice Designation (letter):
40. Manufacturer:
41. Model Number:
42. Vendor Calculations Required: ☐ YES ☐ NO

How to Order an 820000 Safety Relief Valve

Specification Sheet

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Requisition No. ____________________

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Date ____________________

Revised ____________________

By ____________________

General

1. Item Number:
2. Tag Number:
3. Service, Line or Equipment No:
4. Number Required:

Basis of Selection

5. Code:
   ☐ ASME Sec. VIII
   ☐ OTHER Specify:
6. ☐ OTHER Specify:
7. Rupture Disk: ☐ YES ☐ NO

Valve Design

8. Type: Safety Relief
9. Design:
   ☐ API 527 Seat Tightness
   ☐ OTHER Specify:

Connections

10. Flanged
    Inlet Size: Rating: Facing:
11. Threaded
    Inlet - MNPT
    Outlet - FNPT

Materials

12. Body/Bonnet: Bronze
13. Guide: Bronze
14. Seat Material: Bronze
15. Spring: 17-7 PH
16. Cap and Lever Selection
    ☐ Screwed Cap (Standard)
    ☐ Plain Lever ☐ Packed Lever ☐ Gag
17. ☐ OTHER Specify:

Service Conditions

18. Fluid and State:
19. Required Capacity per Valve & Units:
20. Molecular Weight or Specific Gravity:
21. Viscosity at Flowing Temperature & Units:
22. Operating Pressure & Units:
23. Blowdown: ☐ Standard ☐ Other
24. Latent Heat of Vaporization & Units:
25. Operating Temperature & Units:
26. Relieving Temperature & Units:
27. Built-up Back Pressure & Units:
28. Superimposed Back Pressure & Units:
29. Cold differential Test Pressure & Units:
30. Allowable Overpressure in Percent or Units:
31. Compressibility Factor, Z:
32. Ratio of Specific Heats:

Sizing and Selection

33. Calculated Orifice Area (square inches):
34. Selected Orifice Area (square inches):
35. Orifice Designation (letter):
36. Manufacturer:
37. Model Number:
38. Vendor Calculations Required: ☐ YES ☐ NO

How to Order a 2900 POSRV

POSRV Specification Sheet

Page ______ **of** ______

Requisition No. ____________________

Job No. ____________________

Date ____________________

Revised ____________________

By ____________________

General

1. Item Number:
2. Tag Number:
3. Service, Line or Equipment No:
4. Number Required:

Basis of Selection

5. Code: ASME VIII Stamp Required: ☐ YES ☐ NO
   ☐ OTHER Specify
6. Comply with API 526: ☐ YES ☐ NO
7. ☐ Fire ☐ OTHER Specify:
8. Rupture Disk: ☐ YES ☐ NO

Valve Design, Pilot

9. Design Type: Pilot
10. Number of Pilots:
11. Pilot Action: ☐ Pop ☐ Modulating
12. Pilot Sense: ☐ Internal ☐ Remote[Note 1]
13. Seat Type: Resilient
14. Seat Tightness: ☐ API 527 ☐ OTHER
    ☐ Specify:
15. Pilot Vent: ☐ Atmosphere ☐ Outlet
    ☐ OTHER Specify:

Valve Design, Main Base

16. ☐ Metal Seat ☐ Resilient Seat
17. Bellows: ☐ YES ☐ NO

Connections

18. Inlet Size: Rating: Facing:
19. Outlet Size: Rating: Facing:
20. ☐ OTHER Specify:

Materials, Main Valve

21. Body:
22. Nozzle:
23. Seat O-Ring:
24. Disc:
25. Piston Seal:
26. Other O-Rings:
27. Guide:
28. Cover Plate:

Materials, Pilot

29. Body/Bonnet:
30. Internals:
31. Seals:
32. Tubing/Fittings:
33. Spring:
34. Comply with NACE MR0175: ☐ YES ☐ NO
35. ☐ OTHER Specify:

Accessories

36. External Filter: ☐ YES ☐ NO
37. Lifting Lever: N/A
38. Field Test Connection: ☐ YES ☐ NO
39. Backflow Preventer: ☐ YES ☐ NO
40. Manual Blowdown Valve: ☐ YES ☐ NO
41. Heat Exchanger (For High and Low Temperature Applications):
    ☐ YES ☐ NO
42. Dirty Service: ☐ YES ☐ NO
43. ☐ OTHER Specify:

Service Conditions

44. Fluid and State:
45. Required Capacity per Valve & Units:
46. Molecular Weight or Specific Gravity:
47. Viscosity at Flowing Temperature & Units:
48. Operating Pressure & Units:
49. Blowdown: ☐ Standard ☐ Other
50. Latent Heat of Vaporization & Units:
51. Operating Temperature & Units:
52. Relieving Temperature & Units:
53. Built-up Back Pressure & Units:
54. Superimposed Back Pressure & Units:
55. Cold differential Test Pressure & Units:
56. Allowable Overpressure in Percent or Units:
57. Compressibility Factor, Z:
58. Ratio of Specific Heats:

Sizing and Selection

59. Calculated Orifice Area (square inches):
60. Selected Orifice Area (square inches):
61. Orifice Designation (letter):
62. Manufacturer:
63. Model Number:
64. Vendor Calculations Required: ☐ YES ☐ NO

Heat Exchanger

65. Sizing Required:
66. Back Pressure Restrictions on Temperature:
67. Set Pressure (psig):
68. Specific Volume of Media at Inlet Conditions (ft3/lbm):
69. Entropy of Media at Inlet Conditions (btu/lbm*°R):
70. Temperature of Ambient Air (°F) (Min./Max.):
71. Media Temperature Before it Enters the Heat Exchanger (°F):

Remote Sensing

72. Sizing Required:
73. Set Pressure (psig):
74. Orifice Selection:
75. Fluid Density of Media in the condensed State (lbm/ft3):
76. Length of Sensing Line (ft)[NOTE 1]:
77. Equivalent Length of Sensing Line for Valves, Elbows, Tees, etc.:
78. Total Change in Height (ft):

Notes:

1 To assure proper valve operation when pilot is remotely sensed use 3/8" diameter tubing for lengths up to ten feet. Contact factory for proper size of tubing when sensing line exceeds ten feet.

How to Order a 3900 POSRV

POSRV Specification Sheet

Page _____ **of** _____

Requisition No. ______________________

Job No. ______________________

Date ______________________

Revised ______________________

By ______________________

General

1. Item Number:
2. Tag Number:
3. Service, Line or Equipment No:
4. Number Required:

Basis of Selection

5. Code: ASME VIII Stamp Required: ☐ YES ☐ NO
   ☐ OTHER Specify
6. Comply with API 526: ☐ YES ☐ NO
7. ☐ Fire ☐ OTHER Specify:
8. Rupture Disk: ☐ YES ☐ NO

Valve Design

9. Design Type: Pilot
10. Number of Pilots:
11. Pilot Action: ☐ Pop ☐ Modulating
12. Pilot Sense: ☐ Internal ☐ Remote[NOTE 1]
13. Seat Type: Resilient
14. Seat Tightness: ☐ API 527 ☐ OTHER ☐ Specify:
15. Pilot Vent: ☐ Atmosphere ☐ Outlet
    ☐ OTHER Specify:

Connections

16. Inlet Size: Rating: Facing:
17. Outlet Size: Rating: Facing:
18. ☐ OTHER Specify:

Materials, Main Valve

19. Body:
20. Nozzle:
21. Seat O-Ring:
22. Disc:
23. Disc Seal:
24. Other O-Rings:
25. Guide:
26. Cover Plate:

Materials, Pilot

27. Body/Bonnet:
28. Internals:
29. Seat: Seals:
30. Tubing/Fittings:
31. Spring:
32. Comply with NACE MR0175: ☐ YES ☐ NO
33. ☐ OTHER Specify:

Accessories

34. External Filter: ☐ YES ☐ NO
35. Lifting Lever: N/A
36. Field Test Connection: ☐ YES ☐ NO
37. Backflow Preventer: ☐ YES ☐ NO
38. Manual Blowdown Valve: ☐ YES ☐ NO
39. Dirty Service: ☐ YES ☐ NO
40. ☐ OTHER Specify:

Service Conditions

41. Fluid and State:
42. Required Capacity per Valve & Units:
43. Molecular Weight or Specific Gravity:
44. Viscosity at Flowing Temperature & Units:
45. Operating Pressure & Units:
46. Blowdown: ☐ Standard ☐ Other
47. Latent Heat of Vaporization & Units:
48. Operating Temperature & Units:
49. Relieving Temperature & Units:
50. Built-up Back Pressure & Units:
51. Superimposed Back Pressure & Units:
52. Cold differential Test Pressure & Units:
53. Allowable Overpressure in Percent or Units:
54. Compressibility Factor, Z:
55. Ratio of Specific Heats:

Sizing and Selection

56. Calculated Orifice Area (square inches):
57. Selected Orifice Area (square inches):
58. Orifice Designation (letter):
59. Manufacturer:
60. Model Number:
61. Vendor Calculations Required: ☐ YES ☐ NO

Notes:

1 To assure proper valve operation when pilot is remotely sensed use 3/8" diameter tubing for lengths up to ten feet. Contact factory for proper size of tubing when sensing line exceeds ten feet.

How to Order a 13900 POSRV

POSRV Specification Sheet

Page _____ **of** _____

Requisition No. ______________________

Job No. ______________________

Date ______________________

Revised ______________________

By ______________________

General

1. Number of Valves:
2. Size of Valve Inlet:
3. Type Number of Valve:
4. CONSOLIDATED Manufacturer:
5. Body Material:
6. Trim Material (if any other than standard is required):

7. O-Ring Seat Material
8. Set Pressure:
9. Operating Temperature and Relieving Temperature:

10. Back Pressure, if any (indicate if Constant or Variable):

11. Required Capacity:
12. Lading Fluid:
13. Allowable Overpressure:
14. Density
    a) Vapor - molecular weight
    b) Gases - specific gravity (air = 1)

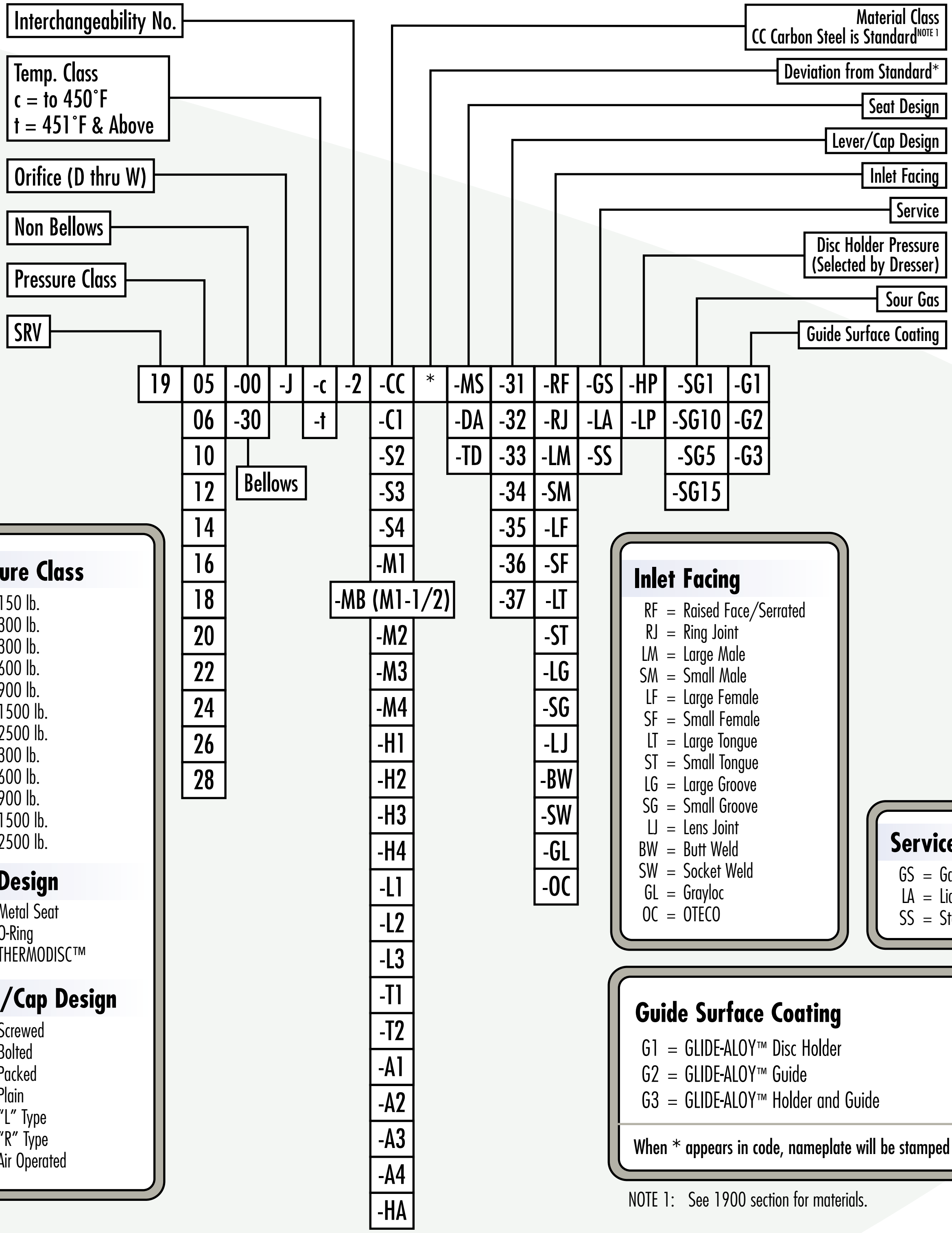
Other

15. Code marking required
    a) ASME Unfired Pressure Vessel Code

Notes:

1900 Flanged Valve Coding

Customer orders for CONSOLIDATED safety relief valves are acknowledged by a computer printout of our internal code. We have supplied the following information for your easy interpretation of this coding.



Pressure Class

05 = 150 lb.
06 = 300 lb.
10 = 300 lb.
12 = 600 lb.
14 = 900 lb.
16 = 1500 lb.
18 = 2500 lb.
20 = 300 lb.
22 = 600 lb.
24 = 900 lb.
26 = 1500 lb.
28 = 2500 lb.

Seat Design

MS = Metal Seat
DA = O-Ring
TD = THERMODISC™

Lever/Cap Design

31 = Screwed
32 = Bolted
33 = Packed
34 = Plain
35 = "L" Type
36 = "R" Type
37 = Air Operated

Inlet Facing

RF = Raised Face/Serrated
RJ = Ring Joint
LM = Large Male
SM = Small Male
LF = Large Female
SF = Small Female
LT = Large Tongue
ST = Small Tongue
LG = Large Groove
SG = Small Groove
LJ = Lens Joint
BW = Butt Weld
SW = Socket Weld
GL = Grayloc
OC = OTECO

Service

GS = Gas
LA = Liquid
SS = Steam

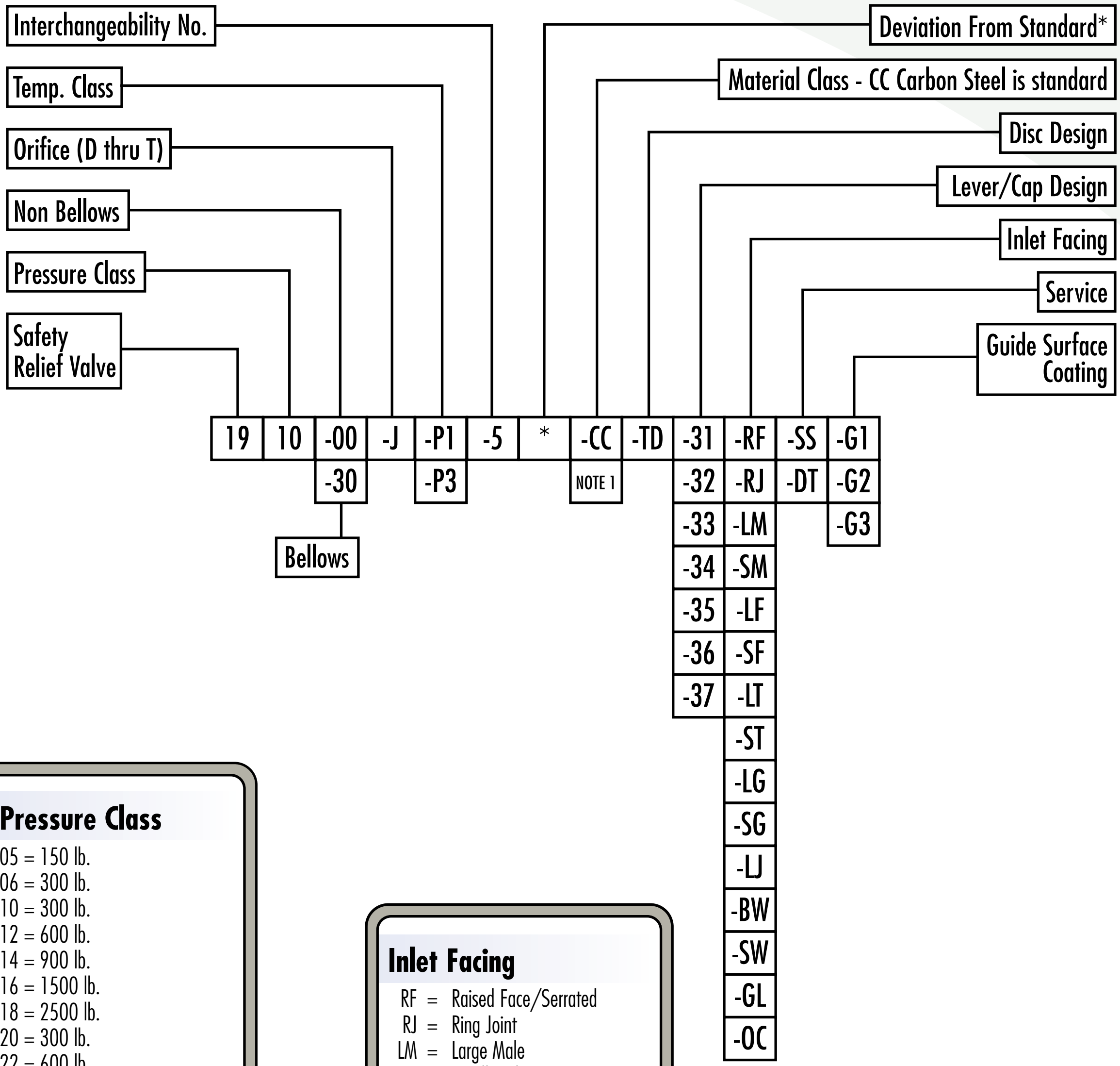
Guide Surface Coating

G1 = GLIDE-ALOY™ Disc Holder
G2 = GLIDE-ALOY™ Guide
G3 = GLIDE-ALOY™ Holder and Guide

When * appears in code, nameplate will be stamped SPEC.

NOTE 1: See 1900 section for materials.

1900/P1, P3 Valve Coding



Pressure Class

05 = 150 lb.
06 = 300 lb.
10 = 300 lb.
12 = 600 lb.
14 = 900 lb.
16 = 1500 lb.
18 = 2500 lb.
20 = 300 lb.
22 = 600 lb.
24 = 900 lb.
26 = 1500 lb.
28 = 2500 lb.

Disc Design

TD = Thermodisc™

Lever/Cap Design

31 = Screwed
32 = Bolted
33 = Packed
34 = Plain
35 = "L" Type
36 = "R" Type
37 = Air Operated

Inlet Facing

RF = Raised Face/Serrated
RJ = Ring Joint
LM = Large Male
SM = Small Male
LF = Large Female
SF = Small Female
LT = Large Tongue
ST = Small Tongue
LG = Large Groove
SG = Small Groove
LJ = Lens Joint
BW = Butt Weld
SW = Socket Weld
GL = Grayloc
OC = OTECO

Service

SS = Steam
DT = Dowtherm

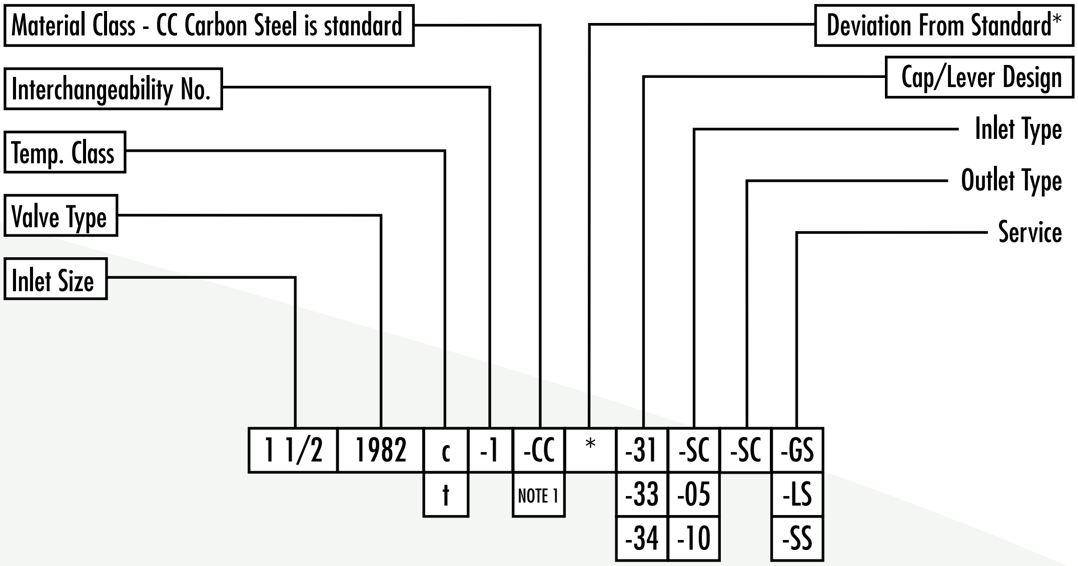
Guide Surface Coating

G1 = GLIDE-ALOY™ Disc Holder
G2 = GLIDE-ALOY™ Guide
G3 = GLIDE-ALOY™ Holder and Guide

When * appears in code, nameplate will be stamped SPEC.

NOTE 1: For other special material requirements, contact factory.

1982 Valve Coding



Temperature Class

400°F & Below = c
401°F & Above = t

Cap/Lever Design

31 = Screwed Cap
33 = Packed
34 = Plain

Inlet Type

SC = Screwed
05 = 150# R.F.
10 = 300# R.F.

Outlet Type

SC = Screwed

Service

GS = Gas
LS = Liquid
SS = Steam

When * appears in code, nameplate will be stamped SPEC.

NOTE 1: For other special material requirements, contact factory.

19000 Valve Coding

Inlet Size	SRV	Orifice Size (Decimal)	Pressure Range	Temperature Class c = 800˚F & Below t = 801˚F & Above	Temperature Range Variations	Interchangeability No.	Material - CC Carbon Steel is standard[NOTE 1]	Deviation From Standard*	Seat Type	Cap/Lever	Inlet Type	Outlet Type	Service	Surface Coating	Back Pressure Design
1-1/2	19	357	L	c	D	-2	-CC	*	-MS	-31	-FT	-FT	-LA	-G1	-BP
1/2		096	M	t	E		-S2		-DA	-33	-MT	-MT	-GS	-G2	
3/4		110	H		F		-S3		-DL	-34	-SW	-SW		-G3	
1		126	P		G		-S4				-BW	-05			
2		226			H		-M1				-05	-10			
		567			0		-MB				-10	-25			
							-M2				-12	-20			
							-M3				-14	-PF			
							-M4				-16				
							-H1				-18				
							-H2				-25				
							-H3				-20				
							-H4				-22				
							-SG				-24				
							-PF				-26				
							-A1				-28				
							-A2				-PF				
							-A3								
							-A4								
							-C1								

Press. Range - psig

L = 5 - 290
M = 291 - 2000
H = 2001 - 8000
P = 15 - 300(PF)

Temp. Range Variations

D = 250°F & Below (PF)
E = 251°F & Above (PF)
F = All Temps. (MS)
G = 251°F & Above (MS)
H = 251°F & Above (MS/SG)
0 = DA (Soft Seat)

Seat Type

MS = Metal Seat
DA = Soft Seat
DL = NOTE 1

Cap/Lever

31 = Screwed
33 = Packed
34 = Plain

Inlet Type

FT = Female NPT
MT = Male NPT
SW = Socket Weld
BW = Butt Weld
05 = 150# R.F.
10 = 300# R.F.
12 = 600# R.F.
14 = 900# R.F.
16 = 1500# R.F.
18 = 2500# R.F.
25 = 150# R.J.
20 = 300# R.J.
22 = 600# R.J.
24 = 900# R.J.
26 = 1500# R.J.
28 = 2500# R.J.
PF = Sanitary Fitting (Max. Press. B/P 400psig)[NOTE 2]

NOTES: 1 Soft seat low pressure liquid service 100 psig and below except .110 Sq. In. Orifice.
2 PF design is for clean service applications and is fully described in separate catalog number SRVPF-2.

Outlet Type

FT = Female NPT
MT = Male NPT
SW = Socket Weld
05 = 150# R.F.
10 = 300# R.F.
25 = 150# R.J.
20 = 300# R.J.
PF = Sanitary Fitting[NOTE 2]

Service

GS = Gas
Air
LA = Liquid Service

Surface Coating

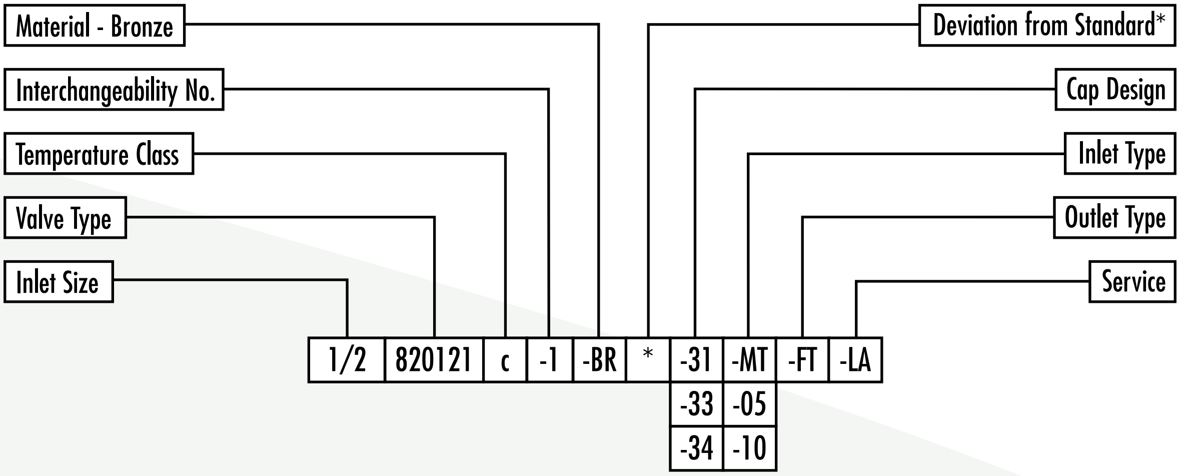
G1 = GLIDE ALOY™ Holder
G2 = GLIDE ALOY™ Guide
G3 = GLIDE ALOY™ Holder & Guide

Back Pressure Design

Med. Pressure
50 - 2000 psig
Max. B/P 400 psig

When * appears in code, nameplate will be stamped SPEC.

820000 Valve Coding



Inlet Size/Valve Type

1/2 = 820121
3/4 = 820121
3/4 = 820216
1 = 820216
1 = 820332
1-1/4 = 820332
1-1/2 = 820857
2 = 820857

Temperature Class

c = 400°F & Below

Material

BR = Bronze

Cap Design

31 = Screwed Cap
33 = Packed
34 = Plain

Inlet Type

MT = Male NPT
05 = 150# RF
10 = 300# RF

Outlet Type

FT = Female NPT

Service

LA = Liquid

When * appears in code, nameplate will be stamped SPEC.

* Special materials
(Contact factory for availability).

2900 POSRV Main Valve Coding

Customer orders for **Consolidated** safety relief valves are acknowledged by a computer printout of our internal code. We have supplied the following information for your easy interpretation of this coding.

SRV	29	
Pressure Class	10	
Non Bellows	-00	
Bellows	-30	
Orifice (D thru W)	J	
Interchangeability Number	-1	
Material Class CC Carbon Steel is standard[NOTE 1]	-CC	-A1 -A2 -A4 -C1 -D1 -D2 -D4 -H1 -H2 -H4 -L1 -L2 -L3 -M1 -MB -M2 -M4 -S2 -S4 -T1
Deviation from Standard*	*	
Seat Design	-MS	-DA -TD
Piston O-Ring Material (DA Seat Material Same)	-B	-V -E -K -T
Inlet Facing	-RF	-RJ -LM -SM -LF -SF -LT -ST -LG -SG -LJ -BW -SW -GL -OC
Service	-GS	-LA -SS
Sensing	-RS	-SR
Guide Surface Coating	-G1	-G2 -G3 -M7 -M8 -M9
Heat Exchanger	-HH	-HL
Sour Gas	-SG	

Pressure Class

05 = 150 lb.
06 = 300 lb.
10 = 300 lb.
12 = 600 lb.
14 = 900 lb.
16 = 1500 lb.
18 = 2500 lb.
20 = 300 lb.
22 = 600 lb.
24 = 900 lb.
26 = 1500 lb.
28 = 2500 lb.

Seat Design

MS = Metal Seat
DA = O-Ring
TD = THERMODISC™

Inlet Facing

RF = Raised Face/Serrated
RJ = Ring Joint
LM = Large Male
SM = Small Male
LF = Large Female
SF = Small Female
LT = Large Tongue
ST = Small Tongue
LG = Large Groove
SG = Small Groove
LJ = Lens Joint
BW = Butt Weld
SW = Socket Weld
GL = Grayloc
OC = Oteco

Heat Exchanger

HH = Media is 506°F or above
HL = Media is -41°F or below

When * appears in code, nameplate will be stamped SPEC.

Service

GS = Gas
LA = Liquid
SS = Steam

Sensing

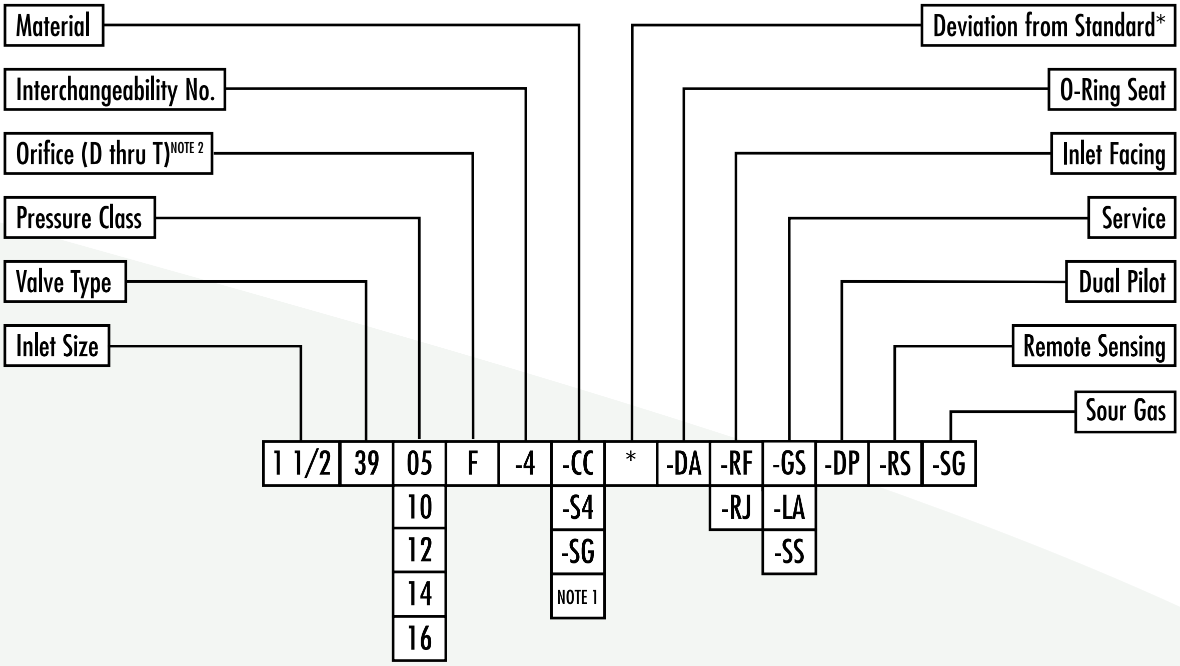
RS = Remote Sensing
SR = Sensing Ring

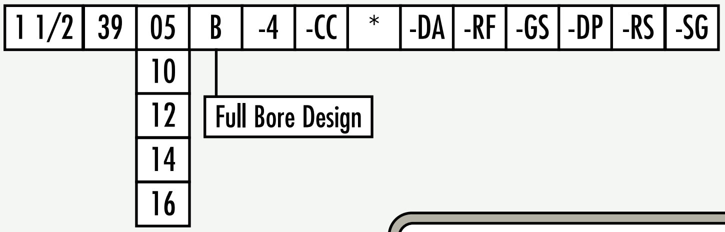
Guide Surface Coating

G1 = GLIDE-ALOY™ Disc Holder and Piston
G2 = GLIDE-ALOY™ Guide and Cover Plate
G3 = GLIDE-ALOY™ Disc Holder, Piston, Guide and Cover Plate
M7 = Mellonite Disc Holder and Piston
M8 = Mellonite Guide and Cover Plate
M9 = Mellonite Disc Holder, Piston, Guide, and Cover Plate

NOTE 1: See 2900 section for materials.

3900 POSRV Main Valve Coding





Pressure Class

05 = 150 Class
10 = 300 Class
12 = 600 Class
14 = 900 Class
16 = 1500 Class

When * appears in code, nameplate will be stamped SPEC.

Material

CC = Standard Material
S4 = Entirely 316 Stainless Steel
C1 = LCC Base and 316 Stainless Steel Cover Plate
SG = Sour Gas
M1 = Monel Wetted
M4 = Entirely Monel
H1 = Hastelloy Wetted
H4 = Entirely Hastelloy
D1 = Duplex Wetted (Consult Factory)
D4 = Entirely Duplex (Consult Factory)
A1 = Alloy 20 Wetted
A4 = Entirely Alloy 20

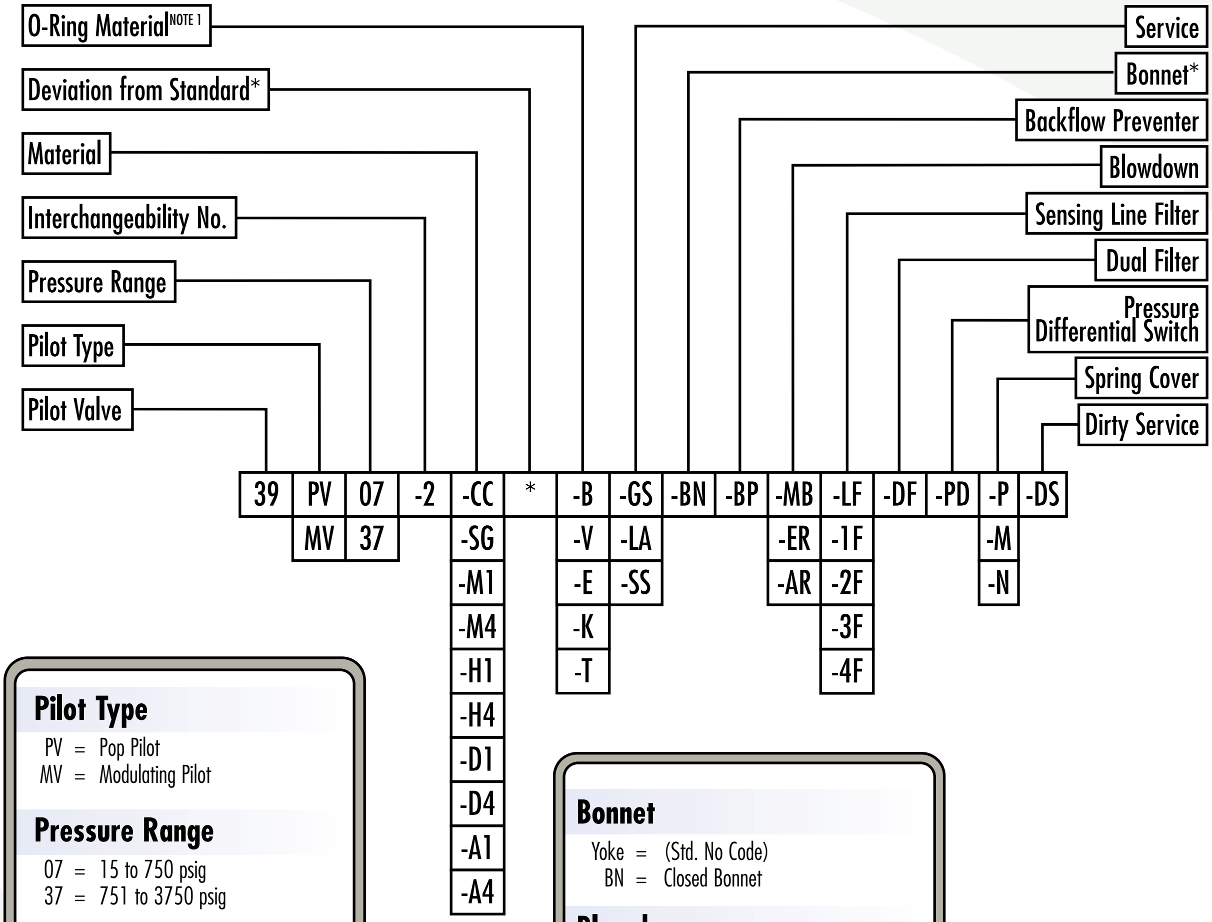
Service

GS = Gas
LA = Liquid
SS = Steam

NOTES: 1 For other special material requirements contact factory
2 Orifice D thru T are standard bore. Inlet Sizes 1-1/2" thru 10".

POSRV Pilot Valve Coding

39PV & 39MV pilots are the actuating mechanisms available for valve designs 2900 and 3900



Pilot Type

PV = Pop Pilot
MV = Modulating Pilot

Pressure Range

07 = 15 to 750 psig
37 = 751 to 3750 psig

Material

A1 = Alloy 20 Wetted
A4 = Entirely Alloy 20
CC = Standard Material
SG = Sour Gas
M1 = Monel Wetted
M4 = Entirely Monel
H1 = Hastelloy C Wetted
H4 = Entirely Hastelloy C
D1 = Duplex Wetted (Consult Factory)
D4 = Entirely Duplex (Consult Factory)

O-Ring Material

B = Buna N (Nitrile)
V = Viton
E = Ethylene Propylene
K = Kalrez
T = Teflon

Service

GS = Gas
LA = Liquid
SS = Steam

Bonnet

Yoke = (Std. No Code)
BN = Closed Bonnet

Blowdown

MB = Manual Blowdown
ER = Electronic Remote
AR = Air Remote

Sensing Line Filter

LF = Line Filter (Std)

Aux. Hi Capacity Filter Option

1F = Carbon Steel
2F = Stainless Steel
3F = Carbon Steel w/ Flush Valve
4F = Stainless Steel w/ Flush Valve

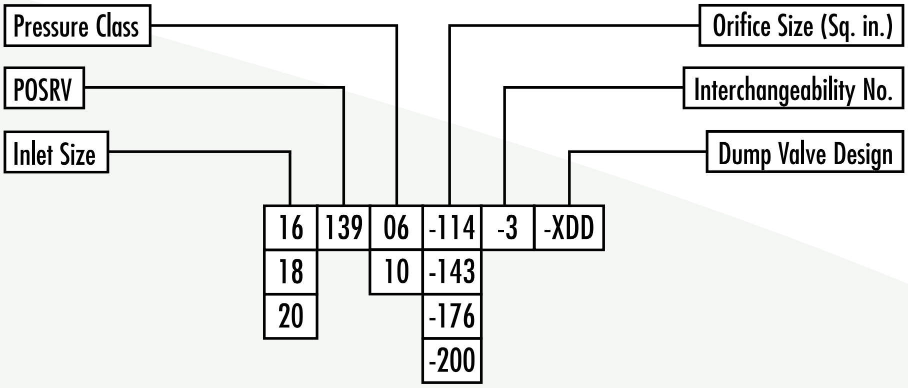
Spring Cover

P = Peek
M = Metal
N = None

When * appears in code, nameplate will be stamped SPEC.

NOTE 1: See 2900 section for special materials for pilot valves

13900 POSRV Valve Coding



As a leading provider of pressure relief valve solutions, **Consolidated** offers world-class global aftermarket services. The global aftermarket program is designed to provide consistent and exceptional repair services, technical training, field support, spare parts production and management, complete equipment replacement, and comprehensive diagnostic services. This global support network consists of Green Tag Centers (GTC®), and **Consolidated** field service technicians that provide OEM experience, knowledge and technology to support all of your MRO needs worldwide, including hands-on training and on-site support.

The **Consolidated** aftermarket service program offers complete services for pressure relief valve products, including on-site installation and start-up, predictive and preventative maintenance programs, equipment testing, rebuilding and trouble-shooting, and complete valve turn-around management. The program also includes on-site inventory planning, diagnostic data interpretation services, on-site machining, field retrofitting, and hands-on training. **Consolidated** aftermarket service support is accessible 24 hours a day and seven days a week year round.

OEM Parts - **Consolidated** fully understands that quick response in obtaining replacement parts and overhaul services is a critical factor in maintaining a smooth operating plant. As a result, WE have placed extremely high importance on this customer need within our global aftermarket program.

Service Parts Inventory Philosophy - **Consolidated's** formulated service parts inventory philosophy is designed to provide prompt valve service capability, thus preventing extended maintenance downtime. Your **Consolidated** sales representative or local Green Tag Center can assist you in developing an optimum inventory plan to fit your company's inventory needs.

Consolidated also provides integrated programs, using tools such as "Avert®" to help manage the support of your installed equipment. These programs are location specific and include plant surveys, data management, scheduling and planning of maintenance, repairs, and overhauls. Historical data and trends can be managed using an asset management system to maximize efficiency of overall equipment support. In addition, **Consolidated** has developed advanced diagnostic tools and services that also assist in the prevention of unexpected or unnecessary maintenance, repair, or overhaul. Available diagnostic tools include the Electronic Valve Tester (EVT®) for pressure relief valves. Diagnostic services include the on-site application of these highly advanced tools by fully trained technicians.

Consolidated® Operations

"The Total Solutions Provider"

Call 1-800-245-VALV for service in the Americas, or contact the nearest Dresser Sales Office for international service and support.

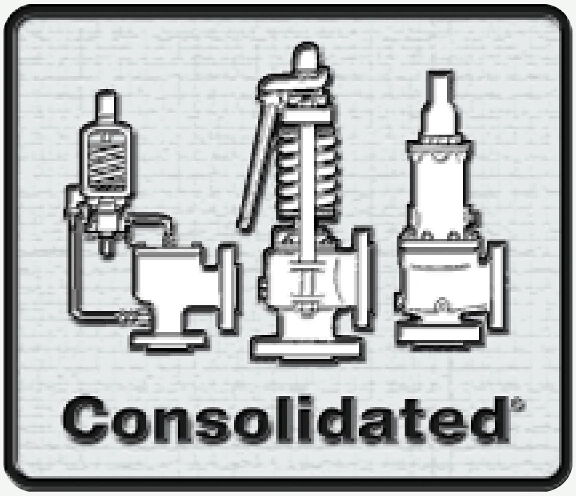
Safety Relief Valve Maintenance Training

CONSOLIDATED Safety Relief Valves are called upon to open and reliever pressure automatically, even after they have been closed for long periods of time. Are you comfortable with the maintenance and repair as it is currently practiced in your shop? Does your inspection department know what to look for to determine if a pressure relief valve needs attention? You check to determine if the valves leak when installed. But, will your valves close after the system reaches overpressure? Will the Valve Disc reach full lift and relieve the required capacity?

CONSOLIDATED's three day ***Safety Relief Valve Maintenance Training Seminars*** are available in the Alexandria, Louisiana Training Center, or at your plant site.

Two-day ***Engineering Sizing and Selection Seminars*** are also available for **CONSOLIDATED** products.

For additional information concerning Training Seminars please contact the **CONSOLIDATED** Training Manager at (318) 640-6054 or by fax at (318) 640-6041.



In-house Review

1900

Safety Relief Valve

Consolidated®

Table of Contents

Introduction

The comprehensive line of spring loaded Consolidated safety relief valves represents over one hundred years of valve manufacturing experience in meeting and solving industry problems involving a wide scope of valve applications.

The flanged Consolidated safety relief valve line consists of valves in a variety of sizes and materials. Each product offering is unique and judgements are required in selecting the proper option.

To accomplish the selection process start with the General Information section of this catalog and follow the prescribed steps necessary to finalize the selection.

This Section, 1900 SRV, should be reviewed against the user's specifications and product offerings selected. Beyond this step, proceed with sizing and then confirmation of the pressure and temperature limits (API or ASME).

1900 Flanged Series safety relief valves are supplied in many variations to suit specific applications.

Product variations covered in subsequent pages are noted below:

Product Variation	Description
1900	Conventional
1900-30	Bellows Construction
1900-35	Balanced Bellows with Auxiliary Balancing Piston
1900HA	Special Materials for Hydrofluoric Acid Service
1900SG	Sour Gas Trim
1900DA	Soft Seat
1900LA	Liquid Trim with Metallic Seats
1900DA-LA	Liquid Trim with Soft Seats
1900TD	Special Trim for Steam & Organic Heat Transfer Media

The Consolidated 1900 series is compliant with the following codes and standards:

ASME B & PVC, Section II - Material (Applicable as required by ASME B & PVC, Section III or VIII)

ASME B & PVC, Section III, class 2 and 3 (Gas, Vapor, and Liquid Service)

ASME B & PVC, Section VIII (Gas, Vapor, and Liquid Service)

ASME B16.34 and ASME B16.5

API 520, 526 and 527

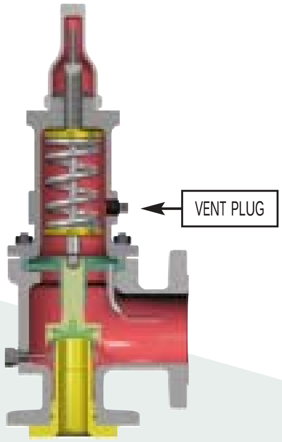
ISO 4126

NACE MR0175 Standard Material Requirements

API Standard 526-1995

Safety relief valves specified within this catalog comply with API standard 526 - Fourth Edition, 1995. The 1900 Series valves previously complied with API standard 526 - Third Edition, 1984. In some cases dimensional and nominal flanges sizes differ between these two editions. When ordering replacement valves that must comply with API Standard 526 - Third Edition, 1984, contact the factory for verification of the correct replacement.

1900 Series Overview



Type 1900 Series

Conventional

1900 Series Conventional Safety Relief Valves

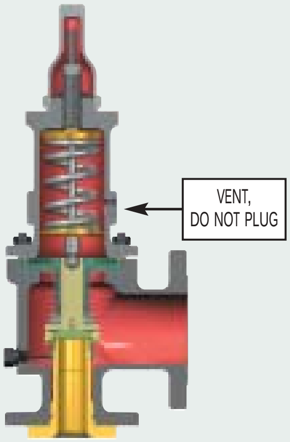
Steel, Flat Seat, Top Guided, High Capacity, Stainless Steel Trim

This standard rugged configuration is equipped with corrosion resistant trim and a carbon steel body, bonnet and cap. The components are top guided, providing for free and repeatable action.

The flat disc seat provides for easy maintenance and remachining.

The exclusive "Eductor Tube" minimizes bonnet cavity pressure so that product performance is predictable.

The nozzle is bottom inserted and rigidly held in position, providing a corrosion resistant path of flow to the valve and corrosion resistant seating surfaces.



Type 1900-30 Series

Balanced Bellows

1900-30 Series Bellows Construction

This valve is the same as the conventional design except that a bellows has been added. When the bellows is installed, the eductor tube is removed.

Caution: It is important that the bonnet be vented to the atmosphere.

A bellows is added to the conventional valve to deal with any of several situations:

(1) Back pressure entering the valve through the valve outlet is excessive or variable. If back pressure fluctuates with ±10% of a nominal value, a bellows is required.

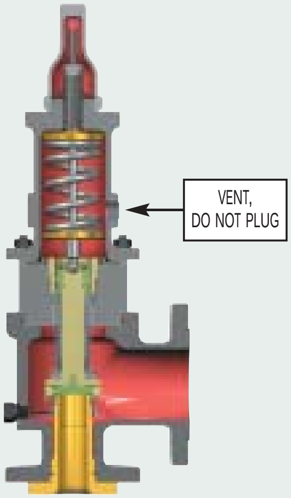
If a built up back pressure exceeds 10% of the set pressure or cold differential set pressure, a bellows must be used.

(2) If the entering fluid is a slurry, highly viscous, or of a nature that it can enter the critical clearances between the guides/disc holder, protect that area with a bellows.

(3) If the fluid being handled is corrosive to the upper works of the valve, isolate the bonnet chamber through use of a bellows.

Conventional valves can be easily converted to a bellows design or vice versa through the use of retrofit kits.

All Consolidated 1900-30 Series valves are balanced bellows designs, meaning that they fully compensate for the effects of back pressure.



Type 1900-35 Series

Balanced Bellows
with Auxiliary Balancing Piston

1900-35 Series Balanced Bellows (with Auxiliary Balancing Piston)

The Balanced Bellows seals the body and fluid stream from the bonnet and working parts. Auxiliary balancing piston assures proper valve performance by compensating for back pressure in case of bellows failure.

The use of an auxiliary balanced piston is indicated when:

(1) back pressure (either constant or variable) exists and;

(2) excessive pressure may build in the bonnet as a result of pressure build-up in the bonnet vent piping and;

(3) resultant build-up of pressure in the bonnet would cause a dangerous condition.

Caution: It is important that the bonnet be vented to the atmosphere.

NOTE: Unless otherwise stated the valve is always supplied with a screwed cap. The exception to this would be where ASME B & PVC, Section VIII requires levers for steam, air, and hot water service over 140°F.

Refer to Accessories for available types of caps, levers, and accessories.

1900 Series Overview

	1900 & 1900-30 Inlet x Outlet Size Combinations (in.) Orifice Area (sq. in.)				Inlet Flange Rating ASME B16.5	Outlet Flange Rating ASME B16.5
ASME API ORIFICE	0.1279 0.110 D	0.2279 0.196 E	0.3568 0.307 F	0.5849 0.503 G		
1905	1 x 2	1 x 2	1-1/2 x 2	1-1/2 x 3	150	150
1906	1 x 2	1 x 2	1-1/2 x 2	1-1/2 x 3	300	
1910	1 x 2	1 x 2	1-1/2 x 2	1-1/2 x 3	300	
1912	1 x 2	1 x 2	1-1/2 x 2	1-1/2 x 3	600	
1914	1-1/2 x 2	1-1/2 x 2	1-1/2 x 3	1-1/2 x 3	900	300
1916	1-1/2 x 2	1-1/2 x 2	1-1/2 x 3	2 x 3	1500	
1918	1-1/2 x 3	1-1/2 x 3	1-1/2 x 3	2 x 3	2500	
1920	1 x 2	1 x 2	1-1/2 x 2	1-1/2 x 3	300	150
1922	1 x 2	1 x 2	1-1/2 x 2	1-1/2 x 3	600	
1923	—	—	—	—	—	
1924	1-1/2 x 2	1-1/2 x 2	1-1/2 x 3	1-1/2 x 3	900	300
1926	1-1/2 x 2	1-1/2 x 2	1-1/2 x 3	2 x 3	1500	
1928	1-1/2 x 3	1-1/2 x 3	1-1/2 x 3	2 x 3	2500	

	1900 & 1900-30 Inlet x Outlet Size Combinations (in.) Orifice Area (sq. in.)												Inlet Flange Rating ASME B16.5	Outlet Flange Rating ASME B16.5
ASME API ORIFICE	0.9127 0.785 H	1.496 1.287 J	2.138 1.838 K	3.317 2.853 L	4.186 3.6 M	5.047 4.34 N	7.417 6.38 P	12.85 11.05 Q	18.6 16 R	30.21 26 T	50.26 N/A V	78.996 N/A W		
1905	1-1/2 x 3	2 x 3	3 x 4	3 x 4	4 x 6	4 x 6	4 x 6	6 x 8	6 x 8	8 x 10	10 x 14	12 x 16	150	150
1906	1-1/2 x 3	2 x 3	3 x 4	3 x 4	4 x 6	4 x 6	4 x 6	6 x 8	6 x 8	8 x 10	10 x 14	12 x 16	300	
1910	2 x 3	3 x 4	3 x 4	4 x 6	4 x 6	4 x 6	4 x 6	6 x 8	6 x 10	8 x 10	10 x 14	12 x 16	300	
1912	2 x 3	3 x 4	3 x 4	4 x 6	4 x 6	4 x 6	4 x 6	6 x 8	6 x 10	—	—	—	600	
1914	2 x 3	3 x 4	3 x 6	4 x 6	4 x 6	4 x 6	4 x 6	—	—	—	—	—	900	
1916	2 x 3	3 x 4	3 x 6	4 x 6*	—	—	—	—	—	—	—	—	1500	300
1918	—	—	—	—	—	—	—	—	—	—	—	—	2500	
1920	2 x 3	3 x 4	3 x 4	4 x 6	4 x 6	4 x 6	4 x 6	6 x 8	6 x 8	8 x 10	10 x 14	12 x 16	300	150
1922	2 x 3	3 x 4	3 x 4	4 x 6	4 x 6	4 x 6	·	6 x 8	6 x 10	—	—	—	600	
1923	—	—	—	—	—	—	4 x 6	—	—	—	—	—	600	
1924	2 x 3	3 x 4	3 x 6	4 x 6	4 x 6	4 x 6	4 x 6	—	—	—	—	—	900	
1926	2 x 3	3 x 4	3 x 6	4 x 6*	—	—	—	—	—	—	—	—	1500	300
1928	—	—	—	—	—	—	—	—	—	—	—	—	2500	

NOTE: Inlet and outlet size combinations as well as Orifice sizes shown in the table above are compliant with API standard 526 - Fourth Edition, 1995.

* 1916L and 1926L are supplied with a 150# outlet.

How Pressure Relief Valves Operate

All pressure relief valves operate on the principle of inlet system pressure overcoming a spring load, allowing the valve to relieve a defined capacity.

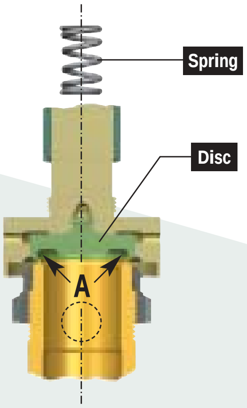


Figure 1900.1 - Closed

When the valve is closed during normal operation (See Figure 1900.1), the vessel pressure acting against the seating surfaces (area "A") is resisted by the spring force. As vessel pressure increases, the pressure at "A" tends to equalize the spring force and the pressure holding the seats together approaches zero.

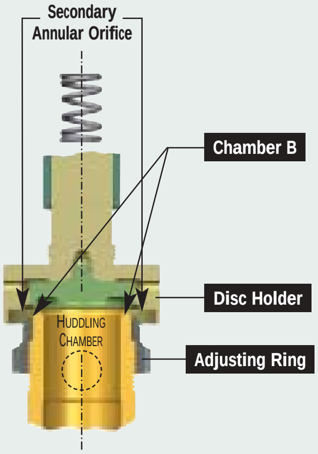


Figure 1900.2 - Partially Open

In vapor or gas service the valve may "simmer" before it will "pop". When the vessel pressure increases to within one to two percent of the set pressure, media will audibly move past the seating surfaces into chamber "B". As a result of restriction of flow in the secondary annular orifice, pressure builds up in chamber "B" (See Figure 1900.2). Since pressure can now act over a larger area, an additional force is available to overcome the spring force. By adjusting the "adjusting ring" the opening in the secondary annular orifice can be altered, thus controlling pressure build-up in chamber "B". This controlled pressure build-up in chamber "B" will overcome the spring force causing the disc to move away from the nozzle seat and the valve to "pop" open.

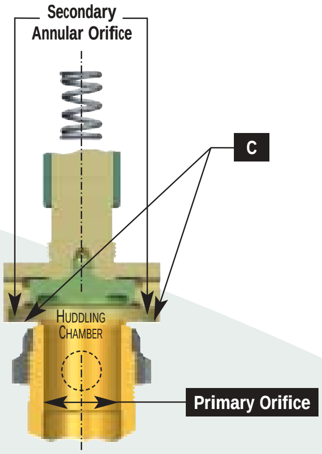


Figure 1900.3 - Fully Open

Once the valve has opened an additional pressure build-up at "C" occurs. (See Figure 1900.3.) This is due to the sudden flow increase and the restriction to flow through another annular orifice formed between the inner edge of the disc holder and the outside diameter of the adjusting ring. These additional forces at "C" cause the disc to lift substantially at "pop".

Flow is restricted by the opening between the nozzle seat and disc seat until the disc seat has been lifted from the nozzle seat approximately one-quarter of the nozzle throat diameter. After the disc has attained this degree of lift, flow is then restricted by the primary orifice rather than by the area between the seating surfaces.

Blowdown (the difference between opening and closing pressure) can be controlled within limits by positioning the single adjusting ring. Blowdown is caused by the result of the spring force not being able to overcome the summation of the forces at "A", "B", and "C" until the pressure at "A" drops below the set pressure.

How Pressure Relief Valves Operate

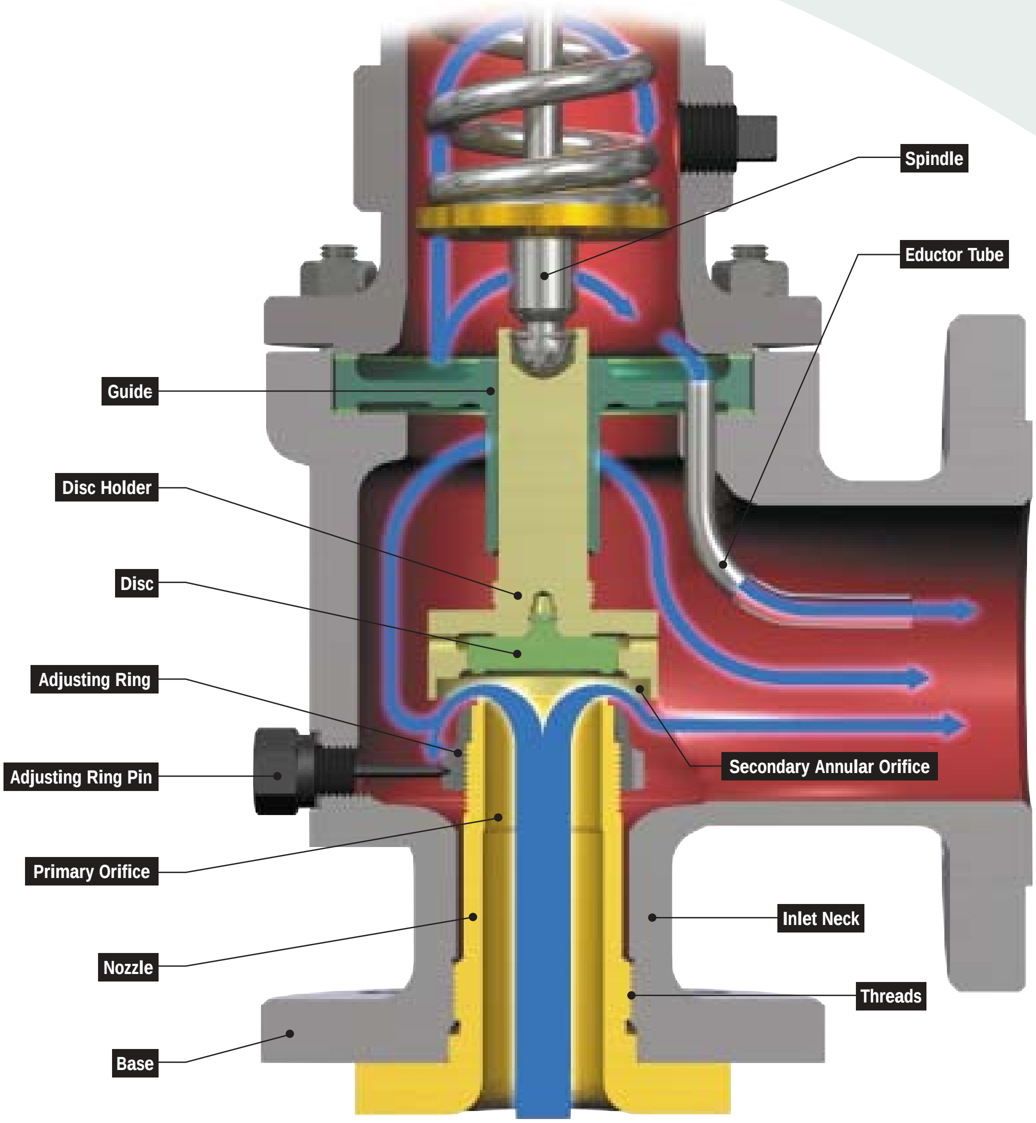


Figure 1900.4

Figure 1900.4 reflects the flow path of fluid through the valve. It is significant to recognize that the system pressure enters through the nozzle and remains at a high pressure until it expands through the secondary annular orifice. Pressure downstream of the secondary annular orifice is much lower than the system pressure. The upper portion of the valve base plus the outlet flange are of a lower pressure rating than the inlet side of the valve.

NOTE: BLOWDOWN SETTINGS - Production testing required by Manufacturers of safety relief valves is governed by ASME Section VIII, UG-136 (d), which does not require the setting of blowdown during production test. Adjusting rings on the 1900 flanged safety relief valve series are factory adjusted to predetermined ring settings. This will provide a consistent opening and closing pressure on the safety relief valve.

Product Features - 1900 Flanged Series

Adjusting Ring

The adjusting ring in the Consolidated safety relief valve is preset to predetermined positions prior to putting the valve in service. Presetting reduces the necessity of popping the valve in service to ascertain that the ring has been set properly for attaining the necessary lift and relieving capacity.

Simple Blowdown Adjustment

Adjustment of Consolidated safety relief valve blowdown, or reseating pressure, is by means of a single adjusting ring. When moved upward, blowdown is increased (lowering the reseating pressure), or when moved downward, the blowdown is decreased (raising the reseating pressure). The simplicity and advantages of this adjustment are obvious when comparing valves having two or more adjusting rings each of which affect valve action as well as blowdown.

Minimum Guiding Area

Guiding areas greater than those required to align the seating surfaces are undesirable in a safety relief valve, especially those used in the process industries. The smaller the guiding area of the valve (when corrosion or contamination from the flowing medium build up in the valve guiding surfaces) the less tendency the guiding area will have to stick and hinder valve operation.

Nozzle

The nozzle is a pressure containing component in constant contact with the process media in both the open and closed valve positions. To ensure maximum reliability and safety, Consolidated flanged SRV nozzles are made from forgings, investment castings, or centrifugal castings.

Spindle Pocket Connection

The connection between the spindle and disc holder in a Consolidated safety relief valve is a positive method of attachment. The Inconel snap ring and groove design make it virtually impossible to remove the spindle from the disc holde, unless the ring is compressed intentionally. This design requires a minimum amount of effort to disassemble during maintenance.

Design Simplicity

Consolidated safety relief valves embody a minimum number of component parts which results in a savings by minimizing spare parts inventory and simplifying valve maintenance.

Maximum Seat Tightness

Seat finish in a safety relief valve is of the utmost importance; otherwise, valve leakage will occur.

Consolidated safety relief valve seats are precision machined and lapped. This ensures positive seating and prevents loss of contained media.

The Thermodisc™ design provides a tighter closure and compensates for temperature variations around the periphery of the nozzle. Thermal distortion, which produces seat leakage, is minimized in steam service.

Cap and Lever Interchangeability

Many times it is necessary to change the type of cap or lever in the field after a valve has been installed. All Consolidated safety relief valves are supplied so they can be converted to any type of lever or cap desired. It is not necessary to remove the valve from the installation, nor will the set pressure be affected when making such a change.

Valve Interchangeability

A Consolidated safety relief valve may be converted from the standard, conventional type valve to the bellows type, or to the O-Ring seat seal type, Thermodisc™ seat Liquid Trim, or vice versa, requiring a minimum number of new parts. This results in lower costs.

Quality Material

All Consolidated safety relief valve castings and forgings are made to ASTM/ASME specifications and are subject to many rigid inspections, ensuring the highest degree of quality.

Coupled with the highest quality workmanship, this ensures continuous protection and long, trouble-free valve life.

Product Features - 1900 Flanged Series

Reduction of Valve Bonnet Pressure

Closed bonnet valves are subject to variable pressure past the guiding surfaces when the valve is open, which adds a variable force to that of the spring, affecting valve performance. To eliminate excess bonnet pressure and ensure good valve opening and closing action, an Eductor Tube is provided.

The Eductor Tube reduces bonnet pressure by pulling discharging fluids out of the bonnet faster than it is possible for the discharging fluids to enter past the guiding surfaces, acting as a siphon due to the drawing effect of the flow through the outlet side of the valve.

Eductor Tube Reduces Bonnet Pressure

An exclusive with CONSOLIDATED valves! During valve discharge, media flows through the clearance between the disc holder and guide, building up bonnet pressure. This adds a variable force to the spring force, which inhibits valve lift. Bonnet pressure is reduced by the eductor effect of the medium flowing at high velocity at the valve outlet.

The greater lifting force (resulting from a reduction in bonnet pressure) introduces important advantages:

(1) Response to blowdown control adjustment is uniform

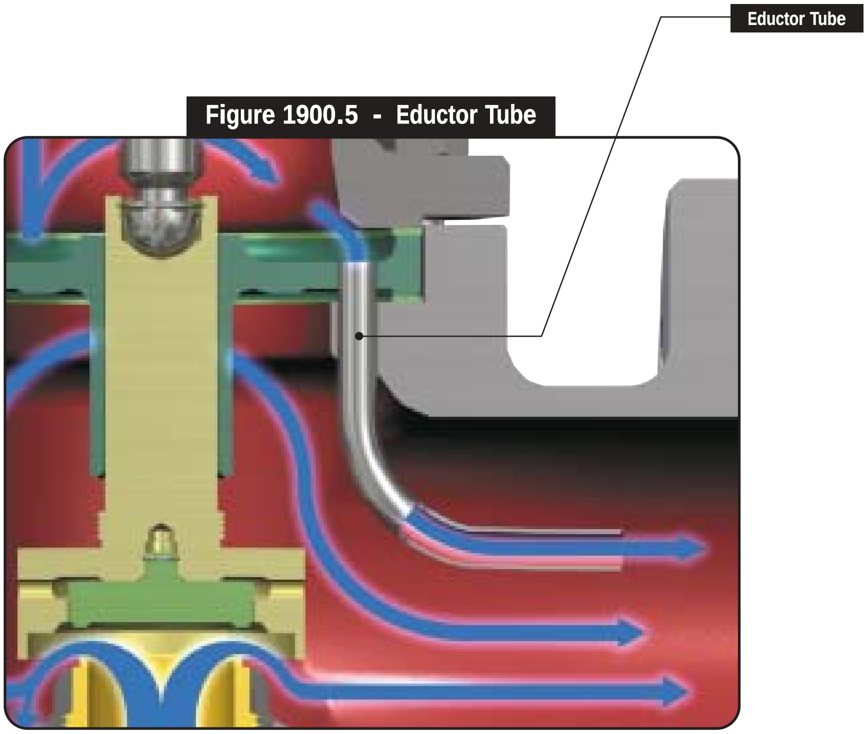
(2) Positive, full-rated capacity at low overpressures is assured

(3) Better operation at higher back pressures with Eductor Tube.

(4) Complete stability (of valve lift and capacity) is assured during operation.

(5) Increases the lifting force when the valve opens and tends to break slight corrosive deposits or surface film which accumulate on the guiding surfaces and retard valve action. (For severe corrosion applications, a bellows valve is recommended.)

Figure 1900.5 - Eductor Tube



1900 Steam Trim (TD) Valves

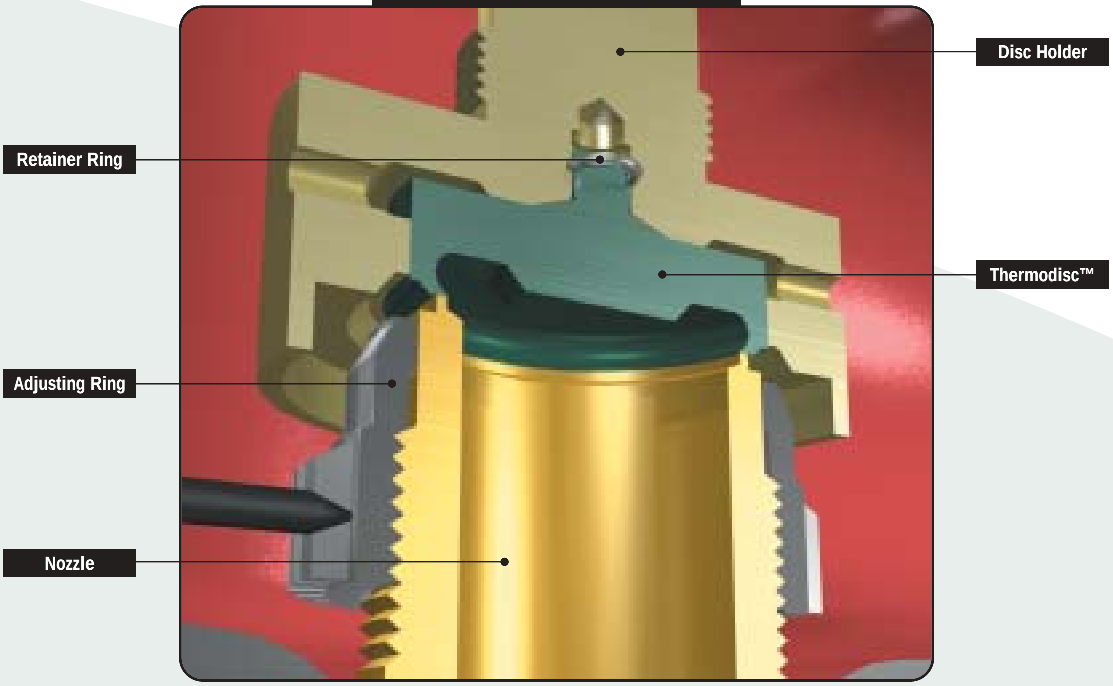
The 1900 TD is specifically designed for steam service and organic heat transfer media and is certified to ASME Code Section VIII.

Thermodisc™ – this is a specifically designed disc for use on high temperature fluids. This concept has more than 40 years of field proven performance that ensures the tightest valves in the world.

A Thermodisc™ is required for steam service.

The Martensitic stainless steel disc construction allows for high strength and toughness. As the set point of the valve is approached, the pressure sealing effect of the Thermodisc™ assists in the tightness of the seat as does the rapid thermal equalization that occurs due to the thin sealing section.

1900 Steam Trim Internals



1900 Disc Design Availability

Valve Type	Disc Design										ASME Code Section
	Standard Solid Disc					Thermodisc[1]					
	Steam	Liquid	Liquid Organic Heat Transfer Media	Vapor Organic Heat Transfer Media	Vapor	Steam	Liquid	Liquid Organic Heat Transfer Media	Vapor Organic Heat Transfer Media	Vapor	
1900	-	X	X	X	X	X	-	-	X	-	VIII
1900-30	-	X	X	X	X	X	-	-	X	-	VIII
1900-35	-	X	X	X	X	X	-	-	X	-	VIII
1900/P1[2]	-	-	-	-	-	X[3]	X[4]	-	X	-	I or VIII
1900/P3[2]	-	-	-	-	-	X[3]	·	-	X	-	I or VIII

NOTES:
1 Thermodisc™ is provided in one material only, a specially heat treated martenistic stainless steel.
2 Refer to the 1900/P Series section for product information.
3 1900/P Series are not intended for overpressure protection of power boiler drum, superheater or reheater equipment.
4 Consult the factory for special conditions that require the use of an ASME Code Section I pressure relief valve. Except for liquid thermal relief applications, the “P” Series are not intended for liquid service.

1900 Liquid Trim (LA) Valves

The Liquid Trim LA (liquid application) represents the second generation of ASME B & PVC, Section VIII certified liquid trim valves and must be used for all liquid applications for both ASME B & PVC, Section VIII certified and non-certified valves. Liquid applications have been defined as follows:

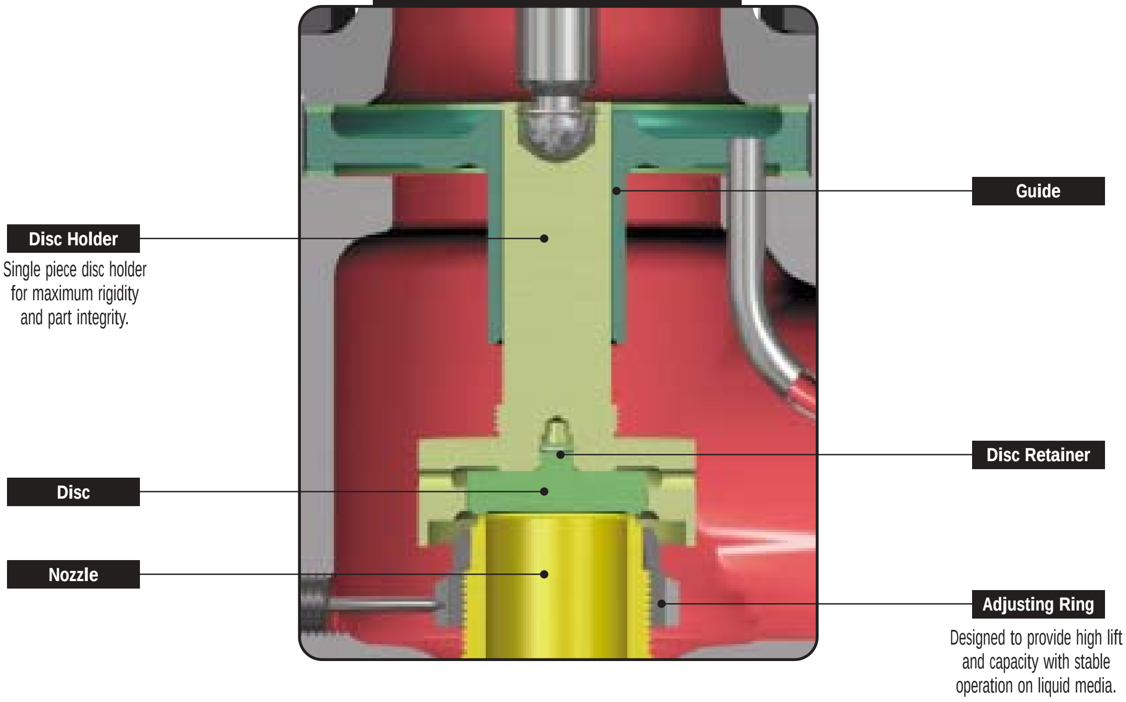
(1) if the fluid remains liquid while flowing through the valve

(2) if flowing fluid flashes going through the valve

(3) for ASME B & PVC, Section VIII certified and non-certified thermal relief applications. (Thermal Relief is to prevent excessive pressure caused by thermal expansion of trapped liquids). The LA trim provides blowdown performance with ranges from 7% to 12% below the set pressure. This valuable feature provides conservation of media, a positive lift and a smooth chatter-free operation. Because of the short blowdown performance of this design, it is critical that the inlet connection always provide for a pressure drop of 3% or less from the vessel to the valve as recommended by API 520.

Conversion of existing 1900 Series valves to liquid trim is available through the factory or your local Green Tag Center.

1900 Liquid Service Internals



1900 Restricted Lift Valves

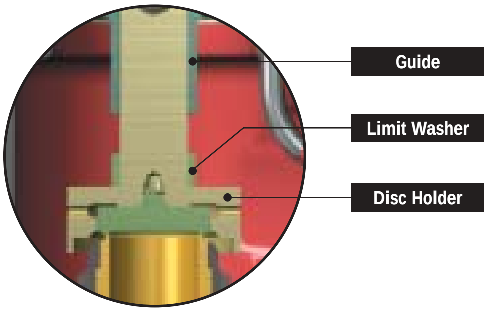
The 1900 series is offered in orifice sizes ranging from the smallest “D” size to the largest “W” size. In order to accomplish certain valve functions some special considerations have to be made. Such a case is the D and E orifice designs noted below.

The D and E valves are restricted lift versions of the “F” orifice valve. The lift is restricted by a limit washer to provide the equivalent effective orifice area for a “D” or “E” orifice. This design is available with a balanced bellows configuration and is designed for back pressure applications.

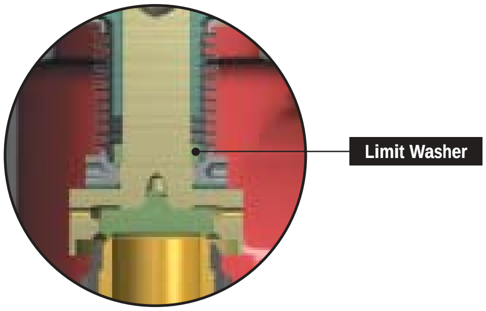
The standard 1900 Series are available with restricted lifts in orifices ranging from “F” to “W” for compressible media only.

D and E Orifice Only

RESTRICTED LIFT



Conventional



Balanced Bellows

Soft Seat Applications

Closeness of Operating Pressure to Set Pressure

Where the operating pressure is close to the set pressure, seat tightness can be maintained at relatively higher operating pressures.

Compressor Discharge and Positive Displacement Pump Service

Mechanical vibration and pressure waves could lift the valve disc with each stroke and may cause flat metal-to-metal seats to rub together and become damaged.

The 45° metal-to-metal load bearing seats in the CONSOLIDATED O-Ring seat seal assure true alignment, aided by full system pressure behind the O-Ring, which effectively seals against leakage.

Corrosive Services

In some services, corrosion of the seating surfaces is the cause of valve leakage. In this type of service, the CONSOLIDATED O-Ring seat seal will protect the metal seat on the nozzle against contact of the corrosive fluid thereby maintaining greater tightness.

Foreign Matter and Slurry Service

Many times foreign material such as pipe scale, welding beads, sand dust particles, etc. may damage the metal-to-metal seating surfaces in a valve of this type when it is open and flowing.

The CONSOLIDATED O-Ring seat seal is designed to absorb the impact of most foreign particles without damage.

Hot Water Boiler Service

When a safety relief valve opens hot water flashes into steam at the seating surfaces and solid particles which float to the water surface are driven against the seating surfaces at steam velocities. CONSOLIDATED O-Ring seat seal valves can withstand this type of service and remain tight to a greater degree than metal-to-metal seat valves.

CONSOLIDATED uses proven quality Teflon® O-Ring seats for this service. In some pressure/temperature applications, Teflon® is not resilient, and leakage may occur.

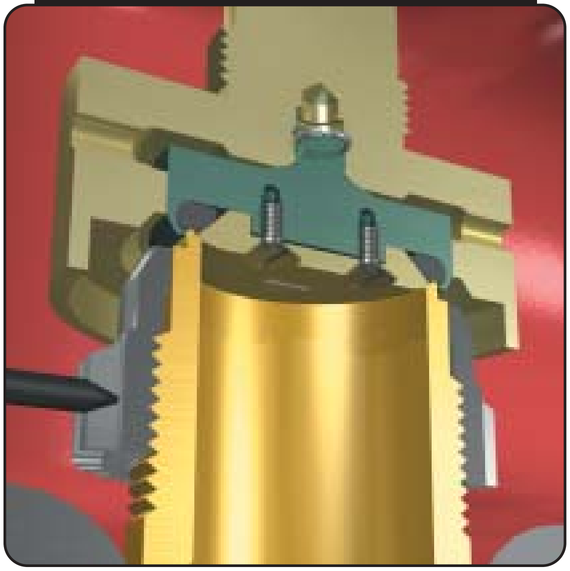
Benefits

Safety Relief Valve leakage which is aggravated by any cause is usually costly. In many cases, expensive product is lost and maintenance costs increased. CONSOLIDATED O-Ring seat seal valves are designed to eliminate leakage in troublesome applications and reduce overall costs. Should leakage occur, it is much simpler and less expensive to replace the O-Ring than to maintain metal-to-metal seats.

O-Ring Conversion

1900 Series CONSOLIDATED metal seated valves can be converted to O-Ring seat seals by installing a few basic parts provided in a conversion kit.

1900-DA soft seats without bellows



1900 Soft Seat (DA) Option

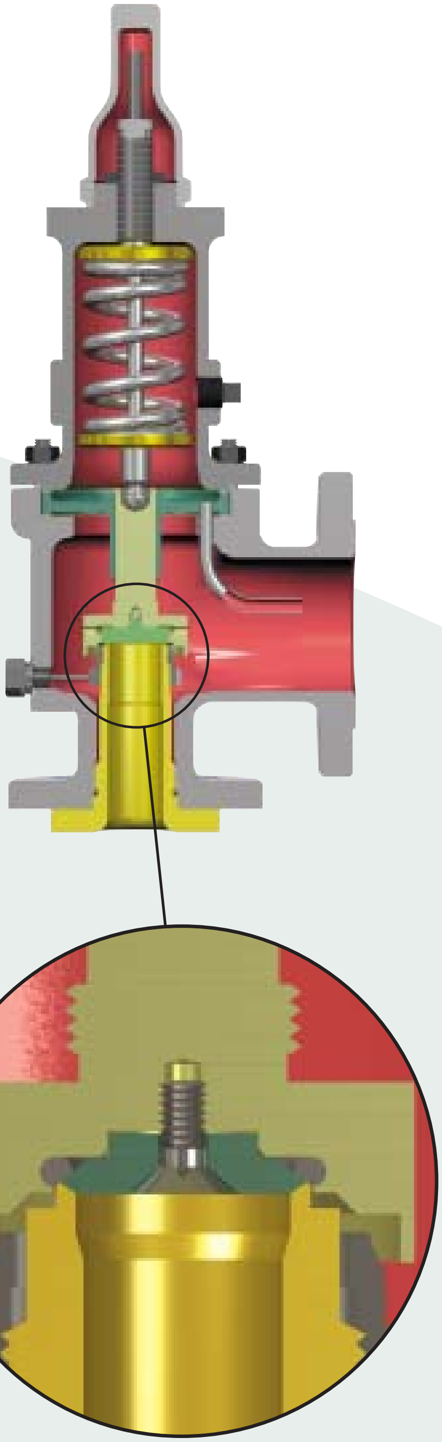
The Double Seal Soft Seat

The double seal design incorporates the merits of both a soft seat and a metal seat design valve. The 45° metal seat provides the load bearing surface to transmit spring force, the slotted O-Ring retainer allows the O-Ring to be pressurized and accomplish the primary sealing function. This O-Ring seal design can be used throughout the full pressure range of the valve. For pressure/temperature ratings of the seal, refer to O-Ring Selection Table in this section (pages 1900.35 and 1900.36).

Tightness: CONSOLIDATED O-Ring seat seal valves are bubble tight at 95% of set pressures over 100 psig.

The following table reflects the percent of set pressure (popping pressure) at which the valve will be bubble tight on air.

Set Pressure (psig)	Percent of Set Pressure
5 to 30	90%
31 to 50	92%
51 to 100	94%
101 to Max rating of valve	95%



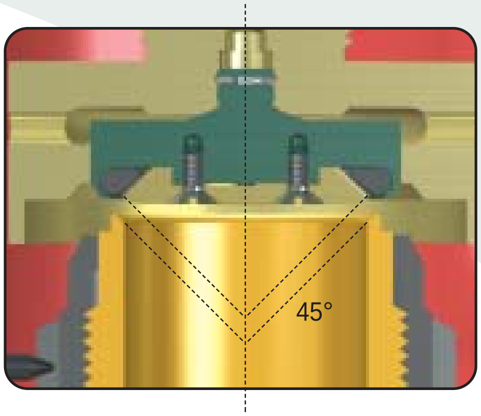
CONSOLIDATED O-Ring seat seals provide positive closure at service pressures closer to the set pressure than is possible with metal-to-metal seats assuring continuous, trouble-free service, and complete valve tightness after numerous “pops”.

NOTE: The CONSOLIDATED 1900 O-Ring design features a secondary metal-to-metal seat which becomes effective if O-Ring integrity is lost due to external fire or other causes. The retainer is lapped to the nozzle at assembly assuring seat tightness.

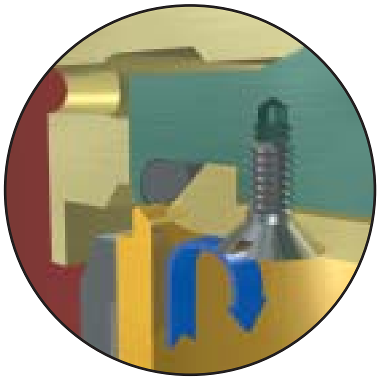
1900 Soft Seat (DA) Option

How the Double Seal Works

Two unique features distinguish the Consolidated O-Ring seat seal safety valve from other designs. These are the 45° metal-to-metal load bearing seats and the slotted O-Ring retainer.

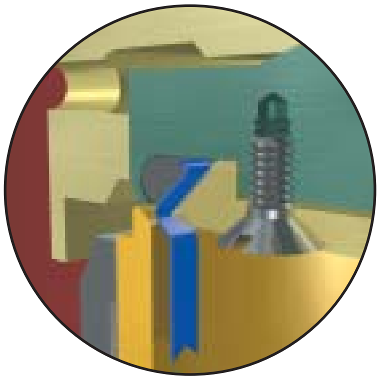


Three Essentials to a Tighter and More Secure Seal:



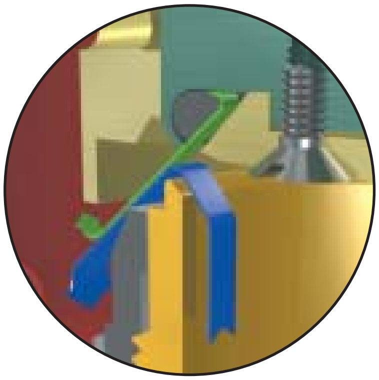
1) Concentric Alignment

The nozzle bore and O-Ring retainer are both machined to an angle of 45°. This ensures that as the valve disc opens and closes, the O-Ring is aligned concentrically against the lip of the nozzle. Close tolerance between the nozzle and the body, or the body and the disc guide and disc holder, also help to ensure a tight seal when the valve is closed. Accurate alignment coupled with the load bearing function of the O-Ring retainer virtually eliminates O-Ring abrasion from valve action.



2) Maximum Sealing Force

On the back side of the O-Ring retainer there are two small slots. When the valve is closed, process media enters between the machined seat of the nozzle and the O-Ring retainer and proceeds up the slots behind the O-Ring. This pressure forces the O-Ring against the lip of the nozzle and the curved recess of the disc holder. As the pressure within the valve rises to set point, the O-Ring is pressed tightly against the nozzle to maintain maximum sealing force until break-away pressure is reached.



3) O-Ring Retention

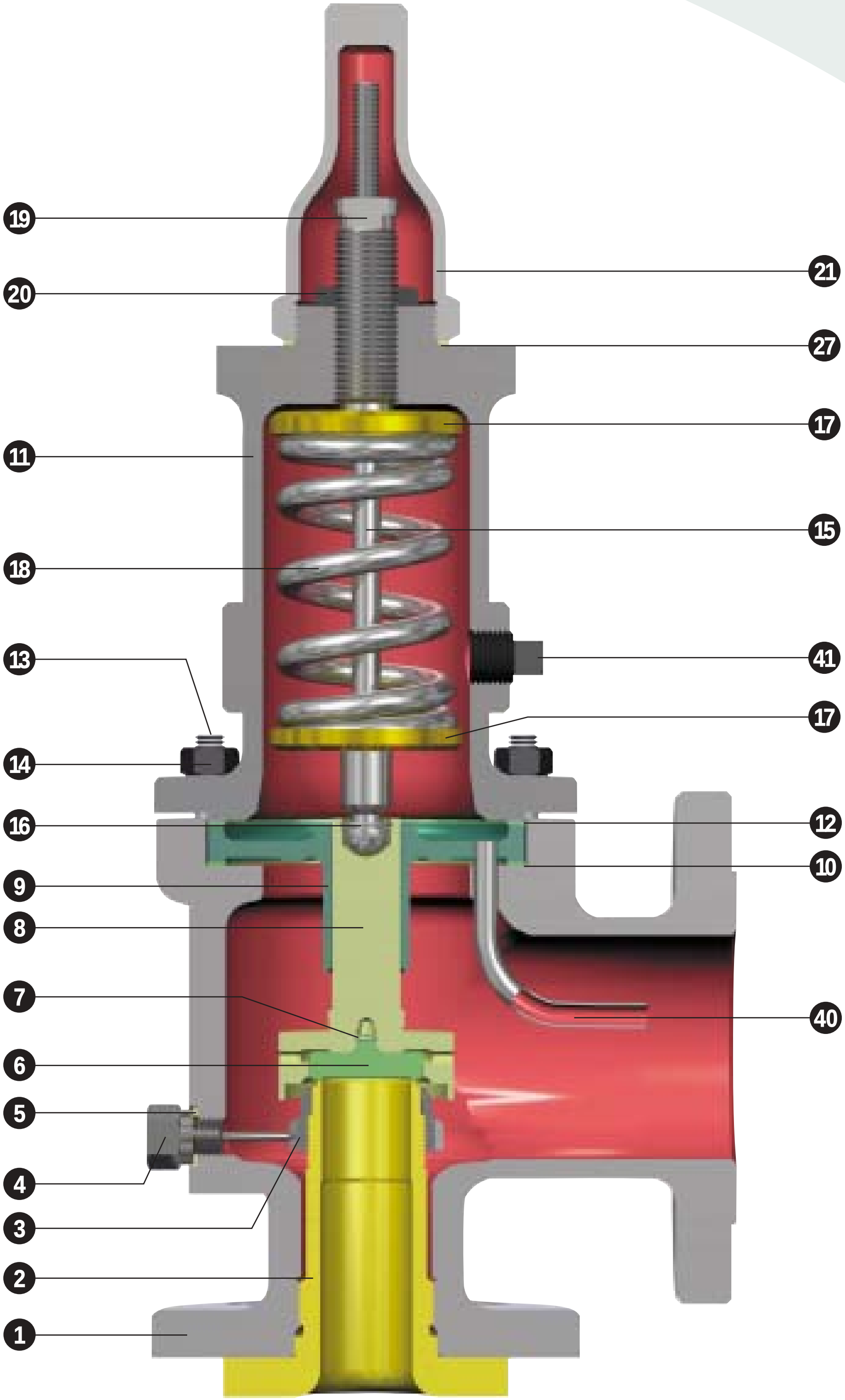
When the valve opens, the pressure behind the O-Ring escapes from the same two slots on the O-Ring retainer. This prevents the O-Ring from being ejected. Additionally, the O-Ring encapsulating retainer prevents the O-Ring from being pulled from its setting by the high velocity, low pressure discharge inside the upper valve body.

Conventional Safety Relief Valves
1900 Series

Standard Material for Conventional Type Safety Relief Valves

	Part	Material
1	Base: Types 1905 thru 1918	SA216 Grade WCC Carbon Steel
	Base: Types 1920 thru 1928	SA217 Grade WC6 Alloy Steel
2	Nozzle	316SS
3	Adjusting Ring	316SS
4	Adjusting Ring Pin	316SS
5	Adjusting Ring Pin Gasket	Soft Iron
6	Disc	316SS
7	Disc Retainer Ring	Inconel X750
8	Disc Holder	316SS
9	Guide	316SS
10	Guide Gasket	Soft Iron
11	Bonnet	SA216 Grade WCC Carbon Steel
12	Bonnet Gasket	Soft Iron
13	Base Stud	B7 Alloy Steel
14	Base Stud Nut	2H Carbon Steel
15	Spindle	410SS
16	Spindle Retainer	Inconel X750
17	Spring Washer	Carbon Steel
18	Spring - types 1900 (-75°F to 800°F)	Alloy Steel
	Spring - types 1920 (801°F to 1000°F)	Inconel X750 or Tungsten
19	Adjusting Screw	416SS
20	Adjusting Screw Locknut	416SS
21	Screwed Cap	Carbon Steel
27	Cap Gasket	Soft Iron
40	Eductor Tube	304SS
41	Vent Pipe Plug	Carbon Steel

For Gas, Vapor, and Liquid Service
1900 Series

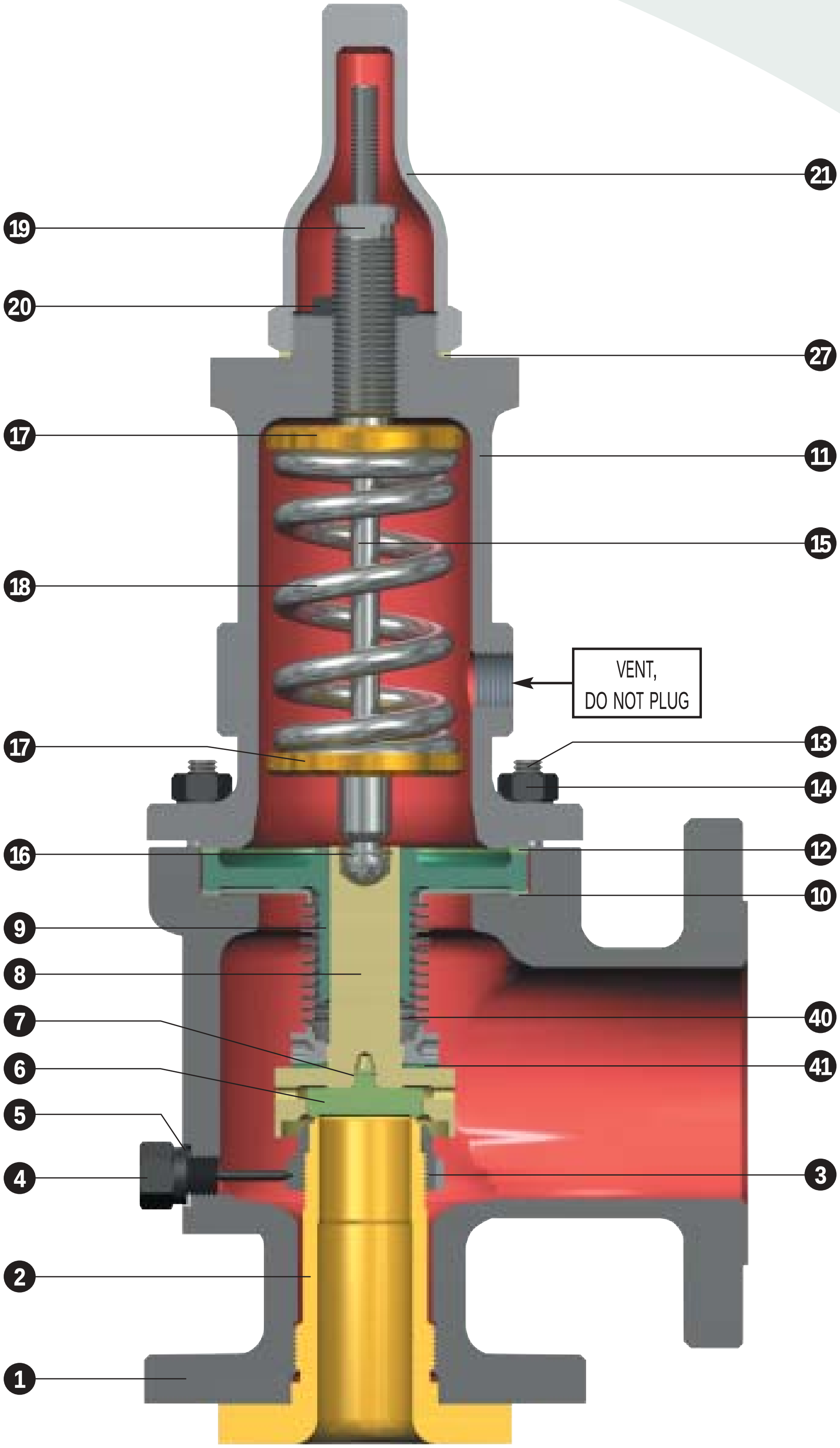


1900-30 Series Bellows Assembly

**Standard Material for
Bellows Type Safety Relief Valves**

	Part	Material
1	Base: Types 1905-30 thru 1918-30	SA216 Grade WCC Carbon Steel
	Base: Types 1920-30 thru 1928-30	SA217 Grade WC6 Alloy Steel
2	Nozzle	316SS
3	Adjusting Ring	316SS
4	Adjusting Ring Pin	316SS
5	Adjusting Ring Pin Gasket	Soft Iron
6	Disc	316SS
7	Disc Retainer Ring	Inconel X750
8	Disc Holder	316S
9	Guide	316SS
10	Guide Gasket	Soft Iron
11	Bonnet	SA216 Grade WCC Carbon Steel
12	Bonnet Gasket	Soft Iron
13	Base Stud	B7 Alloy Steel
14	Base Stud Nut	2H Carbon Steel
15	Spindle	410SS
16	Spindle Retainer	Inconel X750
17	Spring Washer	Carbon Steel
18	Spring - types 1900 (-75°F to 800°F)	Alloy Steel
	Spring - types 1920 (801°F to 1000°F)	Inconel X750 or Tungsten
19	Adjusting Screw	416SS
20	Adjusting Screw Locknut	416SS
21	Screwed Cap	Carbon Steel
27	Cap Gasket	Soft Iron
40	Bellows Assembly	—
	Bellows	Inconel 625
	Bellows Ring & Bellows Flange	316L SS
41	Bellows Gasket	Soft Iron

For Gas, Vapor, and Liquid Service
1900-30 Series

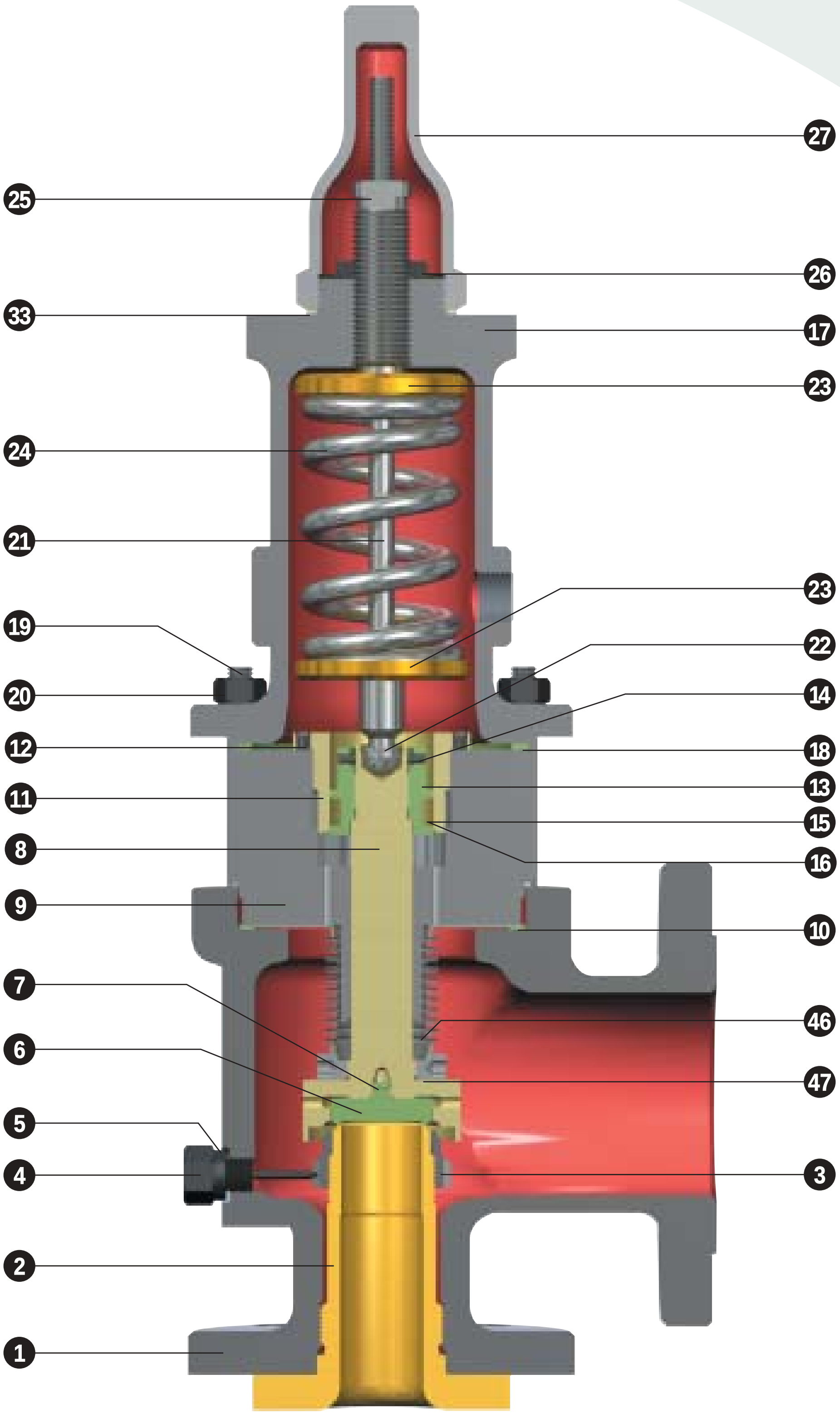


1900-35 Balanced Bellows
with Auxiliary Balancing Piston

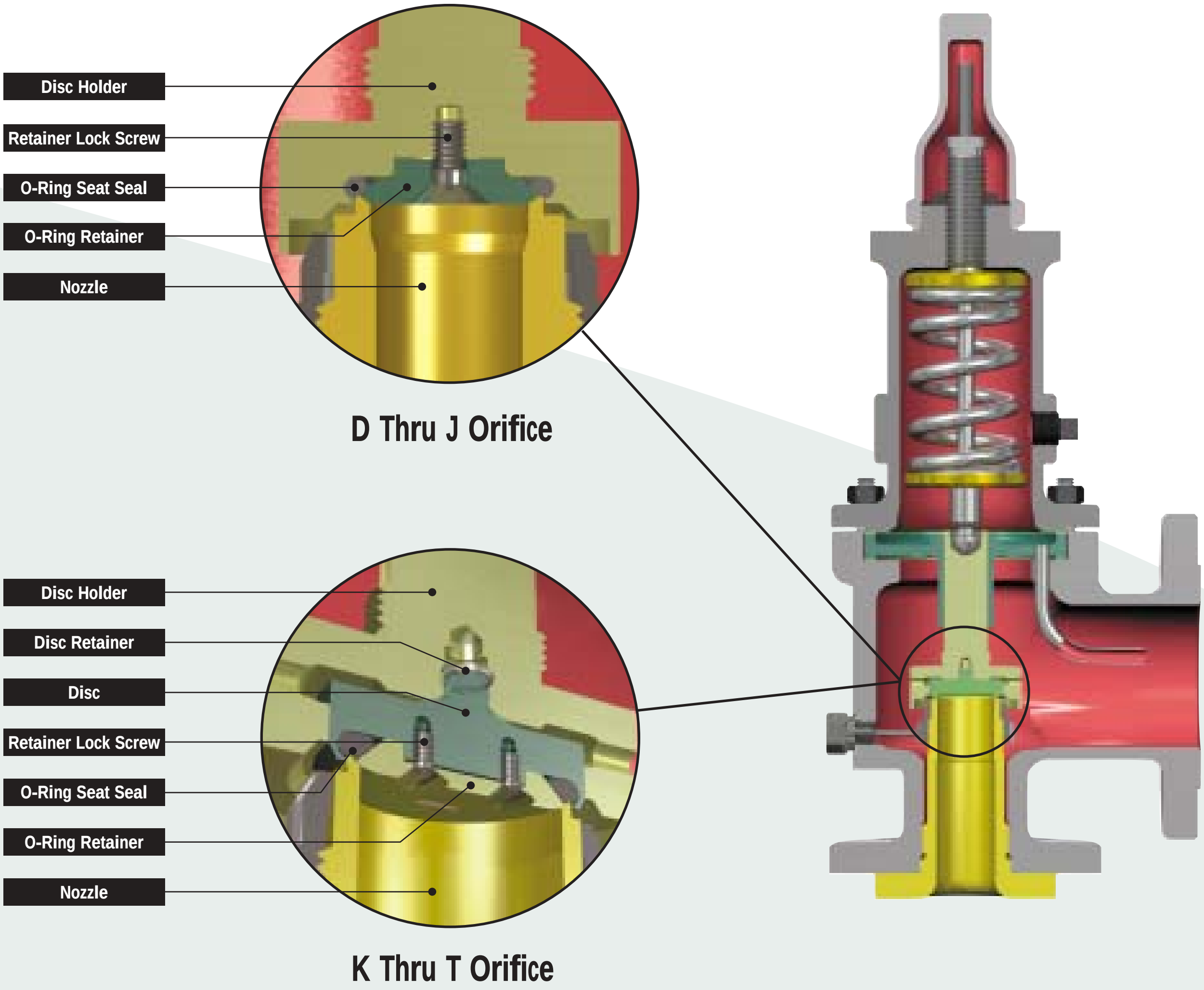
Standard Material for Balanced Piston Type Safety Relief Valves

	Part	Material
1	Base: Types 1905-35 Thru 1918-35	SA216 Grade WCC Carbon Steel
	Base: Types 1920-35 Thru 1928-35	SA217 Grade WC6 Alloy Steel
2	Nozzle	316SS
3	Adjusting Ring	316SS
4	Adjusting Ring Pin	316SS
5	Adjusting Ring Pin Gasket	Soft Iron
6	Disc	316SS
7	Disc Retainer Ring	Inconel X750
8	Disc Holder	316SS
9	Guide	316SS
10	Guide Gasket	Soft Iron
11	Piston Guide	304SS
12	Piston Guide Lockscrew	Carbon Steel
13	Piston	304SS
14	Piston Lockscrew	Carbon Steel
15	Seal Ring	Graphitar Grade 67
16	Seal Ring Expander	410SS
17	Bonnet	SA216 Grade WCC Carbon Steel
18	Bonnet Gasket	Soft Iron
19	Base Stud	B7 Alloy Steel
20	Base Stud Nut	2H Carbon Steel
21	Spindle	410SS
22	Spindle Retainer	Inconel X750
23	Spring Washer	Carbon Steel
24	Spring - types 1900 (-75°F to 800°F)	Alloy Steel
	Spring - types 1900 (801°F to 1000°F)	Inconel X750 or Tungsten
25	Adjusting Screw	416SS
26	Adjusting Screw Locknut	416SS
27	Screwed Cap	Carbon Steel
33	Cap Gasket	Soft Iron
46	Bellows Assembly	—
	Bellows	Inconel 625
	Bellows Ring and Bellows Flange	316 L SS
47	Bellows Gasket	Soft Iron

For Gas, Vapor, and Liquid Service
1900-35 Series



1900 Soft Seat (DA) Option

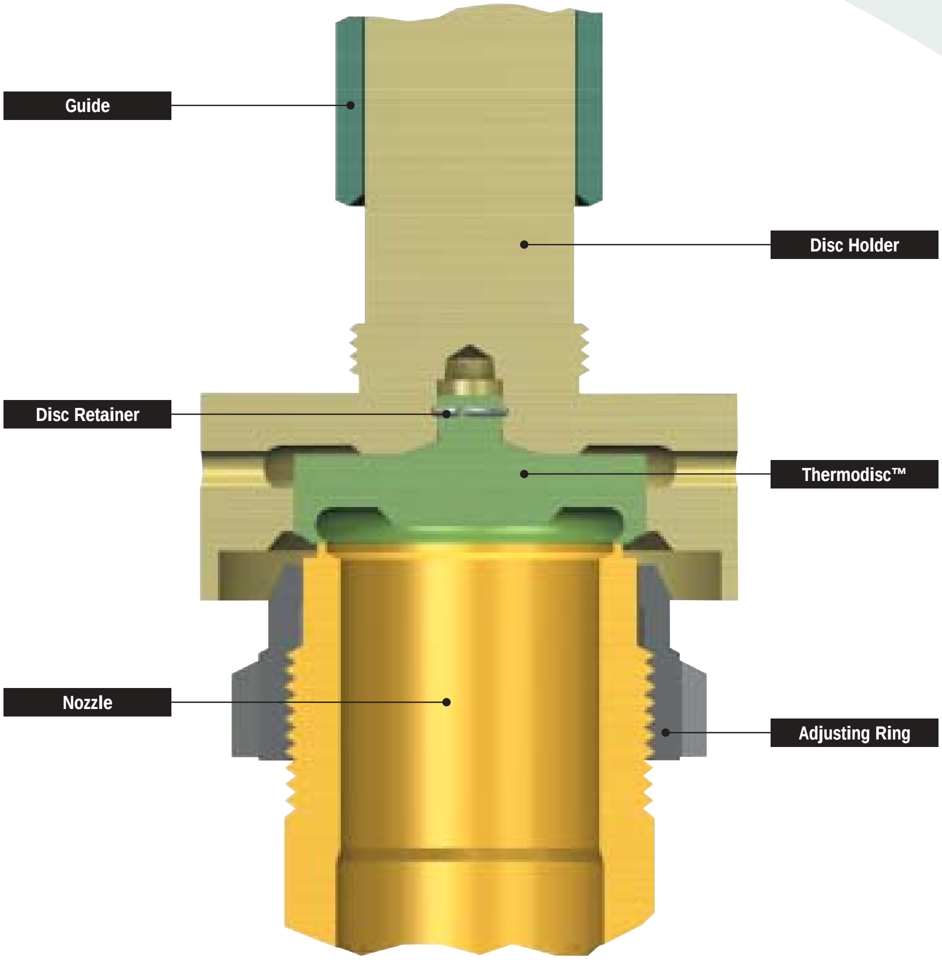


Part Name	Materials[2]
Nozzle	316SS
Disc	316SS
Disc Holder	316SS
Disc Retainer	Inconel X750
O-Ring Retainer	316SS
Retainer Lock Screw(s)	316SS
O-Ring Seat Seal	Select[1]

NOTES: 1 Refer to pages 1900.35 & 1900.36 for O-Ring Selection (Durometer and Temperature Limits). See Technical Information Section for application.

2 Balance of Materials same as 1900 standard construction

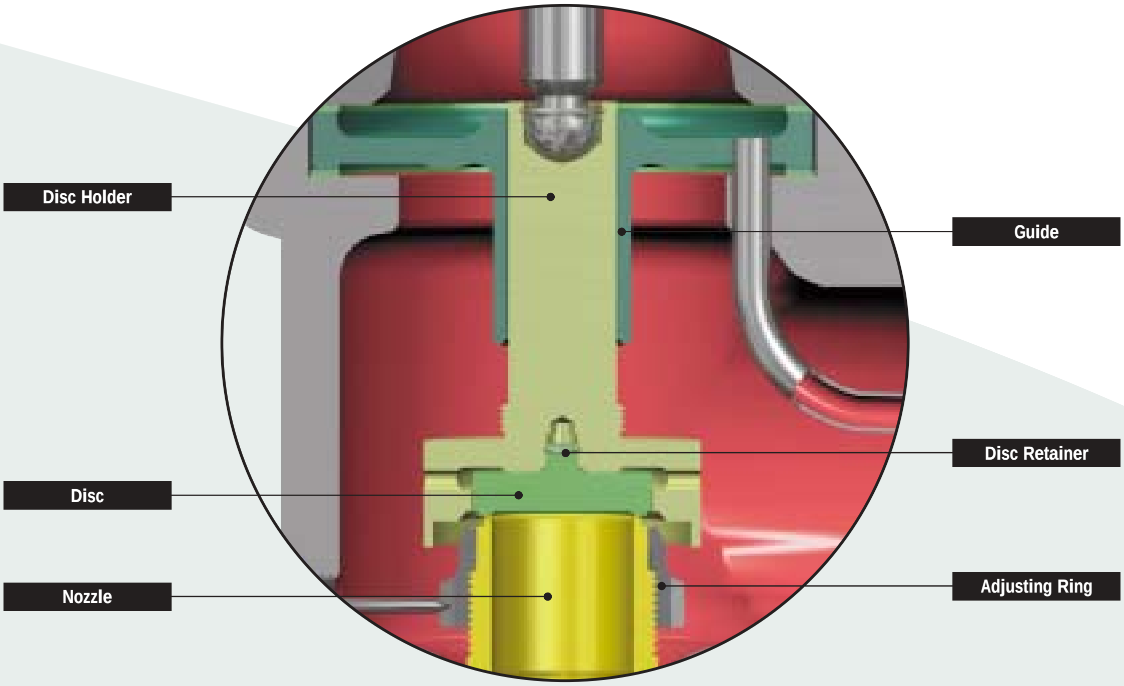
1900 Steam Trim (TD) Option



Part Name	Materials[1]
Nozzle	316SS
Thermodisc™	616SS
Disc Retainer	Inconel X750
Disc Holder	316SS
Guide	316SS
Adjusting Ring	316SS

NOTE: 1 Balance of materials same as 1900 standard construction.

1900 Liquid Trim (LA) Option



Part Name	Materials[1]
Nozzle	316SS
Disc	316SS
Disc Retainer	Inconel X750
Disc Holder	316SS
Guide	316SS
Adjusting Ring	316SS

NOTE 1: Balance of materials same as 1900 standard construction.

1900 Special Material & Service Options

The 1900 Flanged Series offers various material options to satisfy customer needs and API standards. The most common options are listed in this section.

These material options are not the only available options however. Inquire of Dresser Measurement for options not listed here.

Specify the material construction classification using the construction variations such as: S2, H4, etc.

Options included are:

Many other special options are available not necessarily of a material nature. These include, but are not limited to, special facings on connections or special connections. Contact the factory for any special requirements you may have.

1900 Sour Gas (SG) Trims

Material requirements of NACE Standard MR-01-75 are applicable to systems handling sour gas if the total operating pressure of the system is 65 psia or greater and if the partial pressure of H2S in the gas is 0.05 psia or greater.

The SG10 (non-bellows) and SG15 (bellows) material selections are satisfactory for applications in which the valve secondary pressure (outlet side) does not exceed 65 psia (50 psig). Under valve relieving conditions, 50 psig secondary pressure would not normally be exceeded until the valve set pressure exceeds 450 psig (31.0 Bar).

The SG1 (non-bellows) and SG5 (bellows) material selections comply with NACE standard MR-01-75.

Specific applications may be referred to the factory for recommendations.

Special Materials, Sour Gas Service[1]

Component	Construction Variation			
	Conventional Valves		Bellows Valves	
	SG1[4]	SG10[3]	SG5[3 & 4]	SG15[3]
Base: Types 1905 thru 1918	SA216 WCC Carbon Steel	SA216 WCC Carbon Steel	SA216 WCC Carbon Steel	SA216 WCC Carbon Steel
Base: Types 1920 thru 1928	SA217 WC6 Alloy Steel	SA217 WC6 Alloy Steel	SA217 WC6 Alloy Steel	SA217 WC6 Alloy Steel
Nozzle	316SS	316SS	316SS	316SS
Disc	316SS	316SS	316SS	316SS
Bellows Assembly	—	—	—	—
Flange	N/A	N/A	316L SS	316L SS
Bellows	N/A	N/A	Inconel 625[5]	Inconel 625
Ring	N/A	N/A	316L SS	316L SS
Adjusting Ring	316SS	316SS	316SS	316SS
Adjusting Ring Pin	316SS	316SS	316SS	316SS
Disc Holder	316SS	316SS	316SS	316SS
Guide	316SS	316SS	316SS	316SS
Spindle	316SS	410SS	410SS	410SS
Spindle Retainer	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Bonnet	SA216 WCC Carbon Steel	SA216 WCC Carbon Steel	SA216 WCC Carbon Steel	SA216 WCC Carbon Steel
Base Stud	B7 Alloy Steel	B7 Alloy Steel	B7 Alloy Steel	B7 Alloy Steel
Base Stud Nut	2H Carbon Steel	2H Carbon Steel	2H Carbon Steel	2H Carbon Steel
Spring	Inconel X750	[2]	[2]	[2]
Spring Washer	316SS	Carbon Steel	Carbon Steel	Carbon Steel
Adjusting Screw	316SS	416SS	416SS	416SS
Adjusting Screw Locknut	316SS	416SS	416SS	416SS
Disc Retainer	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Cap	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
Cap Gasket	Soft Iron	Soft Iron	Soft Iron	Soft Iron
Bonnet Gasket	Soft Iron	Soft Iron	Soft Iron	Soft Iron
Bellows Gasket	N/A	N/A	Soft Iron	Soft Iron
Guide Gasket	Soft Iron	Soft Iron	Soft Iron	Soft Iron
Adj. Ring Pin Gasket	Soft Iron	Soft Iron	Soft Iron	Soft Iron
Eductor Tube	304SS	304SS	N/A	N/A
Base Plug: Types 1905 thru 1918	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
Base Plug: Types 1920 thru 1928	316SS	316SS	316SS	316SS
Bonnet Plug	Carbon Steel	Carbon Steel	N/A	N/A

NOTES: 1 The materials in red denote variation from standard material construction.
2 Alloy springs are used for temperatures up to 800°F (426.7°C) and are aluminum metallized.
3 SG10 and SG15 are the same as standard valves except for springs being aluminum metallized.
4 SG1 and SG5 are NACE MR-01-75 compliant.
5 Heat treated

1900 Hydrofluoric Acid (HA) Service

To meet the demanding requirements of the extremely corrosive HF Alky service, Dresser Measurement has, in conjunction with major designers and users in this industry, developed the 1900 HA variation. Extensive use of Monel Alloy 400, in the stress relieved condition for critical components, has been utilized for this option.

NACE document 5A171 states, "In practice, occurrence of stress corrosion cracking may either be avoided by complete exclusion of oxygen or may be minimized by stress relieving welded or cold formed parts." The HA materials should not be confused with the M1 through the M4 materials used for other corrosive applications.

In addition to the special stress relieved conditioned Monel 400 materials, a bellows seal and litharged cured soft seat has been incorporated into this option. Long term applications have provided excellent results in the most severe, moist, aerated, HF Alky service.

Special Materials, Hydrofluoric Acid Service[1,2]

Component	Construction Variation
	HA
Base	SA216 WCC (radiographed per supplement S5)
Nozzle	Monel 400 (stressed relieved)
Adjusting Ring	Monel 400
Adjusting Ring pin	Monel 400
Adj. Ring Pin Gasket	Monel 400
Disc	Monel 400 (stressed relieved)
Disc Retainer	Inconel X750
O-Ring	Viton A (litharge cured)
O-Ring Retainer	Monel 400 (stressed relieved)
Retainer Lock Screw	Monel 400
Disc Holder	Monel 400 (stressed relieved)
Guide	Monel 400
Guide Gasket	Monel 400
Bellows Assembly	Monel 400 (stressed relieved)
Flange	Monel 400
Bellows	Monel 400
Ring	Monel 400
Bellows Gasket	Garlock Gylon 35101
Bonnet	SA216 WCC Carbon Steel
Bonnet Gasket	Monel 400
Base Stud	K Monel
Base Stud Nut	K Monel
Spindle	Monel 400
Spindle Retainer	Inconel X750
Spring (-20°F to 800°F)	Carbon Steel (nickel plated)
Spring Washer	Carbon Steel
Adjusting Screw	Monel 400
Adjusting Screw Locknut	Monel 400
Cap	Carbon Steel
Cap Gasket	Monel 400
Limit Washer	Monel 400

NOTES: 1 The materials in red denote variation from standard material construction.
2 To specify valves, add material designation to the valve type, 1910L/HA or 1910-30L/HA.

Corrosive Service

Corrosive Service, Stainless Steel Material[1,2]

Component	Construction Variation		
	S2	S3	S4
Common Components			
Nozzle	316SS	316SS	316SS
Disc	316SS	316SS	316SS
Disc Retainer	Inconel X750	Inconel X750	Inconel X750
Disc Holder	316SS	316SS	316SS
Adjusting Ring	316SS	316SS	316SS
Adjusting Ring Pin	316SS	316SS	316SS
Spindle Retainer	Inconel X750	Inconel X750	Inconel X750
Adjusting Ring Pin Gasket	Monel	Monel	Monel
Guide Gasket	Monel	Monel	Monel
Base, Bonnet, Cap	Carbon Steel	316SS	316SS
Base Studs	B7 Alloy Steel	Gr. B8M	Gr. B8M
Base Stud Nuts	2H Carbon Steel	Gr. 8M	Gr. 8M
Non-Bellows Valve Components			
Guide	316SS	316SS	316SS
Spindle	316SS	316SS	316SS
Adjusting Screw	316SS	316SS	316SS
Adjusting Screw Locknut	316SS	316SS	316SS
Spring	Alloy Steel	Alloy Steel	316SS
Spring Washers	Carbon Steel	Carbon Steel	316SS
Eductor Tube	304SS	316SS	316SS
Bonnet Gasket	Monel	Monel	Monel
Cap Gasket	Monel	Monel	Monel
Bellows Valve Components			
Guide	316SS	316SS	316SS
Spindle	410SS	316SS	316SS
Adjusting Screw	416SS	316SS	316SS
Adjusting Screw Locknut	416SS	316SS	316SS
Bellows Assembly	—	—	—
Flange	316L SS	316L SS	316L SS
Bellows	Inconel 625	Inconel 625	Inconel 625
Ring	316L SS	316L SS	316L SS
Bellows Gasket	Monel	Monel	Monel
Spring	Alloy Steel	Alloy Steel	316SS
Spring Washer	Carbon Steel	Carbon Steel	316SS
Bonnet Gasket	Soft Iron	Monel	Monel
Cap Gasket	Monel	Monel	Monel

NOTES: 1 The materials in red denote variation from standard material construction.
2 To specify valves, add material designation to the valve type, 1910L/S3 or 1910-30L/S3.

Corrosive Service

Corrosive Service, Alloy 20 Material[1,2]

Component	Construction Variation			
	A1	A2	A3	A4
Common Components				
Nozzle	Alloy 20	Alloy 20	Alloy 20	Alloy 20
Disc	Alloy 20	Alloy 20	Alloy 20	Alloy 20
Disc Retainer	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Disc Holder	316SS	Alloy 20	Alloy 20	Alloy 20
Adjusting Ring	316SS	Alloy 20	Alloy 20	Alloy20
Adjusting Ring Pin	316SS	Alloy 20	Alloy 20	Alloy 20
Spindle Retainer	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Adjusting Ring Pin Gasket	Soft Iron	Monel	Monel	Monel
Guide Gasket	Soft Iron	Monel	Monel	Monel
Base, Bonnet, Cap	Carbon Steel	Carbon Steel	[3]	[3]
Base Studs	B7 Alloy Steel	B7 Alloy Steel	Alloy 20	Alloy 20
Base Stud Nuts	2H Carbon Steel	2H Carbon Steel	Alloy 20	Alloy 20
Non-Bellows Valve Components				
Guide	316SS	Alloy 20	Alloy 20	Alloy 20
Spindle	410SS	Alloy 20	Alloy 20	Alloy 20
Adjusting Screw	416SS	Alloy 20	Alloy 20	Alloy 20
Adjusting Screw Locknut	416SS	Alloy 20	Alloy 20	Alloy 20
Spring	Alloy Steel	Alloy Steel	Alloy Steel	Alloy 20
Spring Washers	Carbon Steel	Carbon Steel	Carbon Steel	Alloy 20
Eductor Tube	304SS	304SS	Alloy 20	Alloy 20
Bonnet Gasket	Soft Iron	Monel	Monel	Monel
Cap Gasket	Soft Iron	Monel	Monel	Monel
Bellows Valve Components				
Guide	316SS	316SS	Alloy 20	Alloy 20
Spindle	410SS	410SS	Alloy 20	Alloy 20
Adjusting Screw	416SS	416SS	Alloy 20	Alloy 20
Adjusting Screw Locknut	416SS	416SS	Alloy 20	Alloy 20
Bellows Assembly	—	—	—	—
Flange	316L SS	Alloy 20	Alloy 20	Alloy 20
Bellows	Inconel 625	Alloy 20	Alloy 20	Alloy 20
Ring	316L SS	Alloy 20	Alloy 20	Alloy 20
Bellows Gasket	Soft Iron	Monel	Monel	Monel
Spring	Alloy Steel	Alloy Steel	Alloy Steel	Alloy 20
Spring Washer	Carbon Steel	Carbon Steel	Carbon Steel	Alloy 20
Bonnet Gasket	Soft Iron	Soft Iron	Monel	Monel
Cap Gasket	Soft Iron	Monel	Monel	Monel

NOTES: 1 The materials in red denote variation from standard material construction.
2 To specify valves, add material designation to the valve type, 1910L/A3 or 1910-30L/A3.
3 ASME SA351 grade CN7M alloy steel.

Corrosive Service

Corrosive Service, Monel Material[1,2]

Component	Construction Variation				
	M1	MB (M 1½)	M2	M3	M4
Common Components					
Nozzle	Monel	Monel	Monel	Monel	Monel
Disc	Monel	Monel	Monel	Monel	Monel
Disc Retainer	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Disc Holder	316SS	Monel	Monel	Monel	Monel
Adjusting Ring	316SS	Monel	Monel	Monel	Monel
Adjusting Ring Pin	316SS	Monel	Monel	Monel	Monel
Spindle Retainer	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Adjusting Ring Pin Gasket	Soft Iron	Monel	Monel	Monel	Monel
Guide Gasket	Soft Iron	Monel	Monel	Monel	Monel
Base, Bonnet, Cap	Carbon Steel	Carbon Steel	Carbon Steel	Monel	Monel
Base Studs	B7 Alloy Steel	B7 Alloy Steel	B7 Alloy Steel	K Monel	K Monel
Base Stud Nuts	2H Carbon Steel	2H Carbon Steel	2H Carbon Steel	K Monel	K Monel
Non-Bellows Valve Components					
Guide	316SS	316SS	Monel	Monel	Monel
Spindle	410SS	410SS	Monel	Monel	Monel
Adjusting Screw	416SS	416SS	Monel	Monel	Monel
Adjusting Screw Locknut	416SS	416SS	Monel	Monel	Monel
Spring	Alloy Steel	Alloy Steel	Alloy Steel	Alloy Steel	Inconel
Spring Washers	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel	Monel
Eductor Tube	304SS	304SS	304SS	Monel	Monel
Bonnet Gasket	Soft Iron	Monel	Monel	Monel	Monel
Cap Gasket	Soft Iron	Monel	Monel	Monel	Monel
Bellows Valve Components					
Guide	316SS	316SS	316SS	Monel	Monel
Spindle	410SS	410SS	410SS	Monel	Monel
Adjusting Screw	416SS	416SS	416SS	Monel	Monel
Adjusting Screw Locknut	416SS	416SS	416SS	Monel	Monel
Bellows Assembly	—	—	—	—	—
Flange	316L SS	316L SS	Monel	Monel	Monel
Bellows	Inconel 625	Inconel 625	Monel	Monel	Monel
Ring	316L SS	316L SS	Monel	Monel	Monel
Bellows Gasket	Soft Iron	Monel	Monel	Monel	Monel
Spring	Alloy Steel	Alloy Steel	Alloy Steel	Alloy Steel	Inconel
Spring Washers	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel	Monel
Bonnet Gasket	Soft Iron	Soft Iron	Soft Iron	Monel	Monel
Cap Gasket	Soft Iron	Monel	Monel	Monel	Monel

NOTES: 1 The materials in red denote variation from standard material construction.
2 To specify valves, add material designation to the valve type, 1910L/M3 or 1910-30L/M3.

Corrosive Service

Corrosive Service, Hastelloy Material[1,2]

Component	Construction Variation			
	H1	H2	H3	H4
Common Components				
Nozzle	Hastelloy C	Hastelloy C	Hastelloy C	Hastelloy C
Disc	Hastelloy C	Hastelloy C	Hastelloy C	Hastelloy C
Disc Retainer	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Disc Holder	316SS	Hastelloy C	Hastelloy C	Hastelloy C
Adjusting Ring	316SS	Hastelloy C	Hastelloy C	Hastelloy C
Adjusting Ring Pin	316SS	Hastelloy C	Hastelloy C	Hastelloy C
Spindle Retainer	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Adjusting Ring Pin Gasket	Soft Iron	Monel	Monel	Monel
Guide Gasket	Soft Iron	Monel	Monel	Monel
Base, Bonnet, Cap	Carbon Steel	Carbon Steel	Hastelloy C	Hastelloy C
Base Studs	B7 Alloy Steel	B7 Alloy Steel	Hastelloy C	Hastelloy C
Base Stud Nuts	2H Carbon Steel	2H Carbon Steel	Hastelloy C	Hastelloy C
Non-Bellows Valve Components				
Guide	316SS	Hastelloy C	Hastelloy C	Hastelloy C
Spindle	410SS	Hastelloy C	Hastelloy C	Hastelloy C
Adjusting Screw	416SS	Hastelloy C	Hastelloy C	Hastelloy C
Adjusting Screw Locknut	416SS	Hastelloy C	Hastelloy C	Hastelloy C
Spring	Alloy Steel	Alloy Steel	Alloy Steel	Hastelloy C
Spring Washers	Carbon Steel	Carbon Steel	Carbon Steel	Hastelloy C
Eductor Tube	304SS	304SS	Hastelloy C	Hastelloy C
Bonnet Gasket	Soft Iron	Monel	Monel	Monel
Cap Gasket	Soft Iron	Monel	Monel	Monel
Bellows Valve Components				
Guide	316SS	316SS	Hastelloy C	Hastelloy C
Spindle	410SS	410SS	Hastelloy C	Hastelloy C
Adjusting Screw	416SS	416SS	Hastelloy C	Hastelloy C
Adjusting Screw Locknut	416SS	416SS	Hastelloy C	Hastelloy C
Bellows Assembly	—	—	—	—
Flange	316L SS	Hastelloy C	Hastelloy C	Hastelloy C
Bellows	Inconel 625	Hastelloy C	Hastelloy C	Hastelloy C
Ring	316L SS	Hastelloy C	Hastelloy C	Hastelloy C
Bellows Gasket	Soft Iron	Monel	Monel	Monel
Spring	Alloy Steel	Alloy Steel	Alloy Steel	Hastelloy C
Spring Washer	Carbon Steel	Carbon Steel	Carbon Steel	Hastelloy C
Bonnet Gasket	Soft Iron	Soft Iron	Monel	Monel
Cap Gasket	Soft Iron	Monel	Monel	Monel

NOTES: 1 The materials in red denote variation from standard material construction.
2 To specify valves, add material designation to the valve type, 1910L/H3 or 1910-30L/H3.

Low Temperature

Special Materials for Low Process Fluid Temperature[1,2]

Component	-21°F to -75°F -29°C to -59°C L1[3]	-76°F to -150°F -60°C to -101°C L2	-151°F to -450°F -102°C to -268°C L3
Common Components			
Nozzle	316SS	316SS	316SS
Disc	316SS	316SS	316SS
Disc Retainer	Inconel X750	Inconel X750	Inconel X750
Disc Holder	316SS	316SS	316SS
Adjusting Ring	316SS	316SS	316SS
Adjusting Ring Pin	316SS	316SS	316SS
Spindle Retainer	Inconel X750	Inconel X750	Inconel X750
Cap Gasket	Monel	Monel	Monel
Adjusting Ring Pin Gasket	Monel	Monel	Monel
Guide Gasket	Monel	Monel	Monel
Base	316SS	316SS	316SS
Bonnet	Carbon Steel	316SS	316SS
Cap	Carbon Steel	316SS	316SS
Base Studs	Gr. B8M	Gr. B8M	Gr. B8M
Base Stud Nuts	Gr. 8M	Gr. 8M	Gr. 8M
Non-Bellows Valve Components			
Guide	316SS	316SS	316SS
Spindle	410SS	316SS	316SS
Adjusting Screw	416SS	316SS	316SS
Adjusting Screw Nut	416SS	316SS	316SS
Spring	Alloy Steel	316SS	316SS
Spring Washers	316SS	316SS	316SS
Eductor Tube	304SS	316SS	316SS
Bonnet Gasket	Monel	Monel	Monel
Bellows Valve Components			
Guide	316SS	316SS	316SS
Spindle	410SS	316SS	316SS
Adjusting Screw	416SS	316SS	316SS
Adjusting Screw Nut	416SS	316SS	316SS
Bellows Assembly	—	—	—
Flange	316L SS	316L SS	316L SS
Bellows	Inconel 625	Inconel 625	316L SS
Ring	316L SS	316L SS	316L SS
Bellows Gasket	Monel	Monel	Monel
Spring	Alloy Steel	316SS	316SS
Spring Washer	Carbon Steel	316SS	316SS
Bonnet Gasket	Monel	Monel	Monel

NOTES: 1 The materials in red denote variation from standard material construction.
2 To specify valves, add material designation to the valve type, 1910L/L3 or 1910-30L/L3.
3 SA 352LCC material can be utilized down to -50°F (-45°C) for bases, bonnets, or caps when requested.

Low Temperature

Special Materials for Low Ambient Temperatures
(to -50°F or -45°C[1,2])

Component	Construction Variation
	C1[3]
Common Components	
Nozzle	316SS
Disc	316SS
Disc Retainer	Inconel X750
Disc Holder	316SS
Adjusting Ring	316SS
Adjusting Ring Pin	316SS
Spindle Retainer	Inconel X750
Adjusting Ring Pin Gasket	Soft Iron
Guide Gasket	Soft Iron
Base, Bonnet, Cap	LCC Carbon Steel
Base Studs	B8M
Base Stud Nuts	8M
Non-Bellows Valve Components	
Guide	316SS
Spindle	410SS
Adjusting Screw	416SS
Adjusting Screw Nut	416SS
Spring	Alloy Steel
Spring Washers	316SS
Eductor Tube	304SS
Bonnet Gasket	Soft Iron
Cap Gasket	Soft Iron
Bellows Valve Components	
Guide	316SS
Spindle	410SS
Adjusting Screw	416SS
Adjusting Screw Nut	416SS
Bellows Assembly	—
Flange	316L SS
Bellows	Inconel 625
Ring	316L SS
Bellows Gasket	Soft Iron
Spring	Alloy Steel
Spring Washers	316SS
Bonnet Gasket	Soft Iron
Cap Gasket	Soft Iron

NOTES: 1 The materials in red denote variation from standard material construction.
2 Media temperature may impact valve temperature. Contact factory for assistance.
3 To specify valves, add material designation to the valve type, 1910L / C1 or 1910-30L / C1.

High Temperature

Special Materials for Low Process Fluid Temperature[1,2]

Component	1001°F to 1200°F 538°C to 649°C T1	1201°F to 1500°F 649°C to 815°C T2[3,4]
Common Components		
Nozzle	316SS	316SS / Stellited
Disc	316SS	Inconel X750
Disc Retainer	Inconel X750	Inconel X750
Disc Holder	316SS Glide-Aloy Treated	316SS Glide-Aloy Treated
Adjusting Ring	316SS	316SS
Adjusting Ring Pin	316SS	316SS
Spindle Retainer	Inconel X750	Inconel X750
Cap Gasket	Monel	N/A
Adjusting Ring Pin Gasket	Monel	Monel
Guide Gasket	Monel	Monel
Base	316SS	316SS
Bonnet	316SS	Slotted 316SS
Cap	Carbon Steel	Carbon Steel
Base Studs	Gr. B8M	Gr. B8M
Base Stud Nuts	Gr. 8M	Gr. 8M
Deflector Plate	N/A	304SS
Non-Bellows Valve Components		
Guide	316SS	316SS Glide-Aloy Treated
Spindle	410SS	316SS / Stellited
Adjusting Screw	416SS	416SS
Adjusting Screw Locknut	416SS	416SS
Spring	Inconel X750 or Tungsten	Inconel X750 or Tungsten
Spring Washers	Carbon Steel	410SS
Eductor Tube	304SS	N/A
Bonnet Gasket	Monel	N/A
Bellows Valve Components		
Guide	316SS	316SS Glide-Aloy Treated
Spindle	410SS	316SS / Stellited
Adjusting Screw	416SS	416SS
Adjusting Screw Locknut	416SS	416SS
Bellows Assembly		
Flange	Inconel 625	Inconel 625
Bellows	Inconel 625	Inconel 625
Ring	Inconel 625	Inconel 625
Bellows Gasket	Monel	Monel
Spring	Inconel X750 or Tungsten	Inconel X750 or Tungsten
Spring Washer	Carbon Steel	410SS
Bonnet Gasket	Monel	N/A

NOTES: 1 The materials in red denote variation from standard material construction.
2 To specify valves, add material designation to the valve type, 1920L/T2 or 1920-30L/T2.
3 All T2 valves have ANSI Class 300 outlet flanges.
4 Consult factory for temperatures above 1500°F (815°C).

1900 Valves for Lethal Service

In some industries served by CONSOLIDATED, there are lethal service applications. These applications require special consideration as detailed below. Should you feel that your application may be for lethal service, please review this information. "LETHAL SERVICE" should be prominently indicated in your discussions, inquiries, or purchase orders.

I. Definition

ASME B & PVC, Section VIII (Division 1) states that it is the responsibility of the user to state that the valve will be in lethal service.

IMPORTANT

CONSOLIDATED does not determine if a fluid is lethal. The customer must specify the fluid is lethal and his paperwork should be clearly stamped, identifying the application as a lethal fluid.

The ASME Code definition is as follows:

Lethal Substance - Poisonous gases or liquids of such a nature that a very small amount of the gas or the vapor of the liquid, mixed or unmixed with air, is dangerous to life when inhaled.

ASME B31.3, a chemical plant and petroleum refining piping standard, supplies a similar definition, which they call a "Category M Fluid Service".

II. Valve Requirements for Lethal Service Application

A. Only closed bonnet valves with a screwed or bolted cap or packed lever can be used for lethal service.

B. Valve model numbers that are acceptable for lethal service after modification are 1905/1910 conventional and bellows flanged valves.

C. It is recommended that a soft seat design be used for improved tightness.

D. When service temperature exceeds 450°F (232°C), bolting material review is required by Dresser Measurement Engineering.

E. Use non-sparking material for flammable media. Examples are Bronze, 316 Stainless Steel, and Monel.

III. Base, Bonnet, and Cap Casting Requirements

A. Each casting requires 100% visual inspection

B. Each casting requires complete surface examination either by magnetic particle for steel castings or liquid penetrant for stainless castings.

C. Each casting shall have radiographic examination.

D. All repairs to base, bonnet, and cap castings must be documented.

E. All threads must be inspected for continuity of threads

F. Hydrotest hold time for ten (10) minutes.

G. The base drain plug is to be sealed by seal welding a plug of the same material as the base.

H. The bonnet vent is to be sealed in accordance with paragraph G for conventional valves (non-bellows). Bellows valves are to have the vent connection vented to a safe location.

IV. Additional Requirements

A. Each bellows requires a mass spectrometer leak test to 1×10^{-7} cc/sec to be imposed.

B. It is necessary to seal the nozzle-base joint. The customer must state their preference between a seal weld or O-Ring joint, depending on conformance of their maintenance practice.

C. The nozzle and disc require hydrotesting with a hold time for a minimum of ten (10) minutes.

D. Cleaning procedures and lubricants used shall be acceptable for lethal service.

E. Back pressure testing is required. Documentation of test is required.

O-Ring Selection

O-Ring Selection Table - Durometer (USCS Units)

Valve Type	Set Pressure Range (psig)				
	50[1]	70 - 75[1]	90[2]	Teflon[3] -300°F to 200°F	Teflon[3] 201°F to 500°F
1900D & E	5 to 350	120 to 800	265 to 2000	2000 to 6000	285 to 6000
1900F	5 to 350	120 to 800	265 to 2000	2000 to 6000	285 to 6000
1900G	5 to 375	125 to 780	375 to 1900	1900 to 3705	285 to 3705
1900H	5 to 375	140 to 780	330 to 1900	1900 to 2750	285 to 2750
1900J	5 to 315	45 to 780	150 to 1900	1900 to 2700	285 to 2700
1900K	5 to 235	125 to 580	255 to 1400	1400 to 2220	250 to 2220
1900L	5 to 235	75 to 580	155 to 1400	1400 to 1500	155 to 1500
1900M	5 to 235	70 to 580	140 to 1100	–	140 to 1100
1900N	5 to 235	40 to 580	90 to 1000	–	90 to 1000
1900P	5 to 200	30 to 500	75 to 1000	–	75 to 1000
1900Q	5 to 170	40 to 420	80 to 600	–	80 to 600
1900R	5 to 120	25 to 300	60 to 300	–	60 to 300
19004	5 to 80	15 to 200	30 to 300	–	30 to 300
1900V	–	15 to 300	15 to 300	15 to 300	15 to 300
1900W	–	7 to 300	7 to 300	15 to 300	15 to 300

NOTES: 1 Maximum set pressure for silicone compounds is half of the maximum value.
2 The E962-90D O-Ring can be used in steam service in applications down to 15 psig.
3 Teflon will not be supplied for conditions that deviate from these ranges.

O-Ring Selection

O-Ring Temperature Limits

Materials	Durometer	Description[5]	Temp. Limits (°F)	Temp. Limits (°C)
Nitrile	50	N299-50 or N1009-50	-45 to +225	-43 to +107
	70	N674-70	-40 to +250	-40 to +121
	90	N552-90	-40 to +350	-40 to +177
	70[4]	N1173-70	-25 to +300	-31 to +149
Ethylene/Propylene	50	E981-50	-65 to +212	-53 to +100
	70	E603-70	-65 to +212	-53 to +100
	75 & 80[2]	E740-75 & E515-80	-70 to +250	-57 to +121
	90	E962-90[1]	-70 to +500	-57 to +260
	75	E962-75	-60 to +250/400	-51 to +121/204
Fluorocarbon	50	V986-50	-15 to +400	-26 to +204
	75	V747-75 or V884-75	-15 to +400	-26 to +204
	90	V894-90 or V709-90	-15 to +400	-26 to +204
Neoprene	50	C267-50	-45 to +300	-43 to +149
	70	C944-70 or C873-70	-45 to +300	-43 to +149
Silicone	50	S595-50	-65 to +437	-53 to +225
	70	S604-70	-65 to +437	-53 to +225
Teflon	N/A	Teflon	-300 to +500	-184 to +260
Kalrez[3]	82	1050LF	-42 to +550	-41 to +288
	75	4079	-58 to +601	-50 to +316
	91	3018	-35 to +601	-37 to +316
	65	1058	-40 to +500	-40 to +260

NOTES: 1 EPR962-90D can be used on steam service to lower pressure limit of 15 psig.
2 Set pressure ranges from durometer table shall apply to these compounds (for nuclear service, radiation environment).
3 Consult factory before selecting.
4 Consult factory before using. For use with freon 134A/ester oil service.
5 Refer to Technical Section for O-Ring Selection Tables for various fluids.

1900 Caps, Levers, and Accessories

Lifting Mechanisms

The purpose of the lifting mechanism is to open the valve when the pressure under the valve disc is lower than the set pressure. These mechanisms are made in three basic types: plain lever, packed lever, and air-operated lifting device. The lifting lever may be used as follows:

(1) to lift the disc from the valve seat periodically during the operation of equipment to be sure that the disc holder is not frozen in the guide as a result of corrosion, coking, sulphur deposits, etc. This will ensure protection of the unit at all times. Operating pressure under the disc should be approximately 75% of the set pressure when lifting in accordance with the ASME Code; otherwise the lever assembly could be damaged.

(2) to remove foreign particles which are sometimes trapped under the seat as the valve closes. Immediate cleaning of the valve seat with the pressure of the media, by use of the lifting lever, will correct an otherwise leaking valve, save maintenance costs at a later date and in some cases will avoid a shutdown of the equipment.

(3) to vent equipment to the atmosphere or discharge piping.

Plain Lever

This lever assembly is not pressure-tight and should not be used where back pressure is present or where the escape of vapor discharging from an open valve is undesirable around the lever assembly.

Packed Lever

As indicated by the name, this lifting lever assembly is packed around the lever shaft, so that leakage will not occur around the upper part of the valve when the valve is open or when back pressure is present. The packed lifting lever should be used when positive protection against leakage is required.

Bolted Cap

CONSOLIDATED Standard Safety Relief Valves are supplied with screwed caps but bolted caps are available.

Gag

The purpose of the gag is to hold the safety relief valve closed while equipment is being subjected to an operational hydrostatic test. This is the only purpose for which the gag is intended, and it can be accomplished by pulling the gag hand-tight. Force should never be used. The gag should never be left in the valve during the operation of the equipment. It should be removed each time after using and hung in a safe, convenient location and the sealing plug reinstated and properly torqued.

ASME B & PVC, Section VIII, Lever Requirements

ASME Codes require that a lifting lever must be supplied with the valve for steam, air, and hot water service over 140°F (60°C) applications. However, it need not be a sealed lifting mechanism. The ASME Codes do recommend that sealed lifting mechanisms be used; however, they are not mandatory. The lifting lever may be omitted under Code Case 2203. However, Dresser requires that all orders for pressure relief valves without levers or blowdown valves for steam, air, and water over 140°F (60°C) state specifically that the valves are being purchased per Code Case 2203. The purchaser is responsible for obtaining jurisdictional authorization for use of Code Case 2203.

Thermal Relief Valves: When ASME Code stamped valves are used for thermal relief applications, the ASME Code guidelines shall be followed in regard to lifting levers.

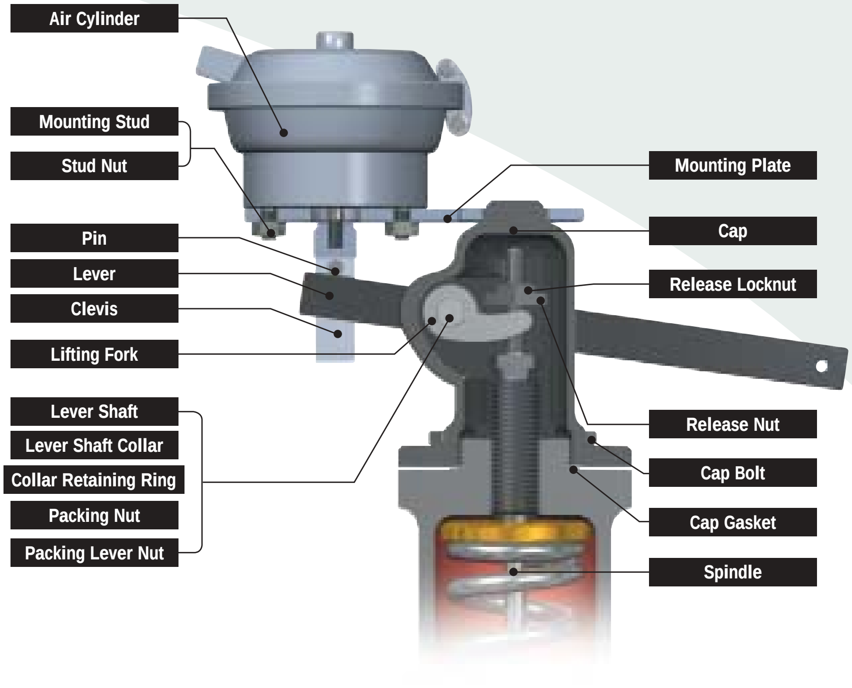
Air-Operated Lifting Device

The Air Operated Lifting Device uses an air cylinder to obtain lifting power to open the valve from a remote control station. Normal operation of the safety relief valve is independent of the lifting device.

Please specify actual required conditions, otherwise the device will be supplied to operate with at least 75% of set pressure under the disc in accordance with the ASME Code.

Requirements for special application: valve size, set pressure, minimum pressure at which the valve must be kept open, air pressure for operator, or electrical characteristics for solenoid operation.

Regulated air, not to exceed 100 psig, is required for operation.



Valve Position Indicators

Valve Position Indicators in general, are a micro switch apparatus used for remote indication of the opening of a Safety Relief Valve. It is designed to activate warning devices such as control panel lights or auditory indicators. This option enhances control function of operators located in remote control stations. Please advise voltage requirements for proper selection of micro switch when ordering.

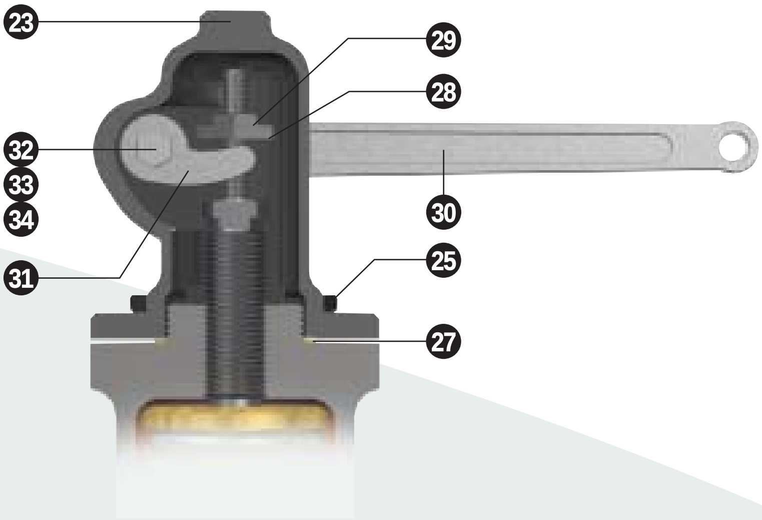
Slotted Bonnet

Steam Jacket

Vent Bug Screen
(Available in 1900-30 bellows valve only)

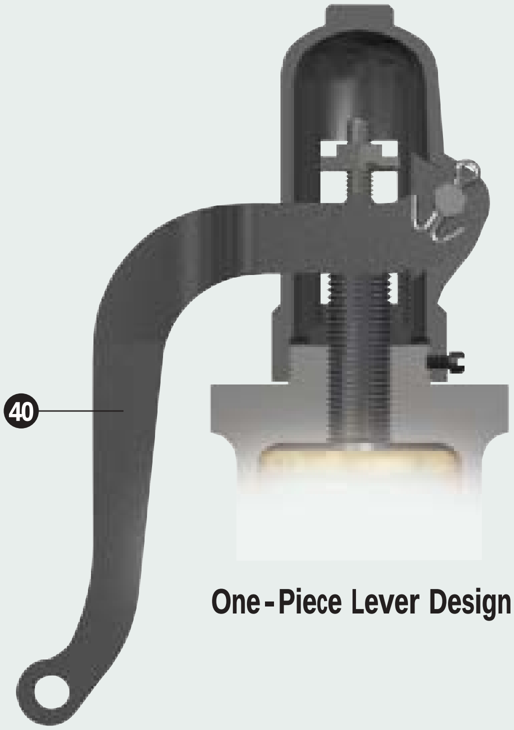
Packed Lever

As indicated by the name, this lifting lever assembly is packed around the lever shaft, so that leakage will not occur around the upper part of the valve when the valve is open or when back pressure is present. The packed lifting lever should be used when positive protection against leakage is required.

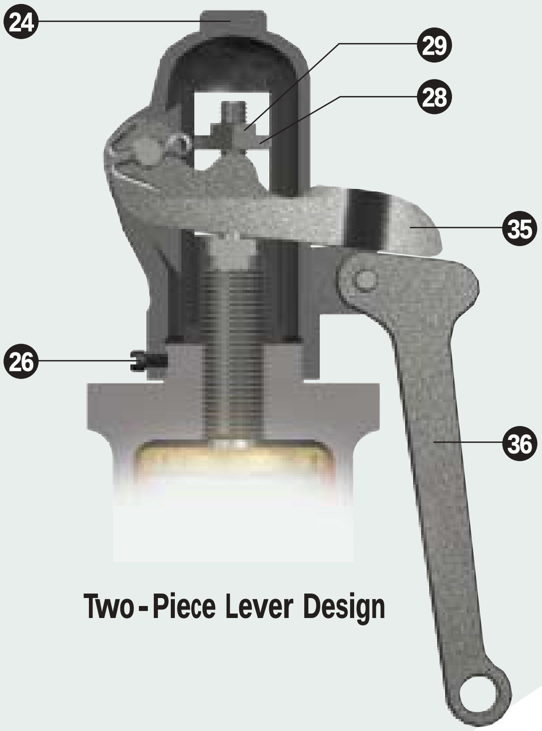


Plain Lever

This lever assembly is not pressure-tight and should not be used where back pressure is present or where the escape of vapor discharging from an open valve is undesirable around the lever assembly. It is designed with either a one or two-piece lever as illustrated below. The design is based on valve size and/or valve set pressure.



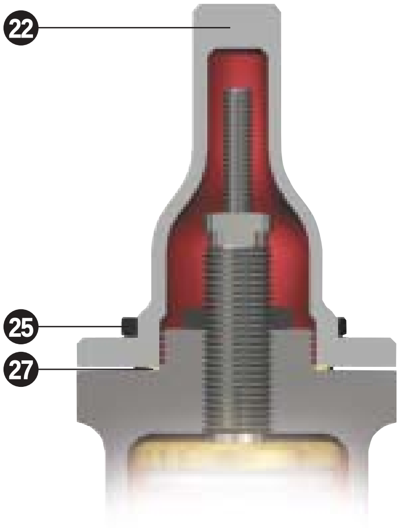
One-Piece Lever Design



Two-Piece Lever Design

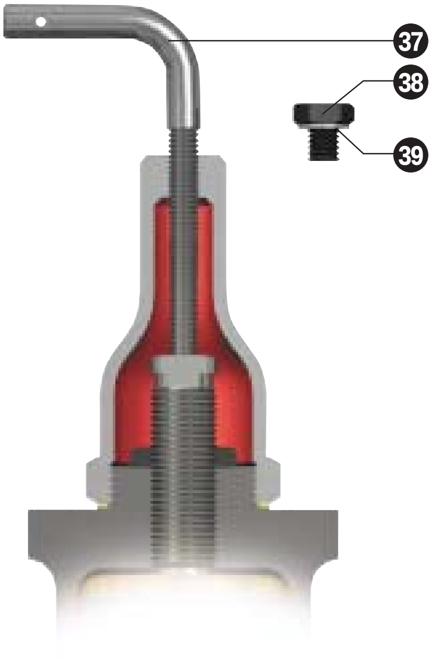
Bolted Cap

CONSOLIDATED standard safety relief valves are supplied with screwed caps, but bolted caps are available.



Cap with Gag

The purpose of the gag is to hold the safety relief valve closed while equipment is being subjected to an operational hydrostatic test. This is the only purpose for which the gag is intended, and it can be accomplished by pulling the gag hand-tight. Force should never be used. The gag should never be left in the valve during the operation of the equipment. It should be removed each time after using and hung in a safe, convenient location.



Cap and Lever Construction[1]
Standard, Alloy, and Hastelloy Material

Cap Type		Component	Construction Variation			
			Standard, A1, A2, H1, H2, L1, M1, MB, M2, S2, T1, T2	Alloy 20 *A3 and A4*	Hastelloy *H3 and H4*	HF Alky *HA*
Packed Lever	**23**	Cap	Carbon Steel	Alloy 20	Hastelloy C	Carbon Steel
	25	Cap Bolts	Carbon Steel	Alloy 20	Hastelloy C	Carbon Steel
	27	Cap Gasket[2]	Soft Iron	Monel	Monel	Monel
	30	Lever	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron
	32	Lever Shaft	410/416SS	410/416SS	410/416SS	410/416SS
	33	Packing	Grafoil	Grafoil	Grafoil	Grafoil or Graphlock
	34	Packing Nut	410/416SS	410/416SS	410/416SS	410/416SS
	31	Lifting Fork	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron
	28	Release Nut	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
	29	Release Lock Nut	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
Plain Lever	**24**	Cap	Malleable Iron	N/A	N/A	Malleable Iron
	26	Cap Set Screw	Carbon Steel	N/A	N/A	Carbon Steel
	35	Top Lever	Malleable Iron	N/A	N/A	Malleable Iron
	36	Drop Lever	Malleable Iron	N/A	N/A	Malleable Iron
	28	Release Nut	Carbon Steel	N/A	N/A	Carbon Steel
	29	Release Lock Nut	Carbon Steel	N/A	N/A	Carbon Steel
	40	Plain Lever (One Piece)	Malleable Iron	N/A	N/A	Malleable Iron
Bolted Cap	**22**	Cap	Carbon Steel	Alloy 20	Hastelloy C	Carbon Steel
	25	Cap Bolts	Carbon Steel	Alloy 20	Hastelloy C	Carbon Steel
	27	Cap Gasket[2]	Soft Iron	Monel	Monel	Monel
Gag	**37**	Gag Bolt	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
	38	Sealing Plug	Carbon Steel	Alloy 20	Hastelloy C	Carbon Steel
	39	Plug Gasket[2]	Soft Iron	Monel	Monel	Monel

NOTES: 1 The materials in red denote variation from standard material construction.
2 Gasket material is Monel for A2, H2, MB, M2 and S2 construction.

Cap and Lever Construction[1]
Monel, Stainless, and Low Temperature Material

Cap Type		Component	Construction Variation		
			Monel *M3 and M4*	Stainless *S3 and S4*	Low Temperature *L2 and L3*
Packed Lever	**23**	Cap	Monel	316SS	316SS
	25	Cap Bolts	Monel K500	B8M	B8M
	27	Cap Gasket	Monel	Monel	Monel
	30	Lever	Malleable Iron	Malleable Iron	Malleable Iron
	32	Lever Shaft	410/416SS	316SS	410/416SS
	33	Packing	Grafoil	Grafoil	Grafoil
	34	Packing Nut	410/416SS	316SS	410/416SS
	31	Lifting Fork	Malleable Iron	316SS	316SS
	28	Release Nut	Carbon Steel	316SS	316SS
	29	Release Lock Nut	Carbon Steel	316SS	316SS
Plain Lever	**24**	Cap	N/A	316SS	316SS
	26	Cap Set Screw	N/A	316SS	316SS
	35	Top Lever	N/A	Malleable Iron	Malleable Iron
	36	Drop Lever	N/A	Malleable Iron	Malleable Iron
	28	Release Nut	N/A	Carbon Steel	Carbon Steel
	29	Release Lock Nut	N/A	Carbon Steel	Carbon Steel
	40	Plain Lever	N/A	Malleable Iron	Malleable Iron
Bolted Cap	**22**	Cap	Monel	316SS	316SS
	25	Cap Bolts	Monel K500	B8M	B8M
	27	Cap Gasket	Monel	Monel	Monel
Gag	**37**	Gag Bolt	Carbon Steel	Carbon Steel	Carbon Steel
	38	Sealing Plug	Monel	316SS	316SS
	39	Plug Gasket	Monel	Monel	Monel

NOTE: 1 The materials in red denote variation from standard material construction.

Bolt-on Jackets

Jacketing of Relief Valves

CONSOLIDATED valve offers simple solutions to your heating problems: Bolt-on Jackets.

Viscous materials that freeze or harden in relief valve nozzles create hazardous conditions. Process pipe jacketing or tracing may not provide sufficient heat to the area in and around the relief valve seat. During a pressure surge, some of the solid materials may stick in and around the seating area, keeping the valve from functioning and re-seating properly. This would result in leakage around the valve seating surface.

The solution to this problem is the Bolt-on Jacket. This jacket is a two piece aluminum casting with a steel pressure chamber embedded in the aluminum jacket casting. The pressure chamber is fabricated of standard pressure vessel materials for various heating fluids and service temperatures. The chamber is designed and tested in accordance with the ASME B & PVC, Section VIII, Div. I. The jacket casting conducts heat from the pressure chamber and rapidly distributes it evenly over the outer surface of the relief valve.

The aluminum casting distributes heat only. It carries no pressure load at any time. Heating fluid is transferred from one half of the jacket to the other by an external connector. A thin layer of heat transfer cement is used between the jacket and the relief valve to promote effective heat transfer by filling any air gaps between the jacket and the relief valve.

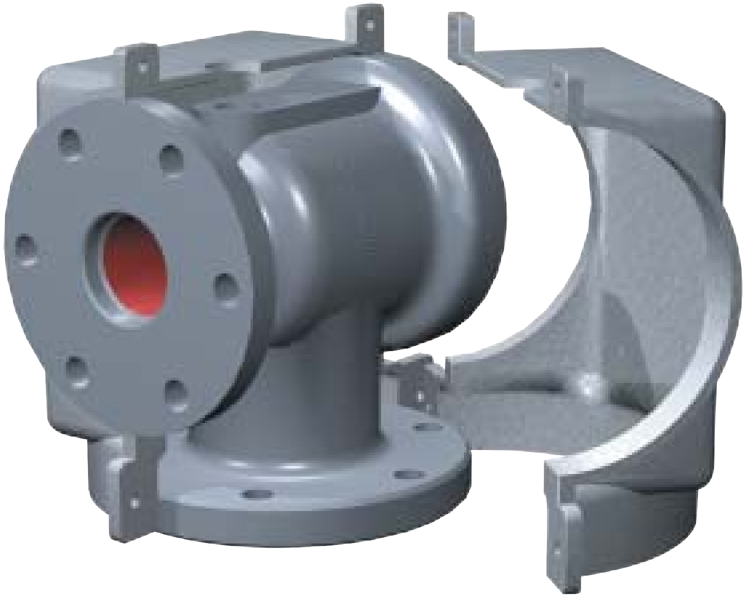
Bolt-on Jacket halves bolt together for quick installation and unbolt for ready access to the relief valve for easy maintenance. The jackets cover the jacket fully from flange to flange providing uniform heat to all process wetted surfaces. Standard service ratings for the jacket are 150 psig and 500°F. Higher ratings are available upon request.

Bolt-on Jackets may be ordered with adjacent flange coverage and with a variety of heating medium connections. Canadian Registration is available for all provinces.

Bolt-on Jackets are operating successfully on relief valves in many different process service applications world wide. Customers should consider jacketing the relief valves whenever the adjacent vessel or piping is heated in some manner. The following lists process applications that typically require jacketing of the relief valve.

- Acrylic Acid
- Ammonium Nitrate
- Coal Tars
- Caprolactam
- Cyanuric Chloride
- DMT
- DNT
- Fluoropolymers
- LLDPE
- Olefins
- Phosphorous
- Polypropylene
- Polystyrene Resins
- Phthalic Anhydride
- Sulphuric Acid
- Sulphur Dioxide
- Some Surfactants
- Tall Oils
- TMA

Typical Bolt-on Jacket



To ensure we provide the proper jacket coverage; please answer the following questions:

(1) Is the process operating at elevated temperatures?
(2) What is the process?
(3) What is the temperature of the process being maintained?
(4) What heating medium is being used in your jacket? What pressure and temperature is this medium?
(5) What type of jacket connections are required?
(6) How is the temperature being maintained on the process piping and other equipment (valves, pumps, meters, etc.)?

The relief valve will probably need a Bolt-on Jacket if it is operating in one of the process services listed above or if the adjacent piping and equipment is heated.

Contact the Factory for assistance.

1900 Flanged Series

This table applies to the standard 1900 Series regardless of materials of construction.

The tables state the inlet flange size of the valve and the flange rating followed by the outlet flange size and the flange rating.

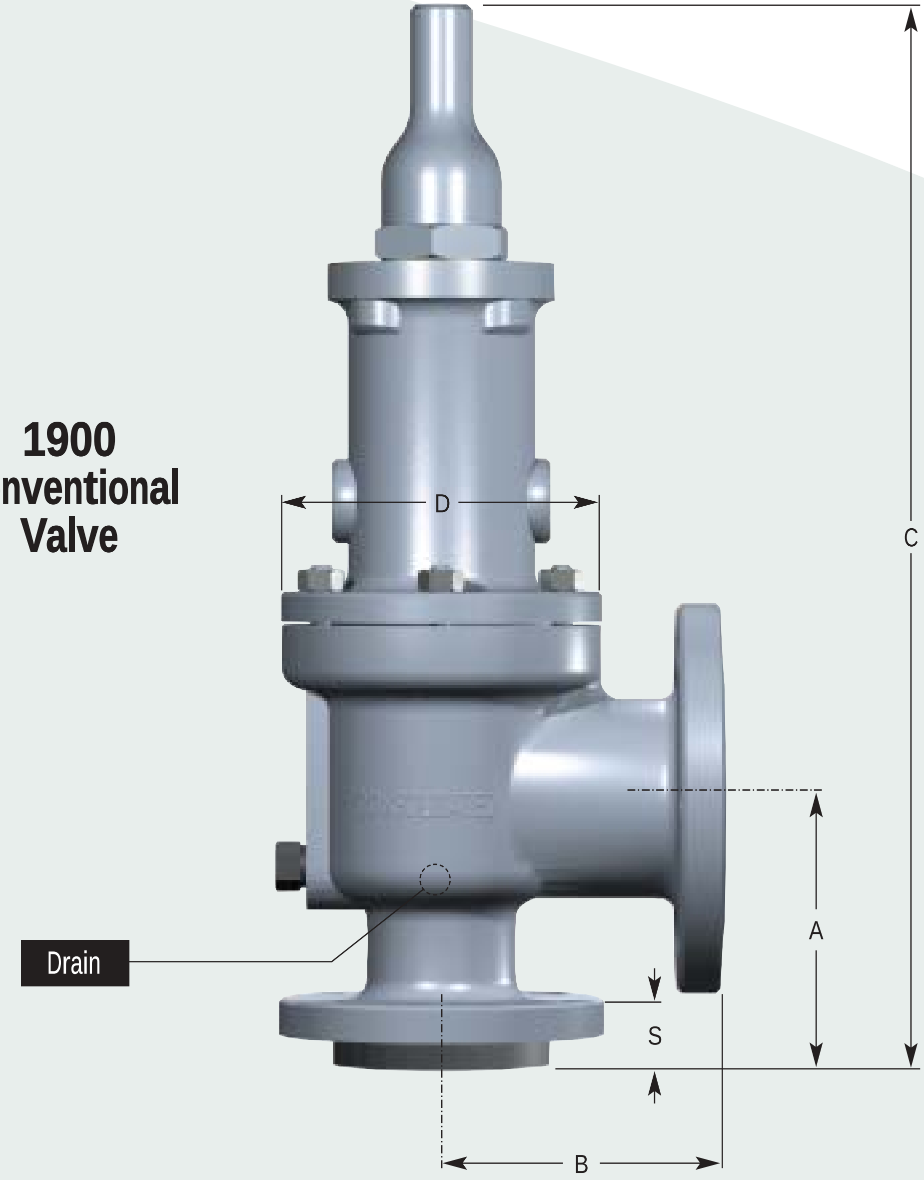
EXAMPLE: 1 - 150 x 2 - 150

Inlet is 1" size with a Class 150# flange. Outlet is 2" size with a Class 150# flange.

If the valve you are reviewing has an inlet or outlet size different from that stated, the dimensions “A” through “S” and weight may not apply.

NOTE: “USCS” Units refers to “U.S. Customary System” Units, the adapted U.S. standard formerly recognized as “English” Units.

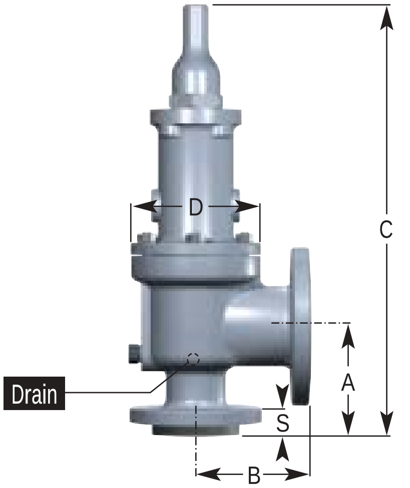
1900 Conventional Valve



1900 Series Valves
USCS Dimensions (in.) and Weights (lbs.)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (lbs.)
				STD	Bellows			
1 - 150 x 2 - 150	1905D	4-1/8	4-1/2	17	18	5-7/16	1-1/8	40
1 - 150 x 2 - 150	1905E	4-1/8	4-1/2	17	18	5-7/16	1-1/8	40
1-1/2 - 150 x 2 - 150	1905F	4-7/8	4-3/4	17-3/4	18-3/4	5-7/16	1-1/4	45
1-1/2 - 150 x 3 - 150*	1905G	4-7/8	4-3/4	17-3/4	19	5-7/16	1-1/4	55
1-1/2 - 150 x 3 - 150	1905H	5-1/8	4-7/8	19-1/2	19-1/2	6-5/16	1-1/4	60
2 - 150 x 3 - 150	1905J	5-3/8	4-7/8	21-1/4	21-1/4	6-7/8	1-5/16	75
3 - 150 x 4 - 150	1905K	6-1/8	6-3/8	24-1/2	24-1/2	7-3/8	1-7/16	110
3 - 150 x 4 - 150	1905L	6-1/8	6-1/2	28-3/4	28-3/4	8-7/8	1-7/16	140
4 - 150 x 6 - 150	1905M	7	7-1/4	29-3/4	29-3/4	9-3/8	1-5/8	185
4 - 150 x 6 - 150	1905N	7-3/4	8-1/4	33	33	10-1/8	1-5/8	220
4 - 150 x 6 - 150	1905P	7-1/8	9	34-1/4	34-1/4	11	1-5/8	260
6 - 150 x 8 - 150	1905Q	9-7/16	9-1/2	41	41	13-5/8	1-13/16	430
6 - 150 x 8 - 150	1905R	9-7/16	9-1/2	43	43	14-1/2	1-13/16	495
8 - 150 x 10 - 150	1905T	10-7/8	11	47-1/2	47-1/2	16-1/2	1-15/16	620
10 - 150 x 14 - 150	1905V	12	16	62	62	21-3/4	2	1600
12 - 150 x 16 - 150	1905W	14	16	70	70	24-1/2	2-13/16	2800
1 - 300 x 2 - 150	1906D	4-1/8	4-1/2	17	18	5-7/16	1-3/8	40
1 - 300 x 2 - 150	1906E	4-1/8	4-1/2	17	18	5-7/16	1-3/8	40
1-1/2 - 300 x 2 - 150	1906F	4-7/8	4-3/4	17-3/4	18-3/4	5-7/16	1-1/2	45
1-1/2 - 300 x 3 - 150*	1906G	4-7/8	4-3/4	17-3/4	19	5-7/16	1-1/2	55
1-1/2 - 300 x 3 - 150	1906H	5-1/8	4-7/8	19-1/2	19-1/2	6-5/16	1-9/16	60
2 - 300 x 3 - 150	1906J	5-3/8	4-7/8	21-1/4	21-1/4	6-7/8	1-9/16	75
3 - 300 x 4 - 150	1906K	6-1/8	6-3/8	24-1/2	24-1/2	7-3/8	1-13/16	115
3 - 300 x 4 - 150	1906L	6-1/8	6-1/2	28-3/4	28-3/4	8-7/8	1-13/16	145
4 - 300 x 6 - 150	1906M	7	7-1/4	29-3/4	29-3/4	9-3/8	1-15/16	190
4 - 300 x 6 - 150	1906N	7-3/4	8-1/4	33	33	10-1/8	1-15/16	225
4 - 300 x 6 - 150	1906P	7-1/8	9	34-1/4	34-1/4	11	1-15/16	270
6 - 300 x 8 - 150	1906Q	9-7/16	9-1/2	41	41	13-5/8	2-1/4	445
6 - 300 x 8 - 150	1906R	9-7/16	9-1/2	43	43	14-1/2	2-1/4	510
8 - 300 x 10 - 150	1906T	10-7/8	11	47-1/4	47-1/4	16-1/2	2-7/16	640
10 - 300 x 14 - 150	1906V	12	16	62	62	21-3/4	2-11/16	1700
12 - 300 x 16 - 150	1906W	14	16	70	70	24-1/2	2-15/16	2860

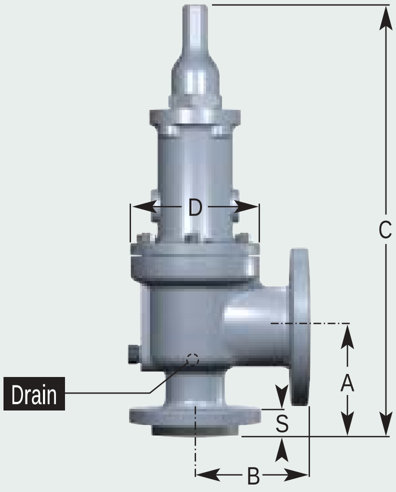
NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



1900 Series Valves
USCS Dimensions (in.) and Weights (lbs.)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (lbs.)
				STD	Bellows			
1 - 300 x 2 - 150	1910D	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
1 - 300 x 2 - 150	1910E	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
1-1/2 - 300 x 2 - 150	1910F	4-7/8	6	18-1/4	19-1/4	5-7/16	1-9/16	50
1-1/2 - 300 x 3 - 150*	1910G	4-7/8	6	18-1/4	19-1/2	5-7/16	1-9/16	60
2 - 300 x 3 - 150	1910H	5-1/8	4-7/8	20-1/4	20-1/4	6-5/16	1-11/16	65
3 - 300 x 4 - 150*	1910J	7-1/4	7-1/8	25-5/8	25-5/8	7-3/8	1-13/16	100
3 - 300 x 4 - 150	1910K	6-1/8	6-3/8	28	28	7-3/4	1-15/16	140
4 - 300 x 6 - 150	1910L	7-1/16	7-1/8	32	32	9-1/2	1-15/16	220
4 - 300 x 6 - 150	1910M	7	7-1/4	32	32	9-3/8	1-15/16	230
4 - 300 x 6 - 150	1910N	7-3/4	8-1/4	34-1/4	34-1/4	10-1/2	1-15/16	260
4 - 300 x 6 - 150	1910P	8-7/8	10	41	41	11-1/2	1-15/16	350
6 - 300 x 8 - 150	1910Q	9-7/16	9-1/2	43-1/4	43-1/4	14	2-1/4	530
6 - 300 x 10 - 150	1910R	9-7/16	10-1/2	45-1/2	45-1/2	14-1/2	2-1/4	550
8 - 300 x 10 - 150#	1910T	10-7/8	11	53-3/8	53-3/8	16-1/2	2-7/16	840
10 - 300 x 14 - 150#	1910V	12	16	66	66	24-1/2	2-11/16	2000
12 - 300 x 16 -150#	1910W	14	16	70	70	24v1/2	2-15/16	2860
1 - 600 x 2 - 150#	1912D	4-1/8	4-1/2	18-1/4	19-1/4	6-5/16	1-3/8	55
1 - 600 x 2 - 150#	1912E	4-1/8	4-1/2	18-1/4	19-1/4	6-5/16	1-3/8	55
1-1/2 - 600 x 2 - 150#	1912F	4-7/8	6	19	20	6-5/16	1-9/16	60
1-1/2 - 600 x 3 - 150#*	1912G	4-7/8	6	19	20-1/4	6-5/16	1-9/16	65
2 - 600 x 3 - 150#	1912H	6-1/16	6-3/8	23	23	7	1-11/16	85
3 - 600 x 4 - 150#*	1912J	7-1/4	7-1/8	29-7/8	29-7/8	9	1-13/16	170
3 - 600 x 4 - 150#	1912K	7-1/4	7-1/8	29-1/4	29-1/4	7-3/4	1-15/16	150
4 - 600 x 6 - 150 #	1912L	7-1/16	8	32	32	9-1/2	2-3/16	230
4 - 600 x 6 - 150 #	1912M	7	8	36-1/4	36-1/4	10-3/4	2-3/16	300
4 - 600 x 6 - 150 #	1912N	7-3/4	8-3/4	39	39	11-3/4	2-3/16	360
4 - 600 x 6 - 150 #	1912P	8-7/8	10	43-1/2	43-1/2	13-7/8	2-3/16	530
6 - 600 x 8 - 150#	1912Q	9-7/16	9-1/2	46	46	14-1/4	2-11/16	645
6 - 600 x 10 - 150#	1912R	9-7/16	10-1/2	47-1/2	47-1/2	15-1/8	2-11/16	675

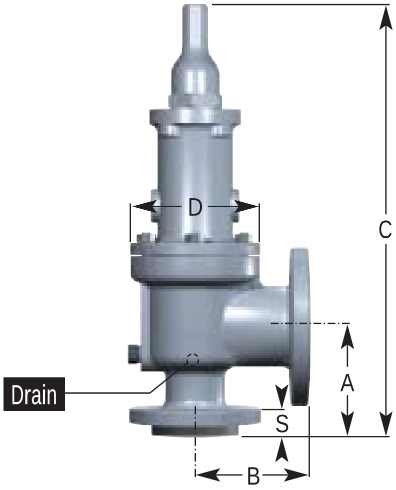
NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



1900 Series Valves
USCS Dimensions (in.) and Weights (lbs.)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (lbs.)
				STD	Bellows			
1-1/2 - 900 x 2 - 300	1914D	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
1-1/2 - 900 x 2 - 300	1914E	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
1-1/2 - 900 x 3 - 300*	1914F	4-7/8	6-1/2	22-1/2	23-1/2	7-13/16	1-15/16	100
1-1/2 - 900 x 3 - 300*	1914G	4-7/8	6-1/2	22-1/2	23-3/4	7-13/16	1-15/16	95
2 - 900 x 3 - 150	1914H	6-1/16	6-3/8	26	26	8-1/4	2-3/16	130
3 - 900 x 4 - 150	1914J	7-1/4	7-1/8	29-3/4	29-3/4	9	2-3/16	195
3 - 900 x 6 - 150	1914K	7-13/16	8-1/2	35-1/4	35-1/4	10-1/2	2-3/16	300
4 - 900 x 6 - 150	1914L	7-3/4	8-3/4	37-1/4	37-1/4	12-1/4	2-7/16	360
4 - 900 x 6 - 150	1914M	7-3/4	8-3/4	37	37	10-3/4	2-7/16	340
4 - 900 x 6 - 150	1914N	7-3/4	8-3/4	39	39	11-3/4	2-7/16	380
4 - 900 x 6 - 150	1914P	8-7/8	10	43-1/2	43-1/2	13-7/8	2-7/16	545
1-1/2 - 1500 x 2 - 300	1916D	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
1-1/2 - 1500 x 2 - 300	1916E	4-1/8	51/2	21-3/4	22-3/4	7-13/16	1-15/16	95
1-1/2 - 1500 x 3 - 300*	1916F	4-7/8	6-1/2	22-1/2	23-1/2	7-13/16	1-15/16	100
2 - 1500 x 3 - 300	1916G	6-1/8	6-3/4	23-3/4	25	7-13/16	2-3/16	100
2 - 1500 x 3 - 300	1916H	6-1/16	6-3/8	26	26	8-1/4	2-3/16	140
3 - 1500 x 4 - 300	1916J	7-1/4	7-1/8	29-3/4	29-3/4	9	2-9/16	220
3 - 1500 x 6 - 300	1916K	7-3/4	8-1/2	35-1/4	35-1/4	10-1/2	2-9/16	320
4 - 1500 x 6 - 150	1916L	7-3/4	8-3/4	37-1/4	37-1/4	12-1/4	2-13/16	370
1-1/2 - 2500 x 3 - 300*	1918D	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
1-1/2 - 2500 x 3 - 300*	1918E	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
1-1/2 - 2500 x 3 - 300*	1918F	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
2 - 2500 x 3 - 300	1918G	6-1/8	6-3/4	23-3/4	25	7-13/16	2-11/16	110

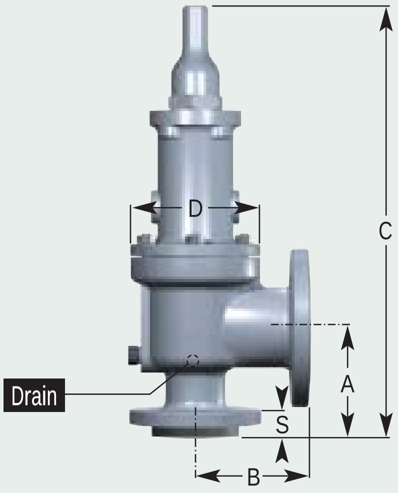
NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



1900 Series Valves
USCS Dimensions (in.) and Weights (lbs.)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1 - 300 x 2 - 150	1920D	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
1 - 300 x 2 - 150	1920E	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
1-1/2 - 300 x 2 - 150	1920F	4-7/8	6	18-1/4	19-1/4	5-7/16	1-9/16	50
1-1/2 - 300 x 3 - 150*	1920G	4-7/8	6	18-1/4	19-1/2	5-7/16	1-9/16	60
2 - 300 x 3 - 150	1920H	5-1/8	4-7/8	20-1/4	20-1/4	6-5/16	1-11/16	65
3 - 300 x 4 - 150*	1920J	7-1/4	7-1/8	25-5/8	25-5/8	7-3/8	1-13/16	100
3 - 300 x 4 - 150	1920K	6-1/8	6-3/8	28	28	7-3/4	1-15/16	140
4 - 300 x 6 - 150	1920L	7-1/16	7-1/8	32	32	9-1/2	1-15/16	220
4 - 300 x 6 - 150	1920M	7	7-1/4	32	32	9-3/8	1-15/16	230
4 - 300 x 6 - 150	1920N	7-3/4	8-1/4	34-1/4	34-1/4	10-1/2	1-15/16	260
4 - 300 x 6 - 150	1920P	8-7/8	10	41	41	11-1/2	1-15/16	350
6 - 300 x 8 - 150	1920Q	9-7/16	9-1/2	41	41	13-5/8	2-1/4	445
6 - 300 x 8 - 150	1920R	9-7/16	9-1/2	43	43	14-1/2	2-1/4	510
8 - 300 x 10 - 150	1920T	10-7/8	11	53-3/8	53-3/8	16-1/2	2-7/16	840
10 - 300 x 14 - 150	1920V	12	16	66	66	24-1/2	2-11/16	2000
12 - 300 x 16 - 150	1920W	14	16	70	70	24-1/2	2-15/16	2860
1 - 600 x 2 - 150	1922D	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
1 - 600 x 2 - 150	1922E	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
1-1/2 - 600 x 2 - 150	1922F	4-7/8	6	18-1/4	19-1/4	5-7/16	1-9/16	50
1-1/2 - 600 x 3 - 150*	1922G	4-7/8	6	19	20-1/4	6-5/16	1-9/16	65
2 - 600 x 3 - 150	1922H	5-1/8	4-7/8	20-1/4	20-1/4	6-5/16	1-11/16	65
3 - 600 x 4 - 150*	1922J	7-1/4	7-1/8	25-5/8	25-5/8	7-3/8	1-13/16	100
3 - 600 x 4 - 150	1922K	6-1/8	6-3/8	28	28	7-3/4	1-15/16	140
4 - 600 x 6 - 150	1922L	7-1/16	8	32	32	9-1/2	2-3/16	230
4 - 600 x 6 - 150	1922M	7	8	36-1/4	36-1/4	10-3/4	2-3/16	300
4 - 600 x 6 - 150	1922N	7-3/4	8-3/4	39	39	11-3/4	2-3/16	360
6 - 600 x 8 - 150	1922Q	9-7/16	9-1/2	46	46	14-1/4	2-11/16	645
6 - 600 x 10 - 150	1922R	9-7/16	10-1/2	47-1/2	47-1/2	15-1/8	2-11/16	675
4 - 600 x 6 - 150	1923P	8-7/8	10	43-1/2	43-1/2	13-7/8	2-3/16	530

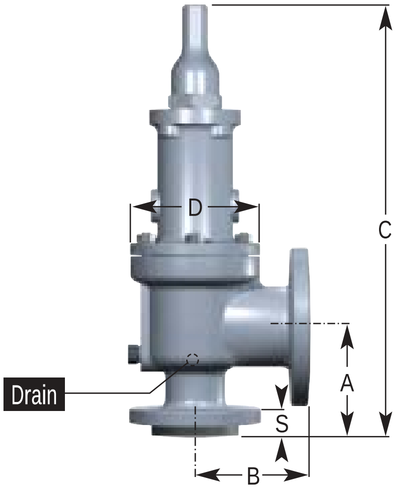
NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



1900 Series Valves
USCS Dimensions (in.) and Weights (lbs.)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (lbs.)
				STD	Bellows			
1-1/2 - 900 x 2 - 300	1924D	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
1-1/2 - 900 x 2 - 300	1924E	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
1-1/2 - 900 x 3 - 300*	1924F	4-7/8	6-1/2	22-1/2	23-1/2	7-13/16	1-15/16	100
1-1/2 - 900 x 3 - 300*	1924G	4-7/8	6-1/2	22-1/2	23-3/4	7-13/16	1-15/16	95
2 - 900 x 3 - 150	1924H	6-1/16	6-3/8	23	23	7	2-3/16	90
3 - 900 x 4 - 150*	1924J	7-1/4	7-1/8	29-7/8	29-7/8	9	2-5/16	180
3 - 900 x 6 - 150*	1924K	7-13/16	8-1/2	35-1/4	35-1/4	10-1/2	2-3/16	300
4 - 900 x 6 - 150	1924L	7-3/4	8-3/4	37-1/4	37-1/4	12-1/4	2-7/16	360
4 - 900 x 6 - 150	1924M	7-3/4	8-3/4	37	37	10-3/4	2-7/16	340
4 - 900 x 6 - 150	1924N	7-3/4	8-3/4	39	39	11-3/4	2-7/16	380
4 - 900 x 6 - 150	1924P	8-7/8	10	43-1/2	43-1/2	13-7/8	2-7/16	545
1-1/2 - 1500 x 2 - 300	1926D	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
1-1/2 - 1500 x 2 - 300	1926E	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
1-1/2 - 1500 x 3 - 300*	1926F	4-7/8	6-1/2	22-1/2	23-1/2	7-13/16	1-15/16	100
2 - 1500 x 3 - 300	1926G	6-1/8	6-3/4	23-3/4	25	7-13/16	2-3/16	100
2 - 1500 x 3 - 300	1926H	6-1/16	6-3/8	26	26	8-1/4	2-3/16	140
3 - 1500 x 4 - 300	1926J	7-1/4	7-1/8	29-3/4	29-3/4	9	2-9/16	220
3 - 1500 x 6 - 300	1926K	7-3/4	8-1/2	35-1/4	35-1/4	10-1/2	2-9/16	320
4 - 1500 x 6 - 150	1926L	7-3/4	8-3/4	37-1/4	37-1/4	12-1/4	2-13/16	370
1-1/2 - 2500 x 3 - 300*	1928D	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
1-1/2 - 2500 x 3 - 300*	1928E	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
1-1/2 - 2500 x 3 - 300*	1928F	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
2 - 2500 x 3 - 300	1928G	6-1/8	6-3/4	23-3/4	25	7-13/16	2-11/16	110

NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



1900 Series Valves
Metric Dimensions (mm) and Weights (Kg)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (Kg)
				STD	Bellows			
1 - 150 x 2 - 150	1905D	104.8	114.3	431.8	457.2	138.1	28.6	18.1
1 - 150 x 2 - 150	1905E	104.8	114.3	431.8	457.2	138.1	28.6	18.1
1-1/2 - 150 x 2 - 150	1905F	123.8	120.7	450.9	476.3	138.1	31.8	20.4
1-1/2 - 150 x 3 - 150	1905G	123.8	120.7	450.9	482.6	138.1	31.8	24.9
1-1/2 - 150 x 3 - 150	1905H	130.2	123.8	495.3	495.3	160.3	31.8	27.2
2 - 150 x 3 - 150	1905J	136.5	123.8	539.8	539.8	174.6	33.3	34
3 - 150 x 4 - 150	1905K	155.6	161.9	622.3	622.3	187.3	36.5	49.9
3 - 150 x 4 - 150	1905L	155.6	165.1	730.3	730.3	225.4	36.5	63.5
4 - 150 x 6 - 150	1905M	177.8	184.2	755.7	755.7	238.1	41.3	83.9
4 - 150 x 6 - 150	1905N	196.9	209.6	838.2	838.2	257.2	41.3	99.8
4 - 150 x 6 - 150	1905P	181	228.6	870	870	279.4	41.3	117.9
6 - 150 x 8 - 150	1905Q	239.7	241.3	1041.4	1041.4	346.1	46	195
6 - 150 x 8 - 150	1905R	239.7	241.3	1092.2	1092.2	368.3	46	224.5
8 - 150 x 10 - 150	1905T	276.2	279.4	1206.5	1206.5	419.1	49.2	281.2
10 - 150 x 14 - 150	1905V	304.8	406.4	1574.8	1574.8	552.5	50.8	725.8
12 - 150 x 16 - 150	1905W	355.6	406.4	1778	1778	622.3	55.6	1270.1
1 - 300 x 2 - 150	1906D	104.8	114.3	431.8	457.2	138.1	34.9	18.1
1 - 300 x 2 - 150	1906E	104.8	114.3	431.8	457.2	138.1	34.9	18.1
1-1/2 - 300 x 2 - 150	1906F	123.8	120.7	450.9	476.3	138.1	38.1	20.4
1-1/2 - 300 x 3 - 150	1906G	123.8	120.7	450.9	482.6	138.1	38.1	24.9
1-1/2 - 300 x 3 - 150	1906H	130.2	123.8	495.3	495.3	160.3	39.7	27.2
2 - 300 x 3 - 150	1906J	136.5	123.8	539.8	539.8	174.6	39.7	34
3 - 300 x 4 - 150	1906K	155.6	161.9	622.3	622.3	187.3	46	52.2
3 - 300 x 4 - 150	1906L	155.6	165.1	730.3	730.3	225.4	46	65.8
4 - 300 x 6 - 150	1906M	177.8	184.2	755.7	755.7	238.1	49.2	86.2
4 - 300 x 6 - 150	1906N	196.9	209.6	938.2	838.2	257.2	49.2	102.1
4 - 300 x 6 -150	1906P	181	228.6	870	870	279.4	49.2	122.5
6 - 300 x 8 - 150	1906Q	239.7	241.3	1041.4	1041.4	346.1	57.2	201.9
6 - 300 x 8 -150	1906R	239.7	241.3	1092.2	1092.2	368.3	57.2	231.3
8 - 300 x 10 - 150	1906T	276.2	279.4	1200.2	1200.2	419.1	61.9	290.3
10 - 300 x 14 - 150	1906V	304.8	406.4	1574.8	1574.8	552.5	68.3	770.1
12 -300 x 16 - 150	1906W	355.6	406.4	1778	1778	622.3	74.6	1300

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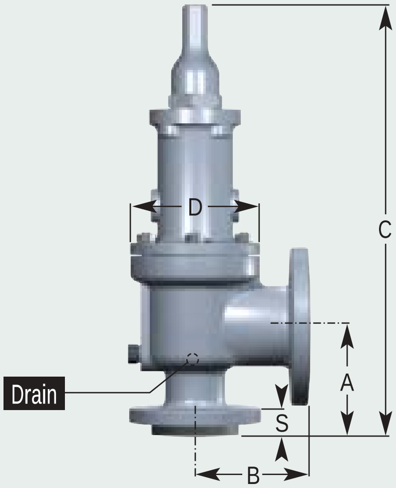
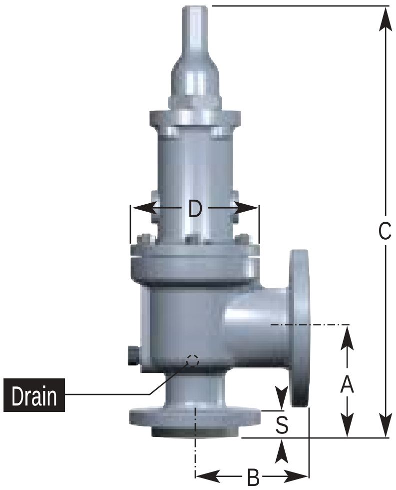


1900 Series Valves
Metric Dimensions (mm) and Weights (Kg)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (Kg)
				STD	Bellows			
1 - 300 x 2 - 150	1910D	104.8	114.3	444.5	469.9	138.1	34.9	22.7
1 - 300 x 2 - 150	1910E	104.8	114.3	444.5	469.9	138.1	34.9	22.7
1-1/2 - 300 x 2 - 150	1910F	123.8	152.4	463.6	489	138.1	39.7	22.7
1-1/2 - 300 x 3 - 150	1910G	123.8	152.4	463.6	495.3	138.1	39.7	27.2
2 - 300 x 3 - 150	1910H	130.2	123.8	514.4	514.4	160.3	42.8	29.5
3 - 300 x 4 - 150	1910J	184.2	181	651	651	187.3	46	45.4
3 - 300 x 4 - 150	1910K	155.6	161.9	711.2	711.2	196.9	49.2	63.5
4 - 300 x 6 - 150	1910L	179.4	181	812.8	812.8	241.3	49.2	99.8
4 - 300 x 6 - 150	1910M	177.8	184.2	812.8	812.8	238.1	49.2	104.3
4 - 300 x 6 - 150	1910N	196.9	209.6	870	870	266.7	49.2	117.9
4 - 300 x 6 - 150	1910P	225.4	254	1041.4	1041.4	292.1	49.2	158.8
6 - 300 x 8 - 150	1910Q	239.7	241.3	1098.6	1098.6	355.6	57.2	240.4
6 - 300 x 10 - 150	1910R	239.7	266.7	1155.7	1155.7	368.3	57.2	249.5
8 - 300 x 10 - 150	1910T	276.2	279.4	1355.7	1355.7	419.1	61.9	381
10 - 300 x 14 - 150	1910V	304.8	406.4	1676.4	1676.4	622.3	68.3	907.2
12 - 300 x 16 -150	1910W	355.6	406.4	1778	1778	622.3	74.6	1300
1 - 600 x 2 - 150	1912D	104.8	114.3	463.6	489	160.3	34.9	25
1 - 600 x 2 - 150	1912E	104.8	114.3	463.6	489	160.3	34.9	25
1-1/2 - 600 x 2 - 150	1912F	123.8	152.4	482.6	508	160.3	39.7	27.2
1-1/2 - 600 x 3 - 150	1912G	123.8	152.4	482.6	514.4	160.3	39.7	29.5
2 - 600 x 3 - 150	1912H	154	161.9	584.2	584.2	177.8	42.8	38.6
3 - 600 x 4 - 150	1912J	184.2	181	759	759	228.6	46	77.1
3 - 600 x 4 - 150	1912K	184.2	181	743	743	196.9	49.2	68
4 - 600 x 6 - 150	1912L	179.4	203.2	812.8	812.8	241.3	55.5	104.3
4 - 600 x 6 - 150	1912M	177.8	203.2	920.8	920.8	273.1	55.5	136.1
4 - 600 x 6 - 150	1912N	196.9	222.3	990.6	990.6	298.5	55.5	163.3
4 - 600 x 6 - 150	1912P	225.4	254	1104.9	1104.9	352.4	55.5	240.4
6 - 600 x 8 - 150	1912Q	239.7	241.3	1168.4	1168.4	362	68.3	292.6
6 - 600 x 10 - 150	1912R	239.7	266.7	1206.5	1206.5	384.2	68.3	306.5

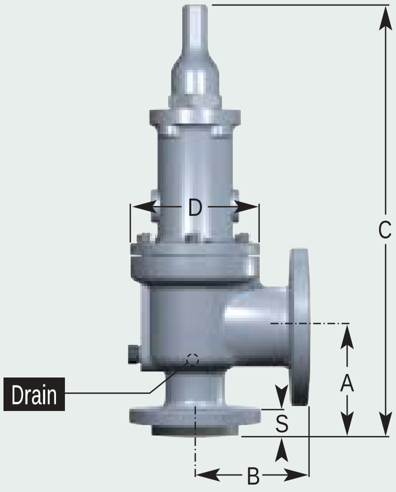
NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



1900 Series Valves
Metric Dimensions (mm) and Weights (Kg)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (Kg)
				STD	Bellows			
1-1/2 - 900 x 2 - 300	1914D	104.8	139.7	552.5	577.9	198.4	49.2	43.1
1-1/2 - 900 x 2 - 300	1914E	104.8	139.7	552.5	577.9	198.4	49.2	43.1
1-1/2 - 900 x 3 - 300*	1914F	123.8	165.1	571.5	596.9	198.4	49.2	45.4
1-1/2 - 900 x 3 - 300*	1914G	123.8	165.1	571.5	603.3	198.4	49.2	43.1
2 - 900 x 3 - 150	1914H	154	161.9	660.4	660.4	209.6	55.5	59
3 - 900 x 4 - 150	1914J	184.2	181	755.7	755.7	228.6	55.5	88.5
3 - 900 x 6 - 150	1914K	198.4	215.9	895.4	895.4	266.7	55.5	136.1
4 - 900 x 6 - 150	1914L	196.9	222.3	946.2	946.2	311.2	61.9	163.3
4 - 900 x 6 - 150	1914M	196.9	222.3	939.8	939.8	273.1	61.9	154.2
4 - 900 x 6 - 150	1914N	196.9	222.3	990.6	990.6	298.5	61.9	172.4
4 - 900 x 6 - 150	1914P	225.4	254	1104.9	1104.9	352.4	61.9	247.2
1-1/2 - 1500 x 2 - 300	1916D	104.8	139.7	552.5	577.9	198.4	49.2	43.1
1-1/2 - 1500 x 2 - 300	1916E	104.8	139.7	552.5	577.9	198.4	49.2	43.1
1-1/2 - 1500 x 3 - 300*	1916F	123.8	165.1	571.5	596.9	198.4	49.2	45.4
2 - 1500 x 3 - 300	1916G	155.6	171.5	603.3	635.5	198.4	55.5	45.4
2 - 1500 x 3 - 300	1916H	154	161.9	660.4	660.4	209.6	55.5	63.5
3 - 1500 x 4 - 300	1916J	184.2	181	755.7	755.7	228.6	65.1	99.8
3 - 1500 x 6 - 300	1916K	196.9	215.9	895.4	895.4	266.7	65.1	145.2
4 - 1500 x 6 - 150	1916L	196.9	222.3	946.2	946.2	311.2	71.4	167.8
1-1/2 - 2500 x 3 - 300*	1918D	139.7	177.8	673.1	698.5	225.4	61.9	68
1-1/2 - 2500 x 3 - 300*	1918E	139.7	177.8	673.1	698.5	225.4	61.9	68
1-1/2 - 2500 x 3 - 300*	1918F	139.7	177.8	673.1	698.5	225.4	61.9	68
2 - 2500 x 3 - 300	1918G	155.6	171.5	603.3	635	198.4	68.2	49.9

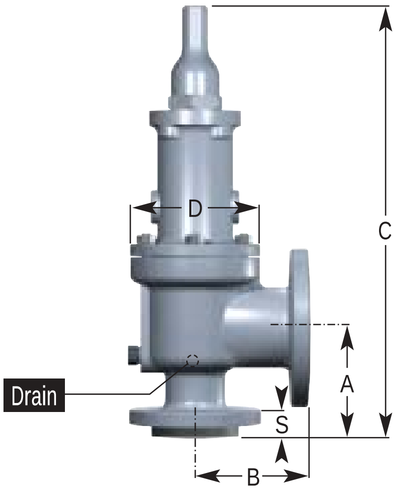
NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



1900 Series Valves
Metric Dimensions (mm) and Weights (Kg)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (Kg)
				STD	Bellows			
1 - 300 x 2 - 150	1920D	104.8	114.3	444.5	469.9	138.1	34.9	22.7
1 - 300 x 2 - 150	1920E	104.8	114.3	444.5	469.9	138.1	34.9	22.7
1-1/2 - 300 x 2 - 150	1920F	123.8	152.4	463.6	489	138.1	39.7	22.7
1-1/2 - 300 x 3 - 150*	1920G	123.8	152.4	463.6	495.3	138.1	39.7	27.2
2 - 300 x 3 - 150	1920H	130.2	123.8	514.4	514.4	160.3	42.8	29.5
3 - 300 x 4 - 150*	1920J	184.2	181	651	651	187.3	46	45.4
3 - 300 x 4 - 150	1920K	155.6	161.9	711.2	711.2	196.9	49.2	63.5
4 - 300 x 6 - 150	1920L	179.4	181	812.8	812.8	241.3	49.2	99.8
4 - 300 x 6 - 150	1920M	177.8	184.2	812.8	812.8	238.1	49.2	104.3
4 - 300 x 6 - 150	1920N	196.9	209.6	870	870	266.7	49.2	117.9
4 - 300 x 6 - 150	1920P	225.4	254	1041.4	1041.4	292.1	49.2	158.8
6 - 300 x 8 - 150	1920Q	239.7	241.3	1041.4	1041.4	346.1	57.2	201.9
6 - 300 x 8 - 150	1920R	239.7	241.3	1092.2	1092.2	368.3	57.2	231.3
8 - 300 x 10 - 150	1920T	276.2	279.4	1355.7	1355.7	419.1	61.9	381
10 - 300 x 14 - 150	1920V	304.8	406.4	1676.4	1676.4	622.3	68.3	907.2
12 - 300 x 16 - 150	1920W	355.6	406.4	1778	1778	622.3	74.6	1300
1 - 600 x 2 - 150	1922D	104.8	114.3	444.5	469.9	138.1	34.9	22.7
1 - 600 x 2 - 150	1922E	104.8	114.3	444.5	469.9	138.1	34.9	22.7
1-1/2 - 600 x 2 - 150	1922F	123.8	152.4	463.6	489	138.1	39.7	22.7
1-1/2 - 600 x 3 - 150*	1922G	123.8	152.4	482.6	514.4	160.3	39.7	29.5
2 - 600 x 3 - 150	1922H	130.2	123.8	514.4	514.4	160.3	42.8	29.5
3 - 600 x 4 - 150*	1922J	184.2	181	651	651	187.3	46	45.4
3 - 600 x 4 - 150	1922K	155.6	161.9	711.2	711.2	196.9	49.2	63.5
4 - 600 x 6 - 150	1922L	179.4	203.2	812.8	812.8	241.3	55.5	104.3
4 - 600 x 6 - 150	1922M	177.8	203.2	920.8	920.8	273.1	55.5	136.1
4 - 600 x 6 - 150	1922N	196.9	222.3	990.6	990.6	298.5	55.5	163.3
6 - 600 x 8 - 150	1922Q	239.7	241.3	1168.4	1168.4	362	68.3	292.6
6 - 600 x 10 - 150	1922R	239.7	266.7	1206.5	1206.5	384.2	68.3	306.2
4 - 600 x 6 - 150	1923P	225.4	254	1104.9	1104.9	352.4	55.5	240.4

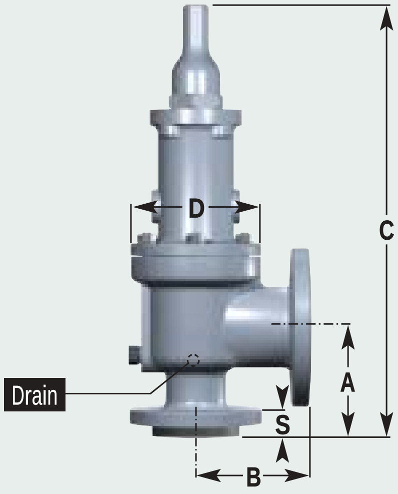
NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



1900 Series Valves
Metric Dimensions (mm) and Weights (Kg)

Size (in.) and Class	Type	A	B	C		D	S	Approx. Weight (Kg)
				STD	Bellows			
1-1/2 - 900 x 2 - 300	1924D	104.8	139.7	552.5	577.9	198.4	49.2	43.1
1-1/2 - 900 x 2 - 300	1924E	104.8	139.7	552.5	577.9	198.4	49.2	43.1
1-1/2 - 900 x 3 - 300*	1924F	123.8	165.1	571.5	596.9	198.4	49.2	45.4
1-1/2 - 900 x 3 - 300*	1924G	123.8	165.1	571.5	603.3	198.4	49.2	43.1
2 - 900 x 3 - 150	1924H	154	161.9	584.2	584.2	177.8	55.5	40.8
3 - 900 x 4 - 150*	1924J	184.2	181	759	759	228.6	58.7	81.6
3 - 900 x 4 - 150*	1924K	198.4	215.9	895.4	895.4	266.7	55.5	136.1
4 - 900 x 6 - 150	1924L	196.9	222.3	946.2	946.2	311.2	61.9	163.3
4 - 900 x 6 - 150	1924M	196.9	222.3	939.8	939.8	273.1	61.9	154.2
4 - 900 x 6 - 150	1924N	196.9	222.3	990.6	990.6	298.5	61.9	172.4
4 - 900 x 6 - 150	1924P	225.4	254	1104.9	1104.9	352.4	61.9	247.2
1-1/2 - 1500 x 2 - 300	1926D	104.8	139.7	552.5	577.9	198.4	49.2	43.1
1-1/2 - 1500 x 2 - 300	1926E	104.8	139.7	552.5	577.9	198.4	49.2	43.1
1-1/2 - 1500 x 3 - 300*	1926F	123.8	165.1	571.5	596.9	198.4	49.2	45.4
2 - 1500 x 3 - 300	1926G	155.6	171.5	603.3	635	198.4	55.5	45.4
2 - 1500 x 3 - 300	1926H	154	161.9	660.4	660.4	209.6	55.5	63.5
3 - 1500 x 4 - 300	1926J	184.2	181	755.7	755.7	228.6	65.1	99.8
3 - 1500 x 6 - 300	1926K	196.9	215.9	895.4	895.4	266.7	65.1	145.2
4 - 1500 x 6 - 150	1926L	196.9	222.3	946.2	946.2	311.2	71.4	167.8
1-1/2 - 2500 x 3 - 300*	1928D	139.7	177.8	673.1	698.5	225.4	61.9	68
1-1/2 - 2500 x 3 - 300*	1928E	139.7	177.8	673.1	698.5	225.4	61.9	68
1-1/2 - 2500 x 3 - 300*	1928F	139.7	177.8	673.1	698.5	225.4	61.9	68
2 - 2500 x 3 - 300#	1928G	155.6	171.5	603.3	635	198.4	68.2	49.9

NOTE: Inlet and outlet combinations as well as orifices sizes shown in the table above are compliant with both API Standard 526, Third Edition, 1984 and Fourth Edition, 1995, except those sizes marked * comply only with API 526, Fourth Edition, 1995. For replacement valves that do not comply with both editions, contact the factory for verification of dimensions and inlet and outlet combinations. The V & W orifice valves are not an API approved orifice size.



Pressure / Temperature Tables

How To Use Rating Tables

The included tables specify important data about the valve including valve sizes, flange ratings, pressure and temperature limits, back pressure ratings, and materials with allowable temperature ranges.

After determining valve size from the Valve Sizing section, or capacity tables in this section, select the proper set of tables and graphs (in the following pages) for the size valve. Enter the pressure/temperature graphs and determine valve type. Review the table of data for that size valve to get other pertinent information.

NOTES: 1 The pressure/temperature limitations shown in the following tables are based on the limits specified in API526 applicable to the 1900 series supplied in standard materials of construction. For pressure/temperature limitations of valves made from special materials, consult the factory or the SRVS sizing program. (Note that 1900-30 bellows design valve supplied with the standard Inconel 625 bellows is limited to a temperature range of 400°F to 1500°F.)

2 ASME Class 300 outlet flanges are permitted for mating purposes only on valves that are normally supplied with standard ASME Class 150 pressure rating. For back pressure applications exceeding the ASME Class 150 pressure rating use SRVS sizing program or contact the factory for assistance.

3 When soft seats are used, they may govern the valve pressure/temperature rating.

Procedure

Example	
Valve Set Pressure	500 psig
Back Pressure	50 psig
Temperature	100°F
Valve	“J”

Enter the graph on page 1900.68 for the “J” size, select set pressure on the bottom scale at 500 psig, follow this line vertically upward until it intersects the 100°F (38°C) line. The selection is a 1910Jc valve.

Results

Referring to the table on page 1900.67, the valve is 3" - 300 x 4" - 150 with a carbon steel body and spring. The back pressure limit is satisfactory for 50 psig back pressure.

Springs

Within given temperature limits, alloy steel springs are specified. Because of material availability from vendors, most springs are of alloy steel construction which provides superior strength and corrosion resistant properties.

Materials

The operating temperature should be used to select the materials in valves for fire sizing applications.

Minimum Set Pressures

The minimum set pressures of the 1900 flanged valves are in accordance with the following table.

Orifice	Low Set Pressure Limit[2]	
	Conventional Valve (psig)	Bellows Valve[1] (psig)
D	5	15
E	5	15
F	5	15
G	4	15
H	4	15
J	5	10
K	5	10
L	6	10
M	6	10
N	9	10
P	7	10
Q	7	10
R	7	10
T	9	10
V	15	15
W	7	15

NOTES: 1 The bonnet must be vented when a bellows is used.

2 Valves with set pressure less than 15 psig cannot be stamped with the ASME stamp.

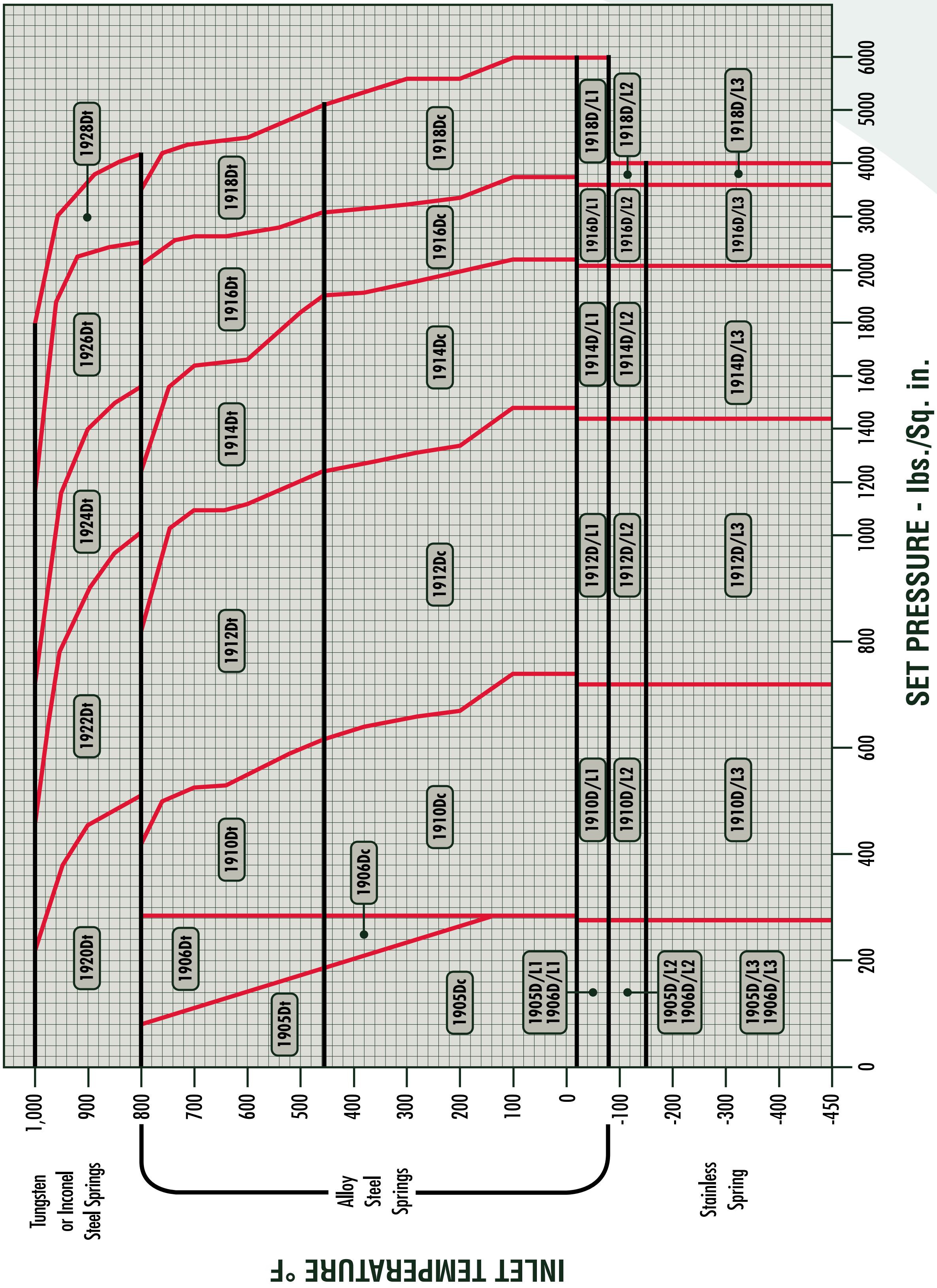
Selection Table for Vapors, Gases and Liquids

1900 & 1900-30 Series, D Orifice - API area: 0.110 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Dc	1905-30Dc	1 x 2	150	150	—	—	—	285	185	—	—	285	230	-20 to 450
1906Dc	1906-30Dc	1 x 2	300	150	—	—	—	285	285	—	—	285	230	
1910Dc	1910-30Dc	1 x 2	300	150	—	—	—	740	615	—	—	285	230	
1912Dc	1912-30Dc	1 x 2	600	150	—	—	—	1480	1235	—	—	285	230	
1914Dc	1914-30Dc	1-1/2 x 2	900	300	—	—	—	2220	1845	—	—	600	500	
1916Dc	1916-30Dc	1-1/2 x 2	1500	300	—	—	—	3705	3080	—	—	600	500	
1918Dc	1918-30Dc	1-1/2 x 3	2500	300	—	—	—	6000	5135	—	—	740	500	
1905Dt	1905-30Dt	1 x 2	150	150	—	—	—	—	185	80	—	285	230	451 to 800
1906Dt	1906-30Dt	1 x 2	300	150	—	—	—	—	285	285	—	285	230	
1910Dt	1910-30Dt	1 x 2	300	150	—	—	—	—	615	410	—	285	230	
1912Dt	1912-30Dt	1 x 2	600	150	—	—	—	—	1235	825	—	285	230	
1914Dt	1914-30Dt	1-1/2 x 2	900	300	—	—	—	—	1845	1235	—	600	500	
1916Dt	1916-30Dt	1-1/2 x 2	1500	300	—	—	—	—	3080	2060	—	600	500	
1918Dt	1918-30Dt	1-1/2 x 3	2500	300	—	—	—	—	5135	3430	—	740	500	
1920Dt	1920-30Dt	1 x 2	300	150	—	—	—	—	—	510	225	285	230	801 to 1000
1922Dt	1922-30Dt	1 x 2	600	150	—	—	—	—	—	1015	445	285	230	
1924Dt	1924-30Dt	1-1/2 x 2	900	300	—	—	—	—	—	1525	670	600	500	
1926Dt	1926-30Dt	1-1/2 x 2	1500	300	—	—	—	—	—	2540	1115	600	500	
1928Dt	1928-30Dt	1-1/2 x 3	2500	300	—	—	—	—	—	4230	1860	740	500	
1905D/L1	1905-30D/L1	1 x 2	150	150	—	—	275	—	—	—	—	275	230	-21 to -75
1906D/L1	1906-30D/L1	1 x 2	300	150	—	—	275	—	—	—	—	275	230	
1910D/L1	1910-30D/L1	1 x 2	300	150	—	—	720	—	—	—	—	275	230	
1912D/L1	1912-30D/L1	1 x 2	600	150	—	—	1440	—	—	—	—	275	230	
1914D/L1	1914-30D/L1	1-1/2 x 2	900	300	—	—	2160	—	—	—	—	600	500	
1916D/L1	1916-30D/L1	1-1/2 x 2	1500	300	—	—	3600	—	—	—	—	600	500	
1918D/L1	1918-30D/L1	1-1/2 x 3	2500	300	—	—	6000	—	—	—	—	720	500	
1905D/L2	1905-30D/L2	1 x 2	150	150	—	275	—	—	—	—	—	275	230	-76 to -150
1906D/L2	1906-30D/L2	1 x 2	300	150	—	275	—	—	—	—	—	275	230	
1910D/L2	1910-30D/L2	1 x 2	300	150	—	720	—	—	—	—	—	275	230	
1912D/L2	1912-30D/L2	1 x 2	600	150	—	1440	—	—	—	—	—	275	230	
1914D/L2	1914-30D/L2	1-1/2 x 2	900	300	—	2160	—	—	—	—	—	600	500	
1916D/L2	1916-30D/L2	1-1/2 x 2	1500	300	—	3600	—	—	—	—	—	600	500	
1918D/L2	1918-30D/L2	1-1/2 x 3	2500	300	—	4000	—	—	—	—	—	720	500	
1905D/L3	1905-30D/L3	1 x 2	150	150	275	—	—	—	—	—	—	275	230	-151 to -450
1906D/L3	1906-30D/L3	1 x 2	300	150	275	—	—	—	—	—	—	275	230	
1910D/L3	1910-30D/L3	1 x 2	300	150	720	—	—	—	—	—	—	275	230	
1912D/L3	1912-30D/L3	1 x 2	600	150	1440	—	—	—	—	—	—	275	230	
1914D/L3	1914-30D/L3	1-1/2 x 2	900	300	2160	—	—	—	—	—	—	600	500	
1916D/L3	1916-30D/L3	1-1/2 x 2	1500	300	3600	—	—	—	—	—	—	600	500	
1918D/L3	1918-30D/L3	1-1/2 x 3	2500	300	4000	—	—	—	—	—	—	720	500	

Selection Chart for Vapors, Gases and Liquids

1900 & 1900-30 Series, D Orifice - API area: 0.110 Sq. in.



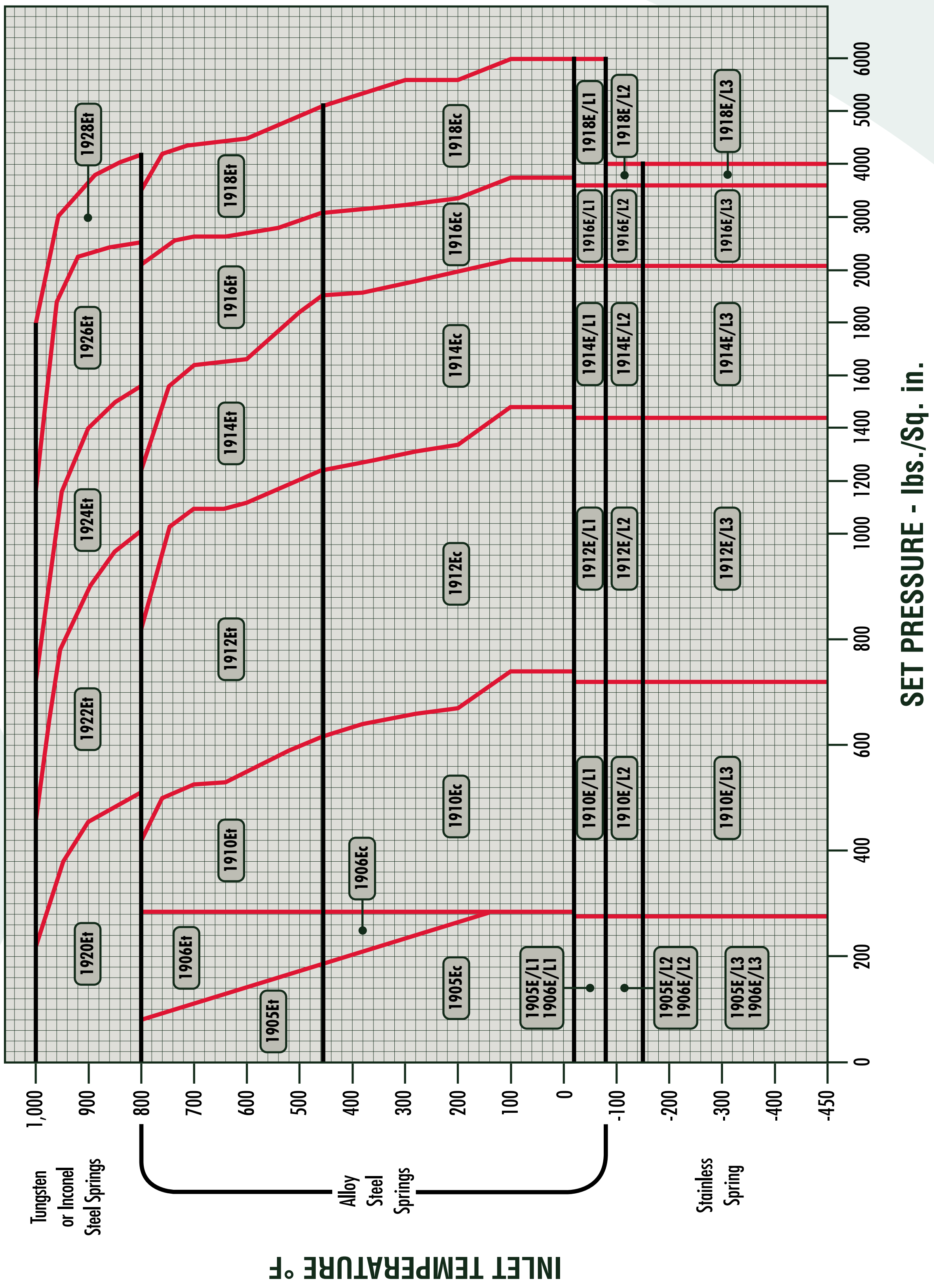
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, E Orifice - API Area: 0.196 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp.
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	Range (°F)
1905Ec	1905-30Ec	1 x 2	150	150	—	—	—	285	185	—	—	285	230	-20 to 450
1906Ec	1906-30Ec	1 x 2	300	150	—	—	—	285	285	—	—	285	230	
1910Ec	1910-30Ec	1 x 2	300	150	—	—	—	740	615	—	—	285	230	
1912Ec	1912-30Ec	1 x 2	600	150	—	—	—	1480	1235	—	—	285	230	
1914Ec	1914-30Ec	1-1/2 x 2	900	300	—	—	—	2220	1845	—	—	600	500	
1916Ec	1916-30Ec	1-1/2 x 2	1500	300	—	—	—	3705	3080	—	—	600	500	
1918Ec	1918-30Ec	1-1/2 x 3	2500	300	—	—	—	6000	5135	—	—	740	500	
1905Et	1905-30Et	1 x 2	150	150	—	—	—	—	185	80	—	285	230	451 to 800
1906Et	1906-30Et	1 x 2	300	150	—	—	—	—	285	285	—	285	230	
1910Et	1910-30Et	1 x 2	300	150	—	—	—	—	615	410	—	285	230	
1912Et	1912-30Et	1 x 2	600	150	—	—	—	—	1235	825	—	285	230	
1914Et	1914-30Et	1-1/2 x 2	900	300	—	—	—	—	1845	1235	—	600	500	
1916Et	1916-30Et	1-1/2 x 2	1500	300	—	—	—	—	3080	2060	—	600	500	
1918Et	1918-30Et	1-1/2 x 3	2500	300	—	—	—	—	5135	3430	—	740	500	
1920Et	1920-30Et	1 x 2	300	150	—	—	—	—	—	510	225	285	230	801 to 1000
1922Et	1922-30Et	1 x 2	600	150	—	—	—	—	—	1015	445	285	230	
1924Et	1924-30Et	1-1/2 x 2	900	300	—	—	—	—	—	1525	670	600	500	
1926Et	1926-30Et	1-1/2 x 2	1500	300	—	—	—	—	—	2540	1115	600	500	
1928Et	1928-30Et	1-1/2 x 3	2500	300	—	—	—	—	—	4230	1860	740	500	
1905E/L1	1905-30E/L1	1 x 2	150	150	—	—	275	—	—	—	—	275	230	-21 to -75
1906E/L1	1906-30E/L1	1 x 2	300	150	—	—	275	—	—	—	—	275	230	
1910E/L1	1910-30E/L1	1 x 2	300	150	—	—	720	—	—	—	—	275	230	
1912E/L1	1912-30E/L1	1 x 2	600	150	—	—	1440	—	—	—	—	275	230	
1914E/L1	1914-30E/L1	1-1/2 x 2	900	300	—	—	2160	—	—	—	—	600	500	
1916E/L1	1916-30E/L1	1-1/2 x 2	1500	300	—	—	3600	—	—	—	—	600	500	
1918E/L1	1918-30E/L1	1-1/2 x 3	2500	300	—	—	6000	—	—	—	—	720	500	
1905E/L2	1905-30E/L2	1 x 2	150	150	—	275	—	—	—	—	—	275	230	-76 to -150
1906E/L2	1906-30E/L2	1 x 2	300	150	—	275	—	—	—	—	—	275	230	
1910E/L2	1910-30E/L2	1 x 2	300	150	—	720	—	—	—	—	—	275	230	
1912E/L2	1912-30E/L2	1 x 2	600	150	—	1440	—	—	—	—	—	275	230	
1914E/L2	1914-30E/L2	1-1/2 x 2	900	300	—	2160	—	—	—	—	—	600	500	
1916E/L2	1916-30E/L2	1-1/2 x 2	1500	300	—	3600	—	—	—	—	—	600	500	
1918E/L2	1918-30E/L2	1-1/2 x 3	2500	300	—	4000	—	—	—	—	—	720	500	
1905E/L3	1905-30E/L3	1 x 2	150	150	275	—	—	—	—	—	—	275	230	-151 to -450
1906E/L3	1906-30E/L3	1 x 2	300	150	275	—	—	—	—	—	—	275	230	
1910E/L3	1910-30E/L3	1 x 2	300	150	720	—	—	—	—	—	—	275	230	
1912E/L3	1912-30E/L3	1 x 2	600	150	1440	—	—	—	—	—	—	275	230	
1914E/L3	1914-30E/L3	1-1/2 x 2	900	300	2160	—	—	—	—	—	—	600	500	
1916E/L3	1916-30E/L3	1-1/2 x 2	1500	300	3600	—	—	—	—	—	—	600	500	
1918E/L3	1918-30E/L3	1-1/2 x 3	2500	300	4000	—	—	—	—	—	—	720	500	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, E Orifice - API Area: 0.196 Sq. in.



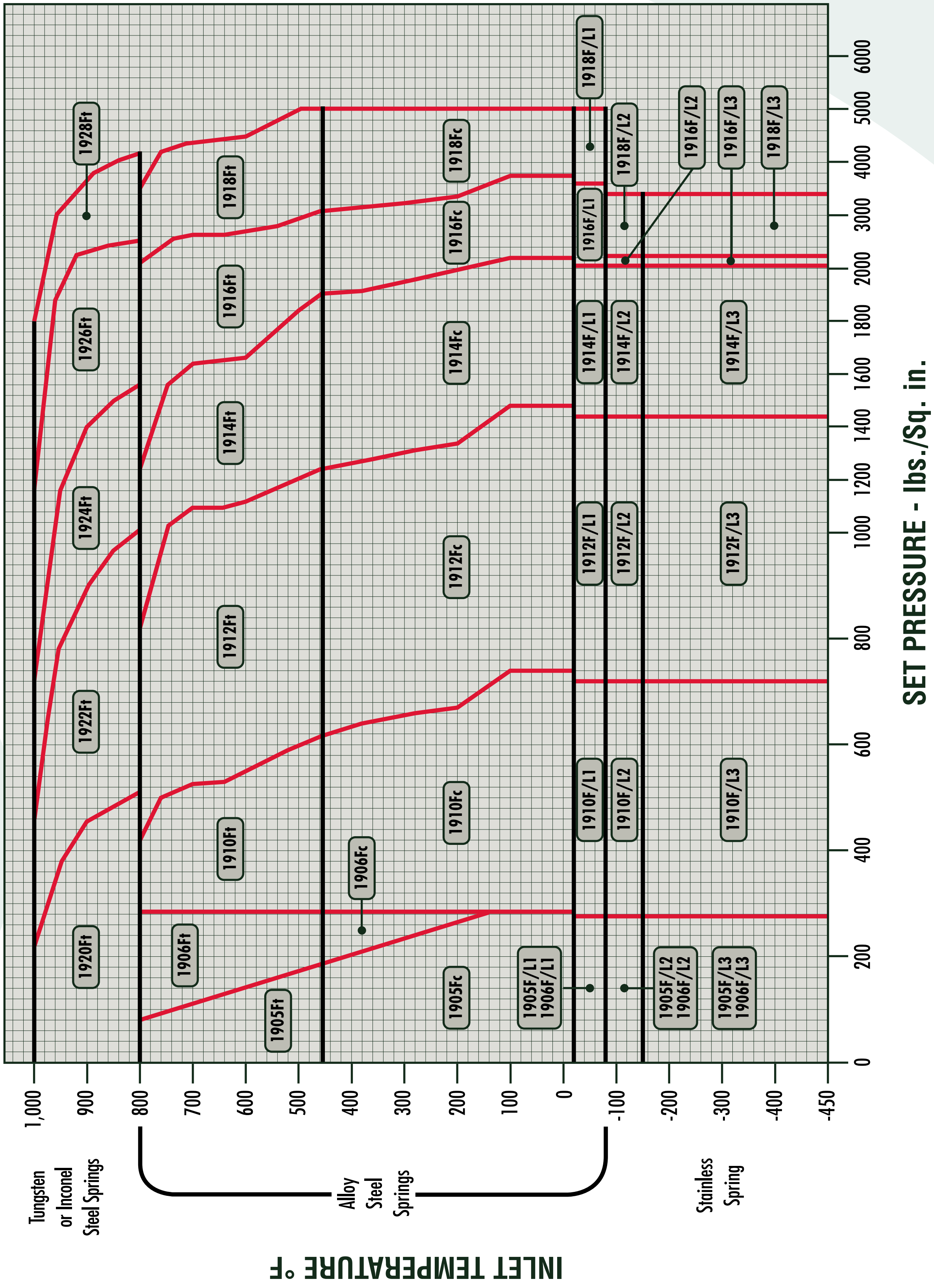
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, F Orifice - API Area: 0.307 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Fc	1905-30Fc	1-1/2 x 2	150	150	—	—	—	285	185	—	—	285	230	-20 to 450
1906Fc	1906-30Fc	1-1/2 x 2	300	150	—	—	—	285	285	—	—	285	230	
1910Fc	1910-30Fc	1-1/2 x 2	300	150	—	—	—	740	615	—	—	285	230	
1912Fc	1912-30Fc	1-1/2 x 2	600	150	—	—	—	1480	1235	—	—	285	230	
1914Fc	1914-30Fc	1-1/2 x 3	900	300	—	—	—	2220	1845	—	—	740	500	
1916Fc	1916-30Fc	1-1/2 x 3	1500	300	—	—	—	3705	3080	—	—	740	500	
1918Fc	1918-30Fc	1-1/2 x 3	2500	300	—	—	—	5000	5000	—	—	740	500	
1905Ft	1905-30Ft	1-1/2 x 2	150	150	—	—	—	—	185	80	—	285	230	451 to 800
1906Ft	1906-30Ft	1-1/2 x 2	300	150	—	—	—	—	285	285	—	285	230	
1910Ft	1910-30Ft	1-1/2 x 2	300	150	—	—	—	—	615	410	—	285	230	
1912Ft	1912-30Ft	1-1/2 x 2	600	150	—	—	—	—	1235	825	—	285	230	
1914Ft	1914-30Ft	1-1/2 x 3	900	300	—	—	—	—	1845	1235	—	740	500	
1916Ft	1916-30Ft	1-1/2 x 3	1500	300	—	—	—	—	3080	2060	—	740	500	
1918Ft	1918-30Ft	1-1/2 x 3	2500	300	—	—	—	—	5135	3430	—	740	500	
1920Ft	1920-30Ft	1-1/2 x 2	300	150	—	—	—	—	—	510	225	285	230	801 to 1000
1922Ft	1922-30Ft	1-1/2 x 2	600	150	—	—	—	—	—	1015	445	285	230	
1924Ft	1924-30Ft	1-1/2 x 3	900	300	—	—	—	—	—	1525	670	740	500	
1926Ft	1926-30Ft	1-1/2 x 3	1500	300	—	—	—	—	—	2540	1115	740	500	
1928Ft	1928-3Ft	1-1/2 x 3	2500	300	—	—	—	—	—	4230	1860	740	500	
1905F/L1	1905-30F/L1	1-1/2 x 2	150	150	—	—	275	—	—	—	—	275	230	-21 to -75
1906F/L1	1906-30F/L1	1-1/2 x 2	300	150	—	—	275	—	—	—	—	275	230	
1910F/L1	1910-30F/L1	1-1/2 x 2	300	150	—	—	720	—	—	—	—	275	230	
1912F/L1	1912-30F/L1	1-1/2 x 2	600	150	—	—	1440	—	—	—	—	275	230	
1914F/L1	1914-30F/L1	1-1/2 x 3	900	300	—	—	2160	—	—	—	—	720	500	
1916F/L1	1916-30F/L1	1-1/2 x 3	1500	300	—	—	3600	—	—	—	—	720	500	
1918F/L1	1918-30F/L1	1-1/2 x 3	2500	300	—	—	5000	—	—	—	—	720	500	
1905F/L2	1905-30F/L2	1-1/2 x 2	150	150	—	275	—	—	—	—	—	275	230	-76 to -150
1906F/L2	1906-30F/L2	1-1/2 x 2	300	150	—	275	—	—	—	—	—	275	230	
1910F/L2	1910-30F/L2	1-1/2 x 2	300	150	—	720	—	—	—	—	—	275	230	
1912F/L2	1912-30F/L2	1-1/2 x 2	600	150	—	1440	—	—	—	—	—	275	230	
1914F/L2	1914-30F/L2	1-1/2 x 3	900	300	—	2160	—	—	—	—	—	720	500	
1916F/L2	1916-30F/L2	1-1/2 x 3	1500	300	—	2200	—	—	—	—	—	720	500	
1918F/L2	1918-30F/L2	1-1/2 x 3	2500	300	—	3400	—	—	—	—	—	720	500	
1905F/L3	1905-30F/L3	1-1/2 x 2	150	150	275	—	—	—	—	—	—	275	230	-151 to -450
1906F/L3	1906-30F/L3	1-1/2 x 2	300	150	275	—	—	—	—	—	—	275	230	
1910F/L3	1910-30F/L3	1-1/2 x 2	300	150	720	—	—	—	—	—	—	275	230	
1912F/L3	1912-30F/L3	1-1/2 x 2	600	150	1440	—	—	—	—	—	—	275	230	
1914F/L3	1914-30F/L3	1-1/2 x 3	900	300	2160	—	—	—	—	—	—	720	500	
1916F/L3	1916-30F/L3	1-1/2 x 3	1500	300	2200	—	—	—	—	—	—	720	500	
1918F/L3	1918-30F/L3	1-1/2 x 3	2500	300	3400	—	—	—	—	—	—	720	500	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, F Orifice - API Area: 0.307 Sq. in. (198 Sq. mm



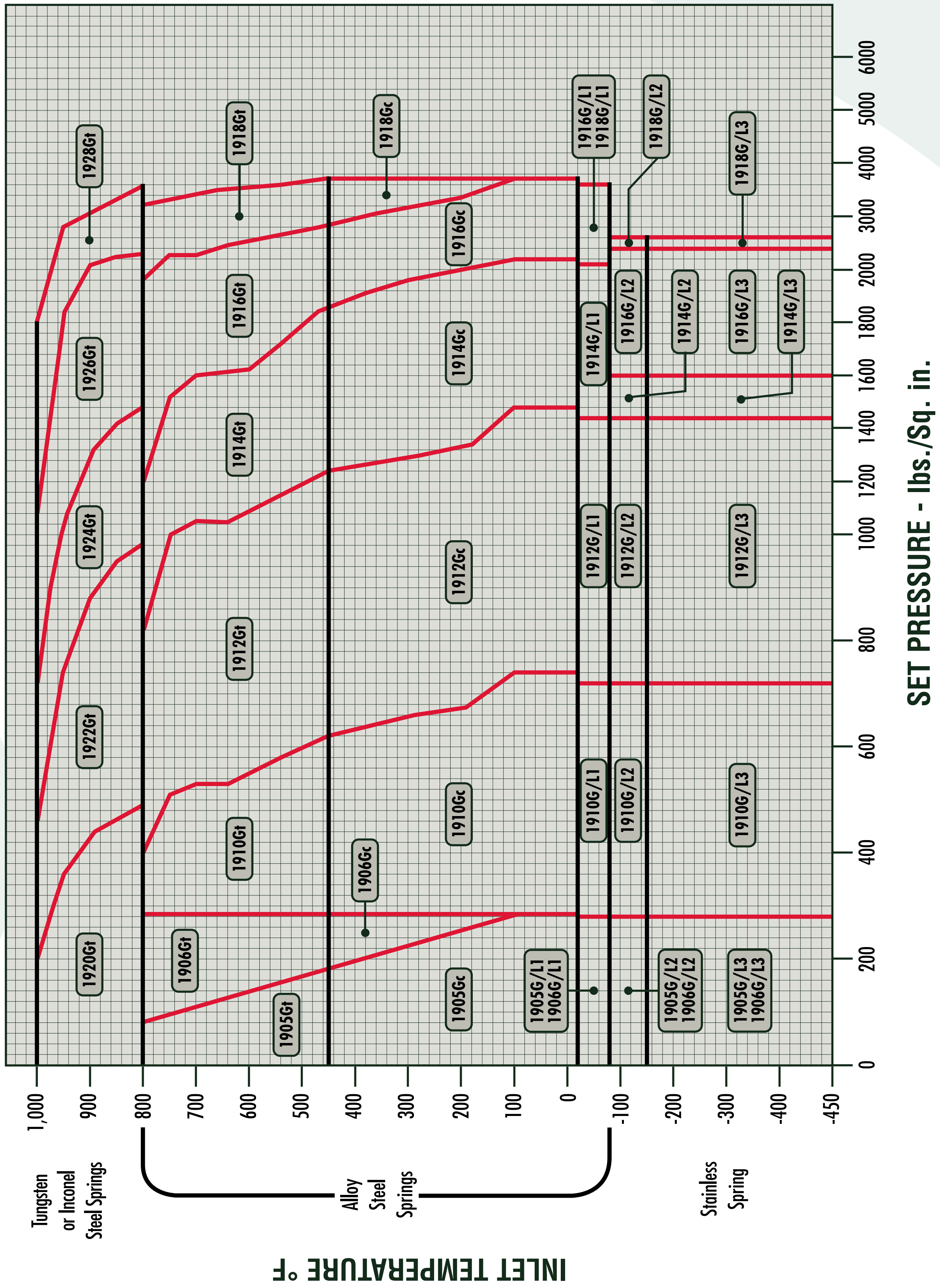
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, G Orifice - API Area: 0.503 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Gc	1905-30Gc	1-1/2 x 3	150	150	—	—	—	285	185	—	—	285	230	-20 to 450
1906Gc	1906-30Gc	1-1/2 x 3	300	150	—	—	—	285	285	—	—	285	230	
1910Gc	1910-30Gc	1-1/2 x 3	300	150	—	—	—	740	615	—	—	285	230	
1912Gc	1912-30Gc	1-1/2 x 3	600	150	—	—	—	1480	1235	—	—	285	230	
1914Gc	1914-30Gc	1-1/2 x 3	900	300	—	—	—	2220	1845	—	—	740	470	
1916Gc	1916-30Gc	2 x 3	1500	300	—	—	—	3705	3080	—	—	740	470	
1918Gc	1918-30Gc	2 x 3	2500	300	—	—	—	3705	3705	—	—	740	470	
1905Gt	1905-30Gt	1-1/2 x 3	150	150	—	—	—	—	185	80	—	285	230	451 to 800
1906Gt	1906-30Gt	1-1/2 x 3	300	150	—	—	—	—	285	285	—	285	230	
1910Gt	1910-30Gt	1-1/2 x 3	300	150	—	—	—	—	615	410	—	285	230	
1912Gt	1912-30Gt	1-1/2 x 3	600	150	—	—	—	—	1235	825	—	285	230	
1914Gt	1914-30Gt	1-1/2 x 3	900	300	—	—	—	—	1845	1235	—	740	470	
1916Gt	1916-30Gt	2 x 3	1500	300	—	—	—	—	3080	2060	—	740	470	
1918Gt	1918-30Gt	2 x 3	2500	300	—	—	—	—	3705	3430	—	740	470	
1920Gt	1920-30Gt	1-1/2 x 3	300	150	—	—	—	—	—	510	225	285	230	801 to 1000
1922Gt	1922-30Gt	1-1/2 x 3	600	150	—	—	—	—	—	1015	445	285	230	
1924Gt	1924-30Gt	1-1/2 x 3	900	300	—	—	—	—	—	1525	670	740	470	
1926Gt	1926-30Gt	2 x 3	1500	300	—	—	—	—	—	2540	1115	740	470	
1928Gt	1928-30Gt	2 x 3	2500	300	—	—	—	—	—	3705	1860	740	470	
1905G/L1	1905-30G/L1	1-1/2 x 3	150	150	—	—	275	—	—	—	—	275	230	-21 to -75
1906G/L1	1906-30G/L1	1-1/2 x 3	300	150	—	—	275	—	—	—	—	275	230	
1910G/L1	1910-30G/L1	1-1/2 x 3	300	150	—	—	720	—	—	—	—	275	230	
1912G/L1	1912-30G/L1	1-1/2 x 3	600	150	—	—	1440	—	—	—	—	275	230	
1914G/L1	1914-30G/L1	1-1/2 x 3	900	300	—	—	2160	—	—	—	—	720	470	
1916G/L1	1916-30G/L1	2 x 3	1500	300	—	—	3600	—	—	—	—	720	470	
1918G/L1	1918-30G/L1	2 x 3	2500	300	—	—	3600	—	—	—	—	720	470	
1905G/L2	1905-30G/L2	1-1/2 x 3	150	150	—	275	—	—	—	—	—	275	230	-76 to -150
1906G/L2	1906-30G/L2	1-1/2 x 3	300	150	—	275	—	—	—	—	—	275	230	
1910G/L2	1910-30G/L2	1-1/2 x 3	300	150	—	720	—	—	—	—	—	275	230	
1912G/L2	1912-30G/L2	1-1/2 x 3	600	150	—	1440	—	—	—	—	—	275	230	
1914G/L2	1914-30G/L2	1-1/2 x 3	900	300	—	1600	—	—	—	—	—	720	470	
1916G/L2	1916-30G/L2	2 x 3	1500	300	—	2450	—	—	—	—	—	720	470	
1918G/L2	1918-30G/L2	2 x 3	2500	300	—	2600	—	—	—	—	—	720	470	
1905G/L3	1905-30G/L3	1-1/2 x 3	150	150	275	—	—	—	—	—	—	275	230	-151 to -450
1906G/L3	1906-30G/L3	1-1/2 x 3	300	150	275	—	—	—	—	—	—	275	230	
1910G/L3	1910-30G/L3	1-1/2 x 3	300	150	720	—	—	—	—	—	—	275	230	
1912G/L3	1912-30G/L3	1-1/2 x 3	600	150	1440	—	—	—	—	—	—	275	230	
1914G/L3	1914-30G/L3	1-1/2 x 3	900	300	1600	—	—	—	—	—	—	720	470	
1916G/L3	1916-30G/L3	2 x 3	1500	300	2450	—	—	—	—	—	—	720	470	
1918G/L3	1918-30G/L3	2 x 3	2500	300	2600	—	—	—	—	—	—	720	470	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, G Orifice - API Area: 0.503 Sq. in.



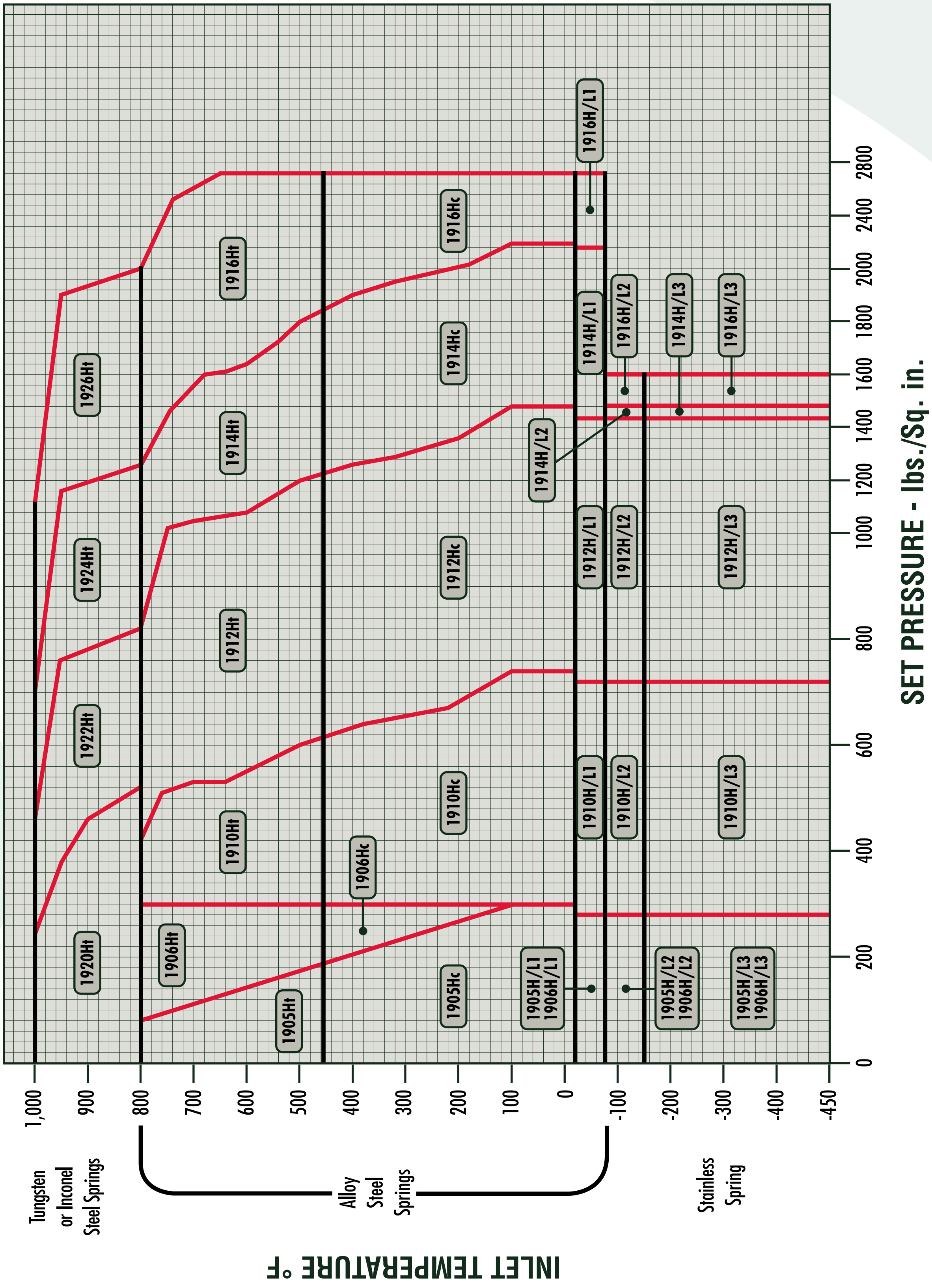
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, H Orifice - API Area: 0.785 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Hc	1905-30Hc	1-1/2 x 3	150	150	—	—	—	285	185	—	—	285	230	-20 to 450
1906Hc	1906-30Hc	1-1/2 x 3	300	150	—	—	—	285	285	—	—	285	230	
1910Hc	1910-30Hc	2 x 3	300	150	—	—	—	740	615	—	—	285	230	
1912Hc	1912-30Hc	2 x 3	600	150	—	—	—	1480	1235	—	—	285	230	
1914Hc	1914-30Hc	2 x 3	900	150	—	—	—	2220	1845	—	—	285	230	
1916Hc	1916-30Hc	2 x 3	1500	300	—	—	—	2750	2750	—	—	740	415	
1905Ht	1905-30Ht	1-1/2 x 3	150	150	275	—	—	—	185	80	—	285	230	451 to 800
1906Ht	1906-30Ht	1-1/2 x 3	300	150	275	—	—	—	285	285	—	285	230	
1910Ht	1910-30Ht	2 x 3	300	150	720	—	—	—	615	410	—	285	230	
1912Ht	1912-30Ht	2 x 3	600	150	1440	—	—	—	1235	825	—	285	230	
1914Ht	1914-30Ht	2 x 3	900	150	1485	—	—	—	1845	1235	—	285	230	
1916Ht	1916-30Ht	2 x 3	1500	300	1600	—	—	—	2750	2060	—	740	415	
1920Ht	1920-30Ht	2 x 3	300	150	—	—	—	—	—	510	225	285	230	801 to 1000
1922Ht	1922-30Ht	2 x 3	600	150	—	—	—	—	—	1015	445	285	230	
1924Ht	1924-30Ht	2 x 3	900	150	—	—	—	—	—	1225	670	285	230	
1926Ht	1926-30Ht	2 x 3	1500	300	—	—	—	—	—	2040	1115	740	415	
1905H/L1	1905-30H/L1	1-1/2 x 3	150	150	—	—	275	—	—	—	—	275	230	-21 to -75
1906H/L1	1906-30H/L1	1-1/2 x 3	300	150	—	—	275	—	—	—	—	275	230	
1910H/L1	1910-30H/L1	2 x 3	300	150	—	—	720	—	—	—	—	275	230	
1912H/L1	1912-30H/L1	2 x 3	600	150	—	—	1440	—	—	—	—	275	230	
1914H/L1	1914-30H/L1	2 x 3	900	150	—	—	2160	—	—	—	—	275	230	
1916H/L1	1916-30H/L1	2 x 3	1500	300	—	—	2750	—	—	—	—	720	415	
1905H/L2	1905-30H/L2	1-1/2 x 3	150	150	—	275	—	—	—	—	—	275	230	-76 to -150
1906H/L2	1906-30H/L2	1-1/2 x 3	300	150	—	275	—	—	—	—	—	275	230	
1910H/L2	1910-30H/L2	2 x 3	300	150	—	720	—	—	—	—	—	275	230	
1912H/L2	1912-30H/L2	2 x 3	600	150	—	1440	—	—	—	—	—	275	230	
1914H/L2	1914-30H/L2	2 x 3	900	150	—	1485	—	—	—	—	—	275	230	
1916H/L2	1916-30H/L2	2 x 3	1500	300	—	1600	—	—	—	—	—	720	415	
1905H/L3	1905-30H/L3	1-1/2 x 3	150	150	—	—	—	—	—	—	—	275	230	-151 to -450
1906H/L3	1906-30H/L3	1-1/2 x 3	300	150	—	—	—	—	—	—	—	275	230	
1910H/L3	1910-30H/L3	2 x 3	300	150	—	—	—	—	—	—	—	275	230	
1912H/L3	1912-30H/L3	2 x 3	600	150	—	—	—	—	—	—	—	275	230	
1914H/L3	1914-30H/L3	2 x 3	900	150	—	—	—	—	—	—	—	275	230	
1916H/L3	1916-30H/L3	2 x 3	1500	300	—	—	—	—	—	—	—	720	415	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, H Orifice - API Area: 0.785 Sq. in.



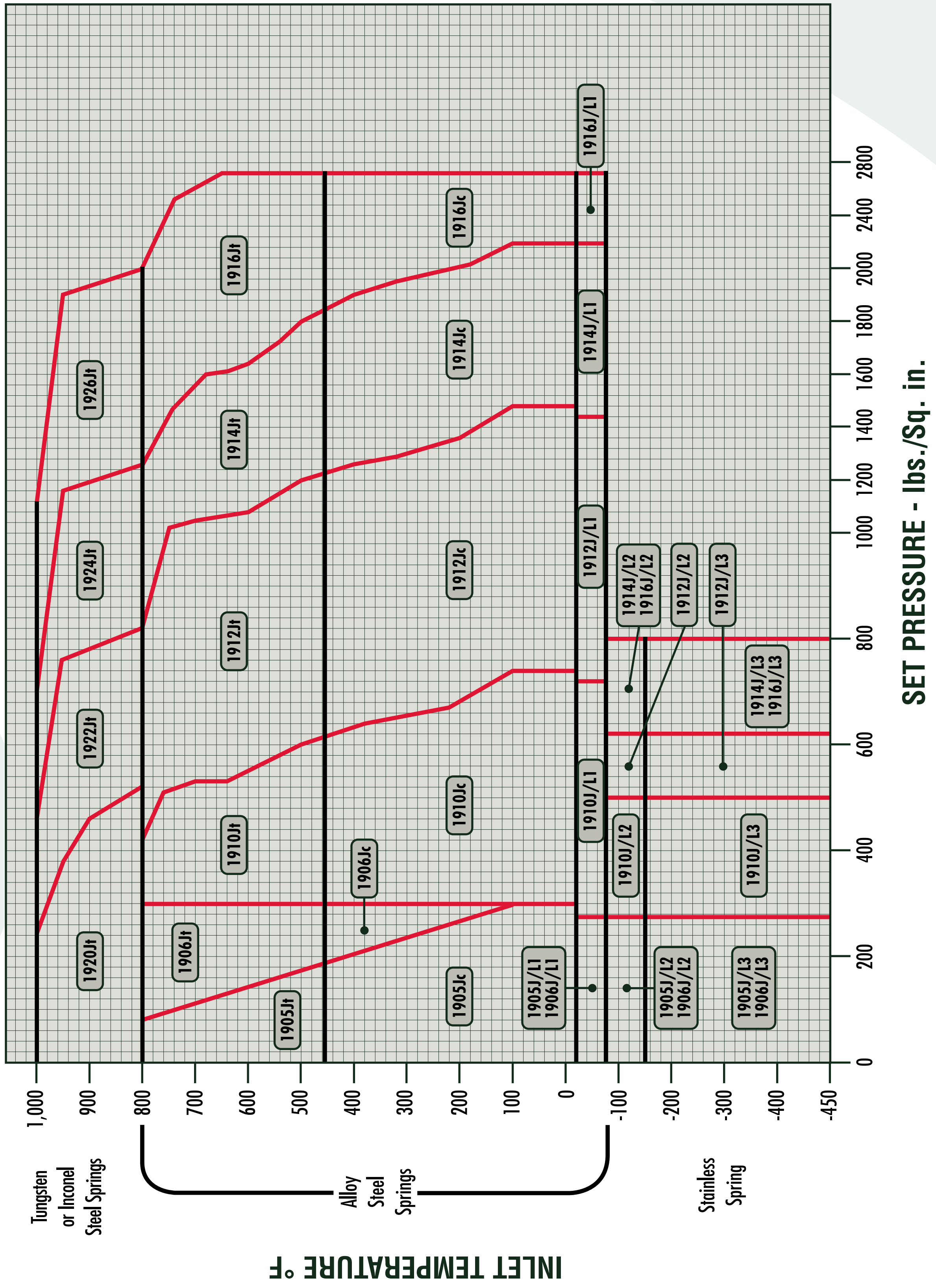
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, J Orifice - API Area: 1.287 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Jc	1905-30Jc	2 x 3	150	150	—	—	—	285	185	—	—	285	230	-20 to 450
1906Jc	1906-30Jc	2 x 3	300	150	—	—	—	285	285	—	—	285	230	
1910Jc	1910-30Jc	3 x 4	300	150	—	—	—	740	615	—	—	285	230	
1912Jc	1912-30Jc	3 x 4	600	150	—	—	—	1480	1235	—	—	285	230	
1914Jc	1914-30Jc	3 x 4	900	150	—	—	—	2220	1845	—	—	285	230	
1916Jc	1916-30Jc	3 x 4	1500	300	—	—	—	2700	2700	—	—	600	230	
1905Jt	1905-30Jt	2 x 3	150	150	—	—	—	—	185	80	—	285	230	451 to 800
1906Jt	1906-30Jt	2 x 3	300	150	—	—	—	—	285	285	—	285	230	
1910Jt	1910-30Jt	3 x 4	300	150	—	—	—	—	615	410	—	285	230	
1912Jt	1912-30Jt	3 x 4	600	150	—	—	—	—	1235	825	—	285	230	
1914Jt	1914-30Jt	3 x 4	900	150	—	—	—	—	1845	1235	—	285	230	
1916Jt	1916-30Jt	3 x 4	1500	300	—	—	—	—	2700	2060	—	600	230	
1920Jt	1920-30Jt	3 x 4	300	150	—	—	—	—	—	510	225	285	230	801 to 1000
1922Jt	1922-30Jt	3 x 4	600	150	—	—	—	—	—	815	445	285	230	
1924Jt	1924-30Jt	3 x 4	900	150	—	—	—	—	—	1225	670	285	230	
1926Jt	1926-30Jt	3 x 4	1500	300	—	—	—	—	—	2040	1115	600	230	
1905J/L1	1905-30J/L1	2 x 3	150	150	—	—	275	—	—	—	—	275	230	-21 to -75
1906J/L1	1906-30J/L1	2 x 3	300	150	—	—	275	—	—	—	—	275	230	
1910J/L1	1910-30J/L1	3 x 4	300	150	—	—	720	—	—	—	—	275	230	
1912J/L1	1912-30J/L1	3 x 4	600	150	—	—	1440	—	—	—	—	275	230	
1914J/L1	1914-30J/L1	3 x 4	900	150	—	—	2160	—	—	—	—	275	230	
1916J/L1	1916-30J/L1	3 x 4	1500	300	—	—	2700	—	—	—	—	600	230	
1905J/L2	1905-30J/L2	2 x 3	150	150	—	275	—	—	—	—	—	275	230	-76 to -150
1906J/L2	1906-30J/L2	2 x 3	300	150	—	275	—	—	—	—	—	275	230	
1910J/L2	1910-30J/L2	3 x 4	300	150	—	500	—	—	—	—	—	275	230	
1912J/L2	1912-30J/L2	3 x 4	600	150	—	625	—	—	—	—	—	275	230	
1914J/L2	1914-30J/L2	3 x 4	900	150	—	800	—	—	—	—	—	275	230	
1916J/L2	1916-30J/L2	3 x 4	1500	300	—	800	—	—	—	—	—	600	230	
1905J/L3	1905-30J/L3	2 x 3	150	150	275	—	—	—	—	—	—	275	230	-151 to -450
1906J/L3	1906-30J/L3	2 x 3	300	150	275	—	—	—	—	—	—	275	230	
1910J/L3	1910-30J/L3	3 x 4	300	150	500	—	—	—	—	—	—	275	230	
1912J/L3	1912-30J/L3	3 x 4	600	150	625	—	—	—	—	—	—	275	230	
1914J/L3	1914-30J/L3	3 x 4	900	150	800	—	—	—	—	—	—	275	230	
1916J/L3	1916-30J/L3	3 x 4	1500	300	800	—	—	—	—	—	—	600	230	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, J Orifice - API Area: 1.287 Sq. in.



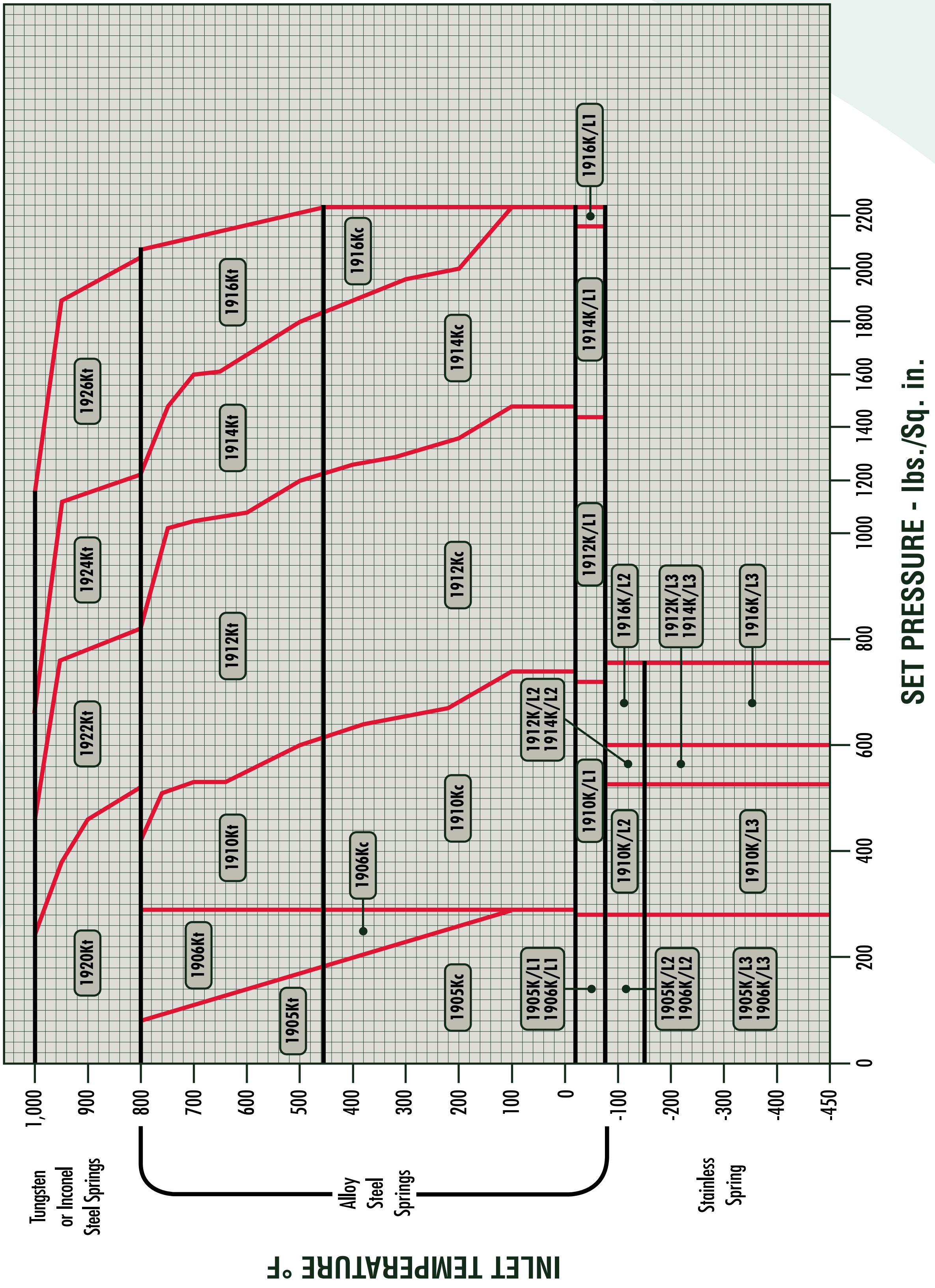
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, K Orifice - API Area: 1.838 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Kc	1905-30Kc	3 x 4	150	150	—	—	—	285	185	—	—	285	150	-20 to 450
1906Kc	1906-30Kc	3 x 4	300	150	—	—	—	285	285	—	—	285	150	
1910Kc	1910-30Kc	3 x 4	300	150	—	—	—	740	615	—	—	285	150	
1912Kc	1912-30Kc	3 x 4	600	150	—	—	—	1480	1235	—	—	285	200	
1914Kc	1914-30Kc	3 x 6	900	150	—	—	—	2220	1845	—	—	285	200	
1916Kc	1916-30Kc	3 x 6	1500	300	—	—	—	2220	2220	—	—	600	200	
1905Kt	1905-30Kt	3 x 4	150	150	—	—	—	—	185	80	—	285	150	451 to 800
1906Kt	1906-30Kt	3 x 4	300	150	—	—	—	—	285	285	—	285	150	
1910Kt	1910-30Kt	3 x 4	300	150	—	—	—	—	615	410	—	285	150	
1912Kt	1912-30Kt	3 x 4	600	150	—	—	—	—	1235	825	—	285	200	
1914Kt	1914-30Kt	3 x 6	900	150	—	—	—	—	1845	1235	—	285	200	
1916Kt	1916-30Kt	3 x 6	1500	300	—	—	—	—	2220	2060	—	600	200	
1920Kt	1920-30Kt	3 x 4	300	150	—	—	—	—	—	510	225	285	150	801 to 1000
1922Kt	1922-30Kt	3 x 4	600	150	—	—	—	—	—	815	445	285	200	
1924Kt	1924-30Kt	3 x 6	900	150	—	—	—	—	—	1225	670	285	200	
1926Kt	1926-30Kt	3 x 6	1500	300	—	—	—	—	—	2040	1115	600	200	
1905K/L1	1905-30K/L1	3 x 4	150	150	—	—	275	—	—	—	—	275	150	-21 to -75
1906K/L1	1906-30K/L1	3 x 4	300	150	—	—	275	—	—	—	—	275	150	
1910K/L1	1910-30K/L1	3 x 4	300	150	—	—	720	—	—	—	—	275	150	
1912K/L1	1912-30K/L1	3 x 4	600	150	—	—	1440	—	—	—	—	275	200	
1914K/L1	1914-30K/L1	3 x 6	900	150	—	—	2160	—	—	—	—	275	200	
1916K/L1	1916-30K/L1	3 x 6	1500	300	—	—	2220	—	—	—	—	600	200	
1905K/L2	1905-30K/L2	3 x 4	150	150	—	275	—	—	—	—	—	275	150	-76 to -150
1906K/L2	1906-30K/L2	3 x 4	300	150	—	275	—	—	—	—	—	275	150	
1910K/L2	1910-30K/L2	3 x 4	300	150	—	525	—	—	—	—	—	275	150	
1912K/L2	1912-30K/L2	3 x 4	600	150	—	600	—	—	—	—	—	275	200	
1914K/L2	1914-30K/L2	3 x 6	900	150	—	600	—	—	—	—	—	275	200	
1916K/L2	1916-30K/L2	3 x 6	1500	300	—	750	—	—	—	—	—	600	200	
1905K/L3	1905-30K/L3	3 x 4	150	150	275	—	—	—	—	—	—	275	150	-151 to -450
1906K/L3	1906-30K/L3	3 x 4	300	150	275	—	—	—	—	—	—	275	150	
1910K/L3	1910-30K/L3	3 x 4	300	150	525	—	—	—	—	—	—	275	150	
1912K/L3	1912-30K/L3	3 x 4	600	150	600	—	—	—	—	—	—	275	200	
1914K/L3	1914-30K/L3	3 x 6	900	150	600	—	—	—	—	—	—	275	200	
1916K/L3	1916-30K/L3	3 x 6	1500	300	750	—	—	—	—	—	—	600	200	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, K Orifice - API Area: 1.838 Sq. in.



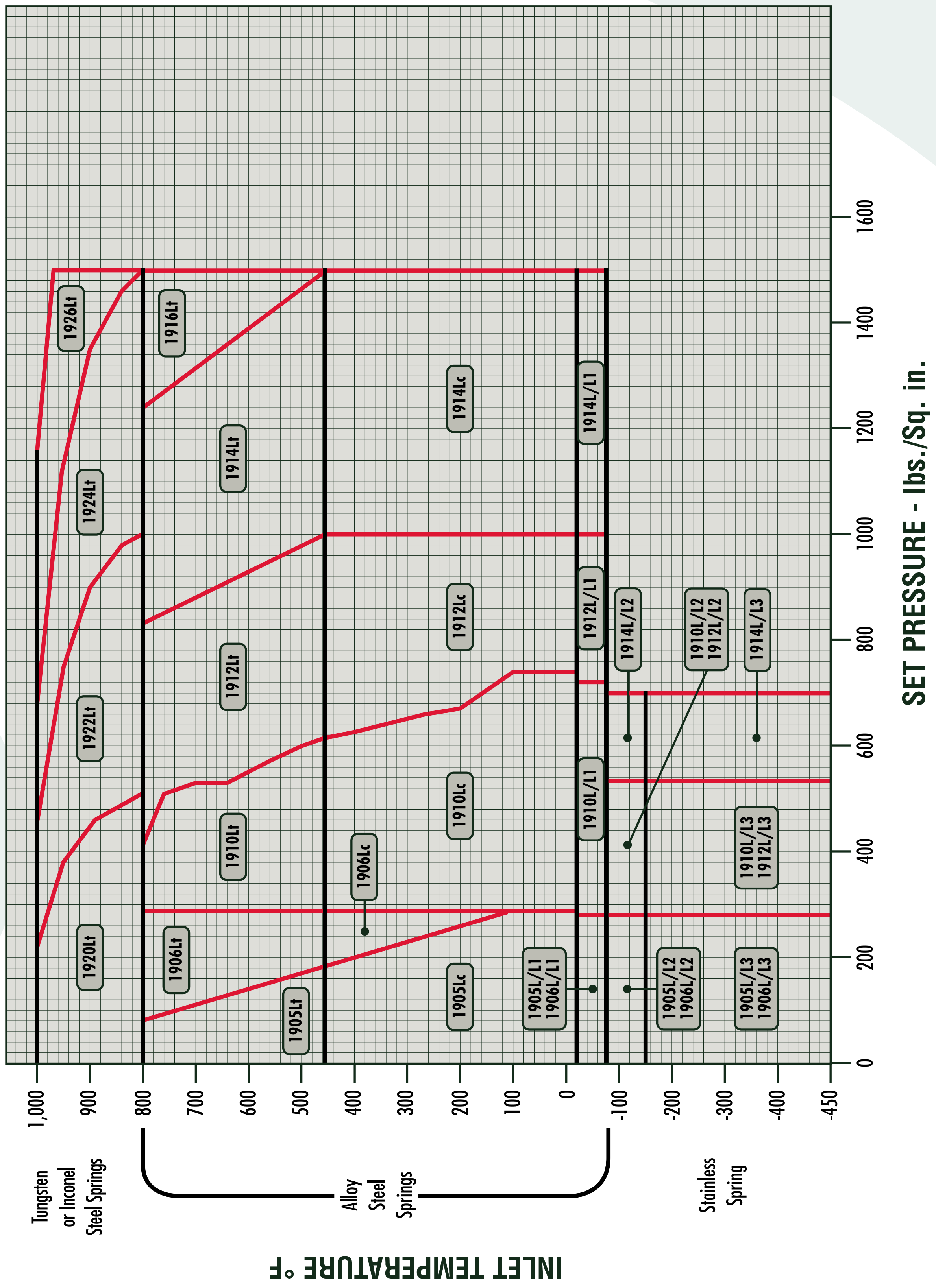
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, L Orifice - API Area: 2.853 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Lc	1905-30Lc	3 x 4	150	150	—	—	—	285	185	—	—	285	100	-20 to 450
1906Lc	1906-30Lc	3 x 4	300	150	—	—	—	285	285	—	—	285	100	
1910Lc	1910-30Lc	4 x 6	300	150	—	—	—	740	615	—	—	285	170	
1912Lc	1912-30Lc	4 x 6	600	150	—	—	—	1000	1000	—	—	285	170	
1914Lc	1914-30Lc	4 x 6	900	150	—	—	—	1500	1500	—	—	285	170	
1905Lt	1905-30Lt	3 x 4	150	150	—	—	—	—	185	80	—	285	100	451 to 800
1906Lt	1906-30Lt	3 x 4	300	150	—	—	—	—	285	285	—	285	100	
1910Lt	1910-30Lt	4 x 6	300	150	—	—	—	—	615	410	—	285	170	
1912Lt	1912-30Lt	4 x 6	600	150	—	—	—	—	1000	825	—	285	170	
1914Lt	1914-30Lt	4 x 6	900	150	—	—	—	—	1500	1235	—	285	170	
1916Lt	1916-30Lt	4 x 6	1500	150	—	—	—	—	1500	1500	—	285	170	
1920Lt	1920-30Lt	4 x 6	300	150	—	—	—	—	—	510	225	285	170	801 to 1000
1922Lt	1922-30Lt	4 x 6	600	150	—	—	—	—	—	1000	445	285	170	
1924Lt	1924-30Lt	4 x 6	900	150	—	—	—	—	—	1500	670	285	170	
1926Lt	1926-30Lt	4 x 6	1500	150	—	—	—	—	—	1500	1115	285	170	
1905L/L1	1905-30L/L1	3 x 4	150	150	—	—	275	—	—	—	—	275	100	-21 to -75
1906L/L1	1906-30L/L1	3 x 4	300	150	—	—	275	—	—	—	—	275	100	
1910L/L1	1910-30L/L1	4 x 6	300	150	—	—	720	—	—	—	—	275	170	
1912L/L1	1912-30L/L1	4 x 6	600	150	—	—	1000	—	—	—	—	275	170	
1914L/L1	1914-30L/L1	4 x 6	900	150	—	—	1500	—	—	—	—	275	170	
1905L/L2	1905-30L/L2	3 x 4	150	150	—	275	—	—	—	—	—	275	100	-76 to -150
1906L/L2	1906-30L/L2	3 x 4	300	150	—	275	—	—	—	—	—	275	100	
1910L/L2	1910-30L/L2	4 x 6	300	150	—	535	—	—	—	—	—	275	170	
1912L/L2	1912-30L/L2	4 x 6	600	150	—	535	—	—	—	—	—	275	170	
1914L/L2	1914-30L/L2	4 x 6	900	150	—	700	—	—	—	—	—	275	170	
1905L/L3	1905-30L/L3	3 x 4	150	150	275	—	—	—	—	—	—	275	100	-151 to -450
1906L/L3	1906-30L/L3	3 x 4	300	150	275	—	—	—	—	—	—	275	100	
1910L/L3	1910-30L/L3	4 x 6	300	150	535	—	—	—	—	—	—	275	170	
1912L/L3	1912-30L/L3	4 x 6	600	150	535	—	—	—	—	—	—	275	170	
1914L/L3	1914-30L/L3	4 x 6	900	150	700	—	—	—	—	—	—	275	170	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, L Orifice - API Area: 2.853 Sq. in.



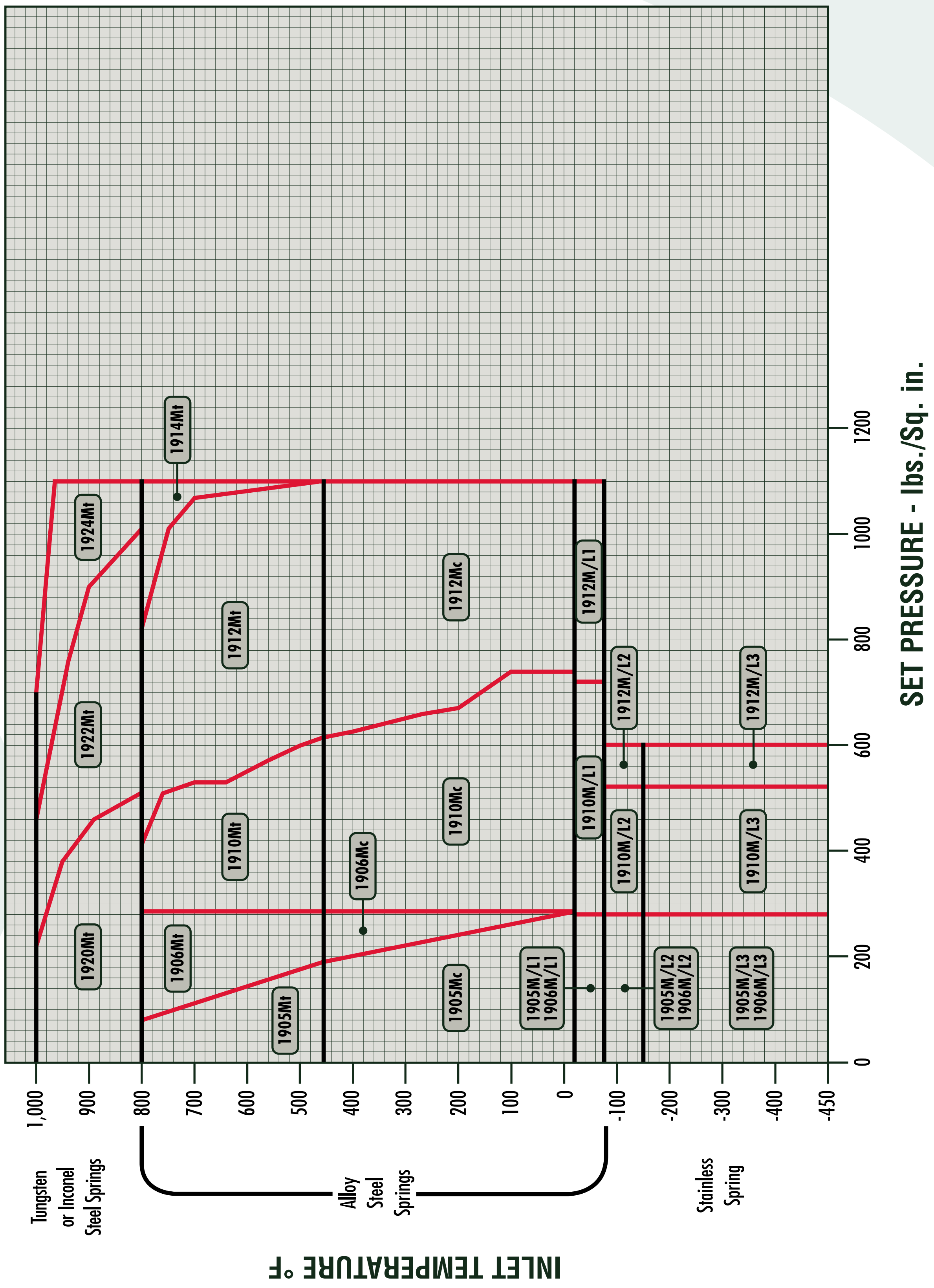
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, M Orifice - API Area: 3.60 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Mc	1905-30Mc	4 x 6	150	150	—	—	—	285	185	—	—	285	80	-20 to 450
1906Mc	1906-30Mc	4 x 6	300	150	—	—	—	285	285	—	—	285	80	
1910Mc	1910-30Mc	4 x 6	300	150	—	—	—	740	615	—	—	285	160	
1912Mc	1912-30Mc	4 x 6	600	150	—	—	—	1100	1100	—	—	285	160	
1905Mt	1905-30Mt	4 x 6	150	150	—	—	—	—	185	80	—	285	80	451 to 800
1906Mt	1906-30Mt	4 x 6	300	150	—	—	—	—	285	285	—	285	80	
1910Mt	1910-30Mt	4 x 6	300	150	—	—	—	—	615	410	—	285	160	
1912Mt	1912-30Mt	4 x 6	600	150	—	—	—	—	1100	825	—	285	160	
1914Mt	1914-30Mt	4 x 6	900	150	—	—	—	—	1100	1100	—	285	160	
1920Mt	1920-30Mt	4 x 6	300	150	—	—	—	—	—	510	225	285	160	801 to 1000
1922Mt	1922-30Mt	4 x 6	600	150	—	—	—	—	—	1015	445	285	160	
1924Mt	1924-30Mt	4 x 6	900	150	—	—	—	—	—	1100	670	285	160	
1905M/L1	1905-30M/L1	4 x 6	150	150	—	—	275	—	—	—	—	275	80	-21 to -75
1906M/L1	1906-30M/L1	4 x 6	300	150	—	—	275	—	—	—	—	275	80	
1910M/L1	1910-30M/L1	4 x 6	300	150	—	—	720	—	—	—	—	275	160	
1912M/L1	1912-30M/L1	4 x 6	600	150	—	—	1000	—	—	—	—	275	160	
1905M/L2	1905-30M/L2	4 x 6	150	150	—	275	—	—	—	—	—	275	80	-76 to -150
1906M/L2	1906-30M/L2	4 x 6	300	150	—	275	—	—	—	—	—	275	80	
1910M/L2	1910-30M/L2	4 x 6	300	150	—	525	—	—	—	—	—	275	160	
1912M/L2	1912-30M/L2	4 x 6	600	150	—	600	—	—	—	—	—	275	160	
1905M/L3	1905-30M/L3	4 x 6	150	150	275	—	—	—	—	—	—	275	80	-151 to -450
1906M/L3	1906-30M/L3	4 x 6	300	150	275	—	—	—	—	—	—	275	80	
1910M/L3	1910-30M/L3	4 x 6	300	150	525	—	—	—	—	—	—	275	160	
1912M/L3	1912-30M/L3	4 x 6	600	150	600	—	—	—	—	—	—	275	160	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, M Orifice - API Area: 3.60 Sq. in.



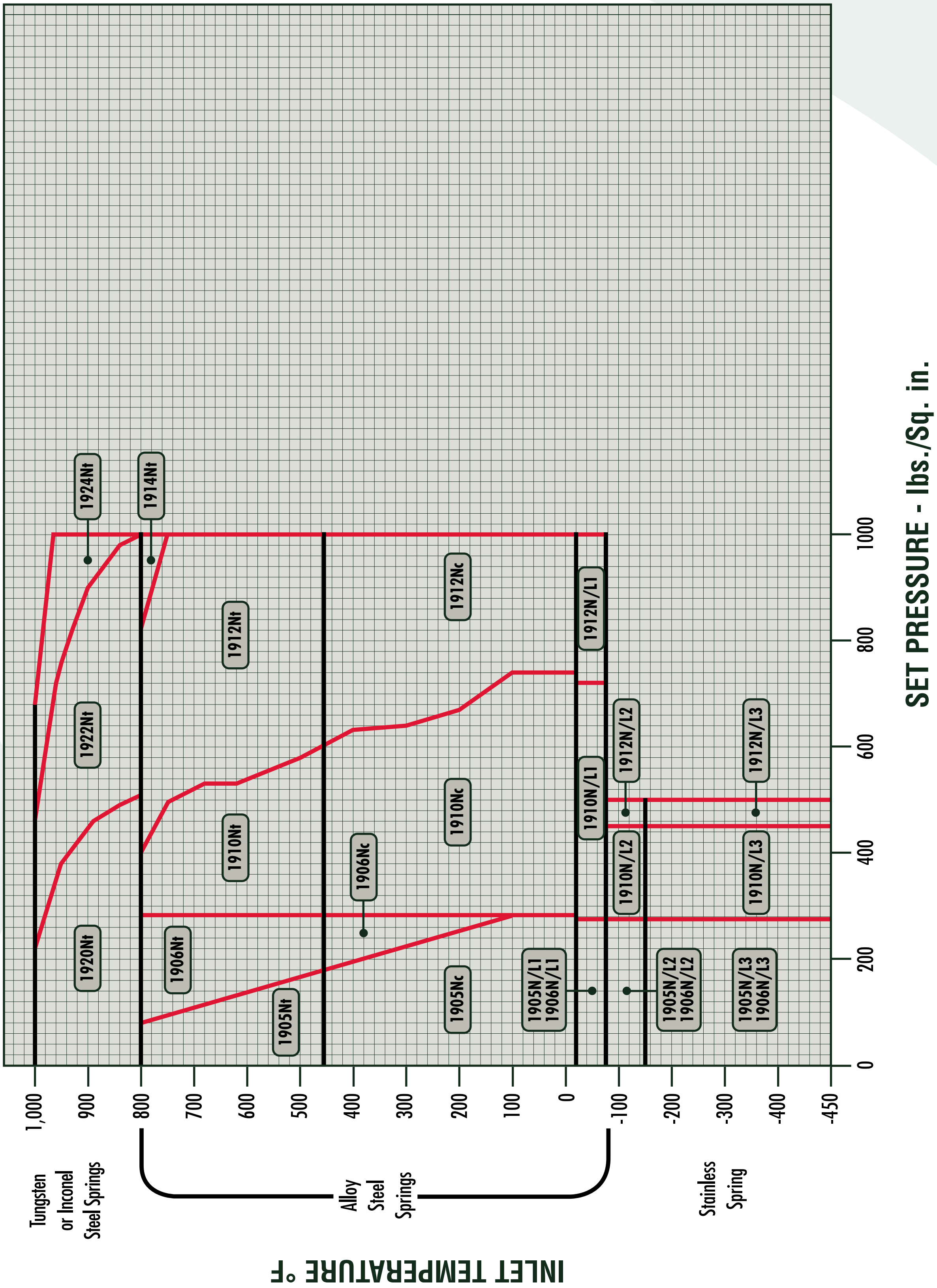
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, N Orifice - API Area: 4.34 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Nc	1905-30Nc	4 x 6	150	150	—	—	—	285	185	—	—	285	80	-20 to 450
1906Nc	1906-30Nc	4 x 6	300	150	—	—	—	285	285	—	—	285	80	
1910Nc	1910-30Nc	4 x 6	300	150	—	—	—	740	615	—	—	285	160	
1912Nc	1912-30Nc	4 x 6	600	150	—	—	—	1000	1100	—	—	285	160	
1905Nt	1905-30Nt	4 x 6	150	150	—	—	—	—	185	80	—	285	80	451 to 800
1906Nt	1906-30Nt	4 x 6	300	150	—	—	—	—	285	285	—	285	80	
1910Nt	1910-30Nt	4 x 6	300	150	—	—	—	—	615	410	—	285	160	
1912Nt	1912-30Nt	4 x 6	600	150	—	—	—	—	1000	825	—	285	160	
1914Nt	1914-30Nt	4 x 6	900	150	—	—	—	—	1000	1000	—	285	160	
1920Nt	1920-30Nt	4 x 6	300	150	—	—	—	—	—	510	225	285	160	801 to 1000
1922Nt	1922-30Nt	4 x 6	600	150	—	—	—	—	—	1000	445	285	160	
1924Nt	1924-30Nt	4 x 6	900	150	—	—	—	—	—	1000	670	285	160	
1905N/L1	1905-30N/L1	4 x 6	150	150	—	—	275	—	—	—	—	275	80	-21 to -75
1906N/L1	1906-30N/L1	4 x 6	300	150	—	—	275	—	—	—	—	275	80	
1910N/L1	1910-30N/L1	4 x 6	300	150	—	—	720	—	—	—	—	285	160	
1912N/L1	1912-30N/L1	4 x 6	600	150	—	—	1000	—	—	—	—	285	160	
1905N/L2	1905-30N/L2	4 x 6	150	150	—	275	—	—	—	—	—	275	80	-76 to -150
1906N/L2	1906-30N/L2	4 x 6	300	150	—	275	—	—	—	—	—	275	80	
1910N/L2	1910-30N/L2	4 x 6	300	150	—	450	—	—	—	—	—	285	160	
1912N/L2	1912-30N/L2	4 x 6	600	150	—	500	—	—	—	—	—	285	160	
1905N/L3	1905-30N/L3	4 x 6	150	150	275	—	—	—	—	—	—	275	80	-151 to -450
1906N/L3	1906-30N/L3	4 x 6	300	150	275	—	—	—	—	—	—	275	80	
1910N/L3	1910-30N/L3	4 x 6	300	150	450	—	—	—	—	—	—	275	160	
1912N/L3	1912-30N/L3	4 x 6	600	150	600	—	—	—	—	—	—	275	160	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, N Orifice - API Area: 4.34 Sq. in.



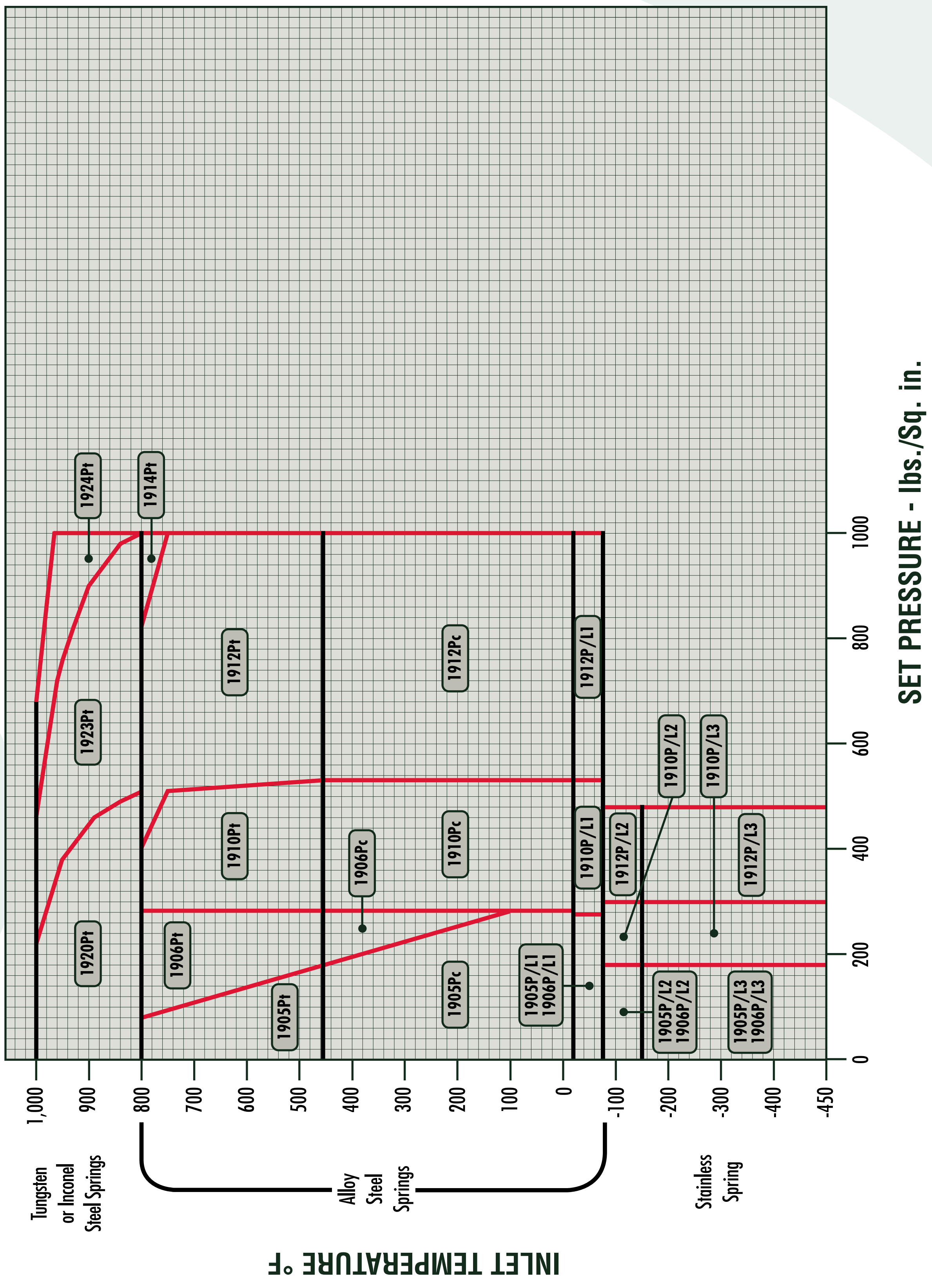
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, P Orifice - API Area: 6.38 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Pc	1905-30Pc	4 x 6	150	150	—	—	—	285	185	—	—	285	80	-20 to 450
1906Pc	1906-30Pc	4 x 6	300	150	—	—	—	285	285	—	—	285	80	
1910Pc	1910-30Pc	4 x 6	300	150	—	—	—	525	525	—	—	285	150	
1912Pc	1912-30Pc	4 x 6	600	150	—	—	—	1000	1100	—	—	285	150	
1905Pt	1905-30Pt	4 x 6	150	150	—	—	—	—	185	80	—	285	80	451 to 800
1906Pt	1906-30Pt	4 x 6	300	150	—	—	—	—	285	285	—	285	80	
1910Pt	1910-30Pt	4 x 6	300	150	—	—	—	—	525	410	—	285	150	
1912Pt	1912-30Pt	4 x 6	600	150	—	—	—	—	1000	825	—	285	150	
1914Pt	1914-30Pt	4 x 6	900	150	—	—	—	—	1000	1000	—	285	150	
1920Pt	1920-30Pt	4 x 6	300	150	—	—	—	—	—	510	225	285	150	801 to 1000
1922Pt	1922-30Pt	4 x 6	600	150	—	—	—	—	—	1000	445	285	150	
1924Pt	1924-30Pt	4 x 6	900	150	—	—	—	—	—	1000	670	285	150	
1905P/L1	1905-30P/L1	4 x 6	150	150	—	—	275	—	—	—	—	275	80	-21 to -75
1906P/L1	1906-30P/L1	4 x 6	300	150	—	—	275	—	—	—	—	275	80	
1910P/L1	1910-30P/L1	4 x 6	300	150	—	—	525	—	—	—	—	275	150	
1912P/L1	1912-30P/L1	4 x 6	600	150	—	—	1000	—	—	—	—	275	150	
1905P/L2	1905-30P/L2	4 x 6	150	150	—	175	—	—	—	—	—	175	80	-76 to -150
1906P/L2	1906-30P/L2	4 x 6	300	150	—	175	—	—	—	—	—	175	80	
1910P/L2	1910-30P/L2	4 x 6	300	150	—	300	—	—	—	—	—	275	150	
1912P/L2	1912-30P/L2	4 x 6	600	150	—	480	—	—	—	—	—	275	150	
1905P/L3	1905-30P/L3	4 x 6	150	150	175	—	—	—	—	—	—	175	80	-151 to -450
1906P/L3	1906-30P/L3	4 x 6	300	150	175	—	—	—	—	—	—	175	80	
1910P/L3	1910-30P/L3	4 x 6	300	150	300	—	—	—	—	—	—	275	150	
1912P/L3	1912-30P/L3	4 x 6	600	150	480	—	—	—	—	—	—	275	150	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, P Orifice - API Area: 6.38 Sq. in.



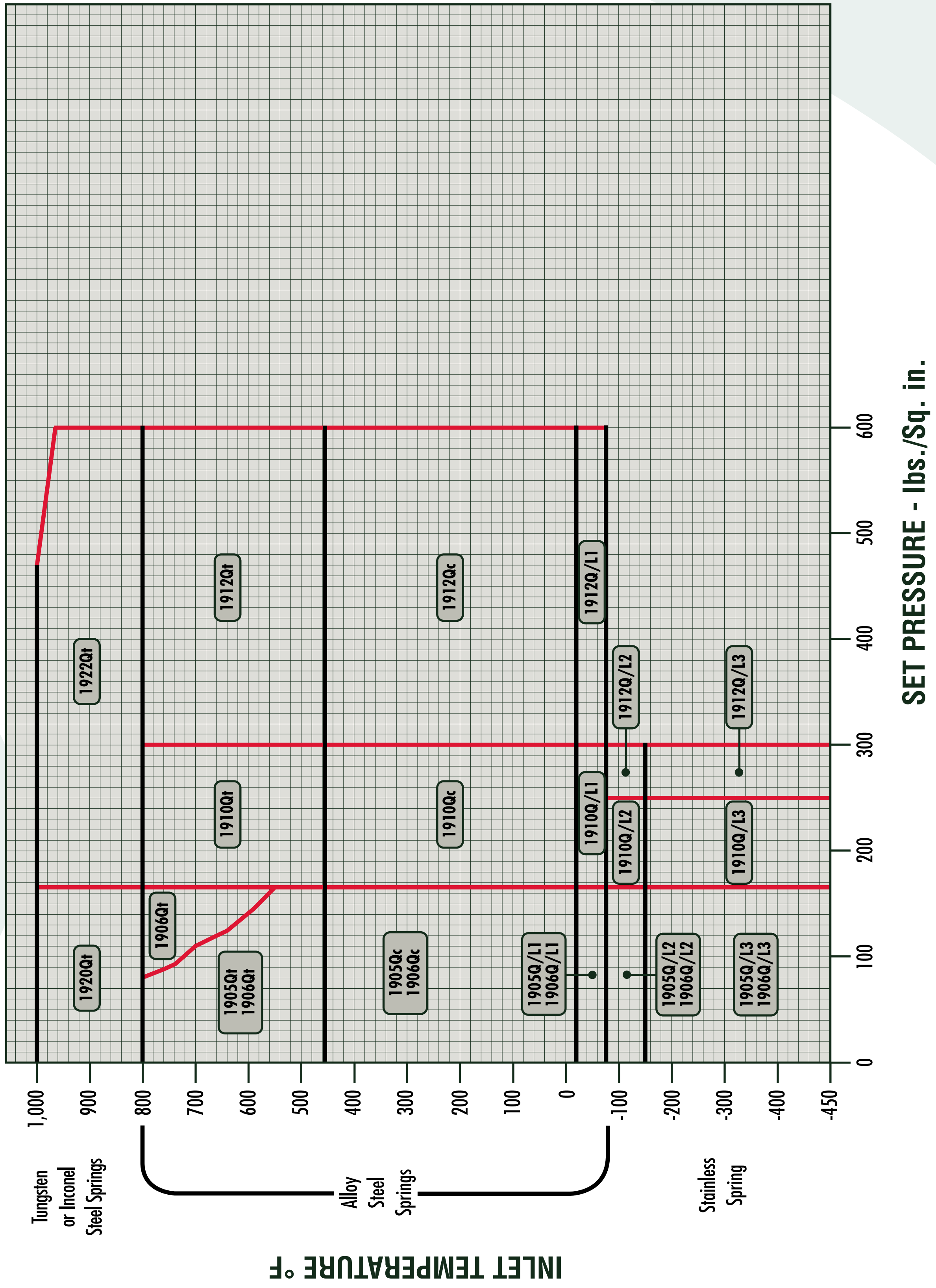
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, Q Orifice - API Area: 11.05 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Qc	1905-30Qc	6 x 8	150	150	—	—	—	165	165	—	—	115	70	-20 to 450
1906Qc	1906-30Qc	6 x 8	300	150	—	—	—	165	165	—	—	115	70	
1910Qc	1910-30Qc	6 x 8	300	150	—	—	—	300	300	—	—	115	115	
1912Qc	1912-30Qc	6 x 8	600	150	—	—	—	600	600	—	—	115	115	
1905Qt	1905-30Qt	6 x 8	150	150	—	—	—	—	165	80	—	115	70	451 to 800
1906Qt	1906-30Qt	6 x 8	300	150	—	—	—	—	165	165	—	115	70	
1910Qt	1910-30Qt	6 x 8	300	150	—	—	—	—	300	300	—	115	115	
1912Qt	1912-30Qt	6 x 8	600	150	—	—	—	—	600	600	—	115	115	
1920Qt	1920-30Qt	6 x 8	300	150	—	—	—	—	—	165	165	115	115	801 to 1000
1922Qt	1922-30Qt	6 x 8	600	150	—	—	—	—	—	600	445	115	115	
1905Q/L1	1905-30Q/L1	6 x 8	150	150	—	—	165	—	—	—	—	115	70	-21 to -75
1906Q/L1	1906-30Q/L1	6 x 8	300	150	—	—	165	—	—	—	—	115	70	
1910Q/L1	1910-30Q/L1	6 x 8	300	150	—	—	300	—	—	—	—	115	115	
1912Q/L1	1912-30Q/L1	6 x 8	600	150	—	—	600	—	—	—	—	115	115	
1905Q/L2	1905-30Q/L2	6 x 8	150	150	—	165	—	—	—	—	—	115	70	-76 to -150
1906Q/L2	1906-30Q/L2	6 x 8	300	150	—	165	—	—	—	—	—	115	70	
1910Q/L2	1910-30Q/L2	6 x 8	300	150	—	250	—	—	—	—	—	115	115	
1912Q/L2	1912-30Q/L2	6 x 8	600	150	—	300	—	—	—	—	—	115	115	
1905Q/L3	1905-30Q/L3	6 x 8	150	150	165	—	—	—	—	—	—	115	70	-151 to -450
1906Q/L3	1906-30Q/L3	6 x 8	300	150	165	—	—	—	—	—	—	115	70	
1910Q/L3	1910-30Q/L3	6 x 8	300	150	250	—	—	—	—	—	—	115	115	
1912Q/L3	1912-30Q/L3	6 x 8	600	150	300	—	—	—	—	—	—	115	115	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, Q Orifice - API Area: 11.05 Sq. in.



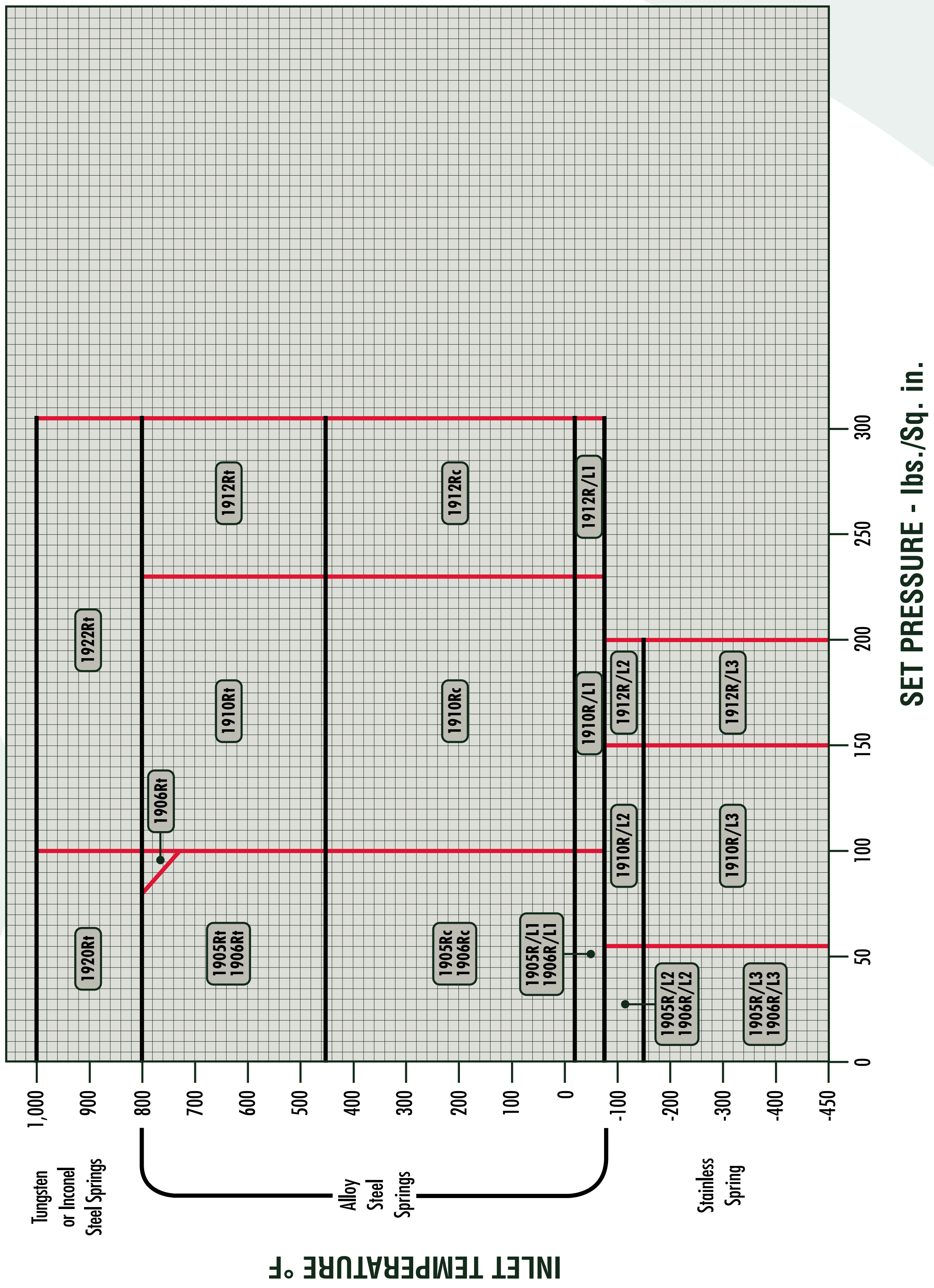
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, R Orifice - API Area: 16.0 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Rc	1905-30Rc	6 x 8	150	150	—	—	—	100	100	—	—	60	60	-20 to 450
1906Rc	1906-30Rc	6 x 8	300	150	—	—	—	100	100	—	—	60	60	
1910Rc	1910-30Rc	6 x 10	300	150	—	—	—	230	230	—	—	100	100	
1912Rc	1912-30Rc	6 x 10	600	150	—	—	—	300	300	—	—	100	100	
1905Rt	1905-30Rt	6 x 8	150	150	—	—	—	—	100	80	—	60	60	451 to 800
1906Rt	1906-30Rt	6 x 8	300	150	—	—	—	—	100	100	—	60	60	
1910Rt	1910-30Rt	6 x 10	300	150	—	—	—	—	230	230	—	100	100	
1912Rt	1912-30Rt	6 x 10	600	150	—	—	—	—	300	300	—	100	100	
1920Rt	1920-30Rt	6 x 8	300	150	—	—	—	—	—	100	100	60	60	801 to 1000
1922Rt	1922-30Rt	6 x 10	600	150	—	—	—	—	—	300	300	100	100	
1905R/L1	1905-30R/L1	6 x 8	150	150	—	—	100	—	—	—	—	60	60	-21 to -75
1906R/L1	1906-30R/L1	6 x 8	300	150	—	—	100	—	—	—	—	60	60	
1910R/L1	1910-30R/L1	6 x 10	300	150	—	—	230	—	—	—	—	100	100	
1912R/L1	1912-30R/L1	6 x 10	600	150	—	—	300	—	—	—	—	100	100	
1905R/L2	1905-30R/L2	6 x 8	150	150	—	55	—	—	—	—	—	55	55	-76 to -150
1906R/L2	1906-30R/L2	6 x 8	300	150	—	55	—	—	—	—	—	55	55	
1910R/L2	1910-30R/L2	6 x 10	300	150	—	150	—	—	—	—	—	100	100	
1912R/L2	1912-30R/L2	6 x 10	600	150	—	200	—	—	—	—	—	100	100	
1905R/L3	1905-30R/L3	6 x 8	150	150	55	—	—	—	—	—	—	55	55	-151 to -450
1906R/L3	1906-30R/L3	6 x 8	300	150	55	—	—	—	—	—	—	55	55	
1910R/L3	1910-30R/L3	6 x 10	300	150	150	—	—	—	—	—	—	100	100	
1912R/L3	1912-30R/L3	6 x 10	600	150	200	—	—	—	—	—	—	100	100	

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, R Orifice - API Area: 16.0 Sq. in.



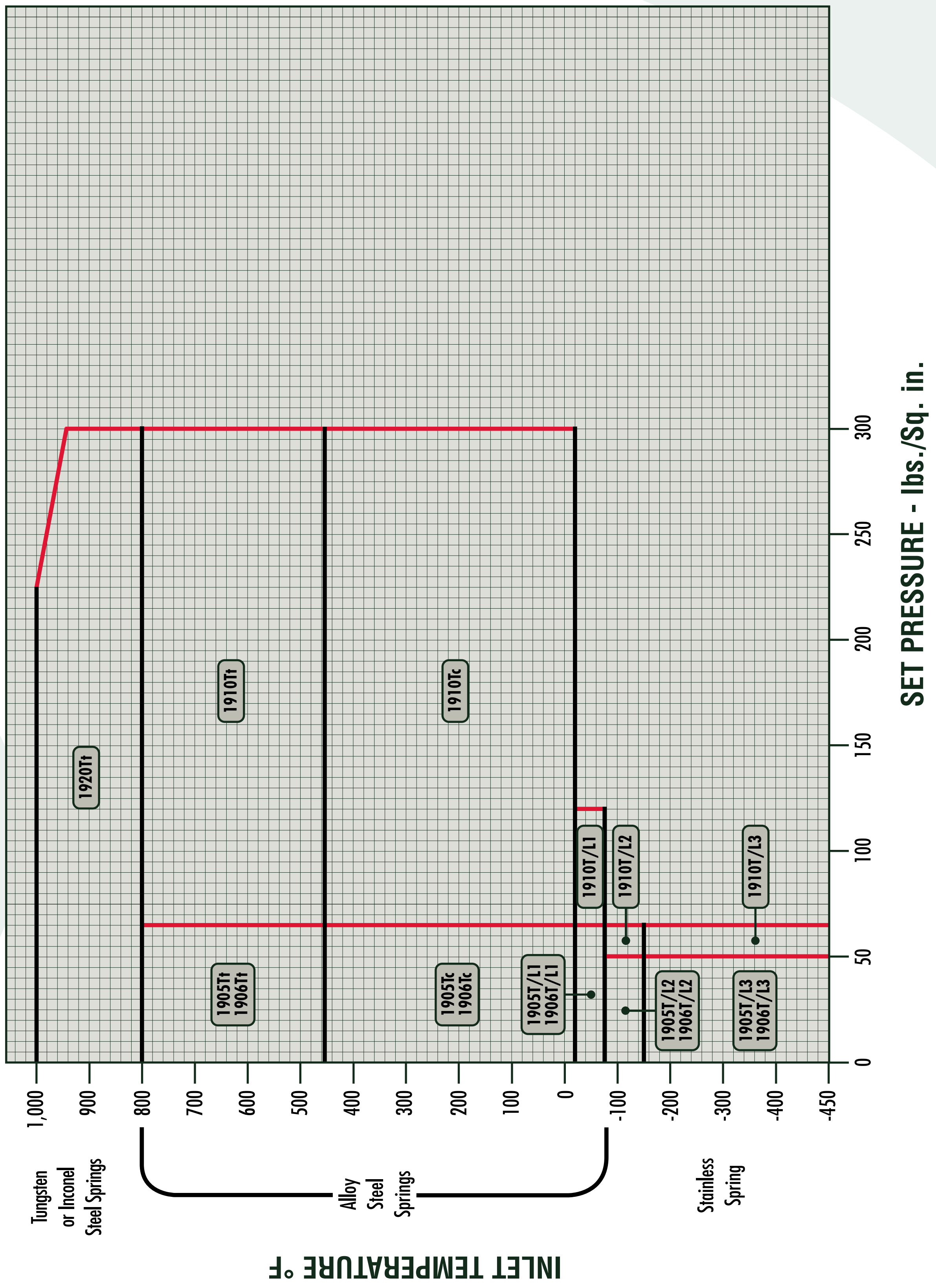
Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, T Orifice - Area: 30.21 Sq. in.

Valve Type Number		Valve Size	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F							Back Press. Limits (psig) at 100°F		Inlet Temp. Range (°F)
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450 -151	-150 -76	-75 -21	-20 +100	+450	+800	+1000	Standard	Bellows	
1905Tc	1905-30Tc	8 x 10	150	150	—	—	—	65	65	—	—	30	30	-20
1906Tc	1906-30Tc	8 x 10	300	150	—	—	—	65	65	—	—	30	30	to
1910Tc	1910-30Tc	8 x 10	300	150	—	—	—	300	300	—	—	100	100	450
1905Tt	1905-30Tt	8 x 10	150	150	—	—	—	—	65	65	—	30	30	451
1906Tt	1906-30Tt	8 x 10	300	150	—	—	—	—	65	65	—	30	30	to
1910Tt	1910-30Tt	8 x 10	300	150	—	—	—	—	300	300	—	100	100	800
1920Tt	1920-30Tt	8 x 10	300	150	—	—	—	—	—	300	225	100	100	801 to 1000
1905T/L1	1905-30T/L1	8 x 10	150	150	—	—	65	—	—	—	—	30	30	-21
1906T/L1	1906-30T/L1	8 x 10	300	150	—	—	65	—	—	—	—	30	30	to
1910T/L1	1910-30T/L1	8 x 10	300	150	—	—	120	—	—	—	—	100	100	-75
1905T/L2	1905-30T/L2	8 x 10	150	150	—	50	—	—	—	—	—	30	30	-76
1906T/L2	1906-30T/L2	8 x 10	300	150	—	50	—	—	—	—	—	30	30	to
1910T/L2	1910-30T/L2	8 x 10	300	150	—	65	—	—	—	—	—	60	60	-150
1905T/L3	1905-30T/L3	8 x 10	150	150	50	—	—	—	—	—	—	30	30	-151
1906T/L3	1906-30T/L3	8 x 10	300	150	50	—	—	—	—	—	—	30	30	to
1910T/L3	1910-30T/L3	8 x 10	300	150	65	—	—	—	—	—	—	60	60	-450

Selection Chart for Vapors, Gases and Liquids

1900 and 1900-30 Series, T Orifice - Area: 30.21 Sq. in.



Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, V Orifice - Area: 50.26 Sq. in.

Valve Type Number		Valve Size Inlet x Outlet	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F			Back Press. Limits (psig) at 100°F	
Standard	Bellows		Inlet R.F. or R.J.	Outlet R.F.	-20 +100	+101 +415	+416 +1000	Standard	Bellows
1905V	1905-30V	10 x 14	150	150	154	154	—	30	30
1906V	1906-30V	10 x 14	300	150	154	154	—	30	30
1910V	1910-30V	10 x 14	300	150	300	300	—	100	100
1920V	1920-30V	10 x 14	300	150	—	—	154	30	30

Selection Table for Vapors, Gases and Liquids

1900 and 1900-30 Series, W Orifice - Area: 78.996 Sq. in.

Valve Type Number		Valve Size Inlet x Outlet	ASME Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F			Back Press. Limits (psig) at 100°F	
Standard	Bellows		Inlet R.F. or R.J.	Outlet R.F.	-20 +100	+101 +415	+416 +1000	Standard	Bellows
1905W	1905-30W	12 x 16	150	150	154	154	—	90	90
1906W	1906-30W	12 x 16	300	150	154	154	—	90	90
1910W	1910-30W	12 x 16	300	150	300	300	—	180	180
1920W	1920-30W	12 x 16	300	150	—	—	154	90	90

1900 Flanged Valve Orifice Capacities for Air (USCS Units)

ASME B & PVC, Section VIII

Capacities Based on Set Pressure plus 10% overpressure or 3 psig, whichever is greater. Capacities in standard feet of air per minute @ 60°F.

Set Press. (psig)	Orifice Designation															
	D 0.1279	E 0.2279	F 0.3568	G 0.5849	H 0.9127	J 1.496	K 2.138	L 3.317	M 4.186	N 5.047	P 7.417	Q 12.85	R 18.6	T 30.21	V 50.26	W 78.996
15	65	117	183	300	468	767	1097	1702	2148	2589	3806	6594	9544	15502	25792	40538
20	75	134	211	346	539	885	1264	1962	2476	2985	4388	7602	11004	17873	29735	46737
30	95	170	267	437	683	1119	1600	2483	3133	3778	5552	9619	13923	22614	37623	59134
40	117	209	328	538	840	1378	1969	3055	3856	4649	6832	11837	17134	27829	46229	72770
50	139	249	390	639	998	1636	2338	3628	4578	5520	8112	14055	20345	33044	54975	86407
60	161	288	451	740	1155	1894	2707	4200	5301	6391	9393	16273	23555	38259	63651	100044
70	184	327	513	841	1313	2152	3076	4773	6023	7263	10673	18492	26766	43474	72327	113681
80	206	367	575	942	1471	2411	3445	5346	6746	8134	11953	20710	29977	48689	81004	127318
90	228	406	636	1043	1628	2669	3814	5918	7469	9005	13234	22928	33188	53904	89680	140954
100	250	445	698	1144	1786	2927	4183	6491	8191	9876	14514	25146	36399	59119	98356	154591
120	294	524	821	1346	2101	3444	4922	7636	9637	11619	17075	29583	42821	69549	115708	181865
140	338	603	944	1548	2416	3960	5660	8781	11082	13361	19636	34019	49242	79979	133061	209138
160	382	682	1067	1750	2731	4477	6398	9926	12527	15104	22196	38456	55664	90409	150413	236412
180	426	760	1190	1952	3046	4993	7136	11072	13972	16846	24757	42892	62086	100839	167766	263685
200	471	839	1314	2154	3361	5510	7874	12217	15417	18589	27318	47329	68507	111270	185118	290959
220	515	918	1437	2356	3676	6023	8612	13362	16863	20331	29879	51765	74929	121700	202470	318233
240	559	996	1560	2558	3991	6543	9351	14507	18308	22074	32439	56202	81351	132130	219823	345506
260	603	1075	1683	2760	4307	7059	10089	15652	19753	23816	35000	60638	87772	142560	237175	372780
280	647	1154	1806	2962	4622	7576	10827	16798	21198	25559	37561	65075	94194	152990	254528	400053
300	691	1232	1930	3164	4937	8092	11565	17943	22644	27301	40122	69511	100616	163420	271880	427327
320	736	1311	2053	3365	5252	8609	12303	19088	24089	39044	42682	73948	—	—	—	—
340	780	1390	2176	3567	5567	9125	13041	20233	25534	30786	45243	78384	—	—	—	—
360	824	1468	2299	3769	5882	9642	13779	21378	26979	32529	47804	82821	—	—	—	—
380	868	1547	2422	3971	6197	10158	14518	22524	28424	34271	50365	87257	—	—	—	—
400	912	1626	2546	4173	6512	10675	15256	23669	29870	36014	52925	91694	—	—	—	—
420	956	1704	2669	4375	6827	11191	15994	24814	31315	37756	55486	96130	—	—	—	—
440	1000	1783	2792	4577	7143	11708	16732	25959	32760	39499	58047	100567	—	—	—	—
460	1045	1862	2915	4779	7458	12224	17470	27104	34205	41241	60608	105003	—	—	—	—
480	1089	1940	3038	4981	7773	12741	18208	28250	35651	42984	63168	109440	—	—	—	—
500	1133	2019	3161	5183	8088	13257	18946	29395	37096	44726	65729	113876	—	—	—	—
600	1354	2413	3777	6193	9663	15840	22637	35121	44322	53439	78533	136059	—	—	—	—
700	1575	2806	4393	7202	11239	18422	26328	40487	51548	62151	91336	—	—	—	—	—
800	1795	3199	5009	8212	12815	21005	30019	46573	58774	70863	104140	—	—	—	—	—
900	2016	3593	5625	9222	14390	26587	33709	52299	66000	79576	116944	—	—	—	—	—
1000	2237	3986	6241	10231	15966	26170	37400	58025	73227	88288	129747	—	—	—	—	—
1100	2458	4380	6875	11241	17541	28752	41091	63751	80453	—	—	—	—	—	—	—
1200	2678	4773	7473	12251	19117	31334	44782	69477	—	—	—	—	—	—	—	—
1300	2899	5166	8089	13260	20692	33917	48472	75203	—	—	—	—	—	—	—	—
1400	3120	5560	8705	14270	22268	36499	52163	80929	—	—	—	—	—	—	—	—
1500	3341	5953	9321	15280	23843	39082	55854	86655	—	—	—	—	—	—	—	—
2000	4445	7920	12400	20328	31721	51994	74308	—	—	—	—	—	—	—	—	—
2500	5549	9887	15480	25377	39599	64907	—	—	—	—	—	—	—	—	—	—
3000	6653	11855	18560	30425	47477	77819	—	—	—	—	—	—	—	—	—	—
4000	8861	15789	24719	—	—	—	—	—	—	—	—	—	—	—	—	—
5000	11068	19723	30878	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	13276	23657	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE: 1 Relieving capacities indicated are 90% of average capacity in accordance with the latest ASME Code requirements. For temperatures other than 60° F and specific gravities other than air use formula sizing method.

SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.

1900 and 1900TD Flanged Valve Orifice Capacities for Steam (USCS Units)

ASME B & PVC, Section VIII

Capacities Based on Set Pressure plus 10% overpressure or 3 psig, whichever is greater. Capacities in lbs. per hour of saturated steam

	Orifice Designation															
Set Press. (psig)	D 0.1279	E 0.2279	F 0.3568	G 0.5849	H 0.9127	J 1.496	K 2.138	L 3.317	M 4.186	N 5.047	P 7.417	Q 12.85	R 18.6	T 30.21	V 50.26	W 78.996
15	184	328	513	842	1314	2154	3078	4776	6027	7266	10679	18502	26781	43498	72367	113743
20	212	378	592	970	1515	2483	3549	5506	6948	8378	12312	21331	30876	50149	83432	131135
30	268	478	749	1228	1916	3142	4490	6966	8792	10600	15578	26989	39066	63451	105563	165919
40	330	589	922	1511	2359	3866	5526	8573	10819	13045	19170	33213	48075	78084	129907	204181
50	392	699	1095	1795	2801	4591	6561	10180	12487	15489	22763	39437	57084	92716	154251	242443
60	454	809	1267	2078	3243	5315	7597	11786	14874	17934	26355	45661	66093	107348	178595	280706
70	516	920	1440	2361	3685	6040	8632	13393	16902	20378	29948	51885	75102	121981	202938	318968
80	578	1030	1613	2645	4127	6765	9668	14999	18929	22823	33540	58109	84111	136613	227282	357230
90	640	1140	1786	2928	4569	7489	10703	16606	20957	25267	37133	64333	93120	151246	251626	395493
100	702	1251	1959	3211	5011	8214	11739	182132	22984	27712	40725	70557	102129	165878	275970	433755
120	826	1472	2304	3778	5895	9663	138101	1426	27039	32601	47910	83005	120147	195143	342657	510280
140	950	1692	2650	4344	6779	11112	5881	24639	31094	37490	55095	95453	138166	224408	373345	586804
160	1073	1913	2996	4911	7663	12561	17952	27852	35149	42379	62280	107901	156184	253673	422033	663329
180	1197	2134	3341	5478	8548	14011	20023	31066	39204	47268	69465	120349	174202	282938	470720	739853
200	1321	2355	3687	6044	9432	15460	22095	34279	43259	52157	76650	132797	192220	312203	519408	816378
220	1445	2575	4032	6611	10316	16909	24166	37492	47314	57046	83835	145245	210238	341467	568095	892903
240	1569	2796	4378	7177	11200	18358	26237	40705	51370	61936	91020	157693	228256	370732	616783	969427
260	1693	3017	4724	7744	12084	19807	28308	43918	55425	66825	98205	170141	246274	399997	665471	1045952
280	1817	3238	5069	8311	12968	21257	30379	47132	59480	71714	105390	182589	264292	429262	714158	1122476
300	1941	3459	5415	8877	13852	22706	32450	50345	63535	76603	112575	195037	282310	458527	762846	1199001
320	2065	3679	5761	9444	14737	24155	34521	53558	67590	81492	119760	207485	—	—	—	—
340	2189	3900	6106	10010	15621	25604	36592	56771	71645	86381	126945	219933	—	—	—	—
360	2312	4121	6452	10577	16505	27053	38663	59985	75700	91270	134130	232381	—	—	—	—
380	2436	4342	6798	11144	17389	28503	40735	63198	79755	96159	141315	244829	—	—	—	—
400	2560	4562	7143	11710	18273	29952	42806	66411	83810	101048	148500	257277	—	—	—	—
420	2684	4783	7489	12277	19157	31401	44877	69624	87865	105938	155685	269725	—	—	—	—
440	2808	5004	7834	12843	20041	32850	46948	72838	91920	110827	162869	282173	—	—	—	—
460	2932	5225	8180	13410	20926	34299	49019	76051	95975	115716	170054	294621	—	—	—	—
480	3056	5446	8526	13977	21810	35749	51090	79264	100030	120605	177239	307069	—	—	—	—
500	3180	5666	8871	14543	22694	37198	53161	82477	104085	125494	184424	319517	—	—	—	—
600	3799	6770	10600	17376	27115	44444	63517	98543	124360	149939	220349	381757	—	—	—	—
700	4419	7874	12328	20209	31535	51690	73872	114609	144365	174385	256274	—	—	—	—	—
800	5038	8978	14056	23042	35956	58936	84228	130676	164911	198831	292199	—	—	—	—	—
900	5658	10082	15784	25875	40377	66182	94583	146742	185186	223276	328124	—	—	—	—	—
1000	6277	11186	17512	28708	44798	73428	104939	162808	205461	247722	364048	—	—	—	—	—
1100	6897	12289	19241	31541	49218	80674	115295	178874	225736	—	—	—	—	—	—	—
1200	7516	13393	20969	34374	53639	87920	125650	194940	246011	—	—	—	—	—	—	—
1300	8136	14497	22697	37207	58060	95166	136006	211006	—	—	—	—	—	—	—	—
1400	8755	15601	24425	40040	62481	102412	146361	227072	—	—	—	—	—	—	—	—
1423	8898	15855	24822	40691	63496	104076	148740	230764	—	—	—	—	—	—	—	—
1500	9420	16785	26279	43079	67222	110183	157468	244304	—	—	—	—	—	—	—	—
2000	13024	23207	36334	59562	92943	152343	217720	—	—	—	—	—	—	—	—	—
2500	17235	30711	48082	78821	122995	201601	—	—	—	—	—	—	—	—	—	—
2903	21551	38401	60121	98557	—	—	—	—	—	—	—	—	—	—	—	—

NOTE 1: Relieving capacities indicated are 90% of average capacity in accordance with the latest ASME Code requirements.
Maximum permissible set pressure on steam is 2903 psig. 3000 psig capacities are included for interpolation purposes only.

NOTE 2: For Superheat Correction Factors refer to pages VS.18 and VS.19 in the Valve Sizing section of this catalog.

SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.

1900LA Flanged Valve Orifice Capacities for Water (USCS Units)

ASME B & PVC, Section VIII

Capacities based on Set Pressure plus 10% overpressure or 3 psig, whichever is greater, 0 psig back pressure. Capacities in gallons of water per minute at 70°F, 90% of average capacity.

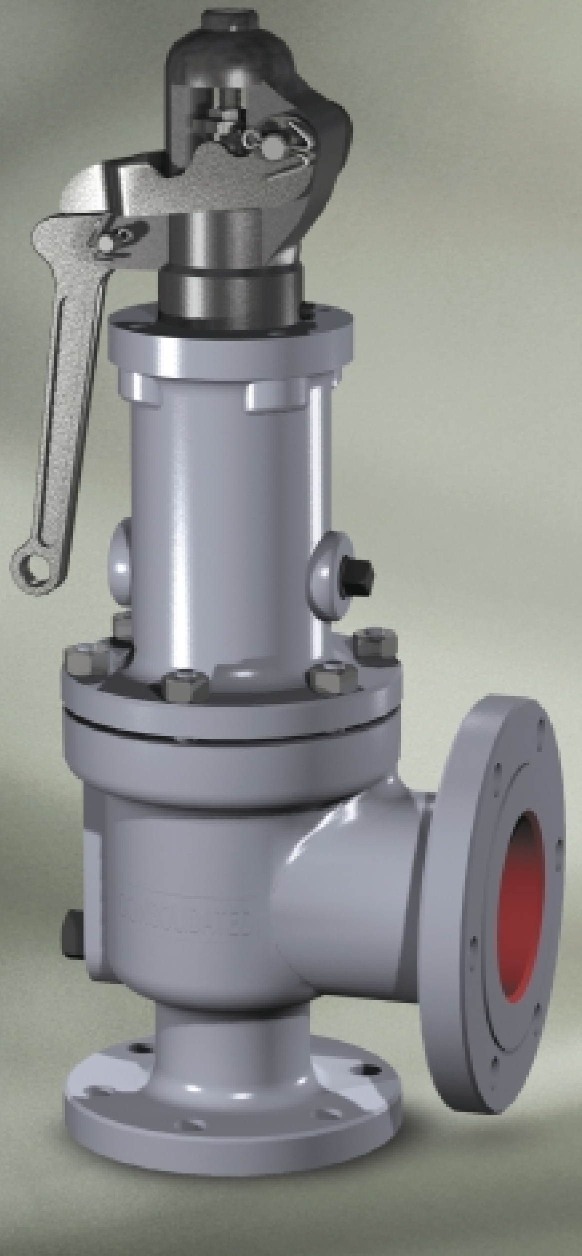
Set Press. (psig)	Orifice Designation															
	D 0.1279	**E** 0.2279	**F** 0.3568	**G** 0.5849	**H** 0.9127	**J** 1.496	**K** 2.138	**L** 3.317	**M** 4.186	**N** 5.047	**P** 7.417	**Q** 12.85	**R** 18.6	**T** 30.21	**V** 50.26	**W** 78.996
15	13	24	38	63	98	161	230	357	451	544	799	1385	2006	3258	5420	8520
20	15	27	43	71	111	182	260	404	510	615	904	1566	2267	3683	6127	9631
30	18	33	52	85	133	218	312	484	611	737	1083	1876	2716	4411	7339	11536
40	21	38	60	98	153	252	360	559	705	851	1250	2166	3136	5094	8475	13321
50	24	42	67	110	172	282	403	625	789	951	1398	2422	3506	5695	9475	14893
60	26	47	73	120	188	308	441	685	864	1042	1531	2653	3841	6239	10380	16314
70	28	50	79	130	203	333	476	739	933	1125	1654	2866	4149	6739	11211	17622
80	30	54	85	139	217	356	509	791	998	1203	1768	3064	4435	7204	11985	18838
90	32	57	90	147	230	378	540	839	1058	1276	1876	3250	4704	7641	12713	19981
100	34	60	95	155	243	398	570	884	1116	1345	1977	3426	4959	8054	13400	21062
120	37	66	104	170	266	436	624	968	1222	1474	2166	3753	5432	8823	14679	23072
140	40	71	112	184	287	471	674	1046	1320	1592	2339	4053	5867	9530	15855	24921
160	43	76	120	197	307	504	721	1118	1411	1702	2501	4333	6273	10188	16950	26642
180	45	81	127	209	326	535	764	1186	1497	1805	2653	4596	6653	10806	17978	28258
200	48	85	134	220	344	564	806	1250	1578	1903	2796	4845	7013	11391	18951	29786
220	50	90	141	231	360	591	845	1311	1655	1995	2933	5081	7355	11947	19876	31240
240	52	94	147	241	377	617	883	1370	1729	2084	3063	5307	7682	12478	20760	32629
260	54	97	153	251	392	643	919	1426	1799	2169	3188	5524	7996	12988	21608	33962
280	57	101	159	260	407	667	953	1479	1867	2251	3309	5733	8298	13478	22423	35244
300	59	105	164	270	421	690	987	1531	1933	2330	3425	5934	8589	13951	23210	36481
320	61	108	170	278	435	713	1019	1582	1996	2407	3537	6128	—	—	—	—
340	62	112	175	287	448	735	1051	1630	2058	2481	3646	6317	—	—	—	—
360	64	115	180	295	461	756	1081	1678	2117	2553	3752	6500	—	—	—	—
380	66	118	185	304	474	777	1111	1724	2175	2623	3855	6678	—	—	—	—
400	68	121	190	311	486	797	1140	1768	2232	2691	3955	6852	—	—	—	—
420	69	124	194	319	498	817	1168	1812	2287	2757	4052	7021	—	—	—	—
440	71	127	199	327	510	836	1195	1855	2341	2822	4148	7186	—	—	—	—
460	73	130	204	334	521	855	1222	1896	2393	2886	4241	7348	—	—	—	—
480	74	133	208	341	533	873	1248	1937	2445	2948	4332	7506	—	—	—	—
500	76	135	212	348	544	891	1274	1977	2495	3009	4422	7661	—	—	—	—
600	83	148	233	382	596	977	1396	2166	2733	3296	4844	8392	—	—	—	—
700	90	160	251	412	643	1055	1508	2339	2952	3560	5232	9064	—	—	—	—
800	96	171	269	441	688	1128	1612	2501	3156	3806	5593	9690	—	—	—	—
900	102	182	285	467	730	1196	1710	2653	3348	4037	5932	10278	—	—	—	—
1000	107	192	300	493	769	1261	1802	2796	3529	4255	6253	10834	—	—	—	—
1100	113	201	315	517	807	1322	1890	2933	3701	—	—	—	—	—	—	—
1200	118	210	329	540	842	1381	1974	3063	—	—	—	—	—	—	—	—
1300	122	219	343	562	877	1438	2055	3188	—	—	—	—	—	—	—	—
1400	127	227	355	583	910	1492	2132	3309	—	—	—	—	—	—	—	—
1500	132	235	368	603	942	1544	2207	3425	—	—	—	—	—	—	—	—
2000	152	271	425	697	1088	1783	2549	—	—	—	—	—	—	—	—	—
2500	170	303	475	779	1216	1994	—	—	—	—	—	—	—	—	—	—
3000	186	332	521	854	1332	2184	—	—	—	—	—	—	—	—	—	—
4000	215	384	601	986	—	—	—	—	—	—	—	—	—	—	—	—
5000	241	429	672	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	264	470	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE: 1 Relieving capacities indicated are 90% of average capacity in accordance with the latest ASME Code requirements.

SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.

1900/P Series

Safety Relief Valve



Consolidated®

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The 1900/P Series Safety Relief Valves are for the following applications only:

ASME B & PVC, Section I Steam and Flashing Water Applications and Organic Vapor Service

The P1 and P3 Series designs are not for ASME B & PVC, Section I Boiler Drum, Superheater or Reheater Applications.

1900/P1 Series

Conventional design - An exclusive with Consolidated valves, the Eductor Tube removes pressure from the bonnet when the valve is open. "D" through "T" orifice sizes. The D & E orifice are restricted lift.

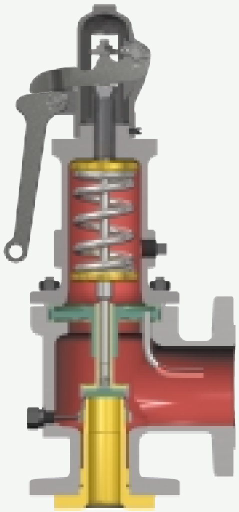
1900-30/P1 Series

Balanced bellows design - Sealing off the guiding area and upper valve parts protects the internal parts above the bellows from exposure to the process fluid. The balanced bellows also cancels out the effects of variable or constant back pressure at the outlet side. "D" through "T" orifice sizes. The D & E orifice are restricted lift.

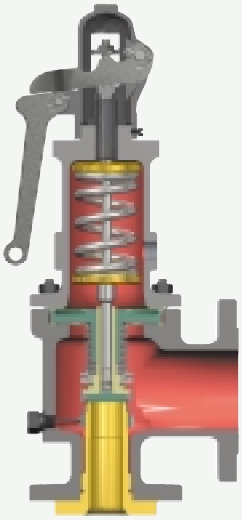
1900/P3 Series

Exposed spring design - The spring in this design is exposed for atmospheric cooling. "D" through "T" orifice sizes.

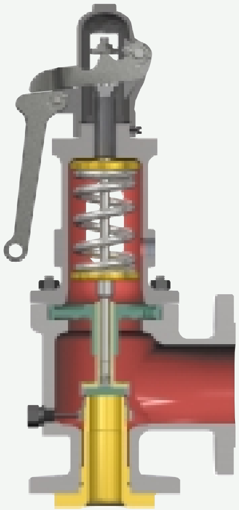
Standard in all three types, the Thermodisc™ Seat is designed for a high degree of seat tightness for steam service or organic fluid applications.



1900/P1 Series



1900-30/P1 Series



1900/P3 Series

1900/P Series Overview

1900/P Inlet x Outlet Size (in.) & Flange Rating Combinations - Orifice Area (sq. in.)

ASME API ORIFICE	0.1279 0.11 D	0.2279 0.196 E	0.3568 0.307 F	0.5849 0.503 G	0.9127 0.7851 H	1.496 1.287 J
1905	1 - 150 x 2 - 150	1 - 150 x 2 - 150	1-1/2 - 150 x 2 - 150	1-1/2 - 150 x 3 - 150	1-1/2 - 150 x 3 - 150	2 - 150 x 3 - 150
1906	1 - 300 x 2 - 150	1 - 300 x 2 - 150	1-1/2 - 300 x 2 - 150	1-1/2 - 300 x 3 - 150	1-1/2 - 300 x 3 - 150	2 - 300 x 3 - 150
1910	1 - 300 x 2 - 150	1 - 300 x 2 - 150	1-1/2 - 300 x 2 - 150	1-1/2 - 300 x 3 - 150	2 - 300 x 3 - 150	3 - 300 x 4 - 150
1912	1 - 600 x 2 - 150	1 - 600 x 2 - 150	1-1/2 - 600 x 2 - 150	1-1/2 - 600 x 3 - 150	2 - 600 x 3 - 150	3 - 600 x 4 - 150
1914	1-1/2 - 900 x 2 - 300	1-1/2 - 900 x 2 - 300	1-1/2 - 900 x 3 - 300	1-1/2 - 900 x 3 - 300	2 - 900 x 3 - 150	3 - 900 x 4 - 150
1916	1-1/2 - 1500 x 2 - 300	1-1/2 - 1500 x 2 - 300	1-1/2 - 1500 x 3 - 300	2 - 1500 x 3 - 300	2 - 1500 x 3 - 300	3 - 1500 x 4 - 300
1918	1-1/2 - 2500 x 3 - 300	1-1/2 - 2500 x 3 - 300	1-1/2 - 2500 x 3 - 300	2 - 2500 x 3 - 300	—	—
1920	1 - 300 x 2 - 150	1 - 300 x 2 - 150	1-1/2 - 300 x 2 - 150	1-1/2 - 300 x 3 - 150	2 - 300 x 3 - 150	3 - 300 x 4 - 150
1921	—	—	—	—	—	—
1922	1 - 600 x 2 - 150	1 - 600 x 2 - 150	1-1/2 - 600 x 2 - 150	1-1/2 - 600 x 3 - 150	2 - 600 x 3 - 150	3 - 600 x 4 - 150
1923	—	—	—	—	—	—
1924	1-1/2 - 900 x 2 - 300	1-1/2 - 900 x 2 - 300	1-1/2 - 900 x 3 - 300	1-1/2 - 900 x 3 - 300	2 - 900 x 3 - 150	3 - 900 x 4 - 150
1926	1-1/2 - 1500 x 2 - 300	1-1/2 - 1500 x 2 - 300	1-1/2 - 1500 x 3 - 300	2 - 1500 x 3 - 300	2 - 1500 x 3 - 300	3 - 1500 x 4 - 300
1928	1-1/2 - 2500 x 3 - 300	1-1/2 - 2500 x 3 - 300	1-1/2 - 2500 x 3 - 300	2 - 2500 x 3 - 300	—	—

1900/P Inlet x Outlet Size (in.) & Flange Rating Combinations - Orifice Area (sq. in.)

ASME API ORIFICE	2.138 1.838 K	3.317 2.853 L	4.186 3.6 M	5.047 4.34 N	7.417 6.38 P	12.85 11.05 Q	18.6 16 R	30.21 26 T
1905	3 - 150 x 4 - 150	3 - 150 x 4 - 150	4 - 150 x 6 - 150	4 - 150 x 6- 150	4 - 150 x 6 - 150	6 - 150 x 8 - 150	6 - 150 x 8 - 150	8 - 150 x 10 - 150
1906	3 - 300 x 4 - 150	3 - 300 x 4 - 150	4 - 300 x 6 - 150	4 - 300 x 6 - 150	4 - 300 x 6 - 150	6 - 300 x 8 - 150	6 - 300 x 8 - 150	8 - 300 x 10 - 150
1910	3 - 300 x 4 - 150	4 - 300 x 6 - 150	4 - 300 x 6 - 150	4 - 300 x 6 - 150	4 - 300 x 6 - 150	6 - 300 x 8 - 150	6 - 300 x 10 - 150	8 - 300 x 10 - 150
1912	3 - 600 x 4 - 150	4 - 600 x 6 - 150	4 - 600 x 6 - 150	4 - 600 x 6 - 150	4 - 600 x 6 - 150	6 - 600 x 8 - 150	6 - 600 x 10 - 150	8 - 600 x 10 - 150
1914	3 - 900 x 6 - 150	4 - 900 x 6 - 150	4 - 900 x 6 - 150	4 - 900 x 6 - 150	4 - 900 x 6 - 150	—	—	—
1916	3 - 1500 x 6 - 300	4 - 1500 x 6 - 150	—	—	—	—	—	—
1918	—	—	—	—	—	—	—	—
1920	3 - 300 x 4 - 150	4 - 300 x 6 - 150	4 - 300 x 6 - 150	4 - 300 x 6 - 150	4 - 300 x 6 - 150	6 - 300 x 8 - 150	6 - 300 x 8 - 150	8 - 300 x 10 - 150
1921	—	—	—	—	—	—	—	—
1922	3 - 600 x 4 - 150	4 - 600 x 6 - 150	4 - 600 x 6 - 150	4 - 600 x 6 - 150	—	6 - 600 x 8 - 150	6 - 600 x 10 - 150	8 - 300 x 10 - 150
1923	—	—	—	—	4 - 600 x 6 - 150	—	—	—
1924	3 - 900 x 6 - 150	4 - 900 x 6 - 150	4 - 900 x 6 - 150	4 - 900 x 6 - 150	4 - 900 x 6 - 150	—	—	—
1926	3 - 1500 x 6 - 300	4 - 1500 x 6 - 150	—	—	—	—	—	—
1928	—	—	—	—	—	—	—	—

NOTES: Inlet and outlet size combinations as well as Orifice sizes shown in the table above are compliant with API standard 526 - Fourth Edition, 1995.
Inlet and outlet flange ratings per ANSI B16.5
For inlet facing selections refer to General Information Section.

1900/P1 Conventional Safety Relief Valves For Steam and Organic Fluids

ASME B & PVC, Section I Organic Fluid, Steam & Flashing Water Applications

Steel, Flat Seat, High Capacity, Stainless Steel Trim

Class Ratings
150, 300, 600, 900, 1500, 2500 psig

Temperature Ratings
1905-1918 – 0°F(17.8°C) to 800°F(426.7°C)
1920-1928 – 801°F(427.2°C) to 850°F(454.4°C)

Orifice Sizes
Lettered “D” through “T”

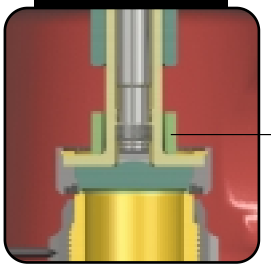
Inlets-Outlets
1" x 2" through 8" x 10" ANSI Flanged

Standard Material for 1900/P1 Conventional Safety Relief Valves

	Part	Material
1	Base: Types 1905 thru 1918	SA216 Grade WCC Carbon Steel
	Base: Types 1920 thru 1928	SA217 Grade WC6 Alloy Steel
2	Nozzle	316SS
3	Adjusting Ring	316SS
4	Adjusting Ring Pin	316SS
5	Adjusting Ring Pin Gasket	Soft Iron
6	Disc	616SS
7	Disc Holder	316SS
8	Disc Holder Ring	410SS
9	Holder Ring Retainer	Electroless Nickel Plated Carbon Steel
10	Guide	Alloy C97800 Leaded Nickel Silver
11	Guide Gasket	Soft Iron
12	Bonnet	SA216 Grade WCC Carbon Steel
13	Bonnet Gasket	Soft Iron
14	Base Stud	B7 Alloy Steel
15	Base Stud Nut	2H Carbon Steel
16	Spindle	410SS
17	Spring Washer	Carbon Steel
18	Spring: Types 1905 thru 1918	Alloy Steel
	Spring: Types 1920 thru 1928	Inconel X750 or Tungsten Steel
19	Adjusting Screw	416SS
20	Adjusting Screw Nut	416SS
22	Plain Cap	Malleable Iron
38	Eductor Tube	304SS
39	Pipe Plug	Carbon Steel
40	Limit Washer (D & E orifice only)	31SS

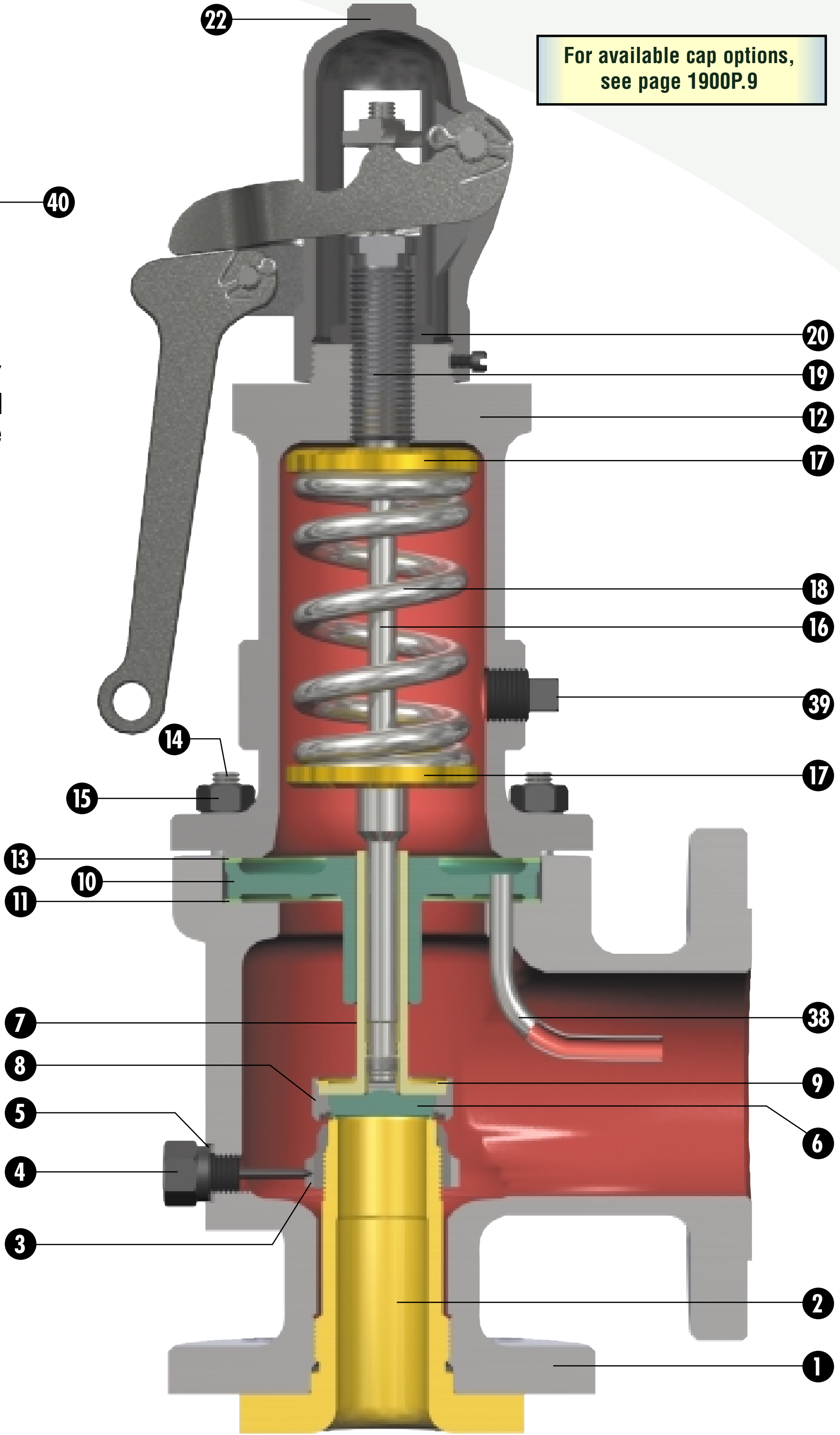
NOTE: (1900/P1 Series design is not for ASME B & PVC Section I Boiler Drum, Superheater or Reheater applications.)

**D & E Orifice only
Restricted Lift**



The D and E valves are restricted lift versions of the "F" orifice valve. The lift is restricted by a limit washer to provide the equivalent effective orifice area for a "D" or "E" orifice. This design is available with a balanced bellows configuration and is designed for back pressure applications.

For available cap options, see page 1900P.9



1900/P1 Series

1900-30/P1 Balanced Bellows Safety Relief Valves For Steam and Organic Fluids

ASME B & PVC, Section I Organic Fluid, Steam & Flashing Water Applications

Steel, Flat Seat, High Capacity, Stainless Steel Trim
With Backpressure Compensating Bellows

Class Ratings
150, 300, 600, 900, 1500, 2500 psig

Temperature Ratings
1905-1918 – 0°F(17.8°C) to 800°F(426.7°C)
1920-1928 – 801°F(427.2°C) to 850°F(454.4°C)

Orifice Sizes
Lettered "D" through "T"

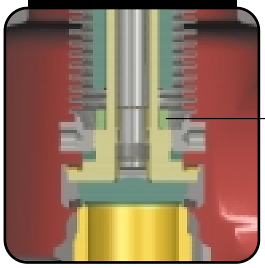
Inlets-Outlets
1" x 2" through 8" x 10" ANSI Flanged

Standard Material for 1900-30/P1 Bellows Safety Relief Valves

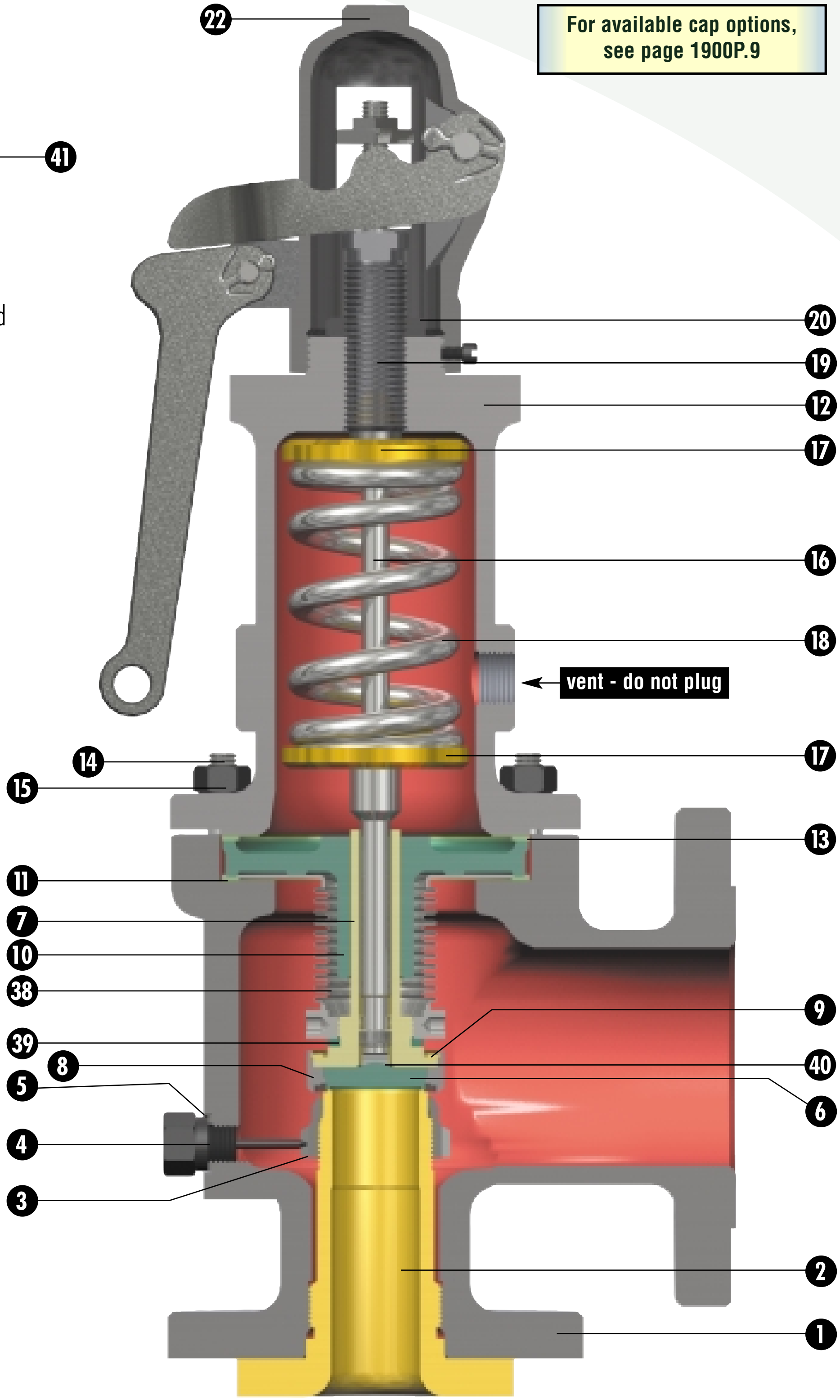
	Part	Material
1	Base: Types 1905-30 thru 1918-30	SA216 Grade WCC Carbon Steel
	Base: Types 1920-30 thru 1928-30	SA217 Grade WC6 Alloy Steel
2	Nozzle	316SS
3	Adjusting Ring	316SS
4	Adjusting Ring Pin	316SS
5	Adjusting Ring Pin Gasket	Soft Iron
6	Disc	616SS
7	Disc Holder	316SS
8	Disc Holder Ring	410SS
9	Holder Ring Retainer	Electroless Nickel Plated Carbon Steel
10	Guide	Alloy C97800 Leaded Nickel Silver
11	Guide Gasket	Soft Iron
12	Bonnet	SA216 Grade WCC Carbon Steel
13	Bonnet Gasket	Soft Iron
14	Base Stud	B7 Alloy Steel
15	Base Stud Nut	2H Carbon Steel
16	Spindle	410 Stainless Steel
17	Spring Washer	Carbon Steel
18	Spring: Types 1905 thru 1918	Alloy Steel
	Spring: Types 1920 thru 1928	Inconel X750 or Tungsten Steel
19	Adjusting Screw	416SS
20	Adjusting Screw Nut	416SS
22	Plain Cap	Malleable Iron
38	Bellows Assembly	—
	Bellows	Inconel 625
	Bellows Flange & Bellows Ring	316L SS
39	Bellows Gasket	Soft Iron
40	Seal Plate	304L SS
41	Limit Washer (D & E orifice only)	316 SS

NOTE: (1900-30/P1 Series design is not for ASME B & PVC Section I Boiler Drum, Superheater or Reheater applications.)

**D & E Orifice only
Restricted Lift**



The D and E valves are restricted lift versions of the "F" orifice valve. The lift is restricted by a limit washer to provide the equivalent effective orifice area for a "D" or "E" orifice. This configuration is designed for back pressure applications.



For available cap options, see page 1900P.9

vent - do not plug

1900-30/P1 Series

1900/P3 Exposed Spring Safety Relief Valves for Steam Service

ASME B & PVC, Section I Steam Generator Applications

Steel, Flat Seat, High Capacity, Stainless Steel Trim

Class Ratings
150, 300, 600, 900, 1500, 2500 psig

Temperature Ratings
0°F(17.8°C) to 850°F(454.4°C)

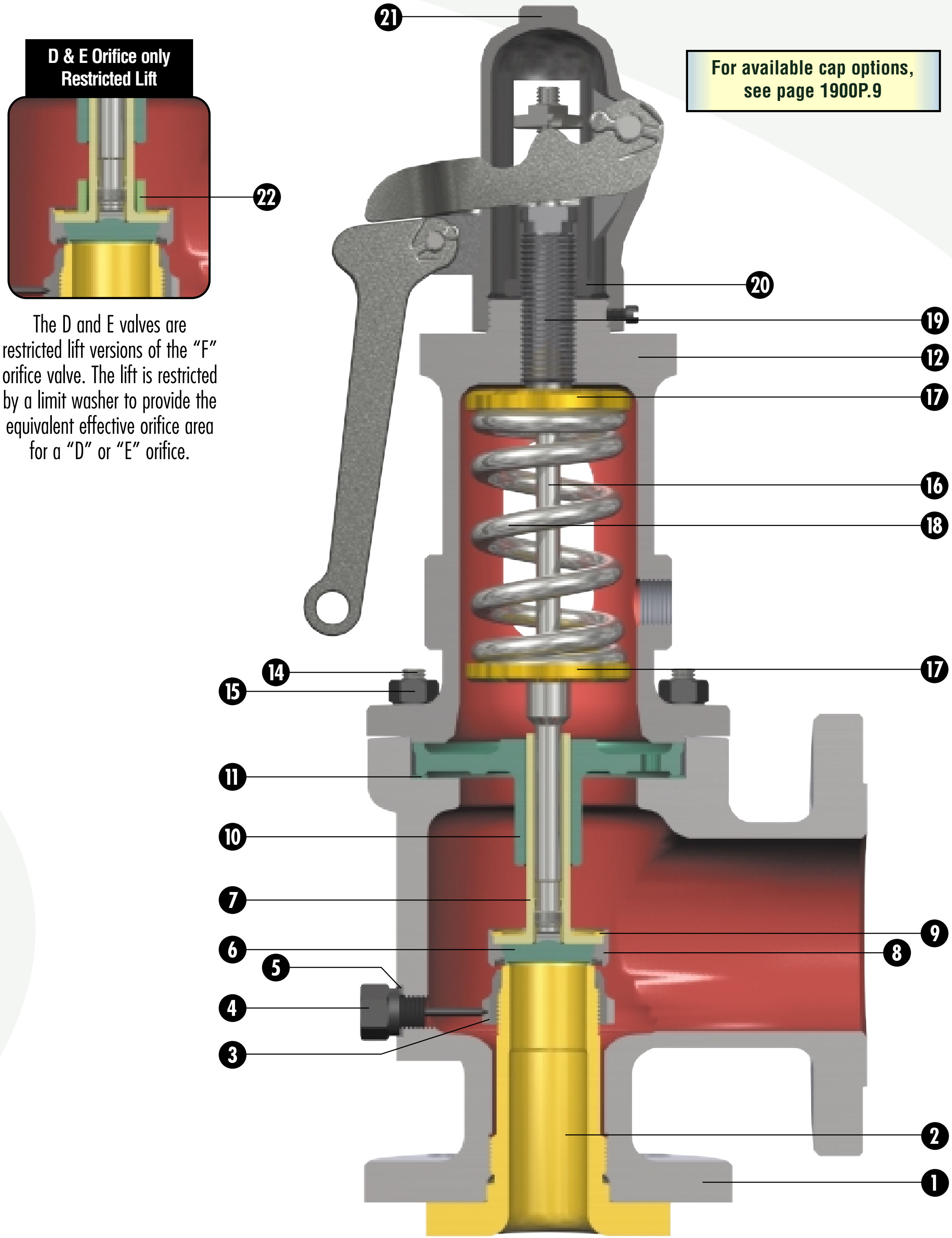
Orifice Sizes
Lettered “D” through “T”

Inlets-Outlets
1" x 2" through 8" x 10" ANSI Flanged

Standard Material for 1900/P3 Conventional Safety Relief Valves

	Part	Material
1	Base: Types 1905 thru 1918	SA216 Grade WCC Carbon Steel
	Base: Types 1920 thru 1928	SA217 Grade WC6 Alloy Steel
2	Nozzle	316SS
3	Adjusting Ring	316SS
4	Adjusting Ring Pin	316SS
5	Adjusting Ring Pin Gasket	Soft Iron
6	Disc	616SS
7	Disc Holder	316SS
8	Disc Holder Ring	410SS
9	Holder Ring Retainer	Electroless Nickel Plated Carbon Steel
10	Guide	Alloy C97800 Leaded Nickel Silver
11	Guide Gasket	Soft Iron
12	Bonnet/Slotted	SA216 Grade WCC Carbon Steel
14	Base Stud	B7 Alloy Steel
15	Base Stud Nut	2H Carbon Steel
16	Spindle	410SS
17	Spring Washer	Carbon Steel
18	Spring	Alloy Steel
19	Adjusting Screw	416SS
20	Adjusting Screw Nut	416SS
21	Plain Cap	Malleable Iron
22	Limit Washer (D & E orifice only)	316SS

NOTE: (1900/P3 Series design is not for ASME B & PVC Section I Boiler Drum, Superheater or Reheater applications.)



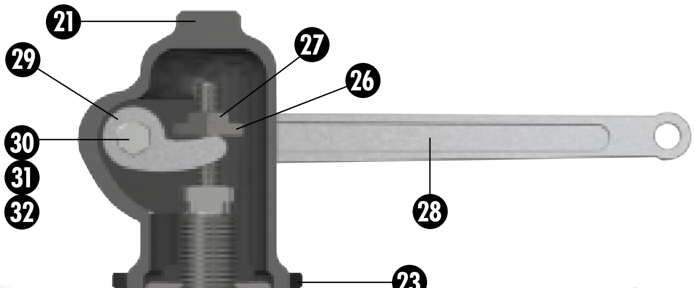
D & E Orifice only Restricted Lift

The D and E valves are restricted lift versions of the "F" orifice valve. The lift is restricted by a limit washer to provide the equivalent effective orifice area for a "D" or "E" orifice.

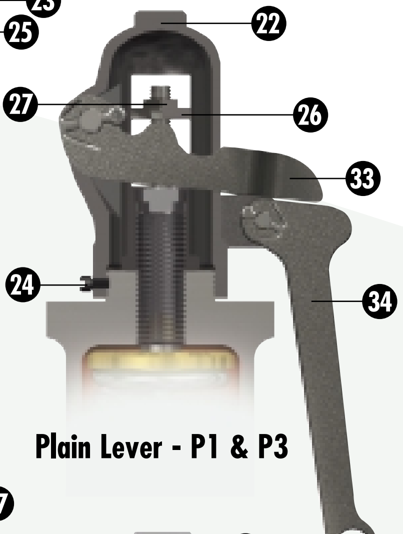
For available cap options, see page 1900P.9

1900/P3 Series

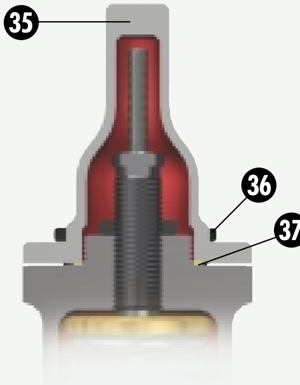
Materials



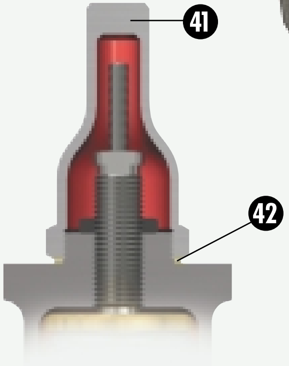
Packed Lever - P1



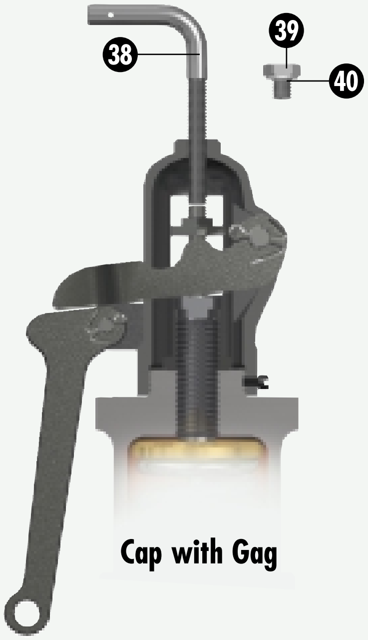
Plain Lever - P1 & P3



Bolted Cap
Organic Fluid Vaporizer Application



Screwed Cap
Organic Fluid Vaporizer Application



Cap with Gag

Standard Material

		Part	Material
Packed	21	Packed Cap	Carbon Steel
	23	Cap Screw	Carbon Steel
	25	Cap Gasket	Soft Iron
	26	Release Nut	Carbon Steel
	27	Release Locknut	Carbon Steel
	28	Lever	Malleable Iron
	29	Lifting Fork	Malleable Iron
	30	Lever Shaft	410/416SS
	31	Packing	Grafoil
	32	Packing Nut	410/416SS
Plain	22	Plain Cap	Malleable Iron
	24	Cap Set Screw	Carbon Steel
	26	Release Nut	Carbon Steel
	27	Release Locknut	Carbon Steel
	33	Top Lever	Malleable Iron
	34	Drop Lever	Malleable Iron
Bolted	35	Bolted Cap	Carbon Steel
	36	Cap Screw	Carbon Steel
	37	Cap Gasket	Soft Iron
Gag	38	Gag Bolt	Carbon Steel
	39	Sealing Plug	Carbon Steel
	40	Plug Gasket	Soft Iron
Screwed	41	Screwed Cap	Carbon Steel
	42	Cap Gasket	Soft Iron

Cap Selection

Safety Valve Application	Valve Type	Screwed Cap[1]	Bolted Cap[1]	Packed Lever	Plain Lever	Gag[2]
Steam Service - Economizer	1900/P1			X	X	X
Steam Service - Steam Generator	1900/P3				X	X
Organic Fluid Vapor[1]	1900/P1	X	X			X

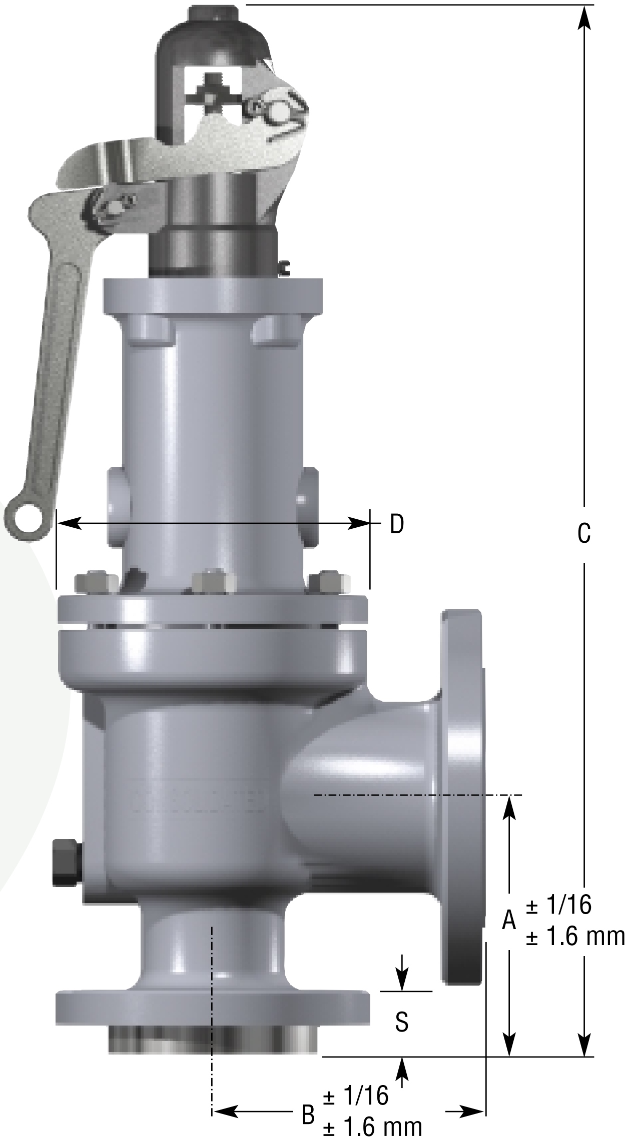
NOTES: 1 ASME B & PVC, Section I (Part PVG-12) requires the safety valve to be a totally enclosed type that is designed so that vapors escaping beyond the valve seat shall not discharge into atmosphere. Safety valves used to protect organic fluid vaporizers are not to be equipped with lifting levers.

2 All caps may be supplied with a gag.

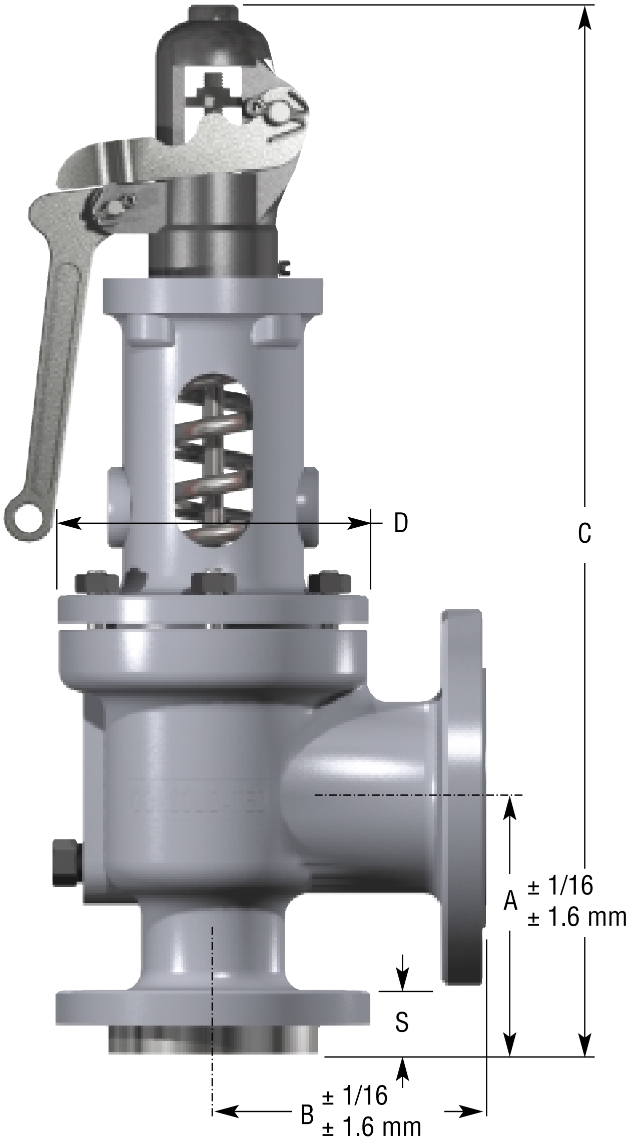
1900/P Series

This table applies to the standard 1900/P Series regardless of materials of construction. If the valve you are reviewing has an inlet or outlet size different from that stated, the dimensions "A" through "S" and weight may not apply.

NOTE: USCS Units refers to "U.S. Customary System" Units, the adapted U.S. standard formerly recognized as "English" Units.



1900/P1 Series



1900/P3 Series

1900/P1 & P3 Series Valves - USCS Units

1900 Steam Internal - Dimensions (in.) & Weights (lbs.) - USCS Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1 x 2	1905D / P1	4-1/8	4-1/2	17	18	5-7/16	1-1/8	45
	1905D / P3	4-1/8	4-1/2	17	—	5-7/16	1-1/8	45
1 x 2	1905E / P1	4-1/8	4-1/2	17	18	5-7/16	1-1/8	45
	1905E / P3	4-1/8	4-1/2	17	—	5-7/16	1-1/8	45
1-1/2 x 2	1905F / P1	4-7/8	4-3/4	17-3/4	18-3/4	5-7/16	1-1/4	45
	1905F / P3	4-7/8	4-3/4	17-3/4	—	5-7/16	1-1/4	45
1-1/2 x 3	1905G / P1	4-7/8	4-3/4	17-3/4	19	5-7/16	1-1/4	55
	1905G / P3	4-7/8	4-3/4	17-3/4	—	5-7/16	1-1/4	55
1-1/2 x 3	1905H / P1	5-1/8	4-7/8	19-1/2	19-1/2	6-5/16	1-1/4	60
	1905H / P3	5-1/8	4-7/8	19-1/2	—	6-5/16	1-1/4	60
2 x 3	1905J / P1	5-3/8	4-7/8	21-1/4	21-1/4	6-7/8	1-5/16	75
	1905J / P3	5-3/8	4-7/8	21-1/4	—	6-7/8	1-5/16	75
3 x 4	1905K / P1	6-1/8	6-3/8	24-1/2	24-1/2	7-1/4	1-7/16	110
	1905K / P3	6-1/8	6-3/8	24-1/2	—	7-1/4	1-7/16	110
3 x 4	1905L / P1	6-1/8	6-1/2	28-3/4	28-3/4	8-7/8	1-7/16	140
	1905L / P3	6-1/8	6-1/2	28-3/4	—	8-7/8	1-7/16	140
4 x 6	1905M / P1	7	7-1/4	29-3/4	29-3/4	9-3/8	1-5/8	185
	1905M / P3	7	7-1/4	29-3/4	—	9-3/8	1-5/8	185
4 x 6	1905N / P1	7-3/4	8-1/4	33	33	10-1/8	1-5/8	220
	1905N / P3	7-3/4	8-1/4	33	—	10-1/8	1-5/8	220
4 x 6	1905P / P1	7-1/8	9	34-1/4	34-1/4	11	1-5/8	260
	1905P / P3	7-1/8	9	34-1/4	—	11	1-5/8	260
6 x 8	1905Q / P1	9-7/16	9-1/2	41	41	13-5/8	1-13/16	430
	1905Q / P3	9-7/16	9-1/2	41	—	13-5/8	1-13/16	430
6 X 8	1905R / P1	9-7/16	9-1/2	43	43	14-1/2	1-13/16	495
	1905R / P3	9-7/16	9-1/2	43	—	14-1/2	1-13/16	495
8 x 10	1905T / P1	10-7/8	11	47-1/4	47-1/4	16-1/2	1-15/16	620
	1905T / P3	10-7/8	11	47-1/4	—	16-1/2	1-15/16	620
1 x 2	1906D / P1	4-1/8	4-1/2	17	18	5-7/16	1-3/8	45
	1906D / P3	4-1/8	4-1/2	17	—	5-7/16	1-3/8	45
1 x 2	1906E / P1	4-1/8	4-1/2	17	18	5-7/16	1-3/8	45
	1906E / P3	4-1/8	4-1/2	17	—	5-7/16	1-3/8	45
1-1/2 x 2	1906F / P1	4-7/8	4-3/4	17-3/4	18-3/4	5-7/16	1-1/2	45
	1906F / P3	4-7/8	4-3/4	17-3/4	—	5-7/16	1-1/2	45
1-1/2 x 3	1906G / P1	4-7/8	4-3/4	17-3/4	19	5-7/16	1-1/2	55
	1906G / P3	4-7/8	4-3/4	17-3/4	—	5-7/16	1-1/2	55
1-1/2 x 3	1906H / P1	5-1/8	4-7/8	19-1/2	19-1/2	6-5/16	1-9/16	60
	1906H / P3	5-1/8	4-7/8	19-1/2	—	6-5/16	1-9/16	60
2 x 3	1906J / P1	5-3/8	4-7/8	21-1/4	21-1/4	6-7/8	1-9/16	75
	1906J / P3	5-3/8	4-7/8	21-1/4	—	6-7/8	1-9/16	75
3 x 4	1906K / P1	6-1/8	6-3/8	24-1/2	24-1/2	7-1/4	1-13/16	115
	1906K / P3	6-1/8	6-3/8	24-1/2	—	7-1/4	1-13/16	115

1900/P1 & P3 Series Valves - USCS Units

1900 Steam Internal - Dimensions (in.) & Weights (lbs.) - USCS Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
3 x 4	1906L / P1	6-1/8	6-1/2	28-3/4	28-3/4	8-7/8	1-13/16	145
	1906L / P3	6-1/8	6-1/2	28-3/4	—	8-7/8	1-13/16	145
4 x 6	1906M / P1	7	7-1/4	29-3/4	29-3/4	9-3/8	1-15/16	190
	1906M / P3	7	7-1/4	29-3/4	—	9-3/8	1-15/16	190
4 x 6	1906N / P1	7-3/4	8-1/4	33	33	10-1/8	1-15/16	225
	1906N / P3	7-3/4	8-1/4	33	—	10-1/8	1-15/16	225
4 x 6	1906P / P1	7-1/8	9	34-1/4	34-1/4	11	1-15/16	270
	1906P / P3	7-1/8	9	34-1/4	—	11	1-15/16	270
6 x 8	1906Q / P1	9-7/16	9-1/2	41	41	13-5/8	2-1/4	445
	1906Q / P3	9-7/16	9-1/2	41	—	13-5/8	2-1/4	445
6 x 8	1906R / P1	9-7/16	9-1/2	43	43	14-1/2	2-1/4	510
	1906R / P3	9-7/16	9-1/2	43	—	14-1/2	2-1/4	510
8 x 10	1906T / P1	10-7/8	11	47-1/4	47-1/4	16-1/2	2-7/16	640
	1906T / P3	10-7/8	11	47-1/4	—	16-1/2	2-7/16	640
1 x 2	1910D / P1	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
	1910D / P3	4-1/8	4-1/2	17-1/2	—	5-7/16	1-3/8	50
1 x 2	1910E / P1	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
	1910E / P3	4-1/8	4-1/2	17-1/2	—	5-7/16	1-3/8	50
1-1/2 x 2	1910F / P1	4-7/8	6	18-1/4	19-1/4	5-7/16	1-9/16	50
	1910F / P3	4-7/8	6	18-1/4	—	5-7/16	1-9/16	50
1-1/2 x 3	1910G / P1	4-7/8	6	18-1/4	19-1/2	5-7/16	1-9/16	60
	1910G / P3	4-7/8	6	18-1/4	—	5-7/16	1-9/16	60
2 x 3	1910H / P1	5-1/8	4-7/8	20-1/4	20-1/4	6-5/16	1-11/16	65
	1910H / P3	5-1/8	4-7/8	20-1/4	—	6-5/16	1-11/16	65
3 x 4	1910J / P1	7-1/4	7-1/8	25-5/8	25-5/8	7-3/8	1-15/16	100
	1910J / P3	7-1/4	7-1/8	25-5/8	—	7-3/8	1-15/16	100
3 x 4	1910K / P1	6-1/8	6-3/8	28	28	7-3/4	1-15/16	140
	1910K / P3	6-1/8	6-3/8	28	—	7-3/4	1-15/16	140
4 x 6	1910L / P1	7-1/16	7-1/8	32	32	9-1/2	1-15/16	220
	1910L / P3	7-1/16	7-1/8	32	—	9-1/2	1-15/16	220
4 x 6	1910M / P1	7	7-1/4	32	32	9-3/8	1-15/16	230
	1910M / P3	7	7-1/4	32	—	9-3/8	1-15/16	230
4 x 6	1910N / P1	7-3/4	8-1/4	34-1/4	34-1/4	10-1/2	1-15/16	260
	1910N / P3	7-3/4	8-1/4	34-1/4	—	10-1/2	1-15/16	260
4 x 6	1910P / P1	8-7/8	10	41	41	11-1/2	1-15/16	350
	1910P / P3	8-7/8	10	41	—	11-1/2	1-15/16	350
6 x 8	1910Q / P1	9-7/16	9-1/2	43-1/4	43-1/4	14	2-1/4	530
	1910Q / P3	9-7/16	9-1/2	43-1/4	—	14	2-1/4	530
6 x 10	1910R / P1	9-7/16	10-1/2	45-1/2	45-1/2	14-1/2	2-1/4	550
	1910R / P3	9-7/16	10-1/2	45-1/2	—	14-1/2	2-1/4	550
8 x 10	1910T / P1	10-7/8	11	53-3/8	53-3/8	16-1/2	2-7/16	840
	1910T / P3	10-7/8	11	53-3/8	—	16-1/2	2-7/16	840

1900/P1 & P3 Series Valves – USCS Units

1900 Steam Internal - Dimensions (in.) & Weights (lbs.) - USCS Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1 x 2	1912D / P1	4-1/8	4-1/2	18-1/4	19-1/4	6-5/16	1-3/8	55
	1912D / P3	4-1/8	4-1/2	18-1/4	—	6-5/16	1-3/8	55
1 x 2	1912E / P1	4-1/8	4-1/2	18-1/4	19-1/4	6-5/16	1-3/8	55
	1912E / P3	4-1/8	4-1/2	18-1/4	—	6-5/16	1-3/8	55
1-1/2 x 2	1912F / P1	4-7/8	6	19	20	6-5/16	1-9/16	60
	1912F / P3	4-7/8	6	19	—	6-5/16	1-9/16	60
1-1/2 x 3	1912G / P1	4-7/8	6	19	20-1/4	6-5/16	1-9/16	65
	1912G / P3	4-7/8	6	19	—	6-5/16	1-9/16	65
2 x 3	1912H / P1	6-1/16	6-3/8	23	23	7	1-11/16	85
	1912H / P3	6-1/16	6-3/8	23	—	7	1-11/16	85
3 x 4	1912J / P1	7-1/4	7-1/8	29-7/8	29-7/8	9	1-13/16	170
	1912J / P3	7-1/4	7-1/8	29-7/8	—	9	1-13/16	170
3 x 4	1912K / P1	7-1/4	7-1/8	29-1/4	29-1/4	7-3/4	1-15/16	150
	1912K / P3	7-1/4	7-1/8	29-1/4	—	7-3/4	1-15/16	150
4 x 6	1912L / P1	7-1/16	8	32	32	9-1/2	2-3/16	230
	1912L / P3	7-1/16	8	32	—	9-1/2	2-3/16	230
4 x 6	1912M / P1	7	8	36-1/4	36-1/4	10-3/4	2-3/16	300
	1912M / P3	7	8	36-1/4	—	10-3/4	2-3/16	300
4 x 6	1912N / P1	7-3/4	8-3/4	39	39	11-3/4	2-3/16	360
	1912N / P3	7-3/4	8-3/4	39	—	11-3/4	2-3/16	360
4 x 6	1912P / P1	8-7/8	10	43-1/2	43-1/2	13-7/8	2-3/16	530
	1912P / P3	8-7/8	10	43-1/2	—	13-7/8	2-3/16	530
6 x 8	1912Q / P1	9-7/16	9-1/2	46	46	14-1/4	2-11/16	645
	1912Q / P3	9-7/16	9-1/2	46	—	14-1/4	2-11/16	645
6 x 10	1912R / P1	9-7/16	10-1/2	47-1/2	47-1/2	15-1/8	2-11/16	675
	1912R / P3	9-7/16	10-1/2	47-1/2	—	15-1/8	2-11/16	675
8 x 10	1912T / P1	10-7/8	11	53-7/8	53-7/8	16-1/2	2-7/16	840
	1912T / P3	10-7/8	11	53-7/8	—	16-1/2	2-7/16	840
1-1/2 x 2	1914D / P1	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
	1914D / P3	4-1/8	5-1/2	21-3/4	—	7-13/16	1-15/16	95
1-1/2 x 2	1914E / P1	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
	1914E / P3	4-1/8	5-1/2	21-3/4	—	7-13/16	1-15/16	95
1-1/2 x 3	1914F / P1	4-7/8	6-1/2	22-1/2	23-1/2	7-13/16	1-15/16	100
	1914F / P3	4-7/8	6-1/2	22-1/2	—	7-13/16	1-15/16	100
1-1/2 x 3	1914G / P1	4-7/8	6-1/2	22-1/2	23-3/4	7-13/16	1-15/16	95
	1914G / P3	4-7/8	6-1/2	22-1/2	—	7-13/16	1-15/16	95
2 x 3	1914H / P1	6-1/16	6-3/8	26	26	8-1/4	2-3/16	130
	1914H / P3	6-1/16	6-3/8	26	—	8-1/4	2-3/16	130
3 x 4	1914J / P1	7-1/4	7-1/8	29-3/4	29-3/4	9	2-3/16	195
	1914J / P3	7-1/4	7-1/8	29-3/4	—	9	2-3/16	195
3 x 6	1914K / P1	7-13/16	8-1/2	35-1/4	35-1/4	10-1/2	2-3/16	300
	1914K / P3	7-13/16	8-1/2	35-1/4	—	10-1/2	2-3/16	300
4 x 6	1914L / P1	7-3/4	8-3/4	37-1/4	37-1/4	12-1/4	2-7/16	360
	1914L / P3	7-3/4	8-3/4	37-1/4	—	12-1/4	2-7/16	360
4 x 6	1914M / P1	7-3/4	8-3/4	37	37	10-3/4	2-7/16	340
	1914M / P3	7-3/4	8-3/4	37	—	10-3/4	2-7/16	340

1900/P1 & P3 Series Valves - USCS Units

1900 Steam Internal - Dimensions (in.) & Weights (lbs.) - USCS Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
4 x 6	1914N / P1	7-3/4	8-3/4	39	39	11-3/4	2-7/16	380
	1914N / P3	7-3/4	8-3/4	39	—	11-3/4	2-7/16	380
4 x 6	1914P / P1	8-7/8	10	43-1/2	43-1/2	13-7/8	2-7/16	545
	1914P / P3	8-7/8	10	43-1/2	—	13-7/8	2-7/16	545
1-1/2 x 2	1916D / P1	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
	1916D / P3	4-1/8	5-1/2	21-3/4	—	7-13/16	1-15/16	95
1-1/2 x 2	1916E / P1	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
	1916E / P3	4-1/8	5-1/2	21-3/4	—	7-13/16	1-15/16	95
1-1/2 x 3	1916F / P1	4-7/8	6-1/2	22-1/2	23-1/2	7-13/16	1-15/16	100
	1916F / P3	4-7/8	6-1/2	22-1/2	—	7-13/16	1-15/16	100
2 x 3	1916G / P1	6-1/8	6-3/4	23-3/4	25	7-13/16	2-3/16	100
	1916G / P3	6-1/8	6-3/4	23-3/4	—	7-13/16	2-3/16	100
2 x 3	1916H / P1	6-1/16	6-3/8	26	26	8-1/4	2-3/16	140
	1916H / P3	6-1/16	6-3/8	26	—	8-1/4	2-3/16	140
3 x 4	1916J / P1	7-1/4	7-1/8	29-3/4	29-3/4	9	2-9/16	220
	1916J / P3	7-1/4	7-1/8	29-3/4	—	9	2-9/16	220
3 x 6	1916K / P1	7-3/4	8-1/2	35-1/4	35-1/4	10-1/2	2-9/16	320
	1916K / P3	7-3/4	8-1/2	35-1/4	—	10-1/2	2-9/16	320
4 x 6	1916L / P1	7-3/4	8-3/4	37-1/4	37-1/4	12-1/4	2-13/16	370
	1916L / P3	7-3/4	8-3/4	37-1/4	—	12-1/4	2-13/16	370
1-1/2 x 3	1918D / P1	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
	1918D / P3	5-1/2	7	26-1/2	—	8-7/8	2-7/16	150
1-1/2 x 3	1918E / P1	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
	1918E / P3	5-1/2	7	26-1/2	—	8-7/8	2-7/16	150
1-1/2 x 3	1918F / P1	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
	1918F / P3	5-1/2	7	26-1/2	—	8-7/8	2-7/16	150
2 x 3	1918G / P1	6-1/8	6-3/4	23-3/4	25	7-13/16	2-11/16	110
	1918G / P3	6-1/8	6-3/4	23-3/4	—	7-13/16	2-11/16	110
1 x 2	1920D / P1	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
	1920D / P3	4-1/8	4-1/2	17-1/2	—	5-7/16	1-3/8	50
1 x 2	1920E / P1	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
	1920E / P3	4-1/8	4-1/2	17-1/2	—	5-7/16	1-3/8	50
1-1/2 x 2	1920F / P1	4-7/8	6	18-1/4	19-1/4	5-7/16	1-9/16	50
	1920F / P3	4-7/8	6	18-1/4	—	5-7/16	1-9/16	50
1-1/2 x 3	1920G / P1	4-7/8	6	18-1/4	19-1/2	5-7/16	1-9/16	60
	1920G / P3	4-7/8	6	18-1/4	—	5-7/16	1-9/16	60
2 x 3	1920H / P1	5-1/8	4-7/8	20-1/4	20-1/4	6-5/16	1-11/16	65
	1920H / P3	5-1/8	4-7/8	20-1/4	—	6-5/16	1-11/16	65
3 x 4	1920J / P1	7-1/4	7-1/8	25-5/8	25-5/8	7-3/8	1-13/16	100
	1920J / P3	7-1/4	7-1/8	25-5/8	—	7-3/8	1-13/16	100
3 x 4	1920K / P1	6-1/8	6-3/8	28	28	7-3/4	1-15/16	140
	1920K / P3	6-1/8	6-3/8	28	—	7-3/4	1-15/16	140

1900/P1 & P3 Series Valves - USCS Units

1900 Steam Internal - Dimensions (in.) & Weights (lbs.) - USCS Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
4 x 6	1920L / P1	7-1/16	7-1/8	32	32	9-1/2	1-15/16	220
	1920L / P3	7-1/16	7-1/8	32	—	9-1/2	1-15/16	220
4 x 6	1920M / P1	7	7-1/4	32	32	9-3/8	1-15/16	230
	1920M / P3	7	7-1/4	32	—	9-3/8	1-15/16	230
4 x 6	1920N / P1	7-3/4	8-1/4	34-1/4	34-1/4	10-1/2	1-15/16	260
	1920N / P3	7-3/4	8-1/4	34-1/4	—	10-1/2	1-15/16	260
4 x 6	1920P / P1	8-7/8	10	41	41	11-1/2	1-15/16	350
	1920P / P3	8-7/8	10	41	—	11-1/2	1-15/16	350
6 x 8	1920Q / P1	9-7/16	9-1/2	41	41	13-5/8	2-1/4	445
	1920Q / P3	9-7/16	9-1/2	41	—	13-5/8	2-1/4	445
6 x 8	1920R / P1	9-7/16	9-1/2	43	43	14-1/2	2-1/4	510
	1920R / P3	9-7/16	9-1/2	43	—	14-1/2	2-1/4	510
8 x 10	1920T / P1	10-7/8	11	53-3/8	53-3/8	16-1/2	2-7/16	840
	1920T / P3	10-7/8	11	53-3/8	—	16-1/2	2-7/16	840
1 x 2	1922D / P1	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
	1922D / P3	4-1/8	4-1/2	17-1/2	—	5-7/16	1-3/8	50
1 x 2	1922E / P1	4-1/8	4-1/2	17-1/2	18-1/2	5-7/16	1-3/8	50
	1922E / P3	4-1/8	4-1/2	17-1/2	—	5-7/16	1-3/8	50
1-1/2 x 2	1922F / P1	4-7/8	6	18-1/4	19-1/4	5-7/16	1-9/16	50
	1922F / P3	4-7/8	6	18-1/4	—	5-7/16	1-9/16	50
1-1/2 x 3	1922G / P1	4-7/8	6	19	20-1/4	6-5/16	1-9/16	65
	1922G / P3	4-7/8	6	19	—	6-5/16	1-9/16	65
2 x 3	1922H / P1	5-1/8	4-7/8	20-1/4	20-1/4	6-5/16	1-11/16	65
	1922H / P3	5-1/8	4-7/8	20-1/4	—	6-5/16	1-11/16	65
3 x 4	1922J / P1	7-1/4	7-1/8	25-5/8	25-5/8	7-3/8	1-13/16	100
	1922J / P3	7-1/4	7-1/8	25-5/8	—	7-3/8	1-13/16	100
3 x 4	1922K / P1	6-1/8	6-3/8	28	28	7-3/4	1-15/16	140
	1922K / P3	6-1/8	6-3/8	28	—	7-3/4	1-15/16	140
4 x 6	1922L / P1	7-1/8	8	32	32	9-1/2	2-3/16	230
	1922L / P3	7-1/8	8	32	—	9-1/2	2-3/16	230
4 x 6	1922M / P1	7	8	36-1/4	36-1/4	10-3/4	2-3/16	300
	1922M / P3	7	8	36-1/4	—	10-3/4	2-3/16	300
4 x 6	1922N / P1	7-3/4	8-3/4	39	39	11-3/4	2-3/16	360
	1922N / P3	7-3/4	8-3/4	39	—	11-3/4	2-3/16	360
6 x 8	1922Q / P1	9-7/16	9-1/2	46	46	14-1/4	2-11/16	645
	1922Q / P3	9-7/16	9-1/2	46	—	14-1/4	2-11/16	645
6 x 10	1922R / P1	9-7/16	10-1/2	47-1/2	47-1/2	15-1/8	2-11/16	675
	1922R / P3	9-7/16	10-1/2	47-1/2	—	15-1/8	2-11/16	675
8 x 10	1922T / P1	10-7/8	11	53-3/8	53-3/8	16-1/2	2-7/16	840
	1922T / P3	10-7/8	11	53-3/8	—	16-1/2	2-7/16	840
4 x 6	1923P / P1	8-7/8	10	43-1/2	43-1/2	13-7/8	2-3/16	530
	1923P / P3	8-7/8	10	43-1/2	—	13-7/8	2-3/16	530

1900/P1 & P3 Series Valves - USCS Units

1900 Steam Internal - Dimensions (in.) & Weights (lbs.) - USCS Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1-1/2 x 2	1924D / P1	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
	1924D / P3	4-1/8	5-1/2	21-3/4	—	7-13/16	1-15/16	95
1-1/2 x 2	1924E / P1	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
	1924E / P3	4-1/8	5-1/2	21-3/4	—	7-13/16	1-15/16	95
1-1/2 x 3	1924F / P1	4-7/8	6-1/2	22-1/2	23-1/2	7-13/16	1-15/16	100
	1924F / P3	4-7/8	6-1/2	22-1/2	—	7-13/16	1-15/16	100
1-1/2 x 3	1924G / P1	4-7/8	6-1/2	22-1/2	23-3/4	7-13/16	1-15/16	95
	1924G / P3	4-7/8	6-1/2	22-1/2	—	7-13/16	1-15/16	95
2 x 3	1924H / P1	6-1/16	6-3/8	23	23	7	2-3/16	90
	1924H / P3	6-1/16	6-3/8	23	—	7	2-3/16	90
3 x 4	1924J / P1	7-1/4	7-1/8	29-7/8	29-7/8	9	2-5/16	180
	1924J / P3	7-1/4	7-1/8	29-7/8	—	9	2-5/16	180
3 x 6	1924K / P1	7-13/16	8-1/2	35-1/4	35-1/4	10-1/2	2-3/16	300
	1924K / P3	7-13/16	8-1/2	35-1/4	—	10-1/2	2-3/16	300
4 x 6	1924L / P1	7-3/4	8-3/4	37-1/4	37-1/4	12-1/4	2-7/16	360
	1924L / P3	7-3/4	8-3/4	37-1/4	—	12-1/4	2-7/16	360
4 x 6	1924M / P1	7-3/4	8-3/4	37	37	10-3/4	2-7/16	340
	1924M / P3	7-3/4	8-3/4	37	—	10-3/4	2-7/16	340
4 x 6	1924N / P1	7-3/4	8-3/4	39	39	11-3/4	2-7/16	380
	1924N / P3	7-3/4	8-3/4	39	—	11-3/4	2-7/16	380
4 x 6	1924P / P1	8-7/8	10	43-1/2	43-1/2	13-7/8	2-7/16	545
	1924P / P3	8-7/8	10	43-1/2	-	13-7/8	2-7/16	545
1-1/2 x 2	1926D / P1	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
	1926D / P3	4-1/8	5-1/2	21-3/4	—	7-13/16	1-15/16	95
1-1/2 x 2	1926E / P1	4-1/8	5-1/2	21-3/4	22-3/4	7-13/16	1-15/16	95
	1926E / P3	4-1/8	5-1/2	21-3/4	—	7-13/16	1-15/16	95
1-1/2 x 3	1926F / P1	4-7/8	6-1/2	22-1/2	23-1/2	7-13/16	1-15/16	100
	1926F / P3	4-7/8	6-1/2	22-1/2	—	7-13/16	1-15/16	100
2 x 3	1926G / P1	6-1/8	6-3/4	23-3/4	25	7-13/16	2-3/16	100
	1926G / P3	6-1/8	6-3/4	23-3/4	—	7-13/16	2-3/16	100
2 x 3	1926H / P1	6-1/16	6-3/8	26	26	8-1/4	2-3/16	140
	1926H / P3	6-1/16	6-3/8	26	—	8-1/4	2-3/16	140
3 x 4	1926J / P1	7-1/4	7-1/8	29-3/4	29-3/4	9	2-9/16	220
	1926J / P3	7-1/4	7-1/8	29-3/4	—	9	2-9/16	220
3 x 6	1926K / P1	7-3/4	8-1/2	35-1/4	35-1/4	10-1/2	2-9/16	320
	1926K / P3	7-3/4	8-1/2	35-1/4	—	10-1/2	2-9/16	320
4 x 6	1926L / P1	7-3/4	8-3/4	37-1/4	37-1/4	12-1/4	2-13/16	370
	1926L / P3	7-3/4	8-3/4	37-1/4	—	12-1/4	2-13/16	370

1900/P1 & P3 Series Valves - USCS Units

1900 Steam Internal - Dimensions (in.) & Weights (lbs.) - USCS Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1-1/2 x 3	1928D / P1	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
	1928D / P3	5-1/2	7	26-1/2	—	8-7/8	2-7/16	150
1-1/2 x 3	1928E / P1	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
	1928E / P3	5-1/2	7	26-1/2	—	8-7/8	2-7/16	150
1-1/2 x 3	1928F / P1	5-1/2	7	26-1/2	27-1/2	8-7/8	2-7/16	150
	1928F / P3	5-1/2	7	26-1/2	—	8-7/8	2-7/16	150
2 x 3	1928G / P1	6-1/8	6-3/4	23-3/4	25	7-13/16	2-11/16	110
	1928G / P3	6-1/8	6-3/4	23-3/4	—	7-13/16	2-11/16	110

1900/P1 & P3 Series Valves - Metric Units

1900 Steam Internal - Dimensions (mm) & Weights (kg) - Metric Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1 x 2	1905D / P1	104.8	114.3	431.8	457.2	138.1	28.6	20.4
	1905D / P3	104.8	114.3	431.8	—	138.1	28.6	20.4
1 x 2	1905E / P1	104.8	114.3	431.8	457.2	138.1	28.6	20.4
	1905E / P3	104.8	114.3	431.8	—	138.1	28.6	20.4
1-1/2 x 2	1905F / P1	123.8	120.7	450.9	476.3	138.1	31.8	20.4
	1905F / P3	123.8	120.7	450.9	—	138.1	31.8	20.4
1-1/2 x 3	1905G / P1	123.8	120.7	450.9	482.6	138.1	31.8	24.9
	1905G / P3	123.8	120.7	450.9	—	138.1	31.8	24.9
1-1/2 x 3	1905H / P1	130.2	123.8	495.3	495.3	160.3	31.8	27.2
	1905H / P3	130.2	123.8	495.3	—	160.3	31.8	27.2
2 x 3	1905J / P1	136.5	123.8	539.8	539.8	174.6	33.3	34
	1905J / P3	136.5	123.8	539.8	—	174.6	33.3	34
3 x 4	1905K / P1	155.6	161.9	622.3	622.3	184.2	36.5	49.9
	1905K / P3	155.6	161.9	622.3	—	184.2	36.5	49.9
3 x 4	1905L / P1	155.6	165.1	730.3	730.3	225.4	36.5	63.5
	1905L / P3	155.6	165.1	730.3	—	225.4	36.5	63.5
4 x 6	1905M / P1	177.8	184.2	755.7	755.7	238.1	41.3	83.9
	1905M / P3	177.8	184.2	755.7	—	238.1	41.3	83.9
4 x 6	1905N / P1	196.9	209.6	838.2	838.2	257.2	41.3	99.8
	1905N / P3	196.9	209.6	838.2	—	257.2	41.3	99.8
4 x 6	1905P / P1	181	228.6	870	870	279.4	41.3	117.9
	1905P / P3	181	228.6	870	—	279.4	41.3	117.9
6 x 8	1905Q / P1	239.7	241.3	1041.4	1041.4	346.1	46	195
	1905Q / P3	239.7	241.3	1041.4	—	346.1	46	195
6 x 8	1905R / P1	239.7	241.3	1092.2	1092.2	368.3	46	224.5
	1905R / P3	239.7	241.3	1092.2	—	368.3	46	224.5
8 x 10	1905T / P1	276.2	279.4	1200.2	1200.2	419.1	49.2	281.2
	1905T / P3	276.2	279.4	1200.2	—	419.1	49.2	281.2
1 x 2	1906D / P1	104.8	114.3	431.8	457.2	138.1	34.9	20.4
	1906D / P3	104.8	114.3	431.8	—	138.1	34.9	20.4
1 x 2	1906E / P1	104.8	114.3	431.8	457.2	138.1	34.9	20.4
	1906E / P3	104.8	114.3	431.8	—	138.1	34.9	20.4
1-1/2 x 2	1906F / P1	123.8	120.7	450.9	476.3	138.1	38.1	20.4
	1906F / P3	123.8	120.7	450.9	—	138.1	38.1	20.4
1-1/2 x 3	1906G / P1	123.8	120.7	450.9	482.6	138.1	38.1	24.9
	1906G / P3	123.8	120.7	450.9	—	138.1	38.1	24.9
1-1/2 x 3	1906H / P1	130.2	123.8	495.3	495.3	160.3	39.7	27.2
	1906H / P3	130.2	123.8	495.3	—	160.3	39.7	27.2
2 x 3	1906J / P1	136.5	123.8	539.8	539.8	174.6	39.7	34
	1906J / P3	136.5	123.8	539.8	—	174.6	39.7	34
3 x 4	1906K / P1	155.6	161.9	622.3	622.3	184.2	46	52.2
	1906K / P3	155.6	161.9	622.3	—	184.2	46	52.2

1900/P1 & P3 Series Valves - Metric Units

1900 Steam Internal - Dimensions (mm) & Weights (kg) - Metric Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
3 x 4	1906L / P1	155.6	165.1	730.3	730.3	225.4	46	65.8
	1906L / P3	155.6	165.1	730.3	—	225.4	46	65.8
4 x 6	1906M / P1	177.8	184.2	755.7	755.7	238.1	49.2	86.2
	1906M / P3	177.8	184.2	755.7	—	238.1	49.2	86.2
4 x 6	1906N / P1	196.9	209.6	838.2	838.2	257.2	49.2	102.1
	1906N / P3	196.9	209.6	838.2	—	257.2	49.2	102.1
4 x 6	1906P / P1	181	228.6	870	870	279.4	49.2	122.5
	1906P / P3	181	228.6	870	—	279.4	49.2	122.5
6 x 8	1906Q / P1	239.7	241.3	1041.4	1041.4	346.1	57.2	201.9
	1906Q / P3	239.7	241.3	1041.4	—	346.1	57.2	201.9
6 x 8	1906R / P1	239.7	241.3	1092.2	1092.2	368.3	57.2	231.3
	1906R / P3	239.7	241.3	1092.2	—	368.3	57.2	231.3
8 x 10	1906T / P1	276.2	279.4	1200.2	1200.2	419.1	61.9	290.3
	1906T / P3	276.2	279.4	1200.2	—	419.1	61.9	290.3
1 x 2	1910D / P1	104.8	114.3	444.5	469.9	138.1	34.9	22.7
	1910D / P3	104.8	114.3	444.5	—	138.1	34.9	22.7
1 x 2	1910E / P1	104.8	114.3	444.5	469.9	138.1	34.9	22.7
	1910E / P3	104.8	114.3	444.5	—	138.1	34.9	22.7
1-1/2 x 2	1910F / P1	123.8	152.4	463.6	489	138.1	39.7	22.7
	1910F / P3	123.8	152.4	463.6	—	138.1	39.7	22.7
1-1/2 x 3	1910G / P1	123.8	152.4	463.6	495.3	138.1	39.7	27.2
	1910G / P3	123.8	152.4	463.6	—	138.1	39.7	27.2
2 x 3	1910H / P1	130.2	123.8	514.4	514.4	160.3	42.9	29.5
	1910H / P3	130.2	123.8	514.4	—	160.3	42.9	29.5
3 x 4	1910J / P1	184.2	181	650.9	650.9	187.3	49.2	45.4
	1910J / P3	184.2	181	650.9	—	187.3	49.2	45.4
3 x 4	1910K / P1	155.6	161.9	711.2	711.2	196.9	49.2	63.5
	1910K / P3	155.6	161.9	711.2	—	196.9	49.2	63.5
4 x 6	1910L / P1	179.4	181	812.8	812.8	241.3	49.2	99.8
	1910L / P3	179.4	181	812.8	—	241.3	49.2	99.8
4 x 6	1910M / P1	177.8	184.2	812.8	812.8	238.1	49.2	104.3
	1910M / P3	177.8	184.2	812.8	—	238.1	49.2	104.3
4 x 6	1910N / P1	196.9	209.6	870	870	266.7	49.2	117.9
	1910N / P3	196.9	209.6	870	—	266.7	49.2	117.9
4 x 6	1910P / P1	225.4	254	1041.4	1041.4	292.1	49.2	158.8
	1910P / P3	225.4	254	1041.4	—	292.1	49.2	158.8
6 x 8	1910Q / P1	239.7	241.3	1098.6	1098.6	355.6	57.2	240.4
	1910Q / P3	239.7	241.3	1098.6	—	355.6	57.2	240.4
6 x 10	1910R / P1	239.7	266.7	1155.7	1155.7	368.3	57.2	249.5
	1910R / P3	239.7	266.7	1155.7	—	368.3	57.2	249.5
8 x 10	1910T / P1	276.2	279.4	1355.7	1355.7	419.1	61.9	381
	1910T / P3	276.2	279.4	1355.7	—	419.1	61.9	381

1900/P1 & P3 Series Valves - Metric Units

1900 Steam Internal - Dimensions (mm) & Weights (kg) - Metric Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1 x 2	1912D / P1	104.8	114.3	463.6	489	160.3	34.9	25
	1912D / P3	104.8	114.3	463.6	—	160.3	34.9	25
1 x 2	1912E / P1	104.8	114.3	463.6	489	160.3	34.9	25
	1912E / P3	104.8	114.3	463.6	—	160.3	34.9	25
1-1/2 x 2	1912F / P1	123.8	152.4	482.6	508	160.3	39.7	27.2
	1912F / P3	123.8	152.4	482.6	—	160.3	39.7	27.2
1-1/2 x 3	1912G / P1	123.8	152.4	482.6	514.4	160.3	39.7	29.5
	1912G / P3	123.8	152.4	482.6	—	160.3	39.7	29.5
2 x 3	1912H / P1	154	161.9	584.2	584.2	177.8	42.9	38.6
	1912H / P3	154	161.9	584.2	—	177.8	42.9	38.6
3 x 4	1912J / P1	184.2	181	758.8	758.8	228.6	46	77.1
	1912J / P3	184.2	181	758.8	—	228.6	46	77.1
3 x 4	1912K / P1	184.2	181	743	743	196.9	49.2	68
	1912K / P3	184.2	181	743	—	196.9	49.2	68
4 x 6	1912L / P1	179.4	203.2	812.8	812.8	241.3	55.5	104.3
	1912L / P3	179.4	203.2	812.8	—	241.3	55.5	104.3
4 x 6	1912M / P1	177.8	203.2	920.8	920.8	273.1	55.5	136.1
	1912M / P3	177.8	203.2	920.8	—	273.1	55.5	136.1
4 x 6	1912N / P1	196.9	222.3	990.6	990.6	298.5	55.5	163.3
	1912N / P3	196.9	222.3	990.6	—	298.5	55.5	163.3
4 x 6	1912P / P1	225.4	254	1104.9	1104.9	352.4	55.5	240.4
	1912P / P3	225.4	254	1104.9	—	352.4	55.5	240.4
6 x 8	1912Q / P1	239.7	241.3	1168.4	1168.4	362	68.3	292.6
	1912Q / P3	239.7	241.3	1168.4	—	362	68.3	292.6
6 x 10	1912R / P1	239.7	266.7	1206.5	1206.5	384.2	68.3	306.2
	1912R / P3	239.7	266.7	1206.5	—	384.2	68.3	306.2
8 x 10	1912T / P1	276.2	279.4	1368.4	1368.4	419.1	61.9	381
	1912 T / P3	276.2	279.4	1368.4	—	419.1	61.9	381
1-1/2 x 2	1914D / P1	104.8	139.7	552.5	577.9	198.4	49.2	43.1
	1914D / P3	104.8	139.7	552.5	—	198.4	49.2	43.1
1-1/2 x 2	1914E / P1	104.8	139.7	552.5	577.9	198.4	49.2	43.1
	1914E / P3	104.8	139.7	552.5	—	198.4	49.2	43.1
1-1/2 x 3	1914F / P1	123.8	165.1	571.5	596.9	198.4	49.2	45.4
	1914F / P3	123.8	165.1	571.5	—	198.4	49.2	45.4
1-1/2 x 3	1914G / P1	123.8	165.1	571.5	603.3	198.4	49.2	43.1
	1914G / P3	123.8	165.1	571.5	—	198.4	49.2	43.1
2 x 3	1914H / P1	154	161.9	660.4	660.4	209.6	55.5	59
	1914H / P3	154	161.9	660.4	—	209.6	55.5	59
3 x 4	1914J / P1	184.2	181	755.7	755.7	228.6	55.5	88.5
	1914J / P3	184.2	181	755.7	—	228.6	55.5	88.5
3 x 6	1914K / P1	198.4	215.9	895.4	895.4	266.7	55.5	136.1
	1914K / P3	198.4	215.9	895.4	—	266.7	55.5	136.1
4 x 6	1914L / P1	196.9	222.3	946.2	946.2	311.2	61.9	163.3
	1914L / P3	196.9	222.3	946.2	—	311.2	61.9	163.3
4 x 6	1914M / P1	196.9	222.3	939.8	939.8	273.1	61.9	154.2
	1914M / P3	196.9	222.3	939.8	—	273.1	61.9	154.2

1900/P1 & P3 Series Valves - Metric Units

1900 Steam Internal - Dimensions (mm) & Weights (kg) - Metric Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
4 x 6	1914N / P1	196.9	222.3	990.6	990.6	298.5	61.9	172.4
	1914N / P3	196.9	222.3	990.6	—	298.5	61.9	172.4
4 x 6	1914P / P1	225.4	254	1104.9	1104.9	352.4	61.9	247.2
	1914P / P3	225.4	254	1104.9	—	352.4	61.9	247.2
1-1/2 x 2	1916D / P1	104.8	139.7	552.5	577.9	198.4	49.2	43.1
	1916D / P3	104.8	139.7	552.5	—	198.4	49.2	43.1
1-1/2 x 2	1916E / P1	104.8	139.7	552.5	577.9	198.4	49.2	43.1
	1916E / P3	104.8	139.7	552.5	—	198.4	49.2	43.1
1-1/2 x 3	1916F / P1	123.8	165.1	571.5	596.9	198.4	49.2	45.4
	1916F / P3	123.8	165.1	571.5	—	198.4	49.2	45.4
2 x 3	1916G / P1	155.6	171.5	603.3	635	198.4	55.5	45.4
	1916G / P3	155.6	171.5	603.3	—	198.4	55.5	45.4
2 x 3	1916H / P1	154	161.9	660.4	660.4	209.6	55.5	63.5
	1916H / P3	154	161.9	660.4	—	209.6	55.5	63.5
3 x 4	1916J / P1	184.2	181	755.7	755.7	228.6	65.1	99.8
	1916J / P3	184.2	181	755.7	—	228.6	65.1	99.8
3 x 6	1916K / P1	196.9	215.9	895.4	895.4	266.7	65.1	145.2
	1916K / P3	196.9	215.9	895.4	—	266.7	65.1	145.2
4 x 6	1916L / P1	196.9	222.3	946.2	946.2	311.2	71.4	167.8
	1916L / P3	196.9	222.3	946.2	—	311.2	71.4	167.8
1-1/2 x 3	1918D / P1	139.7	177.8	673.1	698.5	225.4	61.9	68
	1918D / P3	139.7	177.8	673.1	—	225.4	61.9	68
1-1/2 x 3	1918E / P1	139.7	177.8	673.1	698.5	225.4	61.9	68
	1918E / P3	139.7	177.8	673.1	—	225.4	61.9	68
1-1/2 x 3	1918F / P1	139.7	177.8	673.1	698.5	225.4	61.9	68
	1918F / P3	139.7	177.8	673.1	—	225.4	61.9	68
2 x 3	1918G / P1	155.6	171.5	603.3	635	198.4	68.2	49.9
	1918G / P3	155.6	171.5	603.3	—	198.4	68.2	49.9
1 x 2	1920D / P1	104.8	114.3	444.5	469.9	138.1	34.9	22.7
	1920D / P3	104.8	114.3	444.5	—	138.1	34.9	22.7
1 x 2	1920E / P1	104.8	114.3	444.5	469.9	138.1	34.9	22.7
	1920E / P3	104.8	114.3	444.5	—	138.1	34.9	22.7
1-1/2 x 2	1920F / P1	123.8	152.4	463.6	489	138.1	39.7	22.7
	1920F / P3	123.8	152.4	463.6	—	138.1	39.7	22.7
1-1/2 x 3	1920G / P1	123.8	152.4	463.6	495.3	138.1	39.7	27.2
	1920G / P3	123.8	152.4	463.6	—	138.1	39.7	27.2
2 x 3	1920H / P1	130.2	123.8	514.4	514.4	160.3	42.8	29.5
	1920H / P3	130.2	123.8	514.4	—	160.3	42.8	29.5
3 x 4	1920J / P1	184.2	181	651	651	187.3	46	45.4
	1920J / P3	184.2	181	651	—	187.3	46	45.4
3 x 4	1920K / P1	155.6	161.9	711.2	711.2	196.9	49.2	63.5
	1920K / P3	155.6	161.9	711.2	—	196.9	49.2	63.5

1900/P1 & P3 Series Valves - Metric Units

1900 Steam Internal - Dimensions (mm) & Weights (kg) - Metric Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
4 x 6	1920L / P1	179.4	181	812.8	812.8	241.3	49.2	99.8
	1920L / P3	179.4	181	812.8	—	241.3	49.2	99.8
4 x 6	1920M / P1	177.8	184.2	812.8	812.8	238.1	49.2	104.3
	1920M / P3	177.8	184.2	812.8	—	238.1	49.2	104.3
4 x 6	1920N / P1	196.9	209.6	870	870	266.7	49.2	117.9
	1920N / P3	196.9	209.6	870	—	266.7	49.2	117.9
4 x 6	1920P / P1	225.4	254	1041.4	1041.4	292.1	49.2	158.8
	1920P / P3	225.4	254	1041.4	—	292.1	49.2	158.8
6 x 8	1920Q /P1	239.7	241.3	1041.4	1041.4	346.1	57.2	201.9
	1920Q / P3	239.7	241.3	1041.4	—	346.1	57.2	201.9
6 x 8	1920R / P1	239.7	241.3	1092.2	1092.2	368.3	57.2	231.3
	1920R / P3	239.7	241.3	1092.2	—	368.3	57.2	231.3
8 x 10	1920T / P1	276.2	279.4	1355.7	1355.7	419.1	61.9	381
	1920T / P3	276.2	279.4	1355.7	—	419.1	61.9	381
1 x 2	1922D / P1	104.8	114.3	444.5	469.9	138.1	34.9	22.7
	1922D / P3	104.8	114.3	444.5	—	138.1	34.9	22.7
1 x 2	1922E / P1	104.8	114.3	444.5	469.9	138.1	34.9	22.7
	1922E / P3	104.8	114.3	444.5	—	138.1	34.9	22.7
1-1/2 x 2	1922F / P1	123.8	152.4	463.6	489	138.1	39.7	22.7
	1922F / P3	123.8	152.4	463.6	—	138.1	39.7	22.7
1-1/2 x 3	1922G / P1	123.8	152.4	482.6	514.4	160.3	39.7	29.5
	1922G / P3	123.8	152.4	482.6	—	160.3	39.7	29.5
2 x 3	1922H / P1	130.2	123.8	514.4	514.4	160.3	42.8	29.5
	1922H / P3	130.2	123.8	514.4	—	160.3	42.8	29.5
3 x 4	1922J / P1	184.2	181	650.9	650.9	187.3	46	45.4
	1922J / P3	184.2	181	650.9	—	187.3	46	45.4
3 x 4	1922K / P1	155.6	161.9	711.2	711.2	196.9	49.2	63.5
	1922K / P3	155.6	161.9	711.2	—	196.9	49.2	63.5
4 x 6	1922L / P1	181	203.2	812.8	812.8	241.3	55.6	104.3
	1922L / P3	181	203.2	812.8	—	241.3	55.6	104.3
4 x 6	1922M / P1	177.8	203.2	920.8	920.8	273.1	55.6	136.1
	1922M / P3	177.8	203.2	920.8	-	273.1	55.6	136.1
4 x 6	1922N / P1	196.9	222.3	990.6	990.6	298.5	55.6	163.3
	1922N / P3	196.9	222.3	990.6	—	298.5	55.6	163.3
6 x 8	1922Q / P1	239.7	241.3	1168.4	1168.4	362	68.3	292.6
	1922Q / P3	239.7	241.3	1168.4	—	362	68.3	292.6
6 x 10	1922R / P1	239.7	266.7	1206.5	1206.5	384.2	68.3	306.2
	1922R / P3	239.7	266.7	1206.5	—	384.2	68.3	306.2
8 x 10	1922T / P1	276.2	279.4	1355.7	1355.7	419.1	61.9	381
	1922T / P3	276.2	279.4	1355.7	—	419.1	61.9	381
4 x 6	1923P / P1	225.4	254	1104.9	1104.9	352.4	55.6	240.4
	1923P / P3	225.4	254	1104.9	—	352.4	55.6	240.4

1900/P1 & P3 Series Valves - Metric Units

1900 Steam Internal - Dimensions (mm) & Weights (kg) - Metric Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1-1/2 x 2	1924D / P1	104.8	139.7	552.5	577.9	198.4	49.2	43.1
	1924D / P3	104.8	139.7	552.5	—	198.4	49.2	43.1
1-1/2 x 2	1924E / P1	104.8	139.7	552.5	577.9	198.4	49.2	43.1
	1924E / P3	104.8	139.7	552.5	—	198.4	49.2	43.1
1-1/2 x 3	1924F / P1	123.8	165.1	571.5	596.9	198.4	49.2	45.4
	1924F / P3	123.8	165.1	571.5	—	198.4	49.2	45.4
1-1/2 x 3	1924G / P1	123.8	165.1	571.5	603.3	198.4	49.2	43.1
	1924G / P3	123.8	165.1	571.5	—	198.4	49.2	43.1
2 x 3	1924H / P1	154	161.9	584.2	584.2	177.8	55.6	40.8
	1924H / P3	154	161.9	584.2	—	177.8	55.6	40.8
3 x 4	1924J / P1	184.2	181	758.8	758.8	228.6	58.7	81.6
	1924J / P3	184.2	181	758.8	—	228.6	58.7	81.6
3 x 6	1924K / P1	198.4	215.9	895.4	895.4	266.7	55.6	136.1
	1924K / P3	198.4	215.9	895.4	—	266.7	55.6	136.1
4 x 6	1924L / P1	196.9	222.3	946.2	946.2	311.2	61.9	163.3
	1924L / P3	196.9	222.3	946.2	—	311.2	61.9	163.3
4 x 6	1924M / P1	196.9	222.3	939.8	939.8	273.1	61.9	154.2
	1924M / P3	196.9	222.3	939.8	—	273.1	61.9	154.2
4 x 6	1924N / P1	196.9	222.3	990.6	990.6	298.5	61.9	172.4
	1924N / P3	196.9	222.3	990.6	—	298.5	61.9	172.4
4 x 6	1924P / P1	225.4	254	1104.9	1104.9	352.4	61.9	247.2
	1924P / P3	225.4	254	1104.9	—	352.4	61.9	247.2
1-1/2 x 2	1926D / P1	104.8	139.7	552.5	577.9	198.4	49.2	43.1
	1926D / P3	104.8	139.7	552.5	—	198.4	49.2	43.1
1-1/2 x 2	1926E / P1	104.8	139.7	552.5	577.9	198.4	49.2	43.1
	1926E / P3	104.8	139.7	552.5	—	198.4	49.2	43.1
1-1/2 x 3	1926F / P1	123.8	165.1	571.5	596.9	198.4	49.2	45.4
	1926F / P3	123.8	165.1	571.5	—	198.4	49.2	45.4
2 x 3	1926G / P1	155.6	171.5	603.3	635	198.4	55.6	45.4
	1926G / P3	155.6	171.5	603.3	—	198.4	55.6	45.4
2 x 3	1926H / P1	154	161.9	660.4	660.4	209.6	55.6	63.5
	1926H / P3	154	161.9	660.4	—	209.6	55.6	63.5
3 x 4	1926J / P1	184.2	181	755.7	755.7	228.6	65.1	99.8
	1926J / P3	184.2	181	755.7	—	228.6	65.1	99.8
3 x 6	1926K / P1	196.9	215.9	895.4	895.4	266.7	65.1	145.2
	1926K / P3	196.9	215.9	895.4	—	266.7	65.1	145.2
4 x 6	1926L / P1	196.9	222.3	946.2	946.2	311.2	71.4	167.8
	1926L / P3	196.9	222.3	946.2	—	311.2	71.4	167.8

1900/P1 & P3 Series Valves - Metric Units

1900 Steam Internal - Dimensions (mm) & Weights (kg) - Metric Units

Size	Type	A	B	C		D	S	Approx. Weight
				STD	Bellows			
1-1/2 x 3	1928D / P1	139.7	177.8	673.1	698.5	225.4	61.9	68
	1928D / P3	139.7	177.8	673.1	—	225.4	61.9	68
1-1/2 x 3	1928E / P1	139.7	177.8	673.1	698.5	225.4	61.9	68
	1928E / P3	139.7	177.8	673.1	—	225.4	61.9	68
1-1/2 x 3	1928F / P1	139.7	177.8	673.1	698.5	225.4	61.9	68
	1928F / P3	139.7	177.8	673.1	—	225.4	61.9	68
2 x 3	1928G / P1	155.6	171.5	603.3	635	198.4	68.2	49.9
	1928G / P3	155.6	171.5	603.3	—	198.4	68.2	49.9

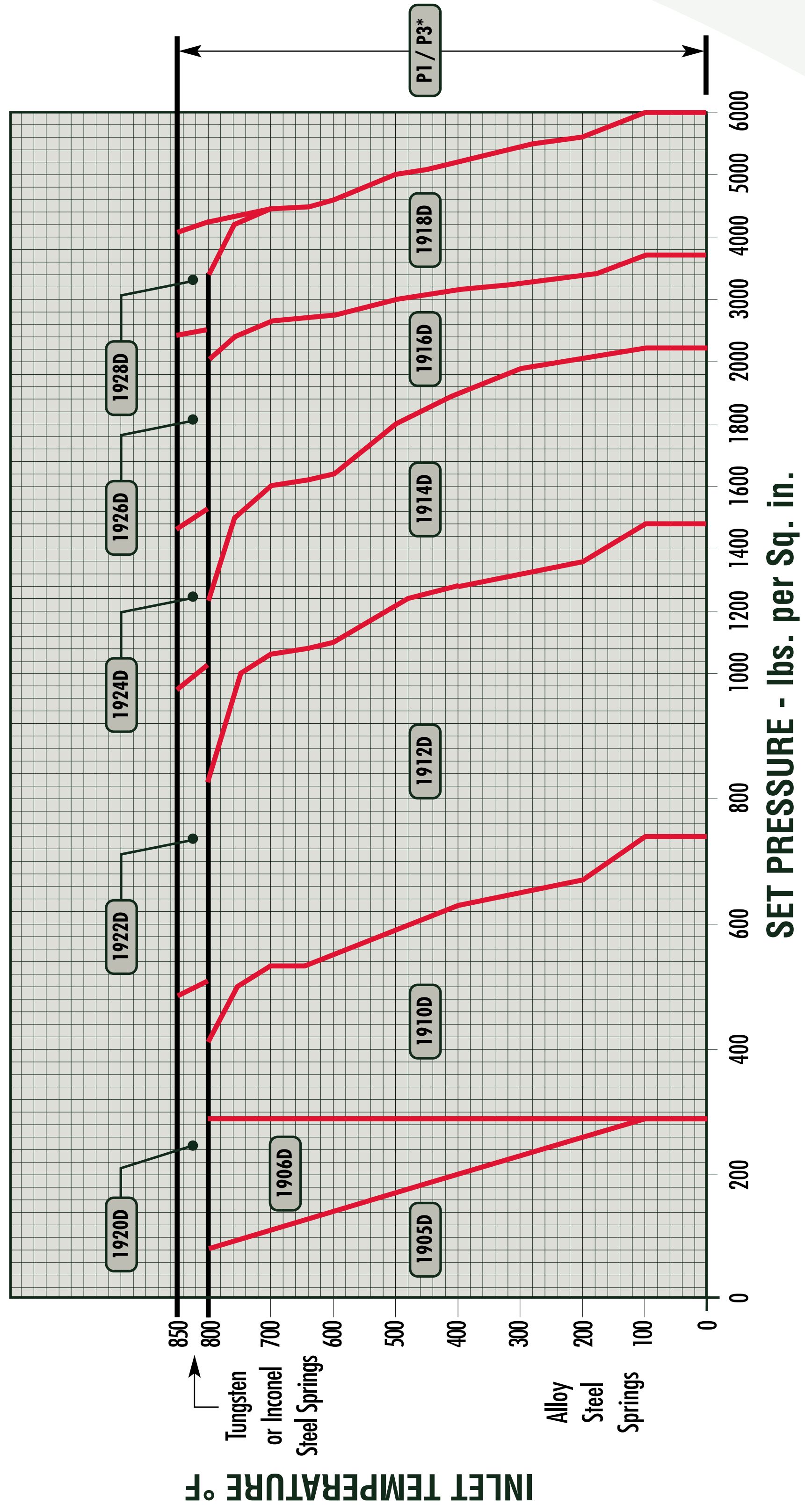
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
D Orifice - API area: 0.110 Sq. in.

Valve Type Number		Valve Size Inlet x Outlet	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows		Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905D / P1	1905-30D / P1	1 x 2	150	150	285	210	80	—	285	230
1905D / P3	—				285	210	80	—	—	—
1906D / P1	1906-30D / P1	1 x 2	300	150	285	285	285	—	285	230
1906D / P3	—				285	285	285	—	—	—
1910D / P1	1910-30D / P1	1 x 2	300	150	740	625	410	—	285	230
1910D / P3	—				740	625	410	—	—	—
1912D / P1	1912-30D / P1	1 x 2	600	150	1480	1205	825	—	285	230
1912D / P3	—				1480	1205	825	—	—	—
1914D / P1	1914-30D / P1	1-1/2 x 2	900	300	2220	1740	1235	—	600	500
1914D / P3	—				2220	1740	1235	—	—	—
1916D / P1	1916-30D / P1	1-1/2 x 2	1500	300	3705	2735	2060	—	600	500
1916D / P3	—				3705	2735	2060	—	—	—
1918D / P1	1918-30D / P1	1-1/2 x 3	2500	300	6000	4460	3430	—	740	500
1918D / P3	—				6000	4460	3430	—	—	—
1920D / P1	1920-30D / P1	1 x 2	300	150	—	—	510	485	285	230
1920D / P3	—				—	—	510	485	—	—
1922D / P1	1922-30D / P1	1 x 2	600	150	—	—	1015	975	285	230
1922D / P3	—				—	—	1015	975	—	—
1924D / P1	1924-30D / P1	1-1/2 x 2	900	300	—	—	1525	1460	600	500
1924D / P3	—				—	—	1525	1460	—	—
1926D / P1	1926-30D / P1	1-1/2 x 2	1500	300	—	—	2540	2435	600	500
1926D / P3	—				—	—	2540	2435	—	—
1928D / P1	1928-30D / P1	1-1/2 x 3	2500	300	—	—	4230	4060	740	500
1928D / P3	—				—	—	4230	4060	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
D Orifice - API area: 0.110 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

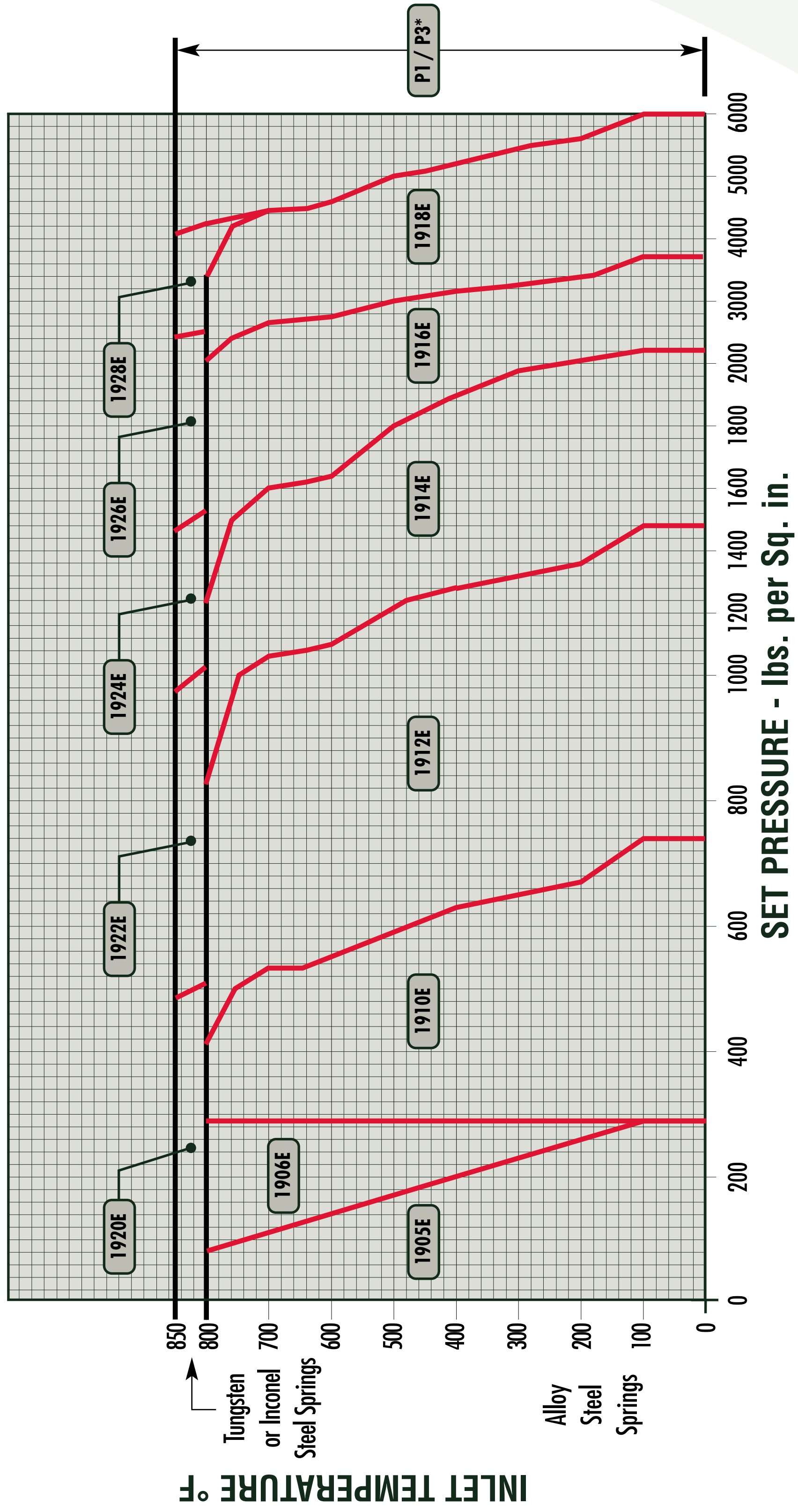
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
E Orifice - API area: 0.196 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905E / P1	1905-30E / P1	1 x 2	150	150	285	210	80	—	285	230
1905E / P3	—				285	210	80	—	—	—
1906E / P1	1906-30E / P1	1 x 2	300	150	285	285	285	—	285	230
1906E / P3	—				285	285	285	—	—	—
1910E / P1	1910-30E / P1	1 x 2	300	150	740	625	410	—	285	230
1910E / P3	—				740	625	410	—	—	—
1912E / P1	1912-30E / P1	1 x 2	600	150	1480	1205	825	—	285	230
1912E / P3	—				1480	1205	825	—	—	—
1914E / P1	1914-30E / P1	1-1/2 x 2	900	300	2220	1740	1235	—	600	500
1914E / P3	—				2220	1740	1235	—	—	—
1916E / P1	1916-30E / P1	1-1/2 x 2	1500	300	3705	2735	2060	—	600	500
1916E / P3	—				3705	2735	2060	—	—	—
1918E / P1	1918-30E / P1	1-1/2 x 3	2500	300	6000	4460	3430	—	740	500
1918E / P3	—				6000	4460	3430	—	—	—
1920E / P1	1920-30E / P1	1 x 2	300	150	—	—	510	485	285	230
1920E / P3	—				—	—	510	485	—	—
1922E / P1	1922-30E / P1	1 x 2	600	150	—	—	1015	975	285	230
1922E / P3	—				—	—	1015	975	—	—
1924E / P1	1924-30E / P1	1-1/2 x 2	900	300	—	—	1525	1460	600	500
1924E / P3	—				—	—	1525	1460	—	—
1926E / P1	1926-30E / P1	1-1/2 x 2	1500	300	—	—	2540	2435	600	500
1926E / P3	—				—	—	2540	2435	—	—
1928E / P1	1928-30E / P1	1-1/2 x 3	2500	300	—	—	4230	4060	740	500
1928E / P3	—				—	—	4230	4060	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
E Orifice - API area: 0.196 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

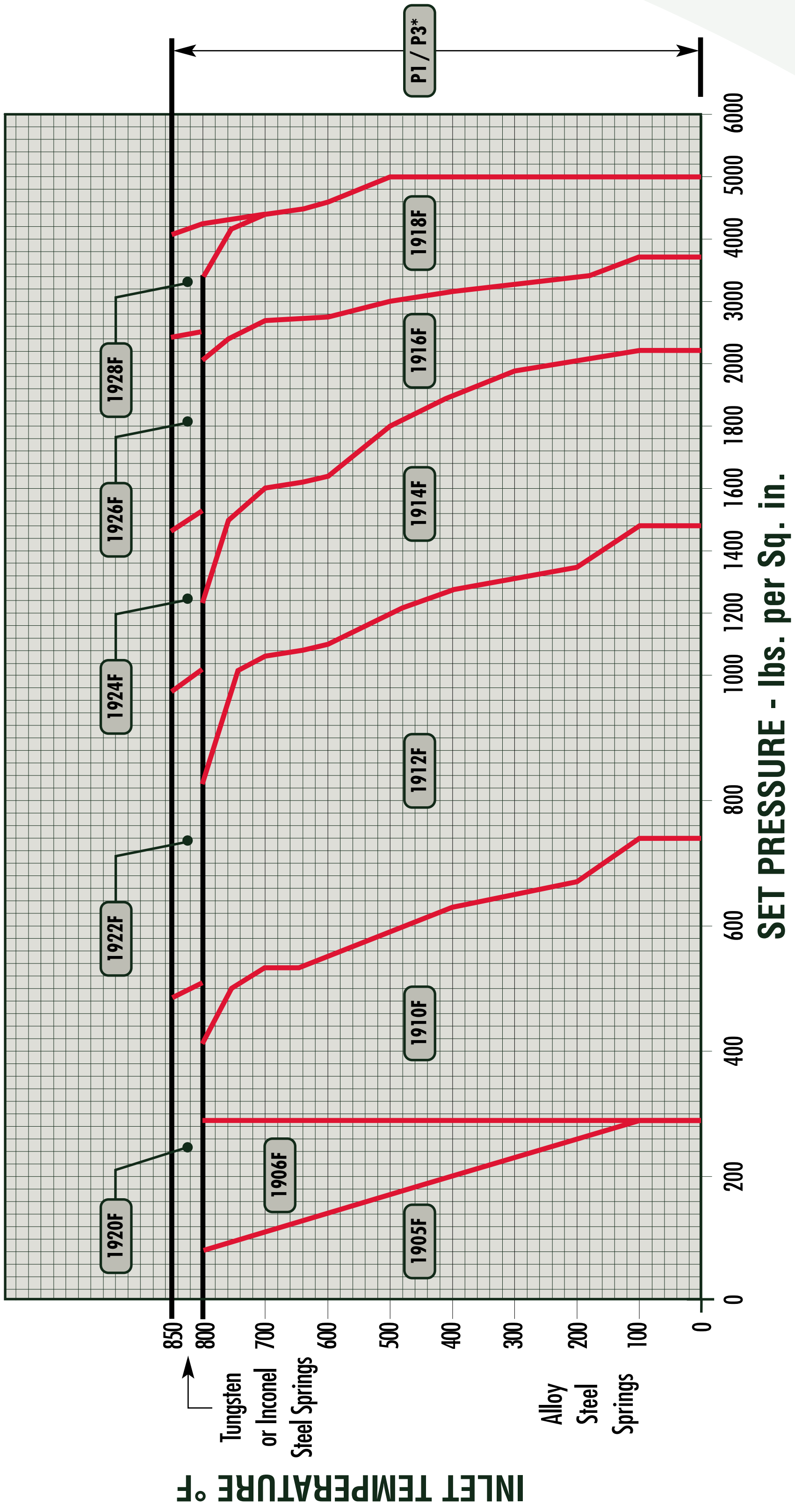
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
F Orifice - API area: 0.307 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905F / P1	1905-30F / P1	1-1/2 x 2	150	150	285	210	80	—	285	230
1905F / P3	—				285	210	80	—	—	—
1906F / P1	1906-30F / P1	1-1/2 x 2	300	150	285	285	285	—	285	230
1906F / P3	—				285	285	285	—	—	—
1910F / P1	1910-30F / P1	1-1/2 x 2	300	150	740	625	410	—	285	230
1910F / P3	—				740	625	410	—	—	—
1912F / P1	1912-30F / P1	1-1/2 x 2	600	150	1480	1205	825	—	285	230
1912F / P3	—				1480	1205	825	—	—	—
1914F / P1	1914-30F / P1	1-1/2 x 3	900	300	2220	1740	1235	—	740	500
1914F / P3	—				2220	1740	1235	—	—	—
1916F / P1	1916-30F / P1	1-1/2 x 3	1500	300	3705	2735	2060	—	740	500
1916F / P3	—				3705	2735	2060	—	—	—
1918F / P1	1918-30F / P1	1-1/2 x 3	2500	300	5000	4460	3430	—	740	500
1918F / P3	—				5000	4460	3430	—	—	—
1920F / P1	1920-30F / P1	1-1/2 x 2	300	150	—	—	510	485	285	230
1920F / P3	—				—	—	510	485	—	—
1922F / P1	1922-30F / P1	1-1/2 x 2	600	150	—	—	1015	975	285	230
1922F / P3	—				—	—	1015	975	—	—
1924F / P1	1924-30F / P1	1-1/2 x 3	900	300	—	—	1525	1460	740	500
1924F / P3	—				—	—	1525	1460	—	—
1926F / P1	1926-30F / P1	1-1/2 x 3	1500	300	—	—	2540	2435	740	500
1926F / P3	—				—	—	2540	2435	—	—
1928F / P1	1928-30F / P1	1-1/2 x 3	2500	300	—	—	4230	4060	740	500
1928F / P3	—				—	—	4230	4060	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
F Orifice - API area: 0.307 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

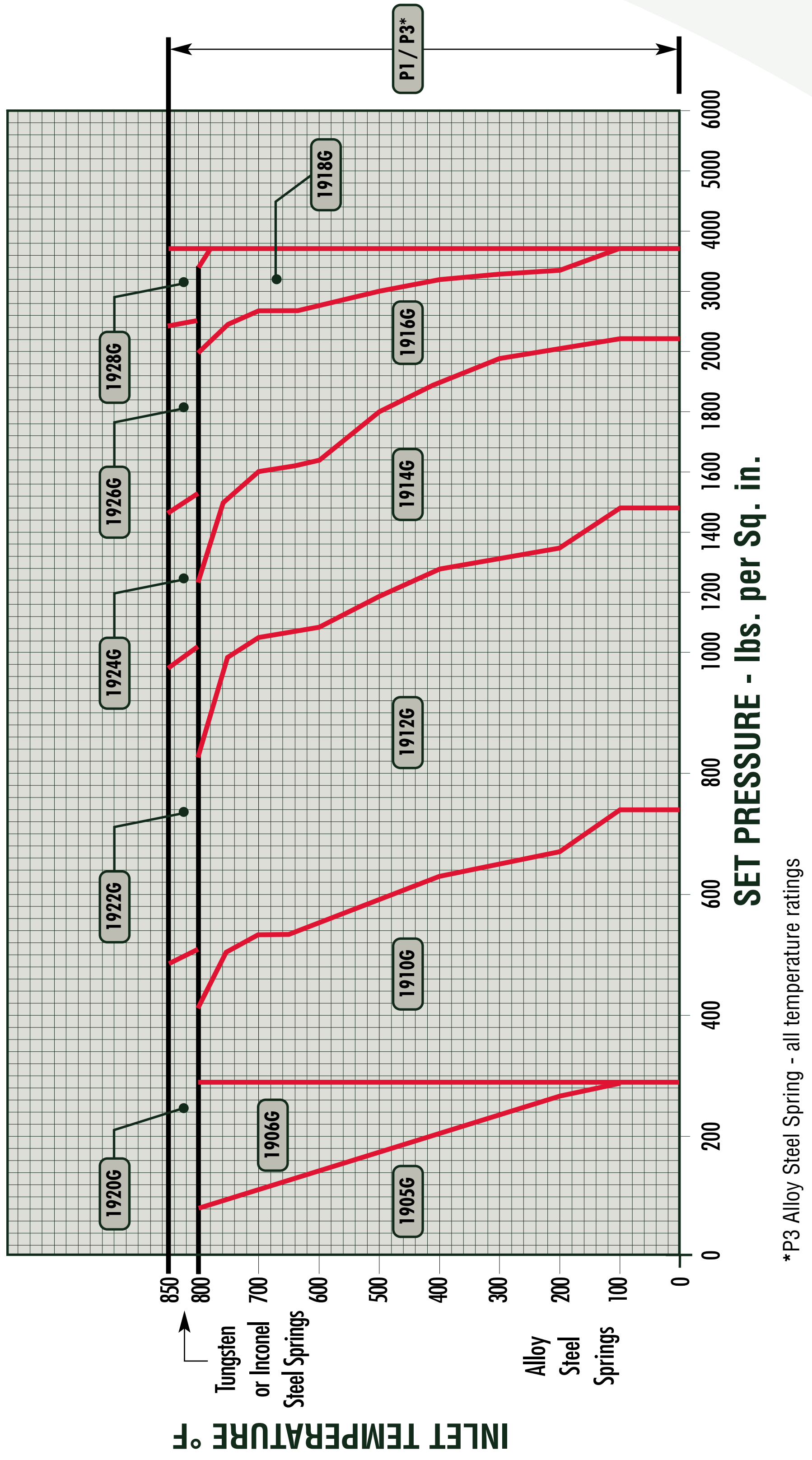
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
G Orifice - API area: 0.503 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905G / P1	1905-30G / P1	1-1/2 x 3	150	150	285	210	80	—	285	230
1905G / P3	—				285	210	80	—	—	—
1906G / P1	1906-30G / P1	1-1/2 x 3	300	150	285	285	285	—	285	230
1906G / P3	—				285	285	285	—	—	—
1910G / P1	1910-30G / P1	1-1/2 x 3	300	150	740	625	410	—	285	230
1910G / P3	—				740	625	410	—	—	—
1912G / P1	1912-30G / P1	1-1/2 x 3	600	150	1480	1205	825	—	285	230
1912G / P3	—				1480	1205	825	—	—	—
1914G / P1	1914-30G / P1	1-1/2 x 3	900	300	2230	1740	1235	—	740	470
1914G / P3	—				2230	1740	1235	—	—	—
1916G / P1	1916-30G / P1	2 x 3	1500	300	3600	2735	2060	—	740	470
1916G / P3	—				3600	2735	2060	—	—	—
1918G / P1	1918-30G / P1	2 x 3	2500	300	3600	3600	3430	—	740	470
1918G / P3	—				3600	3600	3430	—	—	—
1920G / P1	1920-30G / P1	1-1/2 x 3	300	150	—	—	510	485	285	230
1920G / P3	—				—	—	510	485	—	—
1922G / P1	1922-30G / P1	1-1/2 x 3	600	150	—	—	1015	975	285	230
1922G / P3	—				—	—	1015	975	—	—
1924G / P1	1924-30G / P1	1-1/2 x 3	900	300	—	—	1525	1460	740	470
1924G / P3	—				—	—	1525	1460	—	—
1926G / P1	1926-30G / P1	2 x 3	1500	300	—	—	2540	2435	740	470
1926G / P3	—				—	—	2540	2435	—	—
1928G / P1	1928-30G / P1	2 x 3	2500	300	—	—	3600	3600	740	470
1928G / P3	—				—	—	3600	3600	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
G Orifice - API area: 0.503 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

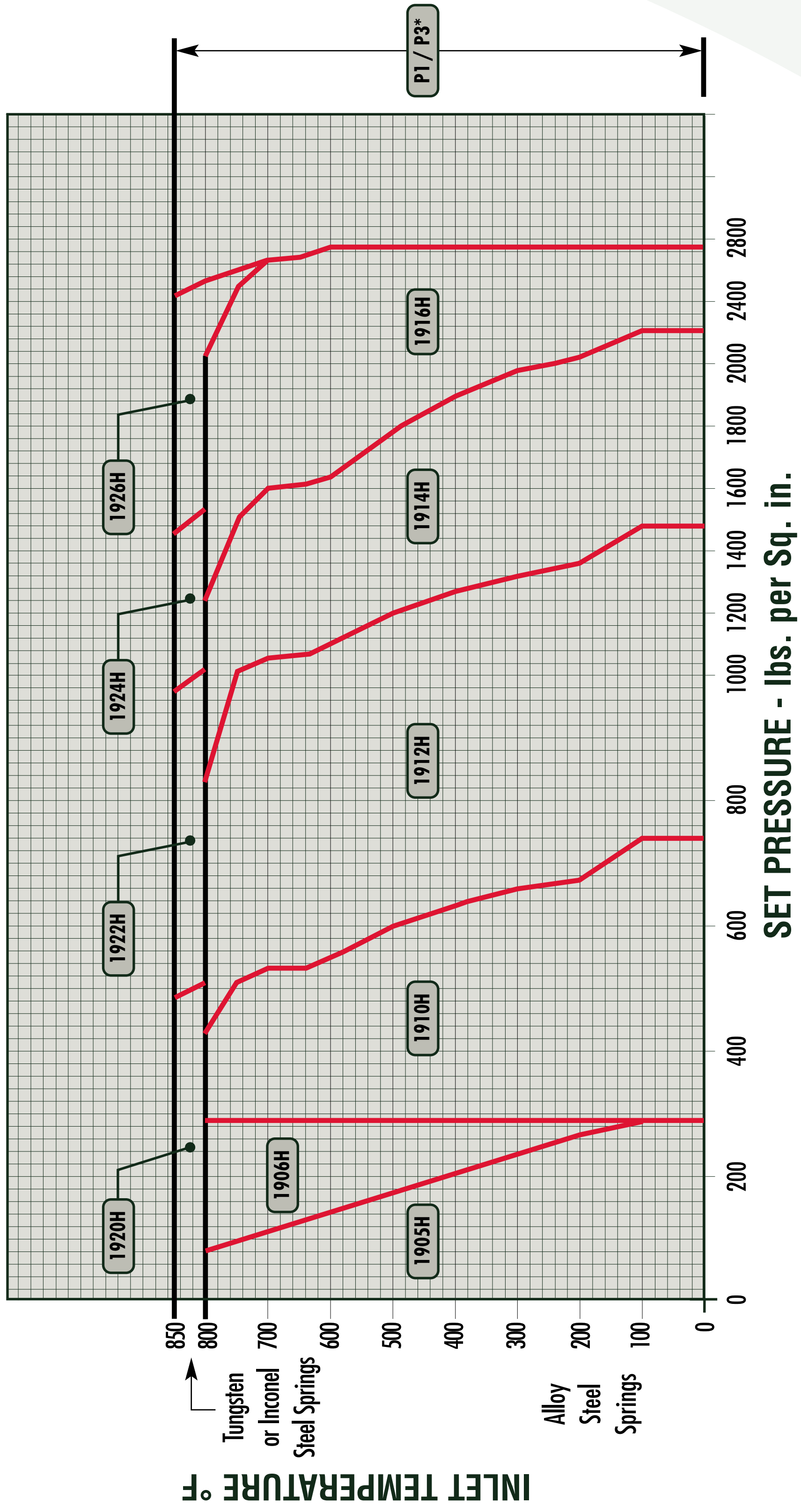
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
H Orifice - API area: 0.785 Sq. in.

Valve Type Number		Valve Size Inlet x Outlet	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows		Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905H / P1	1905-30H / P1	1-1/2 x 3	150	150	285	210	80	—	285	230
1905H / P3	—				285	210	80	—	—	—
1906H / P1	1906-30H / P1	1-1/2 x 3	300	150	285	285	285	—	285	230
1906H / P3	—				285	285	285	—	—	—
1910H / P1	1910-30H / P1	2 x 3	300	150	740	625	410	—	285	230
1910H / P3	—				740	625	410	—	—	—
1912H / P1	1912-30H / P1	2 x 3	600	150	1480	1205	825	—	285	230
1912H / P3	—				1480	1205	825	—	—	—
1914H / P1	1914-30H / P1	2 x 3	900	150	2220	1740	1235	—	285	230
1914H / P3	—				2220	1740	1235	—	—	—
1916H / P1	1916-30H / P1	2 x 3	1500	300	2750	2735	2060	—	740	415
1916H / P3	—				2750	2735	2060	—	—	—
1920H / P1	1920-30H / P1	2 x 3	300	150	—	—	510	485	285	230
1920H / P3	—				—	—	510	485	—	—
1922H / P1	1922-30H / P1	2 x 3	600	150	—	—	1015	975	285	230
1922H / P3	—				—	—	1015	975	—	—
1924H / P1	1924-30H / P1	2 x 3	900	150	—	—	1525	1460	285	230
1924H / P3	—				—	—	1525	1460	—	—
1926H / P1	1926-30H / P1	2 x 3	1500	300	—	—	2540	2435	740	230
1926H / P3	—				—	—	2540	2435	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
H Orifice - API area: 0.785 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

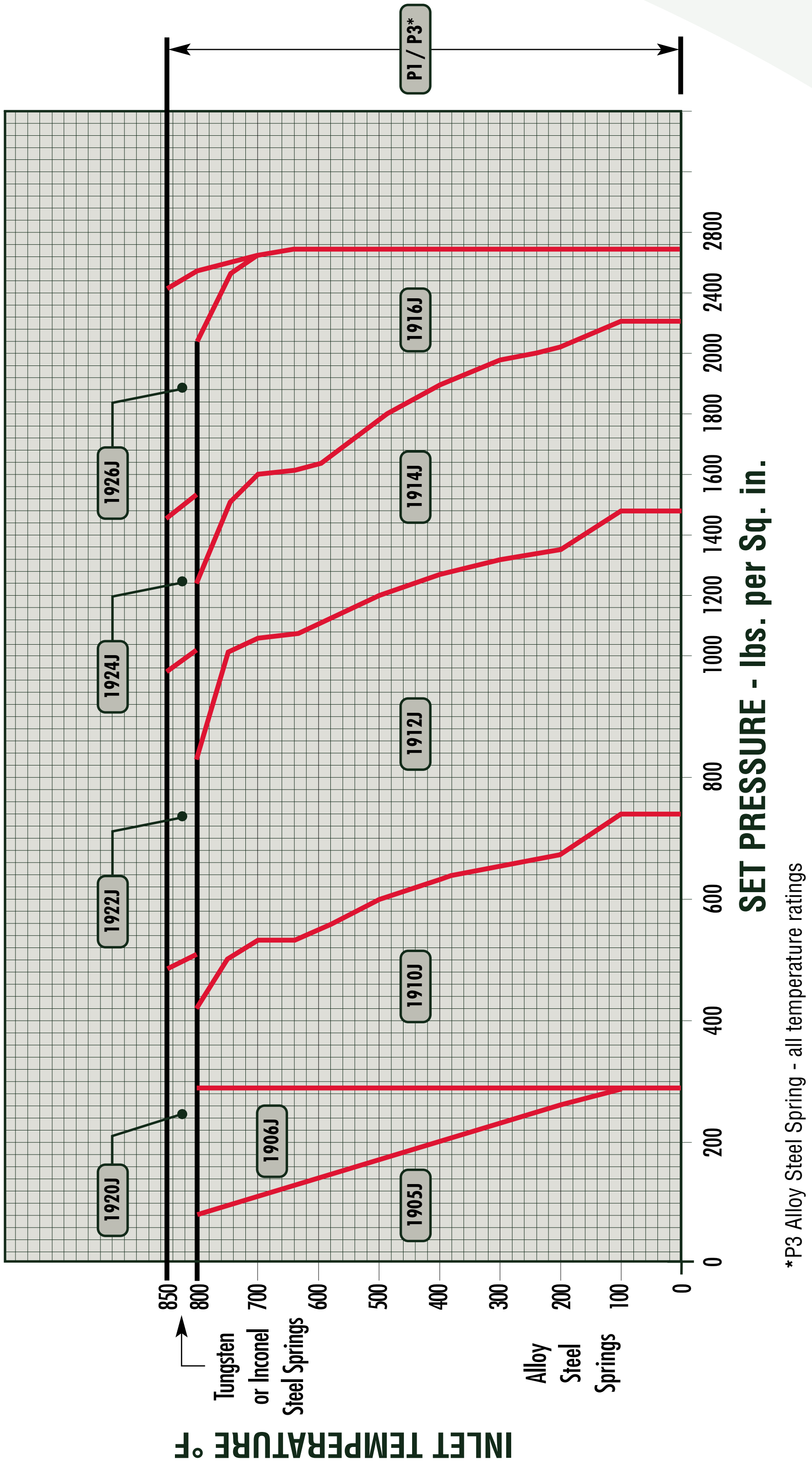
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
J Orifice - API area: 1.287 Sq. in.

Valve Type Number		Valve Size Inlet x Outlet	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows		Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905J / P1	1905-30J / P1	2 x 3	150	150	285	210	80	—	285	230
1905J / P3	—				285	210	80	—	—	—
1906J / P1	1906-30J / P1	2 x 3	300	150	285	285	285	—	285	230
1906J / P3	—				285	285	285	—	—	—
1910J / P1	1910-30J / P1	3 x 4	300	150	740	625	410	—	285	230
1910J / P3	—				740	625	410	—	—	—
1912J / P1	1912-30J / P1	3 x 4	600	150	1480	1205	825	—	285	230
1912J / P3	—				1480	1205	825	—	—	—
1914J / P1	1914-30J / P1	3 x 4	900	150	2220	1740	1235	—	285	230
1914J / P3	—				2220	1740	1235	—	—	—
1916J / P1	1916-30J / P1	3 x 4	1500	300	2700	2700	2060	—	600	230
1916J / P3	—				2700	2700	2060	—	—	—
1920J / P1	1920-30J / P1	3 x 4	300	150	—	—	510	485	285	230
1920J / P3	—				—	—	510	485	—	—
1922J / P1	1922-30J / P1	3 x 4	600	150	—	—	1015	975	285	230
1922J / P3	—				—	—	1015	975	—	—
1924J / P1	1924-30J / P1	3 x 4	900	150	—	—	1525	1460	285	230
1924J / P3	—				—	—	1525	1460	—	—
1926J / P1	1926-30J / P1	3 x 4	1500	300	—	—	2540	2435	600	230
1926J / P3	—				—	—	2540	2435	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
J Orifice - API area: 1.287 Sq. in.



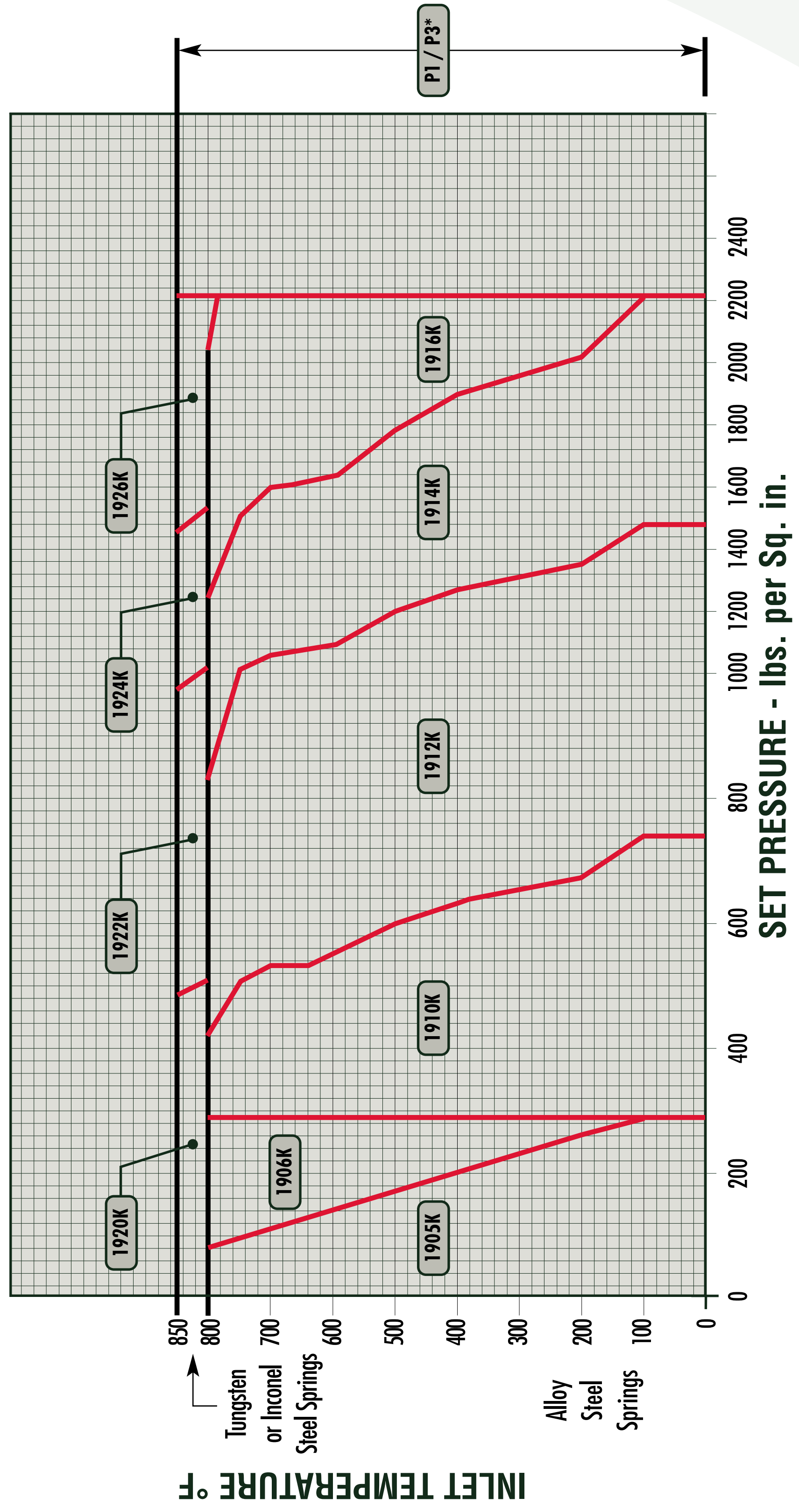
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
K Orifice - API area: 1.838 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905K / P1	1905-30K / P1	3 x 4	150	150	285	210	80	—	285	150
1905K / P3	—				285	210	80	—	—	—
1906K / P1	1906-30K / P1	3 x 4	300	150	285	285	285	—	285	150
1906K / P3	—				285	285	285	—	—	—
1910K / P1	1910-30K / P1	3 x 4	300	150	740	625	410	—	285	150
1910K / P3	—				740	625	410	—	—	—
1912K / P1	1912-30K / P1	3 x 4	600	150	1480	1205	825	—	285	200
1912K / P3	—				1480	1205	825	—	—	—
1914K / P1	1914-30K / P1	3 x 6	900	150	2220	1740	1235	—	285	200
1914K / P3	—				2220	1740	1235	—	—	—
1916K / P1	1916-30K / P1	3 x 6	1500	300	2160	2160	2060	—	600	200
1916K / P3	—				2160	2160	2060	—	—	—
1920K / P1	1920-30K / P1	3 x 4	300	150	—	—	510	485	285	150
1920K / P3	—				—	—	510	485	—	—
1922K / P1	1922-30K / P1	3 x 4	600	150	—	—	1015	975	285	200
1922K / P3	—				—	—	1015	975	—	—
1924K / P1	1924-30K / P1	3 x 6	900	150	—	—	1525	1460	285	200
1924K / P3	—				—	—	1525	1460	—	—
1926K / P1	1926-30K / P1	3 x 6	1500	300	—	—	2160	2160	600	200
1926K / P3	—				—	—	2160	2160	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
K Orifice - API area: 1.838 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

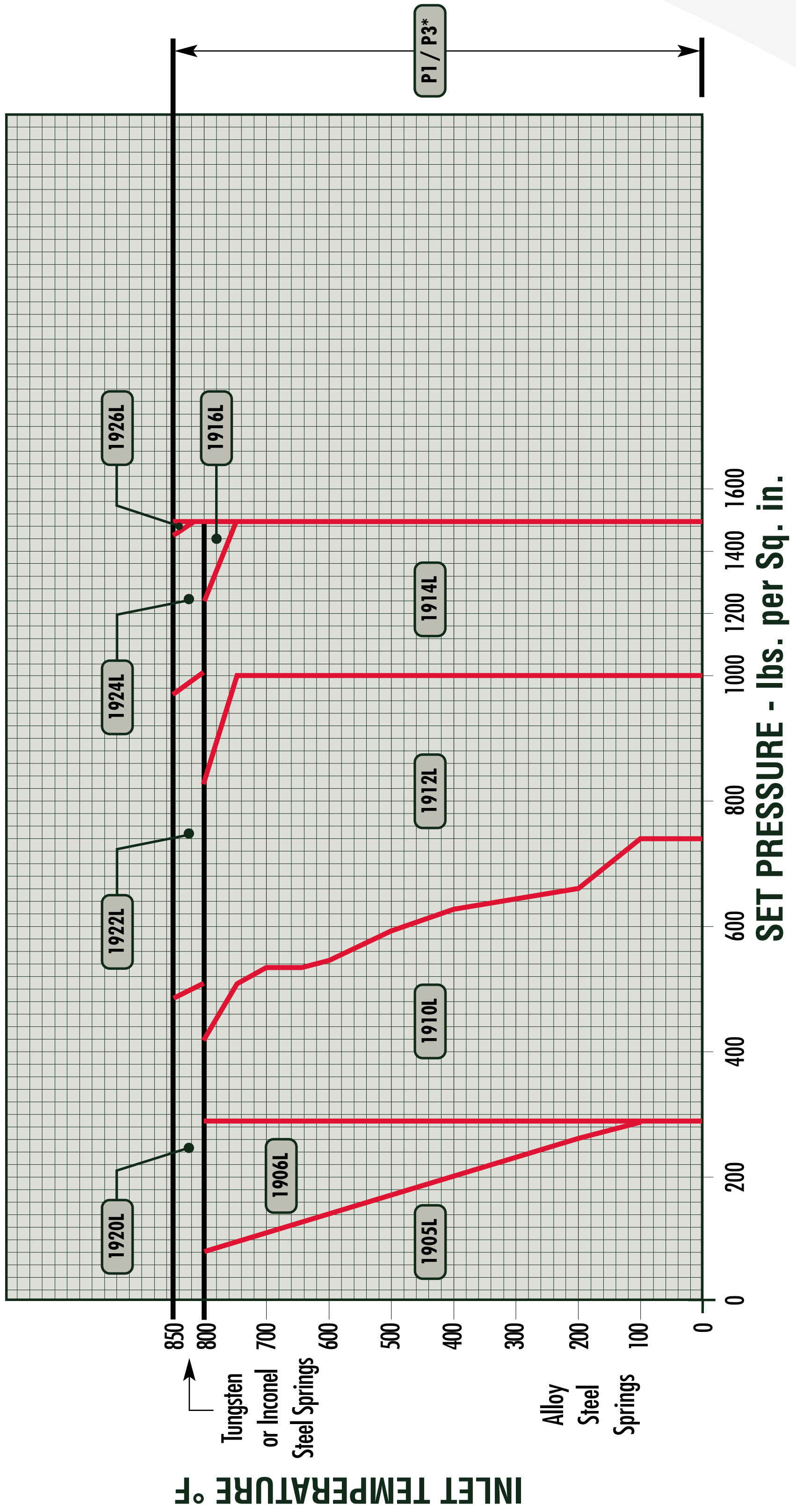
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
L Orifice - API area: 2.853 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905L / P1	1905-30L / P1	3 x 4	150	150	285	210	80	—	285	100
1905L / P3	—				285	210	80	—	—	—
1906L / P1	1906-30L / P1	3 x 4	300	150	285	285	285	—	285	100
1906L / P3	—				285	285	285	—	—	—
1910L / P1	1910-30L / P1	4 x 6	300	150	740	625	410	—	285	170
1910L / P3	—				740	625	410	—	—	—
1912L / P1	1912-30L / P1	4 x 6	600	150	1000	1000	825	—	285	170
1912L / P3	—				1000	1000	825	—	—	—
1914L / P1	1914-30L / P1	4 x 6	900	150	1500	1500	1235	—	285	170
1914L / P3	—				1500	1500	1235	—	—	—
1916L / P1	1916-30L / P1	4 x 6	1500	150	1500	1500	1500	—	285	170
1916L / P3	—				1500	1500	1500	—	—	—
1920L / P1	1920-30L / P1	4 x 6	300	150	—	—	510	485	285	170
1920L / P3	—				—	—	510	485	—	—
1922L / P1	1922-30L / P1	4 x 6	600	150	—	—	1015	975	285	170
1922L / P3	—				—	—	1015	975	—	—
1924L / P1	1924-30L / P1	4 x 6	900	150	—	—	1500	1235	285	170
1924L / P3	—				—	—	1500	1235	—	—
1926L / P1	1926-30L / P1	4 x 6	1500	150	—	—	1500	1500	285	170
1926L / P3	—				—	—	1500	1500	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
L Orifice - API area: 2.853 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

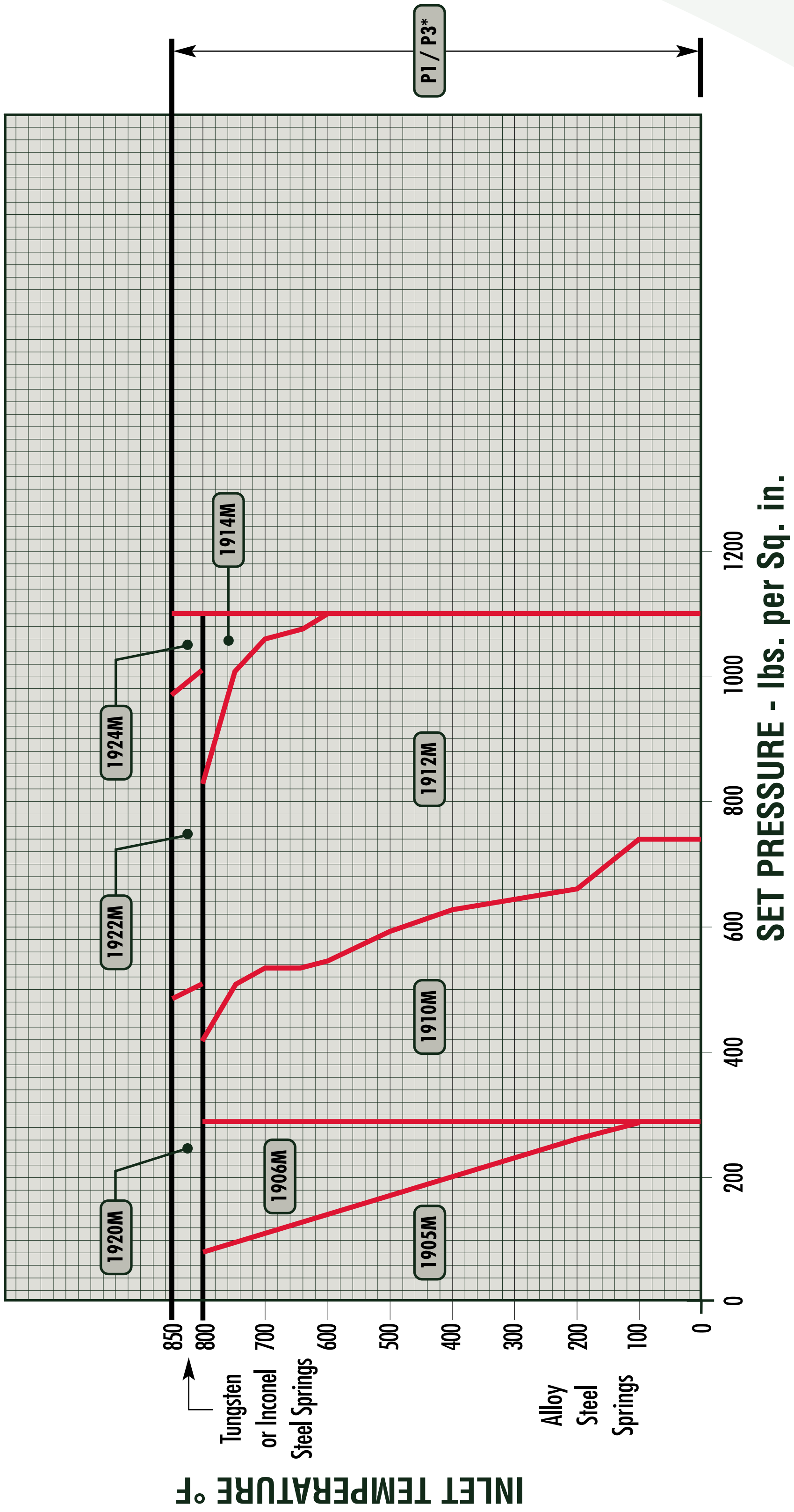
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
M Orifice - API area: 3.60 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905M / P1	1905-30M / P1	4 x 6	150	150	285	210	80	—	285	80
1905M / P3	—				285	210	80	—	—	—
1906M / P1	1906-30M / P1	4 x 6	300	150	285	285	285	—	285	80
1906M / P3	—				285	285	285	—	—	—
1910M / P1	1910-30M / P1	4 x 6	300	150	740	625	410	—	285	160
1910M / P3	—				740	625	410	—	—	—
1912M / P1	1912-30M / P1	4 x 6	600	150	1100	1100	825	—	285	160
1912M / P3	—				1100	1100	825	—	—	—
1914M / P1	1914-30M / P1	4 x 6	900	150	1100	1100	1100	—	285	160
1914M / P3	—				1100	1100	1100	—	—	—
1920M / P1	1920-30M / P1	4 x 6	300	150	—	—	510	485	285	160
1920M / P3	—				—	—	510	485	—	—
1922M / P1	1922-30M / P1	4 x 6	600	150	—	—	1015	975	285	160
1922M / P3	—				—	—	1015	975	—	—
1924M / P1	1924-30M / P1	4 x 6	900	150	—	—	1100	1100	285	160
1924M / P3	—				—	—	1100	1100	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
M Orifice - API area: 3.60 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

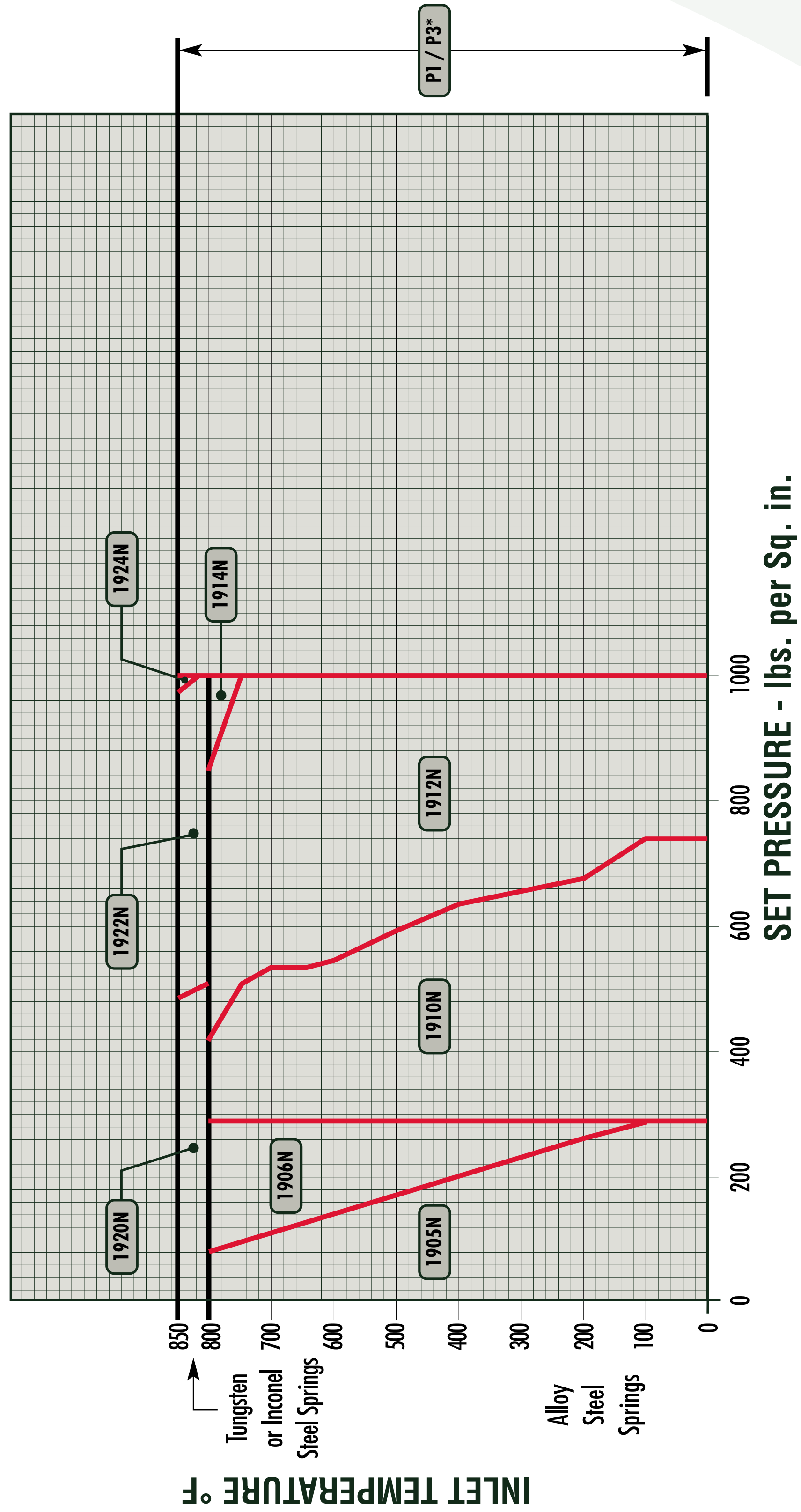
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
N Orifice - API area: 4.34 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905N / P1	1905-30N / P1	4 x 6	150	150	285	210	80	—	285	80
1905N / P3	—				285	210	80	—	—	—
1906N / P1	1906-30N / P1	4 x 6	300	150	285	285	285	—	285	80
1906N / P3	—				285	285	285	—	—	—
1910N / P1	1910-30N / P1	4 x 6	300	150	740	625	410	—	285	160
1910N / P3	—				740	625	410	—	—	—
1912N / P1	1912-30N / P1	4 x 6	600	150	1000	1000	975	—	285	160
1912N / P3	—				1000	1000	975	—	—	—
1914N / P1	1914-30N / P1	4 x 6	900	150	1000	1000	1000	—	285	160
1914N / P3	—				1000	1000	1000	—	—	—
1920N / P1	1920-30N / P1	4 x 6	300	150	—	—	510	485	285	160
1920N / P3	—				—	—	510	485	—	—
1922N / P1	1922-30N / P1	4 x 6	600	150	—	—	1000	975	285	160
1922N / P3	—				—	—	1000	975	—	—
1924N / P1	1924-30N / P1	4 x 6	900	150	—	—	1000	1000	285	160
1924N / P3	—				—	—	1000	1000	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
N Orifice - API area: 4.34 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

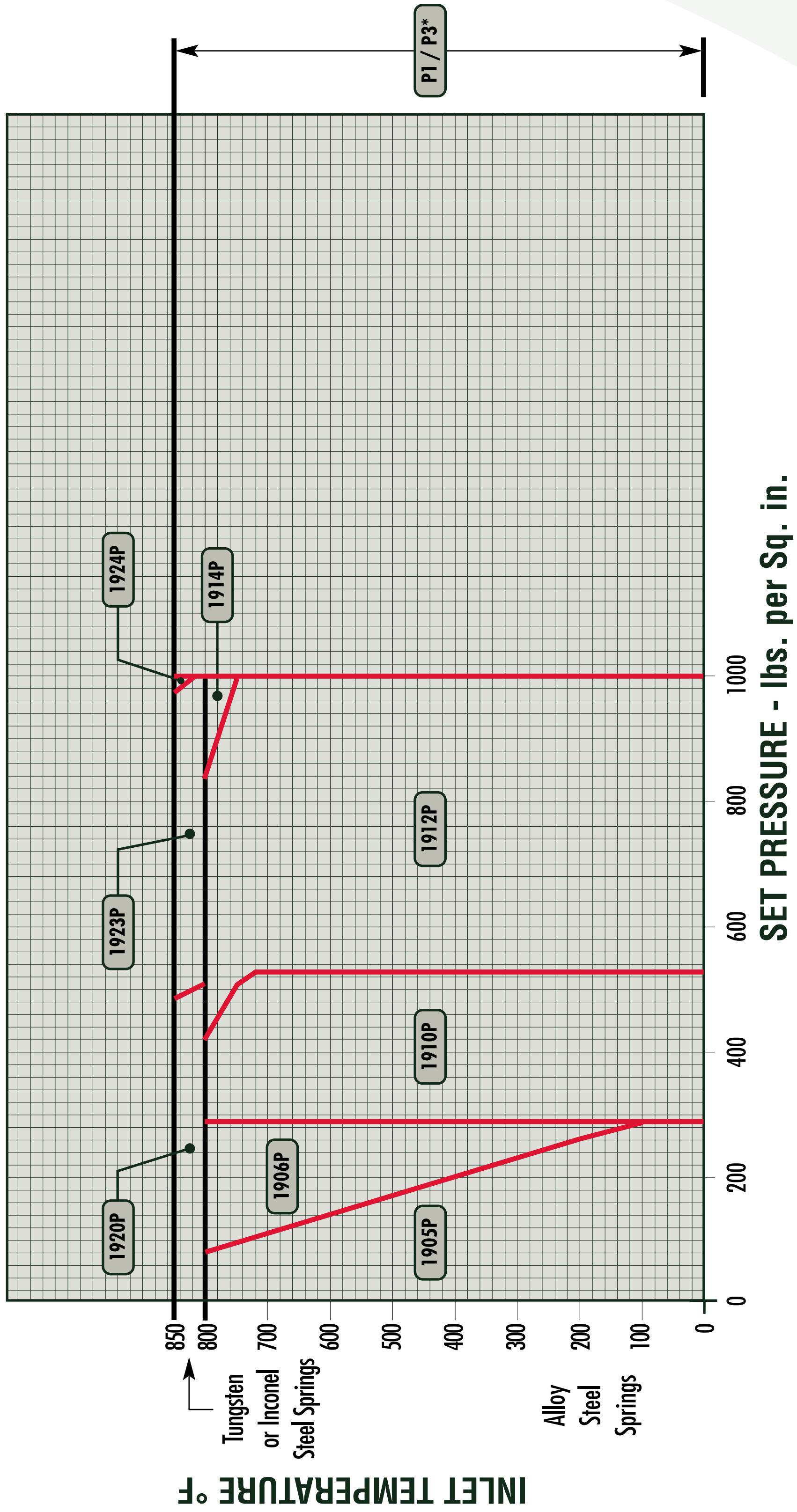
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
P Orifice - API area: 6.38 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905P / P1	1905-30P / P1	4 x 6	150	150	285	210	80	—	285	80
1905P / P3	—				285	210	80	—	—	—
1906P / P1	1906-30P / P1	4 x 6	300	150	285	285	285	—	285	80
1906P / P3	—				285	285	285	—	—	—
1910P / P1	1910-30P / P1	4 x 6	300	150	525	525	410	—	285	150
1910P / P3	—				525	525	410	—	—	—
1912P / P1	1912-30P / P1	4 x 6	600	150	1000	1000	825	—	285	150
1912P / P3	—				1000	1000	825	—	—	—
1914P / P1	1914-30P / P1	4 x 6	900	150	1000	1000	1000	—	285	150
1914P / P3	—				1000	1000	1000	—	—	—
1920P / P1	1920-30P / P1	4 x 6	300	150	—	—	510	485	285	150
1920P / P3	—				—	—	510	485	—	—
1923P / P1	1923-30P / P1	4 x 6	600	150	—	—	1000	975	285	150
1923P / P3	—				—	—	1000	975	—	—
1924P / P1	1924-30P / P1	4 x 6	900	150	—	—	1000	1000	285	150
1924P / P3	—				—	—	1000	1000	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
P Orifice - API area: 6.38 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

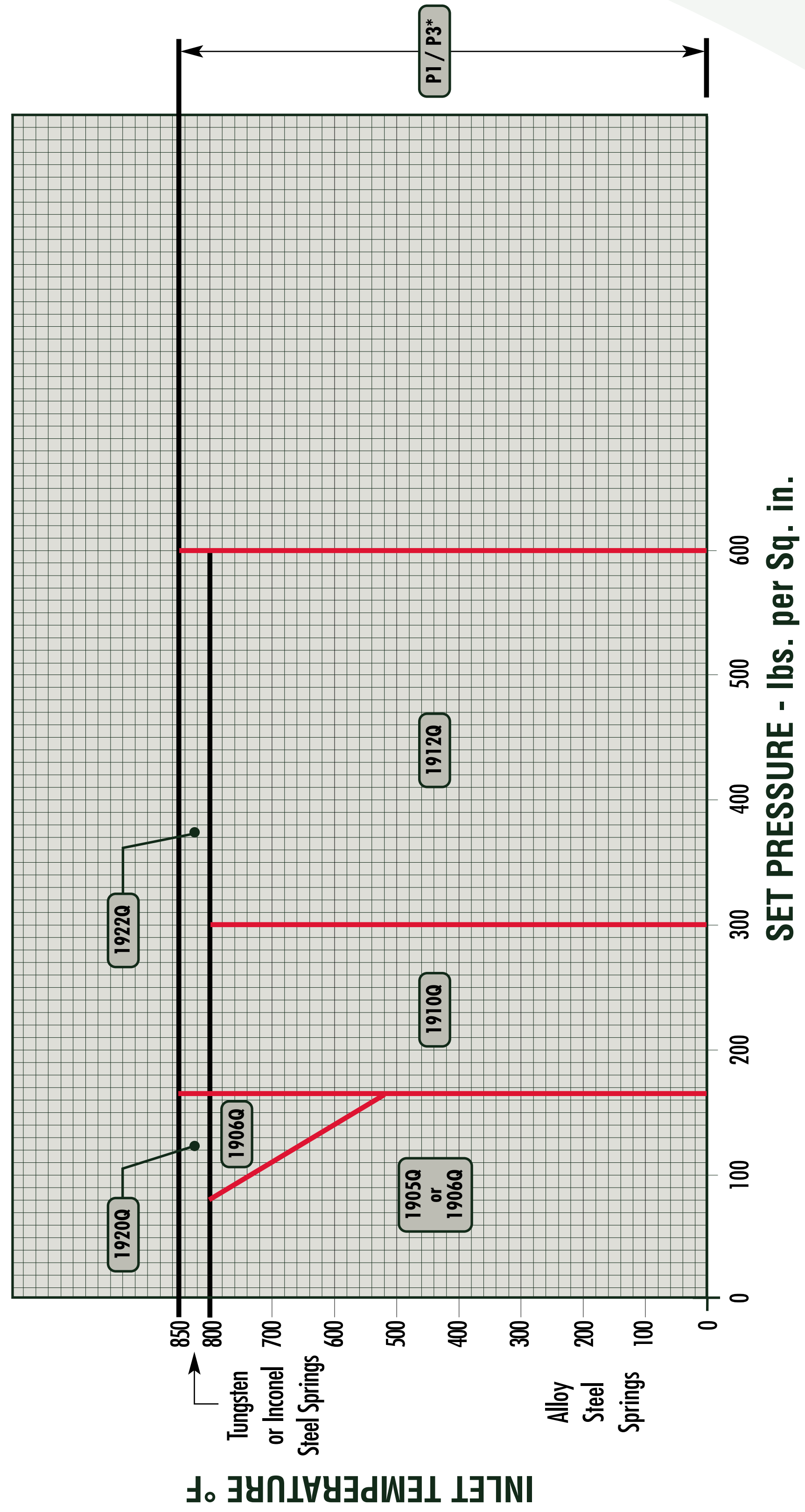
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
Q Orifice - API area: 11.05 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905Q / P1	1905-30Q / P1	6 x 8	150	150	165	165	80	—	115	70
1905Q / P3	—				165	165	80	—	—	—
1906Q / P1	1906-30Q / P1	6 x 8	300	150	165	165	165	—	115	70
1906Q / P3	—				165	165	165	—	—	—
1910Q / P1	1910-30Q / P1	6 x 8	300	150	300	300	300	—	115	115
1910Q / P3	—				300	300	300	—	—	—
1912Q / P1	1912-30Q / P1	6 x 8	600	150	600	600	600	—	115	115
1912Q / P3	—				600	600	600	—	—	—
1920Q / P1	1920-30Q / P1	6 x 8	300	150	—	—	165	165	115	115
1920Q / P3	—				—	—	165	165	—	—
1922Q / P1	1922-30Q / P1	6 x 8	600	150	—	—	600	600	115	115
1922Q / P3	—				—	—	600	600	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
Q Orifice - API area: 11.05 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

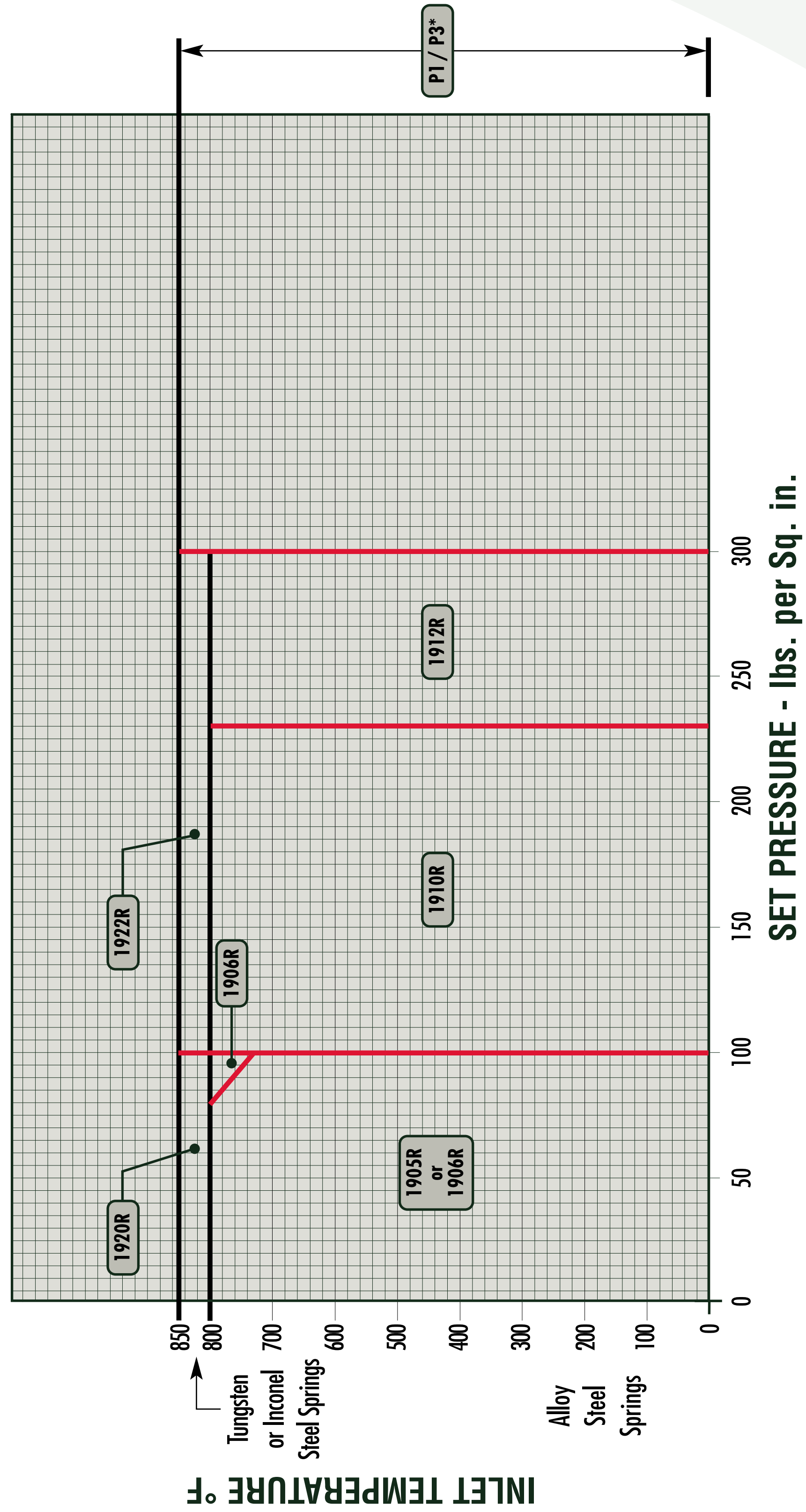
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
R Orifice - API area: 16.0 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905R / P1	1905-30R / P1	6 x 8	150	150	100	100	80	—	60	60
1905R / P3	—				100	100	80	—	—	—
1906R / P1	1906-30R / P1	6 x 8	300	150	100	100	100	—	60	60
1906R / P3	—				100	100	100	—	—	—
1910R / P1	1910-30R / P1	6 x 10	300	150	230	230	230	—	100	100
1910R / P3	—				230	230	230	—	—	—
1912R / P1	1912-30R / P1	6 x 10	600	150	300	300	300	—	100	100
1912R / P3	—				300	300	300	—	—	—
1920R / P1	1920-30R / P1	6 x 8	300	150	—	—	100	100	60	60
1920R / P3	—				—	—	100	100	—	—
1922R / P1	1922-30R / P1	6 x 10	600	150	—	—	300	300	100	100
1922R / P3	—				—	—	300	300	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
R Orifice - API area: 16.0 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

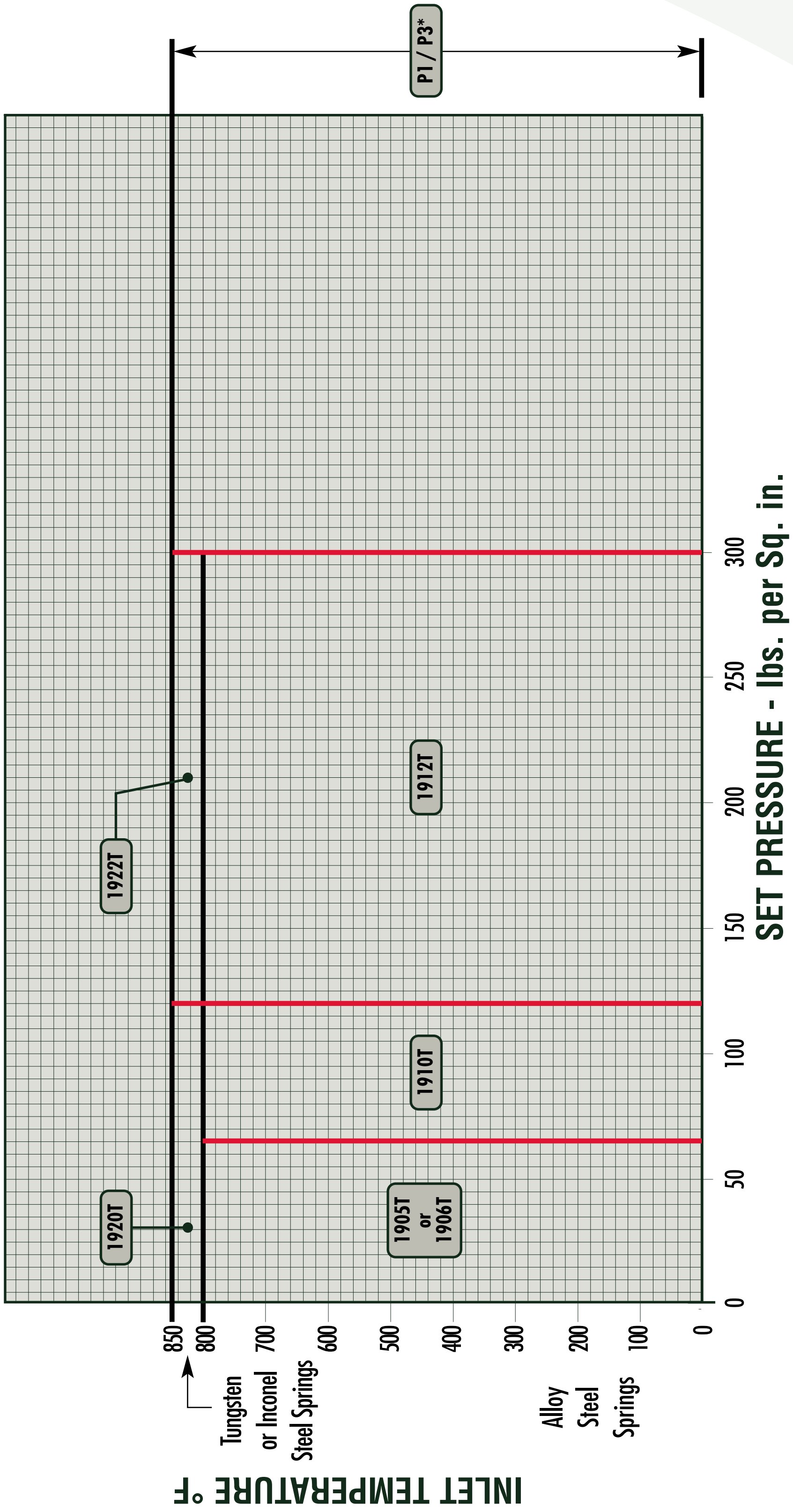
Selection Table for Steam Service

1900 & 1900-30 P1 & P3 Series
T Orifice - Area: 30.21 Sq. in.

Valve Type Number		Valve Size	ANSI Flanged Ratings		Inlet Pressure (psig) & Temperature Limits - °F				Back Press. Limits (psig) at 100°F	
Standard	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100	Sat. Stm.	800	850	Standard	Bellows
1905T / P1	1905-30T / P1	8 x 10	150	150	65	65	65	—	30	30
1905T / P3	—				65	65	65	—	—	—
1906T / P1	1906-30T / P1	8 x 10	300	150	65	65	65	—	30	30
1906T / P3	—				65	65	65	—	—	—
1910T / P1	1910-30T / P1	8 x 10	300	150	120	120	120	—	60	60
1910T / P3	—				120	120	120	—	—	—
1912T / P1	1912-30T / P1	8 x 10	300	150	300	300	300	—	100	100
1912T / P3	—				300	300	300	—	—	—
1920T / P1	1920-30T / P1	8 x 10	300	150	—	—	120	120	60	60
1920T / P3	—				—	—	120	120	—	—
1922T / P1	1922-30T / P1	8 x 10	300	150	—	—	300	300	100	100
1922T / P3	—				—	—	300	300	—	—

Selection Chart for Steam Service

1900 & 1900-30 P1 & P3 Series
T Orifice - Area: 30.21 Sq. in.



*P3 Alloy Steel Spring - all temperature ratings

1900/P1 & P3 Flanged Valves
STANDARD MATERIALS - ORIFICE CAPACITIES - STEAM
ASME B & PVC, Section I - (USCS Units)

Capacities based on Set Pressure plus 3%
or 2 psi overpressure, whichever is greater.
Capacities in lbs. per hour of saturated steam.

Set Press. (psig)	Orifice Area (Sq. in.)													
	D 0.1279	E 0.2279	F 0.3568	G 0.5849	H 0.9127	J 1.496	K 2.138	L 3.317	M 4.186	N 5.047	P 7.417	Q 12.85	R 18.6	T 30.21
15	178	316	496	813	1268	2078	2970	4608	5816	7012	10304	17853	25841	41971
20	206	366	574	941	1468	2406	3439	5335	6733	8118	11930	20668	29917	48591
30	262	466	730	1197	1868	3062	4376	6789	8567	10330	15180	26300	38069	61831
40	318	566	887	1453	2268	3718	5313	8243	10402	12542	18431	31932	46220	75071
50	374	666	1043	1710	2668	4373	6250	9696	12237	14754	21682	37563	54372	88311
60	430	765	1199	1966	3068	5029	7187	11150	14071	16965	24932	43195	62524	101551
70	487	866	1357	2225	3472	5691	8133	12618	15924	19199	28215	48883	70757	114923
80	545	969	1518	2489	3884	6366	9098	14116	17814	21478	31563	54684	79153	128560
90	603	1072	1679	2753	4296	7042	10063	15613	19703	23756	34912	60485	87550	142197
100	660	1175	1841	3017	4708	7717	11029	17110	21593	26034	38260	66285	95946	155835
120	776	1380	2163	3545	5532	9068	12959	20105	25372	30591	44956	77886	112738	183109
140	891	1586	2485	4073	6356	10418	14889	23100	29151	35147	51652	89488	129531	210383
160	1007	1791	2807	4601	7180	11769	16819	26094	32931	39704	58348	101089	146324	237658
180	1123	1997	3129	5129	8004	13119	18750	29089	36710	44261	65045	112690	163116	264932
200	1238	2203	3451	5657	8828	14470	20680	32084	40489	48817	71741	124292	179909	292206
220	1354	2408	3773	6186	9652	15821	22610	35078	44268	53374	78437	135893	196701	319481
240	1469	2614	4095	6714	10476	17171	24540	38073	48048	57930	85134	147494	213494	346755
260	1585	2819	4418	7242	11300	18522	26471	41068	51827	62487	91830	159096	230286	374030
280	1700	3025	4740	7770	12124	19873	28401	44062	55606	67043	98526	170697	247079	401304
300	1816	3231	5062	8298	12948	21223	30331	47057	59385	71600	105222	182298	263871	428578
320	1932	3436	5384	8826	13772	22574	32261	50052	63164	76157	111919	193900	—	—
340	2047	3642	5706	9354	14596	23924	34192	53046	66944	80713	118615	205501	—	—
360	2163	3847	6028	9882	15420	25275	36122	56041	70723	85270	125311	217102	—	—
380	2278	4053	6350	10410	16244	26626	38052	59036	74502	89826	132007	228704	—	—
400	2394	4258	6672	10938	17068	27976	39982	62030	78281	94383	138704	240305	—	—
420	2509	4464	6995	11466	17892	29327	41912	65025	82061	98939	145400	251906	—	—
440	2625	4670	7317	11994	18716	30678	43843	68020	85840	103496	152096	263507	—	—
460	2740	4875	7639	12522	19540	32028	45773	71014	89619	108052	158792	275109	—	—
480	2856	5081	7961	13050	20364	33379	47703	74009	93398	112609	165489	286710	—	—
500	2972	5286	8283	13578	21188	34729	49633	77004	97178	117166	172185	298311	—	—
600	3549	6314	9894	16219	25308	41483	59285	91977	116074	139948	205666	356318	—	—
700	4127	7342	11504	18859	29428	48236	68936	106951	134970	162731	239147	—	—	—
800	4705	8370	13115	21499	33548	54989	78587	121924	153866	185514	272629	—	—	—
900	5283	9398	14726	24140	37668	61742	88238	136897	172762	208297	306110	—	—	—
1000	5861	10426	16336	26780	41788	68495	97889	151871	191658	231080	339591	—	—	—
1100	6439	11454	17947	29420	45909	75248	107541	166844	210554	—	—	—	—	—
1200	7016	12482	19558	32061	50029	82001	117192	181817	—	—	—	—	—	—
1300	7594	13510	21168	34701	54149	88755	126843	196791	—	—	—	—	—	—
1400	8172	14538	22779	37341	58269	95508	136494	211764	—	—	—	—	—	—
1500	8750	15566	24389	39982	62389	102261	146146	226737	—	—	—	—	—	—
1520	8865	15771	24712	40510	63213	103611	148076	—	—	—	—	—	—	—
2000	12018	21380	33500	54917	85694	140460	200738	—	—	—	—	—	—	—
2500	15739	27999	43871	71918	112224	183945	—	—	—	—	—	—	—	—
3000	20351	36203	56725	92989	145104	237838	—	—	—	—	—	—	—	—
3100	21465	38185	59831	98081	153049	250862	—	—	—	—	—	—	—	—

NOTES: 1 Relieving capacities indicated are 90% of average capacity in accordance with latest ASME code requirements.
2 For Superheat Correction Factors, refer to “Technical Information” section.

1982

Safety Relief Valve

Consolidated®

Table of Contents

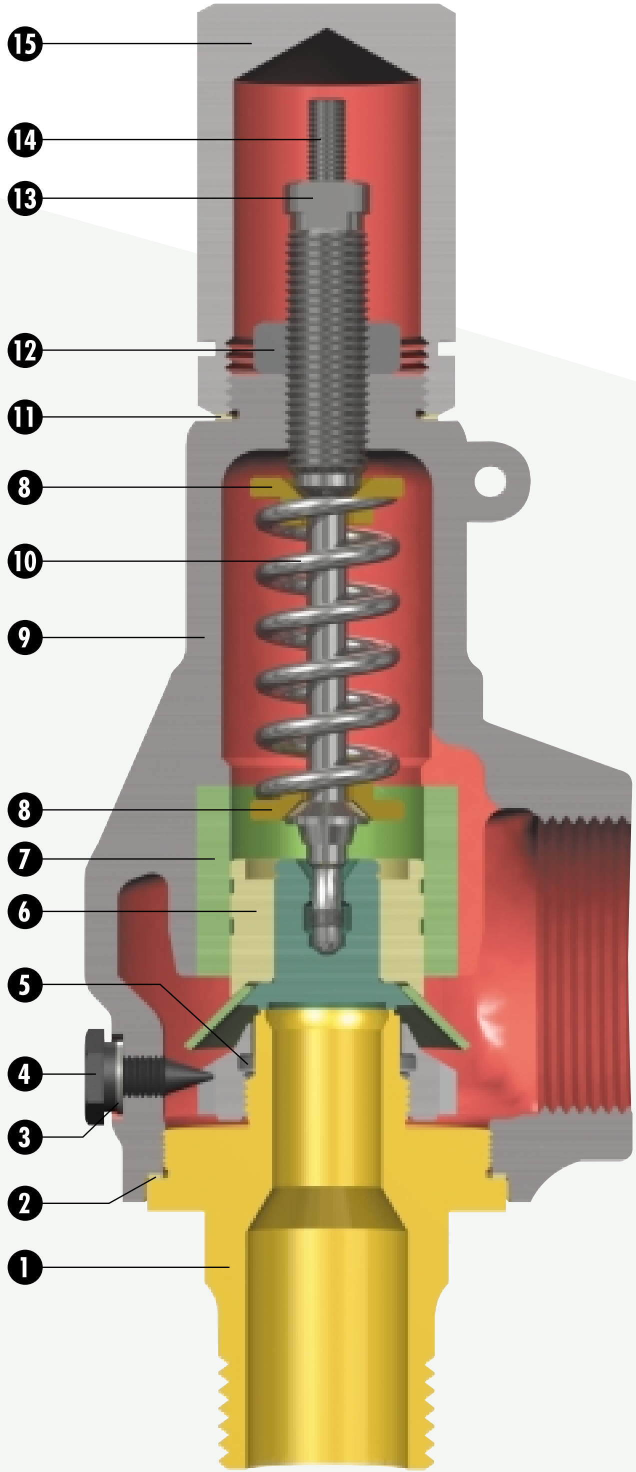
1982

Scope of Design

This product is normally supplied with threaded inlet and oulet connections. The valve ranges in inlet sizes from 1/2" thru 2". Maximum pressure setting is 500 psig, minimum pressure setting is 10 psig. This valve is available with a screwed cap, packed lever, plain lever and gag. Unless otherwise specified, the valve is shipped with a screwed cap. The 2" 1982 valve can be used for all service media except steam service above 100 psig.

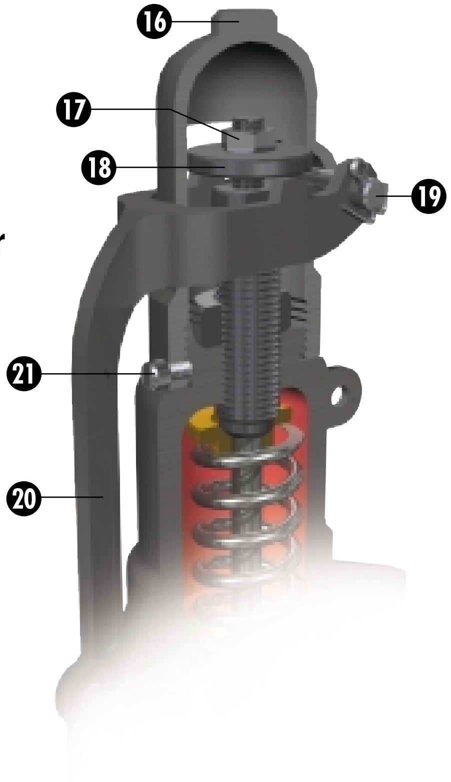
Valve Size (in)	Valve Type	Inlet Pressure & Temperature Limits	Actual (ASME) Orifice Area	Standard Connections		Back Pressure Limit
			(in^2)	INLET	OUTLET	
1/2 x 3/4	1982c 1982t	500 psig to 400°F (204.4°C) 500 psig to 800°F (426.6°C)	.121	Male Threaded	Female Threaded	50 psig
3/4 x 1	1982c 1982t	500 psig to 400°F (204.4°C) 500 psig to 800°F (426.6°C)	.216	Male Threaded	Female Threaded	50 psig
1 x 1-1/2	1982c 1982t	500 psig to 400°F (204.4°C) 500 psig to 800°F (426.6°C)	.332	Male Threaded	Female Threaded	50 psig
1-1/2 x 2	1982c 1982t	500 psig to 400°F (204.4°C) 500 psig to 800°F (426.6°C)	.857	Male Threaded	Female Threaded	50 psig
2 x 2-1/2	1982c 1982t	500 psig to 400°F (204.4°C) 500 psig to 800°F (426.6°C)	1.399	Male Threaded	Female Threaded	50 psig

Materials

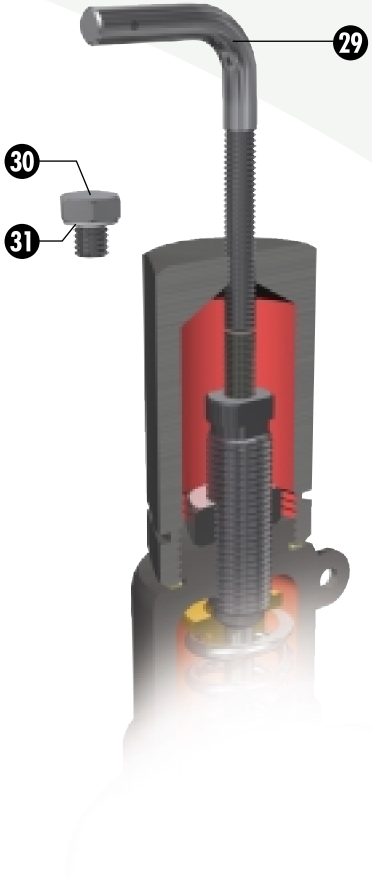


	Part	Material
1	Base	
	1/2", 3/4", 1"	304 SS
	1-1/2", 2"	SA351 CF8 SS
2	Bonnet Gasket	Soft Iron
3	Adjusting Ring Pin Gasket	Soft Iron
4	Adjusting Ring Pin	416 SS
5	Adjusting Ring	316 SS
6	Disc Assembly	
	Disc Collar	304 SS
	Disc Holder	304 SS
	Disc	304 SS
	Disc Retainer	PH15-7 MO SS
7	Guide	410 SS
8	Spring Washer	Carbon Steel (Phosphated)
9	Bonnet	SA216 WCC Carbon Steel (Phospated)
10	Spring	
	1982c	Alloy Steel (Phosphated)
	1982 t	Inconel X-750
11	Cap Gasket	Soft Iron
12	Adjusting Screw Locknut	Carbon Steel (Phosphated)
13	Adjusting Screw	416 SS
14	Spindle	Carbon Steel (Phosphated)
15	Screwed Cap	Carbon Steel (Phosphated)

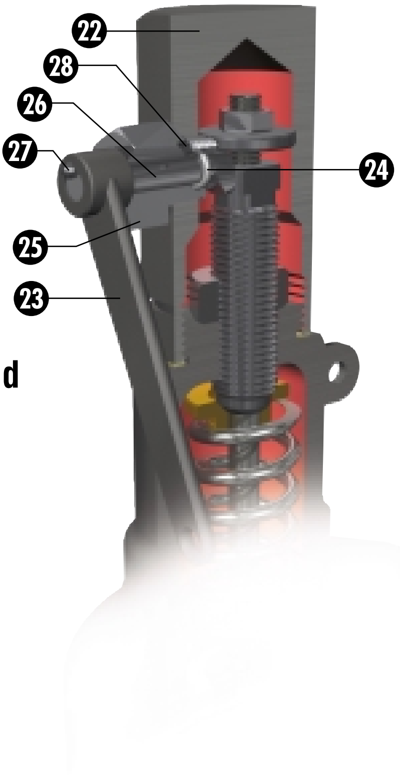
Plain Lever



Cap w/ Gag

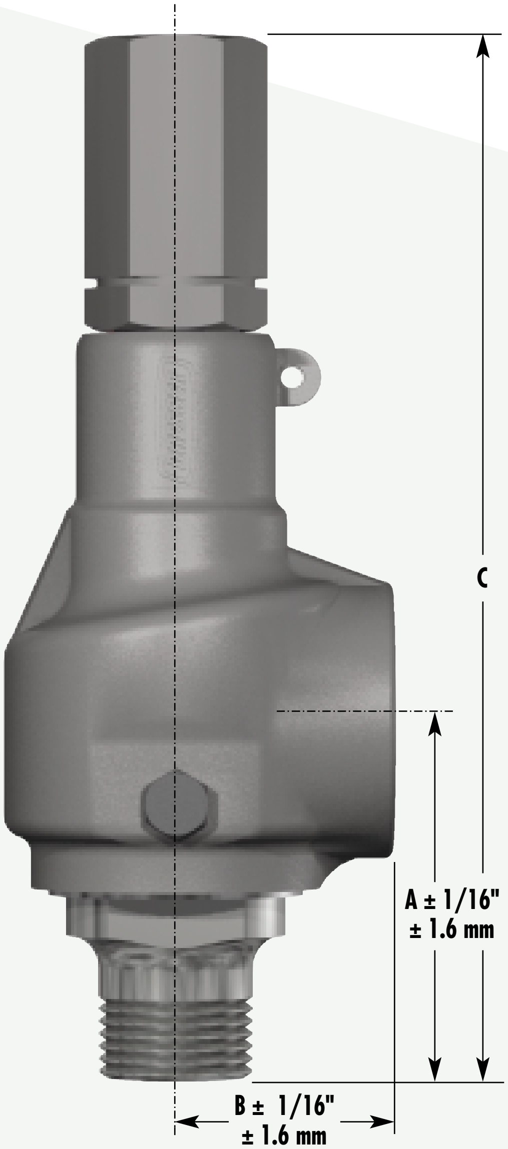


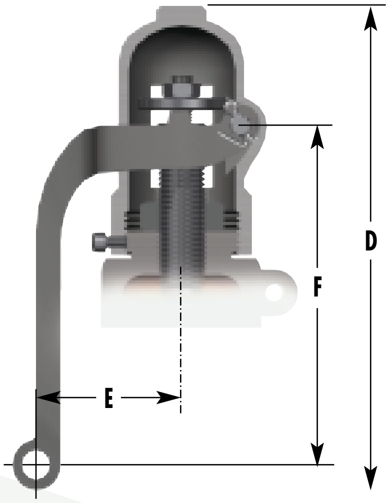
Packed Lever

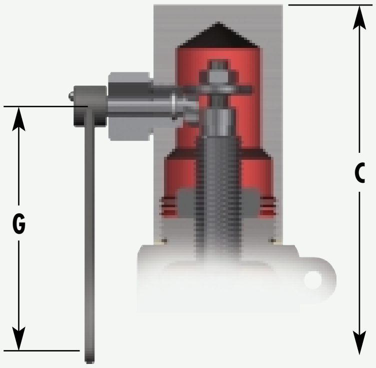


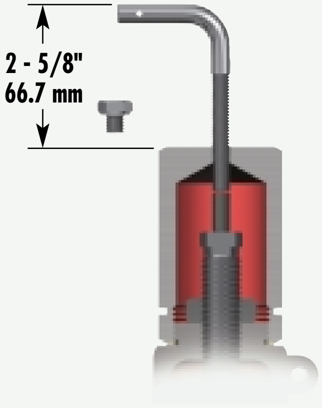
	Part	Material
16	Plain Cap	Malleable Iron
17	Release Locknut	Carbon Steel
18	Release Nut	410/416 SS
19	Lever Pin	Carbon Steel
20	Plain Lever	Malleable Iron
21	Cap Screw	Carbon Steel
22	Packed Cap	Carbon Steel (Phosphated)
23	Packed Lever	Malleable Iron
24	O-Ring	Viton
25	Bushing	416 SS
26	Cam Shaft	410 SS
27	Drive Stud	Carbon Steel (Nickel Plated)
28	Lever Gasket	Soft Iron
29	Gag	Carbon Steel
30	Sealing Plug	Carbon Steel
31	Sealing Plug Gasket	Soft Iron

Dimensions & Weights









Dimensions & Weights

1982 Series Valves
USCS Dimensions (in.) and Weights (lbs.)

Inlet x Outlet	Size & Type	A	B	C	D	E	F	G	Approx. Weight
1/2 MNPT x 3/4 FNPT	1/2 - 1982	2 - 5/8	1-1/4	7 - 1/8	7 - 1/4	1 - 3/8	2 - 3/4	2 - 3/8	2.2
3/4 MNPT x 1 FNPT	3/4 - 1982	2 - 3/4	1-7/16	7 - 1/2	7 - 5/8	1 - 3/8	2 - 3/4	2 - 3/8	3.0
1 MNPT x 1-1/2 FNPT	1 - 1982	3 - 1/4	1-7/8	9 - 1/8	9 - 1/8	2 - 1/8	4 - 5/8	3 - 1/2	5.0
1-1/2 MNPT x 2 FNPT	1-1/2 - 1982	3 - 7/8	2 - 5/8	12	11 - 7/8	3 - 11/16	5 - 13/16	4 - 3/4	12.0
2 MNPT x 2-1/2 FNPT	2 - 1982	4 - 3/8	3 - 1/4	14 - 1/16	13 - 7/8	3 - 11/16	5 - 13/16	4 - 3/4	18.5

1982 Series Valves
Metric Dimensions (mm) and Weights (kg)

Inlet x Outlet	Size & Type	A	B	C	D	E	F	G	Approx. Weight
1/2 MNPT x 3/4 FNPT	1/2 - 1982	66.7	31.8	181.0	184.2	34.9	69.8	60.3	1.0
3/4 MNPT x 1 FNPT	3/4 - 1982	69.9	36.5	190.5	193.7	34.9	69.8	60.3	1.4
1 MNPT x 1-1/2 FNPT	1 - 1982	82.6	47.6	231.8	231.8	54.0	117.5	88.9	2.3
1-1/2 MNPT x 2 FNPT	1-1/2 - 1982	98.4	66.7	304.8	301.6	93.6	147.6	120.7	5.4
2 MNPT x 2-1/2 FNPT	2 - 1982	111.1	82.6	357.2	352.4	93.6	147.6	120.7	8.4

Capacities

1982 Valve Orifice Capacities for Air & Steam (USCS Units)
ASME B & PVC, Section VIII

Set Pressure plus 10% overpressure
or 3 psig, whichever is greater

	SCFM Air @ 60°F (15°C)					Pounds of Saturated Steam Per Hour				
	Valve Size / Orifice Area (Sq. In.)									
Set Press. (psig)	**1/2" (0.121)**	**3/4" (0.216)**	**1" (0.332)**	**1-1/2" (0.857)**	**2" (1.399)**	**1/2" (0.121)**	**3/4" (0.216)**	**1" (0.332)**	**1-1/2" (0.857)**	**2" (1.399)**
15	62	110	170	439	717	174	311	478	1233	2014
20	71	127	196	507	827	200	358	551	1422	2322
30	90	161	248	641	1047	254	453	697	1800	2938
40	111	198	305	789	1288	312	558	858	2215	3616
50	132	236	363	937	1530	371	662	1018	2630	4293
60	153	273	420	1085	1771	429	767	1179	3045	4971
70	174	310	477	1233	2013	488	872	1340	3460	5648
80	195	348	535	1381	2254	547	946	1501	3875	6326
90	215	385	592	1529	2496	605	1081	1662	4290	7004
100	236	422	649	1677	2737	664	1186	1822	4705	7681
120	278	497	764	1972	3220	781	1395	2144	5535	
140	320	571	878	2268	3703	898	1604	2466	6366	
160	362	646	993	2564	4186	1016	1813	2787	7196	
180	403	721	1108	2860	4669	1133	2022	3109	8026	
200	445	795	1222	3156	5152	1250	2232	3431	8856	
220	487	870	1337	3452	5635	1367	2441	3752	9686	
240	529	944	1452	3748	6118	1484	2650	4074	10516	
260	571	1019	1566	4044	6601	1602	2859	4395	11347	
280	612	1093	1681	4340	7084	1719	3069	4717	12177	
300	654	1168	1795	4635	7567	1836	3278	5039	13007	
320	696	1243	1910	4931	8050	1953	3487	5360	13837	
340	738	1317	2025	5227	8533	2070	3696	5682	14667	
360	779	1392	2139	5523	9016	2188	3906	6003	15498	
380	821	1466	2254	5819	9499	2305	4115	6325	16328	
400	863	1541	2369	6115	9982	2422	4324	6647	17158	
420	905	1615	2483	6411	10465	2539	4533	6968	17988	
440	946	1690	2598	6707	10948	2657	4743	7290	18818	
460	988	1765	2712	7002	11431	2774	4952	7612	19649	
480	1030	1839	2827	7298	11914	2891	5161	7933	20479	
500	1072	1914	2942	7594	12397	3008	5370	8255	21309	

Capacities

1982 LS Valve Orifice Capacities for Water (USCS Units)
ASME B & PVC, Section VIII

Set Pressure Plus 10% overpressure
or 3 psig, whichever is greater,
0 psig back pressue

	GPM Water @ 70°F at 10% Overpressure				
	Valve Size / Orifice Area (Sq. In.)				
Set Press. (psig)	1/2" (0.121)	3/4" (0.216)	1" (0.332)	1-1/2" (0.857)	2" (1.399)
15	14.79	26.40	40.57	104.73	170.96
20	16.71	29.84	45.86	118.39	193.26
30	20.02	35.74	54.93	141.80	231.49
40	23.12	41.27	63.43	163.74	267.30
50	25.85	46.14	70.92	183.07	298.85
60	28.31	50.55	77.69	200.54	327.37
70	30.58	54.59	83.91	216.61	353.60
80	32.69	58.36	89.71	231.57	378.02
90	34.68	61.90	95.15	245.61	400.95
100	36.55	65.25	100.30	258.90	422.64
120	40.04	71.48	109.87	283.61	462.97
140	43.25	77.21	118.67	306.33	500.07
160	46.24	82.54	126.87	327.48	534.60
180	49.04	87.55	134.56	347.35	567.03
200	51.70	92.28	141.84	366.14	597.70
220	54.22	96.79	148.76	384.01	626.87
240	56.63	101.09	155.38	401.08	654.75
260	58.94	105.22	161.72	417.46	681.48
280	61.17	109.19	167.83	433.22	707.21
300	63.31	113.02	173.72	448.43	732.03
320	65.39	116.73	179.42	463.13	756.03
340	67.40	120.32	184.94	477.39	779.30
360	69.36	123.81	190.30	491.23	801.90
380	71.26	127.20	195.51	504.69	823.87
400	73.11	130.51	200.59	517.80	845.27
420	74.91	133.73	205.55	530.58	866.15
440	76.68	136.88	210.38	543.07	886.53
460	78.40	139.95	215.11	555.28	906.45
480	80.09	142.96	219.74	567.22	925.95
500	81.74	145.91	224.27	578.92	945.04

In-house Review

19000

Safety Relief Valve

Consolidated®

Table of Contents

19000 Series Threaded Safety Relief Valve

Introduction

The 19000 Series valves are designed and manufactured in compliance with ASME B & PVC, Section VIII and Section III (Class I, II and III) as well as being CEN compliant to the European proposed standards for safety valves. Seat tightness, blowdown and capacity on all types of media meets the industry needs for overpressure protection in chemical, petrochemical, refinery, power generation (nuclear and conventional) and other commercial applications.

General Information

The 19000 Series threaded safety relief valve has 316 stainless steel trim as standard material. Reliable performance and easy maintenance procedures are characteristics of this valve (when properly installed in suitable applications for its design).

The 19000 Series valves has three pressure classes, 19000L (5 through 290 psig), 19000M (291 through 2000 psig), and 19000H (2001 psig and up). Standard 19000 parts are used for both liquid applications and gas applications. It is designed for short blowdown on all medias, typically less than 10%.

All 19000 Series valves have fixed blowdown. This means that the parts are designed so that there is no blowdown adjustment required when setting or testing the valve.

Design Options

a. O-Ring seat seal valves

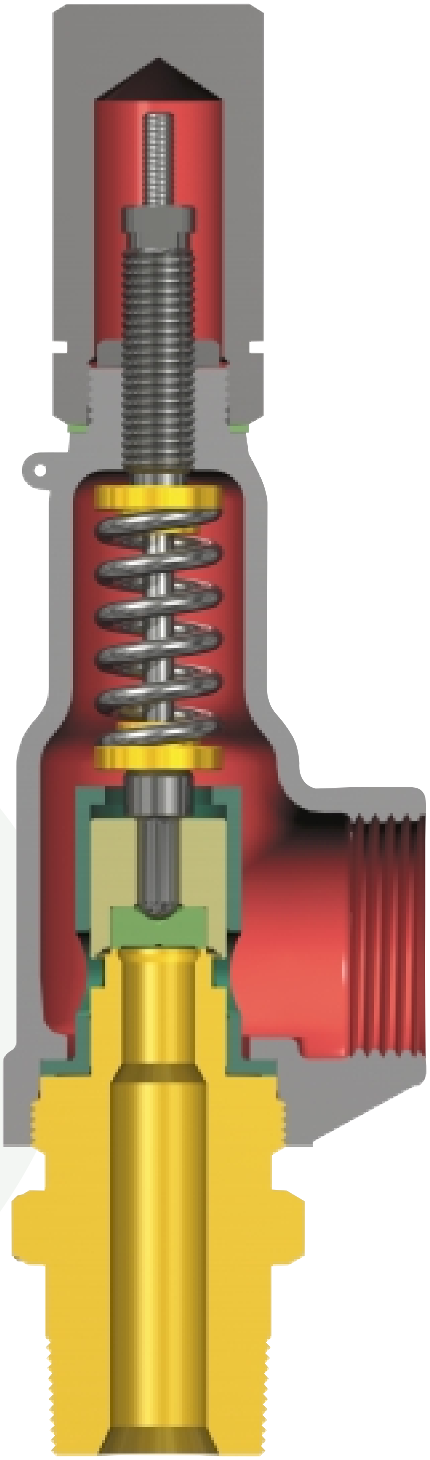
All 19000 Series valves are available with an O-Ring seat seal, as a design option. This optional design provides a bubble tightness in excess of 97% of the valve set pressure, in order to meet application requirements beyond the normal capabilities of metal to metal seat valves. 19000 Series valves with the O-Ring seat seal option are identified by the suffix DA (e.g., 1-19096L-DA).

b. Lifting Levers, Caps and Gags

All 19000 Series valves are designed so that field conversion from the standard screwed cap to a plain lifting lever cap, or to a packed lifting lever cap (or vice versa) does not require valve assembly during resetting. The lifting lever option is designed to open the valve at 75% of the valve set pressure, in compliance with ASME B & PVC, Section VIII. Further, all available 19000 Series valve caps may be equipped with a gag, upon customer request.

c. Inlet/Outlet Connections

All 19000 Series valves can be provided by **Consolidated** with flanges, threaded or socket weld inlet/outlet connections upon customer request.



19000-2

Valve Closed

19000 Standard Valves

This product is normally supplied with threaded inlet and outlet connections. Socket weld or flanged end connections are available as well.

Product type designations change depending on connection sizes, orifice sizes, pressure range, and whether connections are male or female.

Unless otherwise specified, the valve is always supplied with a screwed cap. The exception to this would be where ASME requires levers for steam, air and water service over 140°F (60°C).

Springs of precipitation hardened stainless steel are specified for -75°F to 800°F (-59°C to 426.6°C) and the valves carry a "c" suffix in that case. Inconel springs are used for temperatures 801°F to 1100°F (427.2°C to 593.3°C) and the valve carries a "t" suffix.

When selecting valves for back pressure applications, the following limits apply.

- Constant back pressure: 400 psig maximum
- Variable back pressure (superimposed or built-up): 400 psig or 10% of set pressure whichever is smaller.

Product variations consist of:

- 19000SG - Sour Gas Trim
- 19000DA - Soft Seat
- 19000MBP - Back Pressure Compensation

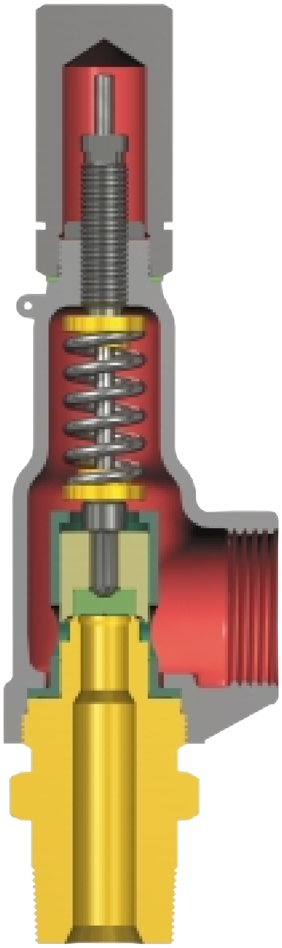
Product material variations include:

- 316 Stainless Steel
- Monel
- Hastelloy
- Alloy 20

Orifice	Pressure Range (psig)	Standard Valve Type	Standard Connections (in.)
.096 sq. in. 61.9 sq. mm	5 to 290	1/2-19096L	1/2 - MNPT x 1 - FNPT
		3/4-19096L	3/4 - MNPT x 1 - FNPT 3/4 - FNPT x 1 - FNPT
		1-19096L	1 - MNPT x 1 - FNPT
	291 to 2000	1/2-19096M	1/2 - MNPT x 1 - FNPT
		3/4-19096M	3/4 - MNPT x 1 - FNPT 3/4 - FNPT x 1 - FNPT
		1-19096M	1 - MNPT x 1 - FNPT
	2001 to 5000	3/4-19096H	3/4 - FNPT x 1 - FNPT
.096 sq. in. 61.9 sq. mm	50 to 2000	1/2-19096MBP	1/2 - MNPT x 1 - FNPT
		3/4-19096MBP	3/4 - MNPT x 1 - FNPT
		1-19096MBP	1 - MNPT x 1 - FNPT
.110 sq. in. 70.9 sq. mm	5 to 290	1/2-19110L	1/2 - MNPT x 1 - FNPT
		3/4-19110L	3/4 - MNPT x 1 - FNPT 3/4 - FNPT x 1 - FNPT
		1-19110L	1 - MNPT x 1 - FNPT
	291 to 2000	1/2-19110M	1/2 - MNPT x 1 - FNPT
		3/4-19110M	3/4 - MNPT x 1 - FNPT 3/4 - FNPT x 1 - FNPT
		1-19110M	1 - MNPT x 1 - FNPT
	2001 to 5000	3/4-19110H	3/4 - FNPT x 1 - FNPT
.126 sq. in. 81.3 sq. mm	5 to 290	3/4-19126L	3/4 - MNPT x 1 - FNPT 3/4 - FNPT x 1 - FNPT
		1-19126L	1 - MNPT x 1 - FNPT
	291 to 2000	3/4-19126M	3/4 - MNPT x 1 - FNPT 3/4 - FNPT x 1 - FNPT
		1-19126M	1 - MNPT x 1 - FNPT
	2001 to 8000	3/4-19126H	3/4 - FNPT x 1 - FNPT
.226 sq. in. 145.8 sq. mm	5 to 290	1-19226L	1 - MNPT x 1-1/2 - FNPT 1 - FNPT x 1-1/2 - FNPT
	291 to 2000	1-19226M	1 - MNPT x 1-1/2 - FNPT 1 - FNPT x 1-1/2 - FNPT
	2001 to 6400	1-19226H	1 - FNPT x 1-1/2 - FNPT
.357 sq. in. 230.3 sq. mm	5 to 290	1 1/2-19357L	1-1/2 - FNPT x 2 - FNPT
	291 to 1500	1 1/2-19357M	1-1/2 - FNPT x 2 - FNPT
.567 sq. in. 365.8 sq. mm	5 to 290	2-19567L	2 - FNPT x 2-1/2 - FNPT
	291 to 1000	2-19567M	2 - FNPT x 2-1/2 - FNPT

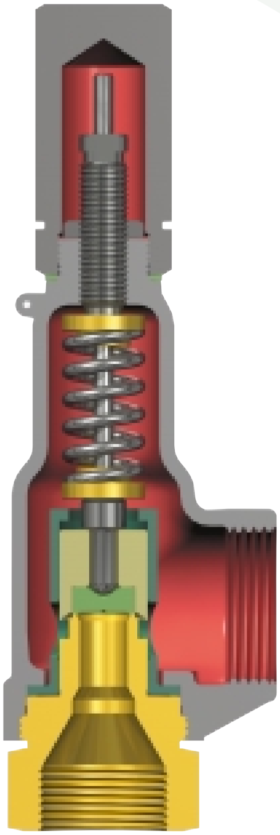
Pressure/Temperature ratings may vary from those for standard valves when other than standard materials are selected. Consult factory if you need assistance.

19000 Standard Valves



19000-2 Male NPT Inlet

19096L, 19110L, 19126L, 19226L,
19096M, 19110M, 19126M, 19226M



19000-2 Female NPT Inlet

19096L, 19110L, 19126L, 19226L, 19357L, 19567L,
19096M, 19110M, 19126M, 19226M, 19357M,
19567M, 19096H, 19110H, 19126H, 19226H

19000SG (Sour Gas)

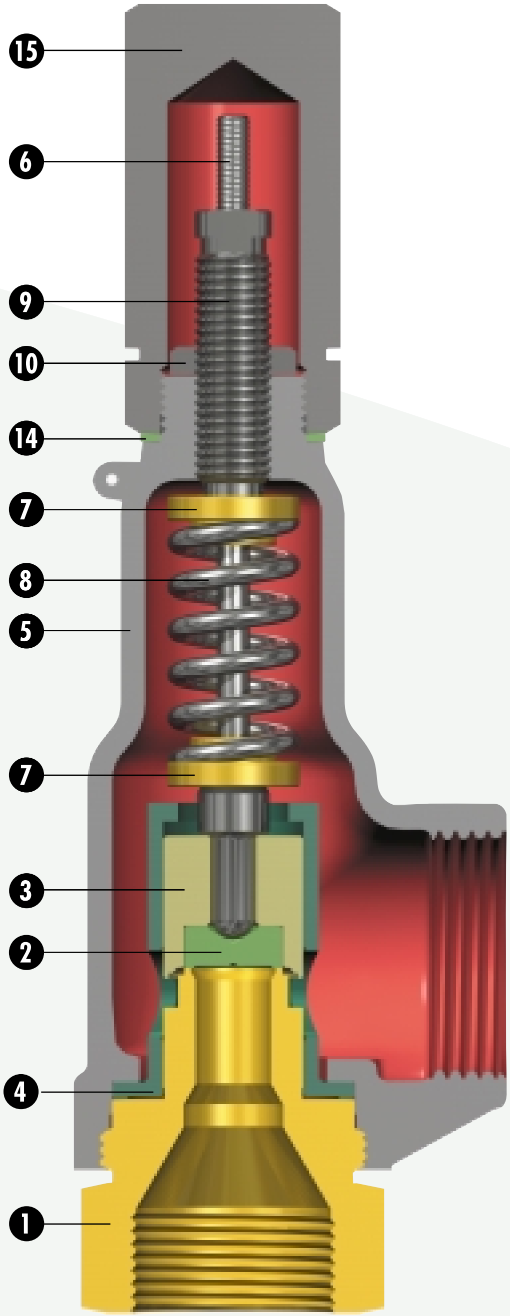
The standard 19000 valve has component materials selected which comply with NACE MR-01-75 requirements (except the valve spring).

To fully comply with MR-01-75, utilize the standard valve and specify an Inconel X750 spring.

When service temperature exceeds 250°F an Inconel X750 disc will be the standard component material meeting the requirements of MR-01-75. Under 250°F the standard component material for the disc is 316SS.

The Inconel X750 disc, Inconel X750 disc holder, Stellite® faced base and Inconel X750 spindle used in high pressure valves will meet the requirements of MR-01-75 when supplied with an Inconel X750 spring.

Materials



19000-2

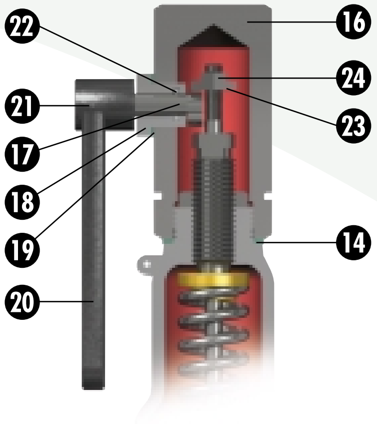
Threaded End Connection

Extension, flange and nipples for flanged and socket-weld connections are not shown.

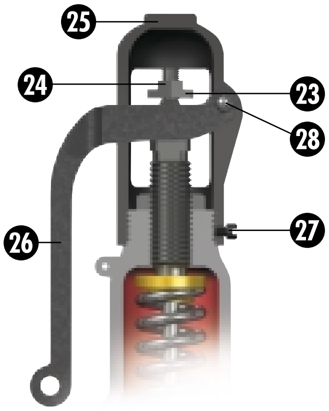
Materials

	Part	Material
1	Base L & M	316SS
	Base H	316 SS/Stellite Hardfaced Seat
2	Disc L & M	316SS
	Disc L & M (Steam)*	616SS
	Disc H	Inconel X750
3	Disc Holder	316SS
4	Guide	316SS
5	Bonnet	SA216 WCC Carbon Steel (phosphated)
6	Spindle L & M	316SS
	Spindle H	Inconel X750
7	Spring Washer	Carbon Steel (phosphated)
8	Spring 19000c	17-7 PH SS
	Spring 19000t	Inconel X750
9	Adjusting Screw	316SS
10	Adjusting Screw Locknut	316SS
11	Gag Bolt	Carbon Steel
12	Sealing Plug	Carbon Steel
13	Sealing Plug Gasket	Soft Iron
14	Cap Gasket	Soft Iron
15	Screwed Cap	Carbon Steel (phosphated)
16	Packed Cap	Carbon Steel (phosphated)
17	Cam Shaft	410SS
18	Bushing	416SS
19	Bushing Gasket	Soft Iron
20	Lever (Packed)	Malleable Iron
21	Drive Pin	Steel (Ni-Plated)
22	O-Ring	Viton 70
23	Release Nut	Carbon Steel
24	Release Lock Nut	Carbon Steel
25	Plain Lever Cap	Malleable Iron
26	Lifting Lever (Plain)	Malleable Iron
27	Cap Screw	Carbon Steel
28	Lever Pin	Carbon Steel

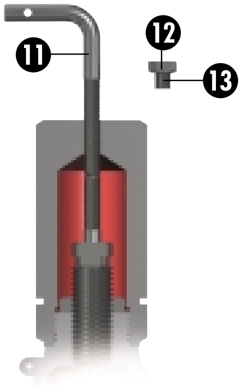
* Supplied for steam service above 251°F (121.7°C)



Packed Lever



Plain Lever



Cap with Gag

Sour Gas (SG) or NACE applications

The 19000 valve materials are standard except for the spring, which will be Inconel X750, and for service temperatures that exceed 250°F, an Inconel X750 disc will be provided.

19000 Soft Seats (DA)

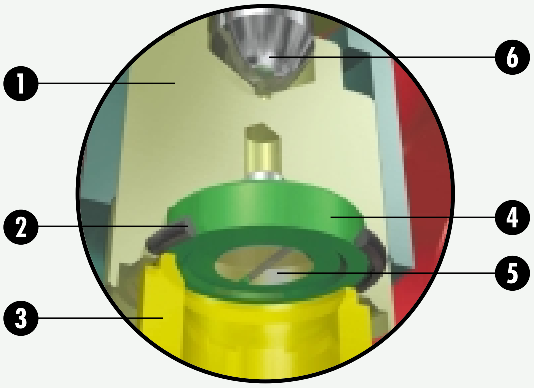
Tightness

CONSOLIDATED O-Ring seat valves are bubble tight at **97%** of set pressures over 100 psig.

Percent of set pressure (popping pressure) at which valve will be bubble tight on air.

Set Pressure (psig)	Percent of Set Pressure
5 to 30	90%
31 to 50	92%
51 to 100	94%
101 to Max rating of valve	**97%**

CONSOLIDATED O-Ring seat seals provide positive seat tightness at service pressures closer to the set pressure than is possible with metal-to-metal seats assuring continuous, trouble-free service, and complete valve closure after numerous "pops".



Soft Seat Material Temperature Limits (°F)

Material	Temperature Limits (°F)
Nitrile	-45 to +350°
Ethylene/Propylene	-70 to +500°
Fluoro-Carbon	-15 to +400°
Fluoro-Silicone	-100 to +350°
Neoprene	-45 to +300°
Silicone	-65 to +437°
Teflon	-300 to +505°

NOTE: Contact factory for other O-Ring materials and the respective temperature limitations.

Applications

The O-Ring design can be used for improved product performance in the same manner as that stated for the 1900 Flanged Series.

Features

- Leak tight seats
- Tight seats at high operating pressures
- Simple replacement of soft seat
- Large selection of soft seat materials
- Soft seats are in standard O-Ring sizes
- Proven seat design

Benefits

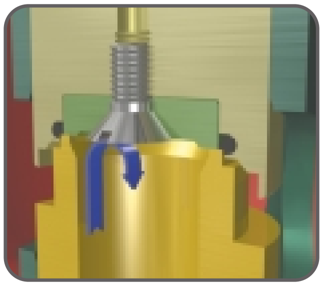
- Potential loss of system pressure and process media reduced
- Maximizes process efficiency and product output
- Reduces maintenance costs
- Suitable for varied process applications
- Replacement seats readily available
- Dependable performance

	Part	Material
1	Disc Holder 19000L	316SS
	Disc Holder 19000M & H	Inconel X750
2	O-Ring Seat Seal	Select
3	Base	316SS
4	O-Ring Retainer 19000L & M	316SS
	O-Ring Retainer 19000H	Inconel X750
5	Retainer Lockscrew	316SS
6	Spindle 19000L	316SS
	Spindle 19000M & H	Inconel X750

Sour Gas (SG) or NACE applications

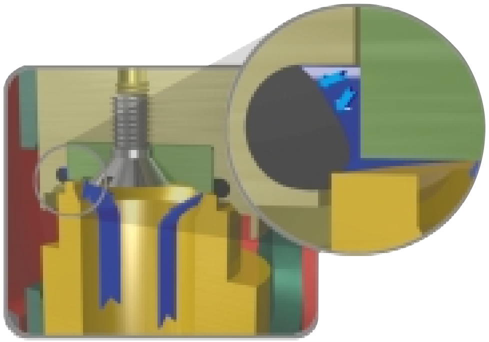
The 19000(DA) valve materials are standard except for the spring which will be Inconel X750.

Operation and Performance



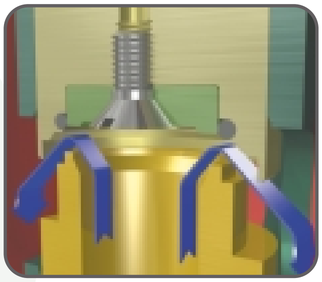
Valve in Closed Position

- 90% of set pressure
  Metal seat contains media
  No leakage - bubble tight



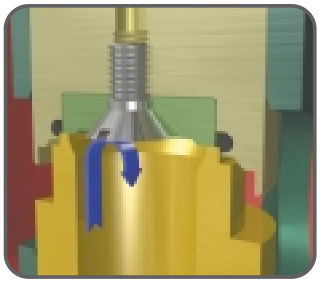
Valve at Greater than 90% of set pressure

- Metal seats separate
- System pressure acts on O-Ring, pressure forces the O-Ring against the lip of the nozzle and curved recess of the disc holder. As the pressure within the valves rises to the set point, the O-Ring is pressed tightly against the nozzle to maintain maximum sealing force until break-away pressure is reached.
- Bubble tight seat to **97%** of set pressure



Valve Flowing

- Full lift
- Flowing rated capacity
- O-Ring is protected from blowouts as the encapsulating retainer prevents the O-Ring from being pulled from its seat by the high velocity, low pressure discharge inside the valve.



Valve Returns to Closed Position

- 90% of set pressure
  Metal seat contains media
  No leakage - bubble tight
- Seat tightness maintained at pressures above 90% after initial closure

Set Pressure PSIG	Percent of Set Pressure
5 to 30	90%
31 to 50	92%
51 to 100	94%
100 to max rating of valve	**97%**

19096MBP

The 19096MBP Series balanced design safety relief valve provides back pressure compensation characteristics that meet the needs of various plant operating systems in today's industrial markets. This design is in compliance with ASME B & PVC, Section VIII requirements. The 19096MBP's versatile design is for use in both compressible and incompressible services.

Features and Benefits

Blowdown performance is typically less than 7% on compressible fluids and typically 15% for fixed blowdown on incompressible applications. This performance minimizes the loss of process fluids during an overpressure excursion and assists in the reduction of operating costs.

An O-Ring seat design provides for leak-tight seals during normal system operation and after cycling during a pressure-relieving mode. Media loss due to seat leakage is eliminated, resulting in savings from the cost of lost product.

A simple design that is easily maintained contributes to reduced maintenance costs and parts inventory.

Versatile Service Conditions

- Compressible and incompressible media
- Upper spring chamber not exposed to process media
- Corrosion resistant stainless steel trim
- Special alloy construction available

Increased Operating Efficiency

- Soft seat design provides maximum seat tightness
- Reduces product loss due to leakage
- Consistent fixed blowdown

19096MBP Performance Criteria

Typical Blowdown as a percent of set pressure	Liquid: 6% to 20% Gas: 3% to 16%
Allowable total Backpressure (The sum of the variable and constant backpressure, superimposed and built-up).	Liquid: 70% of Set Pressure NOTE: Thermal Relief applications may be supplied with backpressure up to 90% of set pressure. Gas: 50% of Set Pressure Total Backpressure for liquid or gas shall not exceed 400 psig
Seat Tightness Bubble Tight	Set Pressure of 50 psig: 92%; 51 psig to 100 psig: 94%; 101 psig to Maximum Rating: 97%

Scope of Design

Inlet Sizes	1/2" through 1" in either threaded, socket weld or 1" flanged design
Outlet Sizes	1" threaded, socket weld or flanged design
Orifice Size	.096 sq. in. (61.9 sq. mm)
Set Pressure Range	50 psig to 2000 psig
Temperature Range	-60°F to 600°F (-51°C to 315°C)
Certification	ASME B & PVC, Section VIII
Backpressure	400 psig - Variable and/or Constant

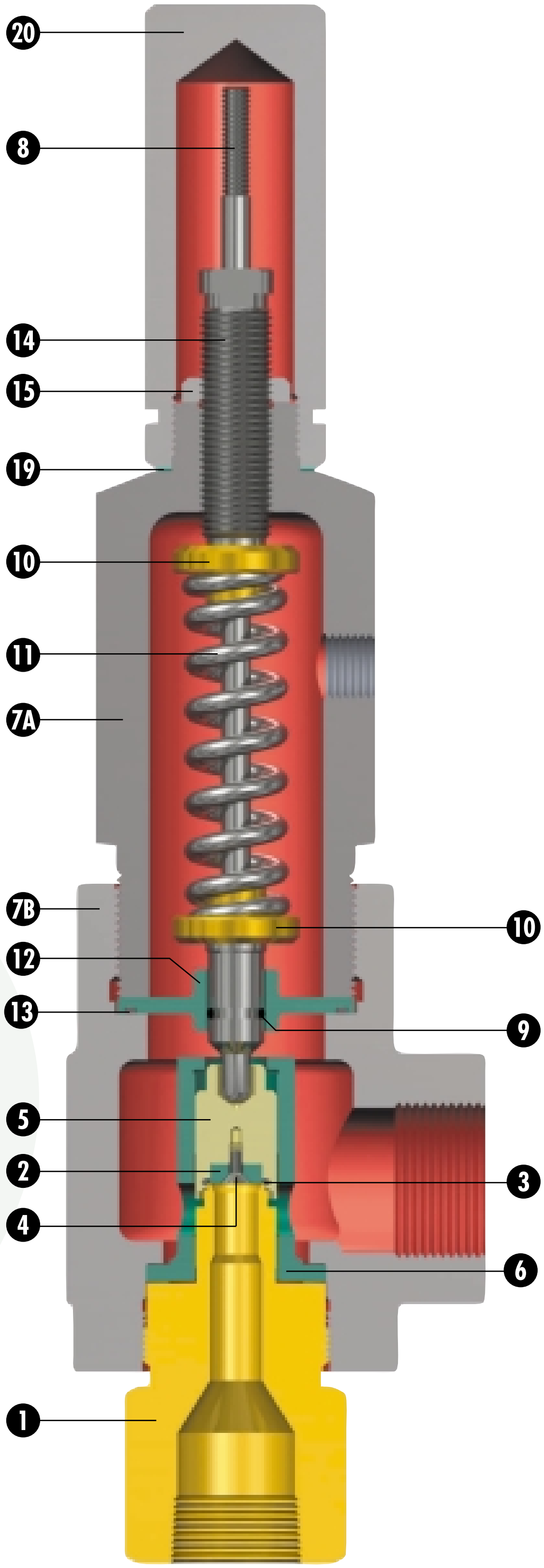
Orifice	Pressure Range (psig)	Standard Valve Type (in.)	Standard Connections (in.)
.096 sq. in. (61.9 sq. mm)	50 to 2000	1/2-19096M-BP	1/2 - MNPT x 1 - FNPT
		3/4-19096M-BP	3/4 - MNPT x 1 - FNPT 3/4 - FNPT x 1 - FNPT
		1-19096M-BP	1 - MNPT x 1 - FNPT

Soft Seat Material Temperature Limits (°F)

Material	Temperature Limits (°F)
Nitrile	-45 to +350°
Ethylene/Propylene	-70 to +500°
Fluoro-Carbon	-15 to +400°
Fluoro-Silicone	-100 to +350°
Neoprene	-45 to +300°
Silicone	-65 to +437°
Teflon	-300 to +505°

NOTE: Contact factory for other O-Ring materials and the respective temperature limitations.

Materials



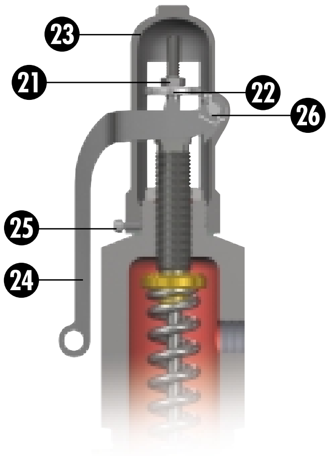
19096MBP

	Part	Material
1	Base	316SS
2	O-Ring Retainer	316SS
3	Seat O-Ring	(See O-Ring Seal Selection Table*)
4	Retainer Lockscrew	316SS
5	Disc Holder	Inconel X750
6	Guide	316SS
7A	Bonnet Top	SA105 Carbon Steel (Phosphated)
7B	Bonnet Bottom	SA105 Carbon Steel (Phosphated)
8	Spindle	Inconel X750
9	Spindle O-Ring	(See O-Ring Selection*)
10	Spring Washer	Carbon Steel (Phosphated)
11	Spring	
	19096c-BP	17-7 PH SS
	19096t-BP	Inconel X750
12	Backup Plate	316SS
13	Backup Plate O-Ring	(See O-Ring Selection*)
14	Adjusting Screw	316SS
15	Adj. Screw Locknut	316SS
16	Gag Bolt	Carbon Steel
17	Sealing Plug	Carbon Steel
18	Sealing Plug Gasket	Soft Iron
19	Cap Gasket	Soft Iron
20	Screwed Cap	Carbon Steel (Phosphated)
21	Release Nut	Carbon Steel
22	Release Locknut	Carbon Steel
23	Plain Lever Cap	Malleable Iron
24	Lifting Lever	Malleable Iron
25	Cap Screw	Carbon Steel
26	Lever Pin	Carbon Steel

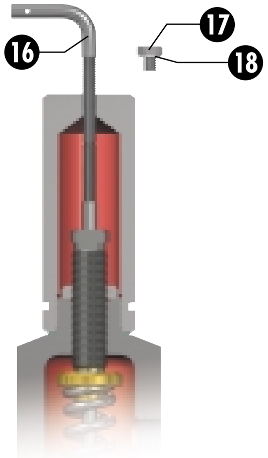
* Backup Plate and Spindle O-Ring material will be the same as the O-Ring material selected for Seat O-Ring.

Sour Gas (SG) or NACE applications

The 19096MBP valve materials are standard except for the spring, which will be Inconel X750.



Plain Lever



Cap with Gag

Standard and 316 Stainless Steel Variations

Part	Standard Valve	316 Stainless Steel Variations			
		S2	S3	S4	C1
Base 19000L	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS
Base 19000M	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS
Base 19000H	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS	SA479 Type 316SS
	Stellite Seats	Stellite Seats	Stellite Seats	Stellite Seats	Stellite Seats
Inlet Nipple	316SS	316SS	316SS	316SS	316SS
Outlet Nipple	Carbon Steel	Carbon Steel	316SS	316SS	316SS
Inlet Extension	316SS	316SS	316SS	316SS	316SS
Inlet Flange	Carbon Steel	Carbon Steel	316SS	316SS	316SS
Outlet Extension	316SS	316SS	316SS	316SS	316SS
Outlet Flange	Carbon Steel	Carbon Steel	316SS	316SS	316SS
Disc 19000 L & M	316SS	316SS	316SS	316SS	316SS
Disc 19000 L & M (Steam)*	616SS	616SS	616SS	616SS	616SS
Disc 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Retainer 19000L	316SS	316SS	316SS	316SS	316SS
O-Ring Retainer 19000M	316SS	316SS	316SS	316SS	316SS
O-Ring Retainer 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Retainer Lock Screw	316SS	316SS	316SS	316SS	316SS
O-Ring Disc Holder 19000L	316SS	316SS	316SS	316SS	316SS
O-Ring Disc Holder 19000M	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Disc Holder 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
MS Disc Holder 19000L	316SS	316SS	316SS	316SS	316SS
MS Disc Holder 19000M	316SS	316SS	316SS	316SS	316SS
MS Disc Holder 19000H	316SS	316SS	316SS	316SS	316SS
O-Ring Seat Seal	Select	Select	Select	Select	Select
Guide	316SS	316SS	316SS	316SS	316SS
Bonnet	SA216, WCC CS	SA216, WCC CS	SA351, CF8M	SA351, CF8M	SA352, LCC
O-Ring Spindle 19000L	316SS	316SS	316SS	316SS	316SS
O-Ring Spindle 19000M	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Spindle 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
MS Spindle 19000L	316SS	316SS	316SS	316SS	316SS
MS Spindle 19000M	316SS	316SS	316SS	316SS	316SS
MS Spindle 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring Washer	Carbon Steel	Carbon Steel	Carbon Steel	316SS	316SS
Spring 19000Lc	17-7PH	17-7PH	17-7PH	316SS	17-7PH
Spring 19000Lt	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring 19000Mc	17-7PH	17-7PH	17-7PH	Inconel X750	17-7PH
Spring 19000Mt	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring 19000Hc	17-7PH	17-7PH	17-7PH	Inconel X750	17-7PH
Spring 19000Ht	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Adjusting Screw	316SS	316SS	316SS	316SS	316SS
Adj. Screw Lock Nut	316SS	316SS	316SS	316SS	316SS
Cap Gasket	Soft Iron	Soft Iron	Monel	Monel	Soft Iron
Screwed Cap	Carbon Steel	Carbon Steel	316SS	316SS	316SS
Packed Cap	Carbon Steel	Carbon Steel	316SS	316SS	316SS
Cam Shaft	410SS	410SS	316SS	316SS	410SS
Bushing	416SS	416SS	316SS	316SS	416SS
Bushing Gasket	Soft Iron	Soft Iron	Monel	Monel	Soft Iron
Packed Lifting Lever	Malleable Iron	Malleable Iron	316SS	316SS	Malleable Iron
Drive Pin	Steel (Ni-Plated)	Steel (Ni-Plated)	303SS	303SS	Steel (Ni-Plated)
O-Ring (Packed Cap)	Viton 70	Viton 70	Viton 70	Viton 70	EPR-70
Release Nut	Carbon Steel	Carbon Steel	316SS	316SS	Carbon Steel
Release Lock Nut	Carbon Steel	Carbon Steel	316SS	316SS	Carbon Steel
Plain Lever Cap	Malleable Iron	Malleable Iron	316SS	316SS	Malleable Iron
Plain Lifting Lever	Malleable Iron	Malleable Iron	316SS	316SS	Malleable Iron
Cap Screw	Carbon Steel	Carbon Steel	316SS	316SS	Carbon Steel
Lever Pin	Carbon Steel	Carbon Steel	316SS	316SS	Carbon Steel
Gag Bolt	Carbon Steel	Carbon Steel	316SS	316SS	Carbon Steel
Sealing Plug	Carbon Steel	Carbon Steel	316SS	316SS	Carbon Steel
Sealing Plug Gasket	Soft Iron	Soft Iron	Monel	Monel	Soft Iron
Bottom Bonnet 19096MBP	SA105, CS	SA105, CS	SA316, SS	SA316, SS	SA316, SS
Top Bonnet 19096MBP	SA105, CS	SA105, CS	SA316, SS	SA316, SS	SA316, SS
Backup Plate 19096MBP	316SS	316SS	316SS	316 SS	316SS
Backup Plate O-Ring 19096MBP	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat
Spindle O-Ring 19096MBP	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat

* Supplied for steam service above 251°F (121.7°C)

Monel Variations

Part	Monel				
	M1	MB	M2	M3	M4
Base 19000L	Monel	Monel	Monel	Monel	Monel
Base 19000M	Monel	Monel	Monel	Monel	Monel
Base 19000H	Inconel 625	Inconel 625	Inconel 625	Inconel 625	Inconel 625
	Stellite Seats	Stellite Seats	Stellite Seats	Stellite Seats	Stellite Seats
Inlet Nipple	Monel	Monel	Monel	Monel	Monel
Outlet Nipple	316SS	316SS	316SS	Monel	Monel
Inlet Extension	Monel	Monel	Monel	Monel	Monel
Inlet Flange	Carbon Steel	Carbon Steel	Carbon Steel	Monel	Monel
Outlet Extension	316SS	316SS	316SS	Monel	Monel
Outlet Flange	Carbon Steel	Carbon Steel	Carbon Steel	Monel	Monel
Disc 19000 L & M	Monel	Monel	Monel	Monel	Monel
Disc 19000 L & M (Steam)*	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Disc 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Retainer 19000L	Monel	Monel	Monel	Monel	Monel
O-Ring Retainer 19000M	Monel	Monel	Monel	Monel	Monel
O-Ring Retainer 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Retainer Lock Screw	Monel	Monel	Monel	Monel	Monel
O-Ring Disc Holder 19000L	Monel	Monel	Monel	Monel	Monel
O-Ring Disc Holder 19000M	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Disc Holder 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
MS Disc Holder 19000L	316SS	Monel	Monel	Monel	Monel
MS Disc Holder 19000M	316SS	Monel	Monel	Monel	Monel
MS Disc Holder 19000H	316SS	Monel	Monel	Monel	Monel
O-Ring Seat Seal	Select	Select	Select	Select	Select
Guide	316SS	Monel	Monel	Monel	Monel
Bonnet	SA216, WCC	SA216, WCC	SA216, WCC	A494 M35-1 Nickel	A494 M35-1 Nickel
	CS	CS	CS	Copper Alloy	Copper Alloy
O-Ring Spindle 19000L	316SS	316SS	Monel	Monel	Monel
O-Ring Spindle 19000M	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Spindle 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
MS Spindle 19000L	316SS	316SS	Monel	Monel	Monel
MS Spindle 19000M	316SS	316SS	Monel	Monel	Monel
MS Spindle 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring Washer	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel	Monel
Spring 19000Lc	17-7 PH	17-7 PH	17-7 PH	17-7 PH	Inconel X750
Spring 19000Lt	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring 19000Mc	17-7 PH	17-7 PH	17-7 PH	17-7 PH	Inconel X750
Spring 19000Mt	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring 19000Hc	17-7 PH	17-7 PH	17-7 PH	17-7 PH	Inconel X750
Spring 19000Ht	Inconel X750	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Adjusting Screw	316SS	316SS	316SS	Monel	Monel
Adj. Screw Lock Nut	316SS	316SS	316SS	Monel	Monel
Cap Gasket	Soft Iron	Soft Iron	Soft Iron	Monel	Monel
Screwed Cap	Carbon Steel	Carbon Steel	Carbon Steel	Monel	Monel
Packed Cap	Carbon Steel	Carbon Steel	Carbon Steel	-	-
Cam Shaft	410SS	410SS	410SS	-	-
Bushing	416SS	416SS	416SS	-	-
Bushing Gasket	Soft Iron	Soft Iron	Soft Iron	-	-
Packed Lifting Lever	Malleable Iron	Malleable Iron	Malleable Iron	-	-
Drive Pin	Steel (Ni-Plated)	Steel (Ni-Plated)	Steel (Ni-Plated)	-	-
O-Ring (Packed Cap)	Viton 70	Viton 70	Viton 70	-	-
Release Nut	Carbon Steel	Carbon Steel	Carbon Steel	-	-
Release Lock Nut	Carbon Steel	Carbon Steel	Carbon Steel	-	-
Plain Lever Cap	Malleable Iron	Malleable Iron	Malleable Iron	-	-
Plain Lifting Lever	Malleable Iron	Malleable Iron	Malleable Iron	-	-
Cap Screw	Carbon Steel	Carbon Steel	Carbon Steel	-	-
Lever Pin	Carbon Steel	Carbon Steel	Carbon Steel	-	-
Gag Bolt	Carbon Steel	Carbon Steel	Carbon Steel	316SS	316SS
Sealing Plug	Carbon Steel	Carbon Steel	Carbon Steel	Monel	Monel
Sealing Plug Gasket	Soft Iron	Soft Iron	Soft Iron	Monel	Monel
Bottom Bonnet 19096MBP	SA105, CS	SA105, CS	SA105, CS	Monel	Monel
Top Bonnet 19096MBP	SA105, CS	SA105, CS	SA105, CS	Monel	Monel
Backup Plate 19096MBP	Same as O-Ring Seat	Monel	Monel	Monel	Monel
Backup Plate O-Ring 19096MBP	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat
Spindle O-Ring 19096MBP		Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat

* Supplied for steam service above 251°F (121.7°C)

Hastelloy Variations

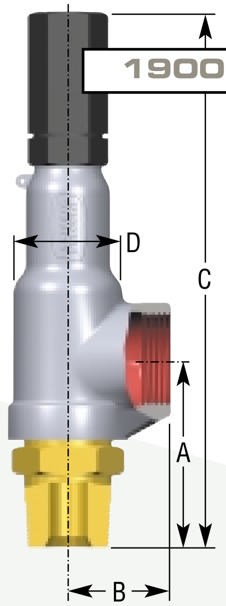
Part	Hastelloy			
	H1	H2	H3	H4
Base 19000L	Hastelloy	Hastelloy	Hastelloy	Hastelloy
Base 19000M	Hastelloy	Hastelloy	Hastelloy	Hastelloy
Base 19000H	Inconel 625	Inconel 625	Inconel 625	Inconel 625
	Stellite Seats	Stellite Seats	Stellite Seats	Stellite Seats
Inlet Nipple	Hastelloy	Hastelloy	Hastelloy	Hastelloy
Outlet Nipple	316SS	316SS	Hastelloy	Hastelloy
Inlet Extension	Hastelloy	Hastelloy	Hastelloy	Hastelloy
Inlet Flange	Carbon Steel	Carbon Steel	Hastelloy	Hastelloy
Outlet Extension	316SS	316SS	Hastelloy	Hastelloy
Outlet Flange	Carbon Steel	Carbon Steel	Hastelloy	Hastelloy
Disc 19000 L & M	Hastelloy	Hastelloy	Hastelloy	Hastelloy
Disc 19000 L & M (Steam)*	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Disc 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Retainer 19000L	Hastelloy	Hastelloy	Hastelloy	Hastelloy
O-Ring Retainer 19000M	Hastelloy	Hastelloy	Hastelloy	Hastelloy
O-Ring Retainer 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Retainer Lock Screw	Hastelloy	Hastelloy	Hastelloy	Hastelloy
O-Ring Disc Holder 19000L	Hastelloy	Hastelloy	Hastelloy	Hastelloy
O-Ring Disc Holder 19000M	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Disc Holder 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
MS Disc Holder 19000L	316SS	Hastelloy	Hastelloy	Hastelloy
MS Disc Holder 19000M	316SS	Hastelloy	Hastelloy	Hastelloy
MS Disc Holder 19000H	316SS	Hastelloy	Hastelloy	Hastelloy
O-Ring Seat Seal	Select	Select	Select	Select
Guide	316SS	Hastelloy	Hastelloy	Hastelloy
Bonnet	SA216, WCC	SA216, WCC	SA494 CW12 MW	SA494 CW12 MW
	CS	CS	Nickel Alloy	Nickel Alloy
O-Ring Spindle 19000L	316SS	Hastelloy	Hastelloy	Hastelloy
O-Ring Spindle 19000M	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Spindle 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
MS Spindle 19000L	316SS	Hastelloy	Hastelloy	Hastelloy
MS Spindle 19000M	316SS	Hastelloy	Hastelloy	Hastelloy
MS Spindle 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring Washer	Carbon Steel	Carbon Steel	Carbon Steel	Hastelloy
Spring 19000Lc	17-7 PH	17-7 PH	17-7 PH	Hastelloy
Spring 19000Lt	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring 19000Mc	17-7 PH	17-7 PH	17-7 PH	Inconel X750
Spring 19000Mt	Inconel X750	Inconel X-750	Inconel X-750	Inconel X750
Spring 19000Hc	17-7 PH	17-7 PH	17-7 PH	Inconel X750
Spring 19000Ht	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Adjusting Screw	316SS	316SS	Hastelloy	Hastelloy
Adj. Screw Lock Nut	316SS	316SS	Hastelloy	Hastelloy
Cap Gasket	Soft Iron	Soft Iron	Monel	Monel
Screwed Cap	Carbon Steel	Carbon Steel	Hastelloy	Hastelloy
Packed Cap	Carbon Steel	Carbon Steel	-	-
Cam Shaft	410SS	410SS	-	-
Bushing	416SS	416SS	-	-
Bushing Gasket	Soft Iron	Soft Iron	-	-
Packed Lifting Lever	Malleable Iron	Malleable Iron	-	-
Drive Pin	Steel (Ni-Plated)	Steel (Ni-Plated)	-	-
O-Ring (Packed Cap)	Viton 70	Viton 70	-	-
Release Nut	Carbon Steel	Carbon Steel	-	-
Release Lock Nut	Carbon Steel	Carbon Steel	-	-
Plain Lever Cap	Malleable Iron	Malleable Iron	-	-
Plain Lifting Lever	Malleable Iron	Malleable Iron	-	-
Cap Screw	Carbon Steel	Carbon Steel	-	-
Lever Pin	Carbon Steel	Carbon Steel	-	-
Gag Bolt	Carbon Steel	Carbon Steel	316SS	316SS
Sealing Plug	Carbon Steel	Carbon Steel	Hastelloy	Hastelloy
Sealing Plug Gasket	Soft Iron	Soft Iron	Monel	Monel
Bottom Bonnet 19096MBP	SA105, CS	SA105, CS	Hastelloy	Hastelloy
Top Bonnet 19096MBP	SA105, CS	SA105, CS	Hastelloy	Hastelloy
Backup Plate 19096MBP	Same as O-Ring Seat	Hastelloy	Hastelloy	Hastelloy
Backup Plate O-Ring 19096MBP	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat
Spindle O-Ring 19096MBP		Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat

* Supplied for steam service above 251°F (121.7°C)

Alloy 20 Variations

Part	Alloy 20			
	A1	A2	A3	A4
Base 19000L	Alloy 20	Alloy 20	Alloy 20	Alloy 20
Base 19000M	Alloy 20	Alloy 20	Alloy 20	Alloy 20
Base 19000H	Inconel 625	Inconel 625	Inconel 625	Inconel 625
	Stellite Seats	Stellite Seats	Stellite Seats	Stellite Seats
Inlet Nipple	Alloy 20	Alloy 20	Alloy 20	Alloy 20
Outlet Nipple	316SS	316SS	Alloy 20	Alloy 20
Inlet Extension	Alloy 20	Alloy 20	Alloy 20	Alloy 20
Inlet Flange	Carbon Steel	Carbon Steel	Alloy 20	Alloy 20
Outlet Extension	316SS	316SS	Alloy 20	Alloy 20
Outlet Flange	Carbon Steel	Carbon Steel	Alloy 20	Alloy 20
Disc 19000 L & M	Alloy 20	Alloy 20	Alloy 20	Alloy 20
Disc 19000 L & M (Steam)*	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Disc 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Retainer 19000L	Alloy 20	Alloy 20	Alloy 20	Alloy 20
O-Ring Retainer 19000M	Alloy 20	Alloy 20	Alloy 20	Alloy 20
O-Ring Retainer 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Retainer Lock Screw	Alloy 20	Alloy 20	Alloy 20	Alloy 20
O-Ring Disc Holder 19000L	Alloy 20	Alloy 20	Alloy 20	Alloy 20
O-Ring Disc Holder 19000M	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Disc Holder 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
MS Disc Holder 19000L	316SS	Alloy 20	Alloy 20	Alloy 20
MS Disc Holder 19000M	316SS	Alloy 20	Alloy 20	Alloy 20
MS Disc Holder 19000H	316SS	Alloy 20	Alloy 20	Alloy 20
O-Ring Seat Seal	Select	Select	Select	Select
Guide	316SS	Alloy 20	Alloy 20	Alloy 20
Bonnet	SA216, WCC CS	SA216, WCC CS	SA351 CN7M	SA351 CN7M
O-Ring Spindle 19000L	316SS	Alloy 20	Alloy 20	Alloy 20
O-Ring Spindle 19000M	Inconel X750	Inconel X750	Inconel X750	Inconel X750
O-Ring Spindle 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
MS Spindle 19000L	316SS	Alloy 20	Alloy 20	Alloy 20
MS Spindle 19000M	316SS	Alloy 20	Alloy 20	Alloy 20
MS Spindle 19000H	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring Washer	Carbon Steel	Carbon Steel	Carbon Steel	Alloy 20
Spring 19000Lc	17-7 PH	17-7 PH	17-7 PH	Alloy 20
Spring 19000Lt	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring 19000Mc	17-7 PH	17-7 PH	17-7 PH	Inconel X750
Spring 19000Mt	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Spring 19000Hc	17-7 PH	17-7 PH	17-7 PH	Inconel X750
Spring 19000Ht	Inconel X750	Inconel X750	Inconel X750	Inconel X750
Adjusting Screw	316SS	316SS	Alloy 20	Alloy 20
Adj. Screw Lock Nut	316SS	316SS	Alloy 20	Alloy 20
Cap Gasket	Soft Iron	Soft Iron	Monel	Monel
Screwed Cap	Carbon Steel	Carbon Steel	Alloy 20	Alloy 20
Packed Cap	Carbon Steel	Carbon Steel	-	-
Cam Shaft	410SS	410SS	-	-
Bushing	416SS	416SS	-	-
Bushing Gasket	Soft Iron	Soft Iron	-	-
Packed Lifting Lever	Malleable Iron	Malleable Iron	-	-
Drive Pin	Steel (Ni-Plated)	Steel (Ni-Plated)	-	-
O-Ring (Packed Cap)	Viton 70	Viton 70	-	-
Release Nut	Carbon Steel	Carbon Steel	-	-
Release Lock Nut	Carbon Steel	Carbon Steel	-	-
Plain Lever Cap	Malleable Iron	Malleable Iron	-	-
Plain Lifting Lever	Malleable Iron	Malleable Iron	-	-
Cap Screw	Carbon Steel	Carbon Steel	-	-
Lever Pin	Carbon Steel	Carbon Steel	-	-
Gag Bolt	Carbon Steel	Carbon Steel	316SS	316SS
Sealing Plug	Carbon Steel	Carbon Steel	Alloy 20	Alloy 20
Sealing Plug Gasket	Soft Iron	Soft Iron	Monel	Monel
Bottom Bonnet 19096MBP	SA105	SA105	Alloy 20	Alloy 20
Top Bonnet 19096MBP	SA105	SA105	Alloy 20	Alloy 20
Backup Plate 19096MBP	Alloy 20	Alloy 20	Alloy 20	Alloy 20
Backup Plate O-Ring 19096MBP	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat
Spindle O-Ring 19096MBP	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat	Same as O-Ring Seat

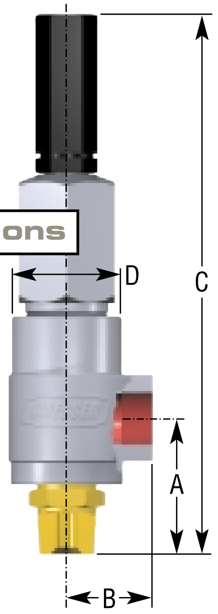
* Supplied for steam service above 251°F (121.7°C)



19000 Threaded Connections

CAUTION
Do not seal weld inlet and outlet connections.

19096MBP Threaded Connections



The key to selecting the appropriate dimensions is to use the numbers in the column named "Type". The "Size" column defines the valve by inlet size and connection type, then by outlet size and connection type.

Example: 1/2 - MNPT x 1 - FNPT

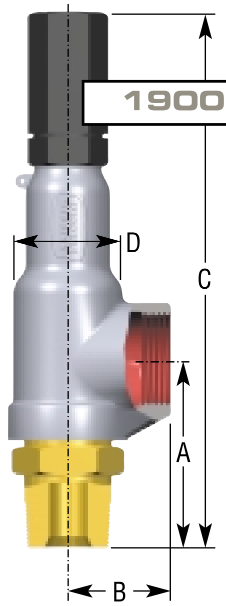
Inlet size is 1/2" with a male NPT pipe thread and the outlet is 1" size with a female NPT pipe thread. "SW" indicates socket weld. "Flanged Connections" show size of flange and pressure rating.

NOTES: 1 "USCS" Units refers to "U.S. Customary System" Units, the adopted U.S. Standard formerly recognized as "English" Units.

2 Valves are provided with a male pipe threaded (MNPT) or a female pipe threaded (FNPT) inlet connection as specified in the table below.

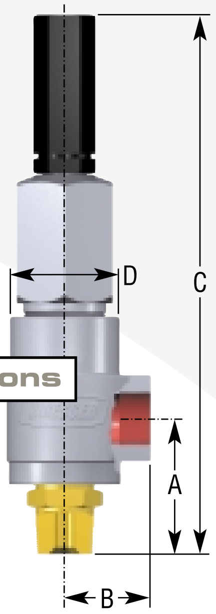
Threaded Connections (Inches & Pounds)

Size (in.)	Type	A	B	C		D		Approx. Weight	
				19000	MBP	19000	MBP	19000	MBP
3/4 - FNPT x 1 - FNPT	19096L	3-1/8	1-7/8	10-1/4	N/A	2	N/A	4-1/2	N/A
1/2 - MNPT x 1 - FNPT	19096L	3-1/4	1-7/8	10-3/8	N/A	2	N/A	4-3/4	N/A
3/4 - MNPT x 1 - FNPT	19096L	3-1/4	1-7/8	10-3/8	N/A	2	N/A	4-3/4	N/A
1 - MNPT x 1 - FNPT	19096L	3-1/4	1-7/8	10-3/8	N/A	2	N/A	4-3/4	N/A
3/4 - FNPT x 1 - FNPT	19096M	3-1/8	2	12-1/16	12-3/4	2-9/16	3-3/4	6-1/2	11-1/2
1/2 - MNPT x 1 - FNPT	19096M	3-1/4	2	12-3/16	12-7/8	2-9/16	3-3/4	6-1/2	11-1/2
3/4 - MNPT x 1 - FNPT	19096M	3-1/4	2	12-3/16	12-7/8	2-9/16	3-3/4	6-1/2	11-1/2
1 - MNPT x 1 - FNPT	19096M	3-1/4	2	12-3/16	12-7/8	2-9/16	3-3/4	6-1/2	11-1/2
3/4 - FNPT x 1 - FNPT	19096H	3-1/8	2-3/8	12-1/2	N/A	3-1/8	N/A	11-1/2	N/A
3/4 - FNPT x 1 - FNPT	19110L	3-1/8	1-7/8	10-1/4	N/A	2	N/A	4-1/2	N/A
1/2 - MNPT x 1 - FNPT	19110L	3-1/4	1-7/8	10-3/8	N/A	2	N/A	4-3/4	N/A
3/4 - MNPT x 1 - FNPT	19110L	3-1/4	1-7/8	10-3/8	N/A	2	N/A	4-3/4	N/A
1 - MNPT x 1 - FNPT	19110L	3-1/4	1-7/8	10-3/8	N/A	2	N/A	4-3/4	N/A
3/4 - FNPT x 1 - FNPT	19110M	3-1/8	2	12-1/16	N/A	2-9/16	N/A	6-1/2	N/A
1/2 - MNPT x 1 - FNPT	19110M	3-1/4	2	12-3/16	N/A	2-9/16	N/A	6-1/2	N/A
3/4 - MNPT x 1 - FNPT	19110M	3-1/4	2	12-3/16	N/A	2-9/16	N/A	6-1/2	N/A
1 - MNPT x 1 - FNPT	19110M	3-1/4	2	12-3/16	N/A	2-9/16	N/A	6-1/2	N/A
3/4 - FNPT x 1 - FNPT	19110H	3-1/8	2-3/8	12-1/2	N/A	3-1/8	N/A	11-1/2	N/A
3/4 - FNPT x 1 - FNPT	19126L	3-1/8	1-7/8	10-1/4	N/A	2	N/A	5	N/A
3/4 - MNPT x 1 - FNPT	19126L	3-1/4	1-7/8	10-3/8	N/A	2	N/A	5-1/4	N/A
1 - MNPT x 1 - FNPT	19126L	3-1/4	1-7/8	10-3/8	N/A	2	N/A	5-1/4	N/A
3/4 - FNPT x 1 - FNPT	19126M	3-1/8	2	12-1/16	N/A	2-9/16	N/A	6-1/2	N/A
3/4 - MNPT x 1 - FNPT	19126M	3-1/4	2	12-3/16	N/A	2-9/16	N/A	6-1/2	N/A
1 - MNPT x 1 - FNPT	19126M	3-1/4	2	12-3/16	N/A	2-9/16	N/A	6-1/2	N/A
3/4 - FNPT x 1 - FNPT	19126H	3-1/8	3-1/8	15-15/16	N/A	4-5/8	N/A	30	N/A
1 - FNPT x 1-1/2 - FNPT	19226L	3-3/8	2-1/4	11-3/8	N/A	2-3/8	N/A	6-1/2	N/A
1- MNPT x 1-1/2 - FNPT	19226L	3-5/8	2-1/4	11-5/8	N/A	2-3/8	N/A	6-3/4	N/A
1 - FNPT x 1-1/2 - FNPT	19226M	3-3/8	2-3/8	12-3/4	N/A	3-1/8	N/A	11-1/2	N/A
1 - MNPT x 1-1/2 - FNPT	19226M	3-5/8	2-3/8	13	N/A	3-1/8	N/A	11-1/2	N/A
1 - FNPT x 1-1/2 - FNPT	19226H	3-1/8	3-1/8	15-15/16	N/A	4-5/8	N/A	30	N/A
1-1/2 - FNPT x 2 - FNPT	19357L	4-1/16	3-1/8	15-1/16	N/A	3-5/8	N/A	18	N/A
1-1/2 - FNPT x 2 - FNPT	19357M	4-1/16	3-1/8	16-7/8	N/A	4-5/8	N/A	30	N/A
2 - FNPT x 2-1/2 - FNPT	19567L	4-1/16	3-1/8	15-1/16	N/A	3-5/8	N/A	19	N/A
2 - FNPT x 2-1/2 - FNPT	19567M	4-1/16	3-1/8	16-7/8	N/A	4-5/8	N/A	30	N/A



19000 Threaded Connections

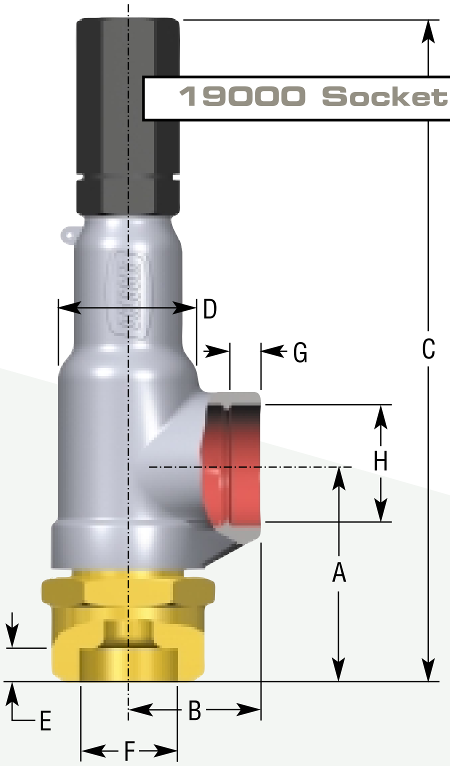
CAUTION
Do not seal weld inlet and outlet connections.



19096MBP Threaded Connections

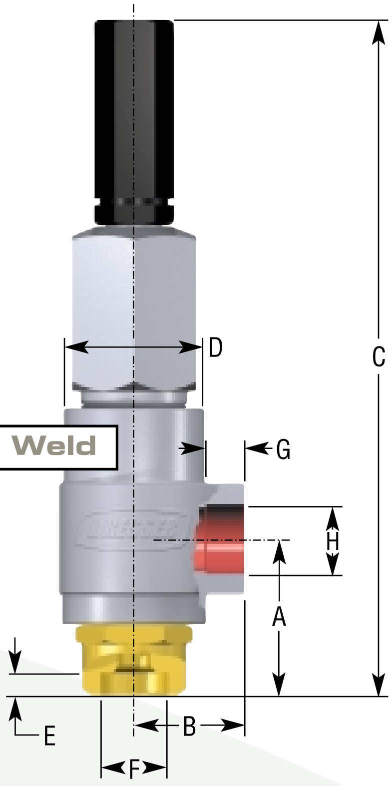
Threaded Connections (Millimeters & Kilograms)

Size (mm)	Type	A	B	C		D		Approx. Weight	
				19000	MBP	19000	MBP	19000	MBP
3/4 - FNPT x 1 - FNPT	19096L	79.4	47.6	260.4	N/A	50.8	N/A	2.0	N/A
1/2 - MNPT x 1 - FNPT	19096L	82.6	47.6	263.5	N/A	50.8	N/A	2.2	N/A
3/4 - MNPT x 1 - FNPT	19096L	82.6	47.6	263.5	N/A	50.8	N/A	2.2	N/A
1 - MNPT x 1 - FNPT	19096L	82.6	47.6	263.5	N/A	50.8	N/A	2.2	N/A
3/4 - FNPT x 1 - FNPT	19096M	79.4	50.8	306.4	323.9	65.1	95.3	2.9	5.2
1/2 - MNPT x 1 - FNPT	19096M	82.6	50.8	309.6	327.0	65.1	95.3	2.9	5.2
3/4 - MNPT x 1 - FNPT	19096M	82.6	50.8	309.6	327.0	65.1	95.3	2.9	5.2
1 - MNPT x 1 - FNPT	19096M	82.6	50.8	309.6	327.0	65.1	95.3	2.9	5.2
3/4 - FNPT x 1 - FNPT	19096H	79.4	60.3	317.5	N/A	79.37	N/A	5.2	N/A
3/4 - FNPT x 1 - FNPT	19110L	79.4	47.6	260.4	N/A	50.8	N/A	2.0	N/A
1/2 - MNPT x 1 - FNPT	19110L	82.6	47.6	263.5	N/A	50.8	N/A	2.2	N/A
3/4 - MNPT x 1 - FNPT	19110L	82.6	47.6	263.5	N/A	50.8	N/A	2.2	N/A
1 - MNPT x 1 - FNPT	19110L	82.6	47.6	263.5	N/A	50.8	N/A	2.2	N/A
3/4 - FNPT x 1 - FNPT	19110M	79.4	50.8	306.4	N/A	65.1	N/A	2.9	N/A
1/2 - MNPT x 1 - FNPT	19110M	82.6	50.8	309.6	N/A	65.1	N/A	2.9	N/A
3/4 - MNPT x 1 - FNPT	19110M	82.6	50.8	309.6	N/A	65.1	N/A	2.9	N/A
1 - MNPT x 1 - FNPT	19110M	82.6	50.8	309.6	N/A	65.1	N/A	2.9	N/A
3/4 - FNPT x 1 - FNPT	19110H	79.4	60.3	317.5	N/A	79.4	N/A	5.2	N/A
3/4 - FNPT x 1 - FNPT	19126L	79.4	47.6	260.4	N/A	50.8	N/A	2.3	N/A
3/4 - MNPT x 1 - FNPT	19126L	82.6	47.6	263.5	N/A	50.8	N/A	2.4	N/A
1 - MNPT x 1 - FNPT	19126L	82.6	47.6	263.5	N/A	50.8	N/A	2.4	N/A
3/4 - FNPT x 1 - FNPT	19126M	79.4	50.8	306.4	N/A	65.1	N/A	2.9	N/A
3/4 - MNPT x 1 - FNPT	19126M	82.6	50.8	309.6	N/A	65.1	N/A	2.9	N/A
1 - MNPT x 1 - FNPT	19126M	82.6	50.8	309.6	N/A	65.1	N/A	2.9	N/A
3/4 - FNPT x 1 - FNPT	19126H	79.4	79.4	404.8	N/A	117.5	N/A	13.6	N/A
1 - FNPT x 1-1/2 - FNPT	19226L	85.7	57.2	288.9	N/A	60.3	N/A	2.9	N/A
1 - MNPT x 1-1/2 - FNPT	19226L	92.1	57.2	295.3	N/A	60.3	N/A	3.1	N/A
1 - FNPT x 1-1/2 - FNPT	19226M	85.7	60.3	323.9	N/A	79.4	N/A	5.2	N/A
1 - MNPT x 1-1/2 - FNPT	19226M	92.1	60.3	330.2	N/A	79.4	N/A	5.2	N/A
1 - FNPT x 1-1/2 - FNPT	19226H	79.4	79.4	404.8	N/A	117.5	N/A	13.6	N/A
1-1/2 - FNPT x 2 - FNPT	19357L	103.2	79.4	382.6	N/A	92.08	N/A	8.2	N/A
1-1/2 - FNPT x 2 - FNPT	19357M	103.2	79.4	428.6	N/A	117.5	N/A	13.6	N/A
2 - FNPT x 2-1/2 - FNPT	19567L	103.2	79.4	382.6	N/A	92.08	N/A	8.6	N/A
2 - FNPT x 2-1/2 - FNPT	19567M	103.2	79.4	428.6	N/A	117.5	N/A	13.6	N/A



19000 Socket Weld

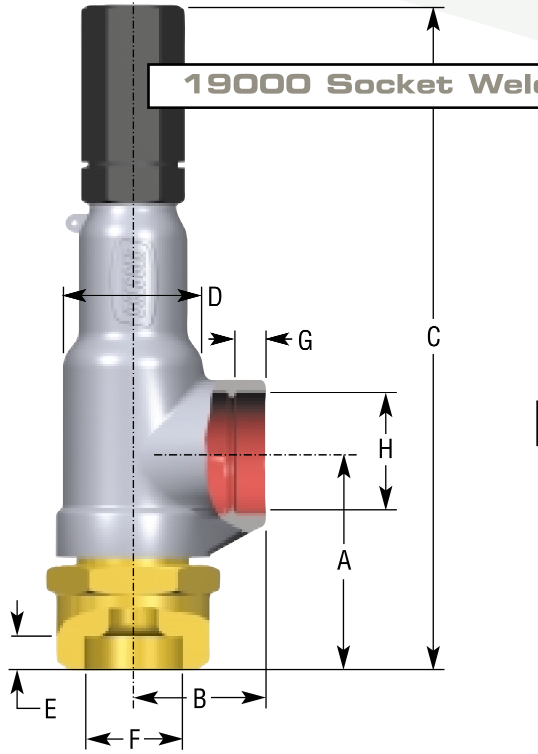
CAUTION
Avoid excessive
weld deposits.



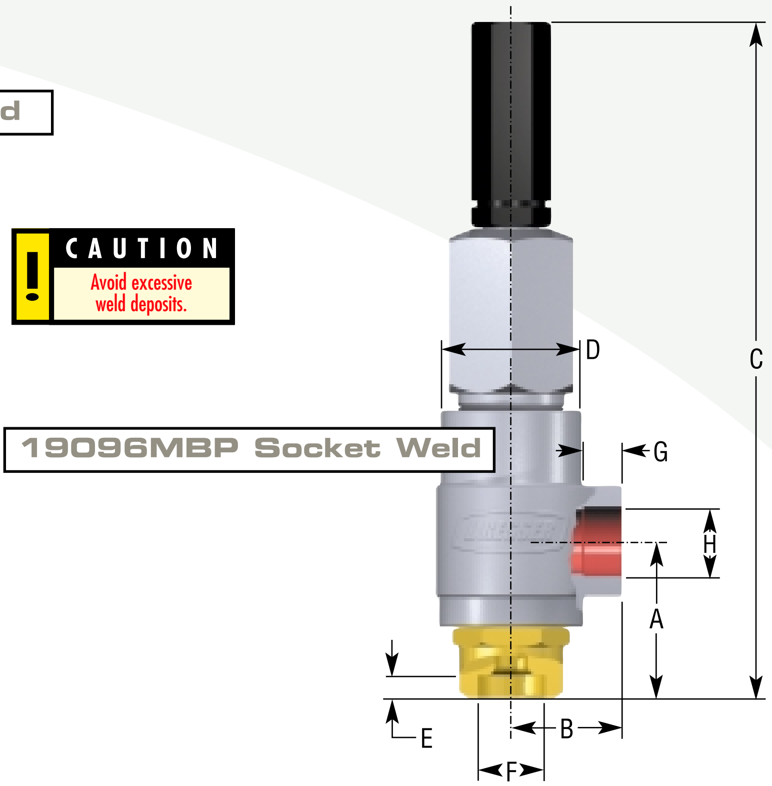
19096MBP Socket Weld

Socket Weld Connections (Inches & Pounds)

Size (in.)	Type	A	B	C		D		E	F Dia.	G	H Dia.	Approx. Weight	
				19000	MBP	19000	MBP					19000	MBP
1/2 - SW x 1 - SW	19096L	3-1/2	1-7/8	10-5/8	N/A	2	N/A	1/2	.855	5/8	1.330	5-1/2	N/A
3/4 - SW x 1 - SW	19096L	3-1/2	1-7/8	10-5/8	N/A	2	N/A	1/2	1.065	5/8	1.330	5-1/2	N/A
1 - SW x 1 - SW	19096L	3-1/2	1-7/8	10-5/8	N/A	2	N/A	1/2	1.330	5/8	1.330	6-1/4	N/A
1/2 - SW x 1 - SW	19096M	3-1/2	2	12-7/16	13-1/8	2-9/16	3-3/4	1/2	.855	5/8	1.330	7	12
3/4 - SW x 1 - SW	19096M	3-1/2	2	12-7/16	13-1/8	2-9/16	3-3/4	1/2	1.065	5/8	1.330	7-1/2	12-1/2
1 - SW x 1 - SW	19096M	3-1/2	2	12-7/16	13-1/8	2-9/16	3-3/4	1/2	1.330	5/8	1.330	8	13
3/4 - SW x 1 - SW	19096H	4	2-3/8	13-3/8	N/A	3-1/8	N/A	1/2	1.065	5/8	1.330	12	N/A
1/2 - SW x 1 - SW	19110L	3-1/2	1-7/8	10-5/8	N/A	2	N/A	1/2	.855	5/8	1.330	5-1/2	N/A
3/4 - SW x 1 - SW	19110L	3-1/2	1-7/8	10-5/8	N/A	2	N/A	1/2	1.065	5/8	1.330	5-1/2	N/A
1 - SW x 1 - SW	19110L	3-1/2	1-7/8	10-5/8	N/A	2	N/A	1/2	1.330	5/8	1.330	6-1/4	N/A
1/2 - SW x 1 - SW	19110M	3-1/2	2	12-7/16	N/A	2-9/16	N/A	1/2	.855	5/8	1.330	7	N/A
3/4 - SW x 1 - SW	19110M	3-1/2	2	12-7/16	N/A	2-9/16	N/A	1/2	1.065	5/8	1.330	7-1/2	N/A
1 - SW x 1 - SW	19110M	3-1/2	2	12-7/16	N/A	2-9/16	N/A	1/2	1.330	5/8	1.330	8	N/A
3/4 - SW x 1 - SW	19110H	4	2-3/8	13-3/8	N/A	3-1/8	N/A	1/2	1.065	5/8	1.330	12	N/A
3/4 - SW x 1 - SW	19126L	3-1/2	1-7/8	10-5/8	N/A	2	N/A	1/2	1.065	5/8	1.330	6	N/A
1 - SW x 1 - SW	19126L	3-1/2	1-7/8	10-5/8	N/A	2	N/A	1/2	1.330	5/8	1.330	6-3/4	N/A
3/4 - SW x 1 - SW	19126M	3-1/2	2	12-7/16	N/A	2-9/16	N/A	1/2	1.065	5/8	1.330	7	N/A
1 - SW x 1 - SW	19126M	3-1/2	2	12-7/16	N/A	2-9/16	N/A	1/2	1.330	5/8	1.330	8	N/A
3/4 - SW x 1 - SW	19126H	4-1/2	3-1/8	17-5/16	N/A	4-5/8	N/A	5/8	1.065	5/8	1.330	32	N/A
1 - SW x 1-1/2 - SW	19226L	3-15/16	2-1/4	11-15/16	N/A	2-3/8	N/A	1/2	1.330	5/8	1.915	8	N/A
1 - SW x 1-1/2 - SW	19226M	3-15/16	2-3/8	13-5/16	N/A	3-1/8	N/A	1/2	1.330	5/8	1.915	12-1/2	N/A
1 - SW x 1-1/2 - SW	19226H	4-1/2	3-1/8	17-5/16	N/A	4-5/8	N/A	5/8	1.330	5/8	1.915	32	N/A
1-1/2 - SW x 2 - SW	19357L	4-3/4	3-1/8	15-3/4	N/A	3-5/8	N/A	5/8	1.915	5/8	2.406	18-1/4	N/A
1-1/2 - SW x 2 - SW	19357M	4-3/4	3-1/8	17-9/16	N/A	4-5/8	N/A	5/8	1.915	5/8	2.406	31	N/A
2 - SW x 2-1/2 - SW	19567L	5-3/8	3-1/8	16-3/8	N/A	3-5/8	N/A	5/8	2.406	5/8	2.906	24	N/A
2 - SW x 2-1/2 - SW	19567M	5-3/8	3-1/8	18-3/16	N/A	4-5/8	N/A	5/8	2.406	5/8	2.906	34	N/A



CAUTION
Avoid excessive weld deposits.



Socket Weld Connections (Millimeters & Kilograms)

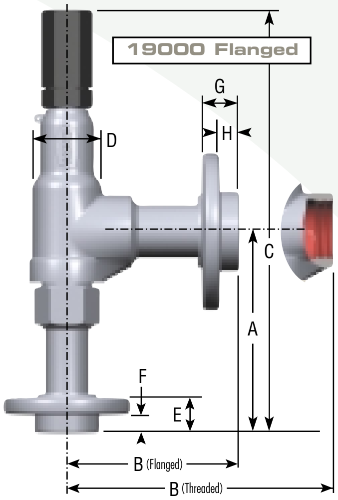
Size (mm)	Type	A	B	C		D		E	F Dia.	G	H Dia.	Approx. Weight	
				19000	MBP	19000	MBP					19000	MBP
1/2 - SW x 1 - SW	19096L	88.9	47.6	269.9	N/A	50.8	N/A	12.7	21.7	15.9	33.8	2.5	N/A
3/4 - SW x 1 - SW	19096L	88.9	47.6	269.9	N/A	50.8	N/A	12.7	27.1	15.9	33.8	2.5	N/A
1 - SW x 1 - SW	19096L	88.9	47.6	269.9	N/A	50.8	N/A	12.7	33.8	15.9	33.8	2.8	N/A
1/2 - SW x 1 - SW	19096M	88.9	50.8	315.9	333.4	65.1	95.3	12.7	21.7	15.9	33.8	3.2	5.4
3/4 - SW x 1 - SW	19096M	88.9	50.8	315.9	333.4	65.1	95.3	12.7	27.1	15.9	33.8	3.4	5.6
1 - SW x 1 - SW	19096M	88.9	50.8	315.9	333.4	65.1	95.3	12.7	33.8	15.9	33.8	3.6	5.9
3/4 - SW x 1 - SW	19096H	101.6	60.3	339.7	N/A	79.4	N/A	12.7	27.1	15.9	33.8	5.4	N/A
1/2 - SW x 1 - SW	19110L	88.9	47.6	269.9	N/A	50.8	N/A	12.7	21.7	15.9	33.8	2.5	N/A
3/4 - SW x 1 - SW	19110L	88.9	47.6	269.9	N/A	50.8	N/A	12.7	27.1	15.9	33.8	2.5	N/A
1 - SW x 1 - SW	19110L	88.9	47.6	269.9	N/A	50.8	N/A	12.7	33.8	15.9	33.8	2.8	N/A
1/2 - SW x 1 - SW	19110M	88.9	50.8	315.9	N/A	65.1	N/A	12.7	21.7	15.9	33.8	3.2	N/A
3/4 - SW x 1 - SW	19110M	88.9	50.8	315.9	N/A	65.1	N/A	12.7	27.1	15.9	33.8	3.4	N/A
1 - SW x 1 - SW	19110M	88.9	50.8	315.9	N/A	65.1	N/A	12.7	33.8	15.9	33.8	3.6	N/A
3/4 - SW x 1 - SW	19110H	101.6	60.3	339.7	N/A	79.4	N/A	12.7	27.1	15.9	33.8	5.4	N/A
3/4 - SW x 1 - SW	19126L	88.9	47.6	269.9	N/A	50.8	N/A	12.7	27.1	15.9	33.8	2.7	N/A
1 - SW x 1 - SW	19126L	88.9	47.6	269.9	N/A	50.8	N/A	12.7	33.8	15.9	33.8	3.1	N/A
3/4 - SW x 1 - SW	19126M	88.9	50.8	315.9	N/A	65.1	N/A	12.7	27.1	15.9	33.8	3.2	N/A
1 - SW x 1 - SW	19126M	88.9	50.8	315.9	N/A	65.1	N/A	12.7	33.8	15.9	33.8	3.6	N/A
3/4 - SW x 1 - SW	19126H	114.3	79.4	439.7	N/A	117.5	N/A	15.9	27.1	15.9	33.8	14.5	N/A
1 - SW x 1-1/2 - SW	19226L	100.0	57.2	303.2	N/A	66.3	N/A	12.7	33.8	15.9	48.6	3.6	N/A
1 - SW x 1-1/2 - SW	19226M	100.0	60.3	338.1	N/A	79.4	N/A	12.7	33.8	15.9	48.6	5.7	N/A
1-SW x 1-1/2 - SW	19226H	114.3	79.4	439.7	N/A	117.5	N/A	15.9	33.8	15.9	48.6	14.5	N/A
1-1/2 - SW x 2 - SW	19357L	120.7	79.4	400.1	N/A	92.08	N/A	15.9	48.6	15.9	61.1	8.3	N/A
1-1/2 - SW x 2 - SW	19357M	120.7	79.4	446.1	N/A	117.5	N/A	15.9	48.6	15.9	61.1	14.1	N/A
2 - SW x 2-1/2 - SW	19567L	136.5	79.4	415.9	N/A	92.08	N/A	15.9	61.1	15.9	73.8	10.9	N/A
2 - SW x 2-1/2 - SW	19567M	136.5	79.4	462.0	N/A	117.5	N/A	15.9	61.1	15.9	73.8	15.4	N/A

19000 Flanged Connections (Inches & Pounds)

Size (in.)	Type	Inlet (RF or RJ) ANSI Standard Except Thickness	Outlet		A	B		C	D	E	F	G		H	Approx. Weight	
			Female NPT (in.)	(RF or RJ) ANSI Standard Except Thickness	(in.)	NPT (in.)	Flange (in.)	(in.)	(in.)	RF or RJ (in.)	RF or RJ (in.)	Class 150# RF or RJ (in.)	Class 300# RF or RJ (in.)	RF or RJ (in.)	Threaded Outlet (lbs.)	Flanged Outlet (lbs.)
1/2	19096L	1/2 - 150	1	1 - 150	6	1-7/8	4-7/8	13-1/8	2	7/8	7/16	1-1/16	—	1/2	6-1/4	9-1/4
	19110L	1/2 - 300								1					7-1/4	10-1/4
3/4	19096L	3/4 - 150	1	1 - 150	6-1/4	1-7/8	4-7/8	13-3/8	2	1	1/2	1-1/16	—	1/2	7	10
	19110L	3/4 - 300								1-1/8					8-1/2	11-1/2
1	19096L	1 - 150	1	1 - 150	6-1/2	1-7/8	4-7/8	13-5/8	2	1-1/16	1/2	1-1/16	—	1/2	7-3/4	10-3/4
	19110L	1 - 300								1-3/16					9-1/4	12-1/4
3/4	19126L	3/4 - 150	1	1 - 150	6-1/4	1-7/8	4-7/8	13-3/8	2	1	1/2	1-1/16	—	1/2	7-1/2	10-1/2
		3/4 - 300								1-1/8					9	12
1	19126L	1 - 150	1	1 - 150	6-1/2	1-7/8	4-7/8	13-5/8	2	1-1/16	1/2	1-1/16	—	1/2	8-1/4	11-1/4
		1 - 300								1-3/16					9-3/4	12-3/4
1	19226L	1 - 150	1-1/2	1-1/2 - 150	6-1/4	2-1/4	6-1/8	14-1/4	2-3/8	1-1/16	1/2	1-3/16	—	1/2	9-3/4	14-3/4
		1 - 300								1-3/16					11-1/4	16-1/4
1-1/2	19357L	1-1/2 - 150	2	2 - 150	7-1/8	3-1/8	6-1/8	18-1/8	3-5/8	1-3/16	1/2	1-3/8	—	5/8	22-3/4	30-1/4
		1-1/2 - 300								1-5/16					26-1/4	33-3/4
2	19567L	2 - 150	2-1/2	2-1/2 - 150	7-1/8	3-1/8	6-1/8	18-1/8	3-5/8	1-3/8	5/8	1-1/2	—	5/8	26-3/4	38-1/4
		2 - 300								1-1/2					28-3/4	40-1/4
1/2	19096M 19110M	1/2 - 300	1	1 - 150	6	2	4-7/8	14-15/16	2-9/16	1	7/16	1-1/16	—	1/2	9	12
		1/2 - 600		1 - 150	6			14-15/16		1	7/16	1-1/16	—		9	12
		1/2 - 900		1 - 300	6-1/2			15-7/16		1-1/2	5/8	—	1-3/16		13-1/4	17-3/4
		1/2 - 1500		1 - 300	6-1/2			15-7/16		1-1/2	5/8	—	1-3/16		13-1/4	17-3/4
3/4	19096M 19110M	3/4 - 300	1	1 - 150	6-1/4	2	4-7/8	15-3/16	2-9/16	1-1/8	1/2	1-1/16	—	1/2	10-1/4	13-1/4
		3/4 - 600		1 - 150	6-1/4			15-3/16		1-1/8	1/2	1-1/16	—		10-1/4	13-1/4
		3/4 - 900		1 - 300	6-3/4			15-11/16		1-5/8	5/8	—	1-3/16		13-1/2	18
		3/4 - 1500		1 - 300	6-3/4			15-11/16		1-5/8	5/8	—	1-3/16		13-1/2	18
1	19096M 19110M	1 - 300	1	1 - 150	6-1/2	2	4-7/8	15-7/16	2-9/16	1-3/16	1/2	1-1/16	—	1/2	11	14
		1 - 600		1 - 150	6-1/2			15-7/16		1-3/16	1/2	1-1/16	—		11	14
		1 - 900		1 - 300	7-1/2			16-7/16		1-3/4	5/8	—	1-3/16		15-1/2	20
		1 - 1500		1 - 300	7-1/2			16-7/16		1-3/4	5/8	—	1-3/16		15-1/2	20
3/4	19126M	3/4 - 300	1	1 - 150	6-1/4	2	4-7/8	15-3/16	2-9/16	1-1/8	1/2	1-1/16	—	1/2	10-1/4	13-1/4
		3/4 - 600		1 - 150	6-1/4			15-3/16		1-1/8	1/2	1-1/16	—		10-1/4	13-1/4
		3/4 - 900		1 - 300	6-3/4			15-11/16		1-5/8	5/8	—	1-3/16		13-1/2	18
		3/4 - 1500		1 - 300	6-3/4			15-11/16		1-5/8	5/8	—	1-3/16		13-1/2	18
1	19126M	1 - 300	1	1 - 150	6-1/2	2	4-7/8	15-7/16	2-9/16	1-3/16	1/2	1-1/16	—	1/2	11	14
		1 - 600		1 - 150	6-1/2			15-7/16		1-3/16	1/2	1-1/16	—		11	14
		1 - 900		1 - 300	7-1/2			16-7/16		1-3/4	5/8	—	1-3/16		15-3/4	20-1/4
		1 - 1500		1 - 300	7-1/2			16-7/16		1-3/4	5/8	—	1-3/16		15-3/4	20-1/4

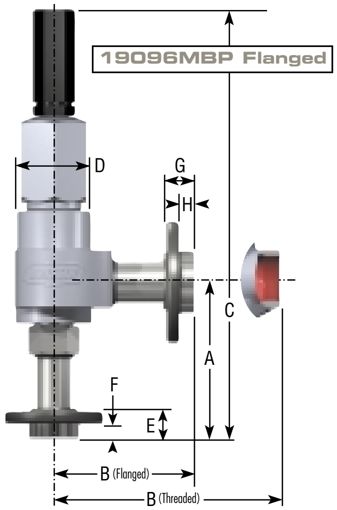
19000 Flanged Connections (Inches & Pounds)

Size (in.)	Type	Inlet (RF or RJ) ANSI Standard Except Thickness	Outlet		A	B		C	D	E	F	G		H	Approx. Weight	
			Female NPT (in.)	(RF or RJ) ANSI Standard Except Thickness	(in.)	NPT (in.)	Flange (in.)	(in.)	(in.)	RF or RJ (in.)	RF or RJ (in.)	Class 150# RF or RJ (in.)	Class 300# RF or RJ (in.)	RF or RJ (in.)	Threaded Outlet (lbs.)	Flanged Outlet (lbs.)
1	19226M	1 - 300	1-1/2	1-1/2 - 150	6-1/4	2-3/8	6-1/8	15-5/8	3-1/8	1-3/16	1/2	1-3/16	—	1/2	16	21
		1 - 600		1-1/2 - 150	6-1/4			15-5/8		1-3/16	1/2	1-3/16	—		16	21
		1 - 900		1-1/2 - 300	7-1/4			16-5/8		1-3/4	5/8	—	1-5/16		20-1/2	29
		1 - 1500		1-1/2 - 300	7-1/4			16-5/8		1-3/4	5/8	—	1-5/16		20-1/2	29
1-1/2	19357M	1-1/2 - 300	2	2 - 150	7-1/8	3-1/8	6-1/8	19-15/16	4-5/8	1-5/16	1/2	1-3/8	—	5/8	38-1/4	45-3/4
		1-1/2 - 600		2 - 150	7-1/8			19-15/16		1-3/8	1/2	1-3/8	—		38-1/4	45-3/4
		1-1/2 - 900		2 - 300	8-1/4			21-1/16		1-7/8	5/8	—	1-1/2		46-3/4	56-1/4
		1-1/2 - 1500		2 - 300	8-1/4			21-1/16		1-7/8	5/8	—	1-1/2		46-3/4	56-1/4
2	19567M	2 - 300	2-1/2	2-1/2 - 150	7-1/8	3-1/8	6-1/8	19-15/16	4-5/8	1-1/2	5/8	1-1/2	—	5/8	39-3/4	51-1/4
		2 - 600		2-1/2 - 150	7-1/8			19-15/16		1-5/8		1-1/2	—		40-3/4	52-1/4
		2 - 900		2-1/2 - 300	8-1/4			21-1/16		2-1/8		—	1-5/8		55-1/4	68-3/4
		2 - 1500		2-1/2 - 300	8-1/4			21-1/16		2-1/8		—	1-5/8		55-1/4	68-3/4
3/4	19096H/ 19110H	3/4 - 1500	1	1 - 300	6-1/2	2-3/8	6-1/4	15-5/8	3-1/8	1-5/8	5/8	—	1-3/16	1/2	18-1/2	23
		3/4 -2500								1-7/8		—	1-3/16		20-3/4	25-1/4
3/4	19126H	3/4 - 1500	1	1 - 300	6-1/2	3-1/8	6-1/4	19-1/16	4-5/8	1-5/8	5/8	—	1-3/16	1/2	37	41-1/2
		3/4 - 2500								1-7/8		—	1-3/16		39	43-1/2
1	19226H	1 - 1500	1-1/2	1-1/2 - 300	7-1/4	3-1/8	6-1/8	16-3/8	4-5/8	1-3/4	5/8	—	1-5/16	1/2	39	47
		1 - 2500								2		—	1-5/16		43-1/2	51-1/2



19096MBP Flanged Connections (Inches & Pounds)

Size (in.)	Type	Inlet (RF or RJ) ANSI Standard Except Thickness	Outlet		A	B		C	D	E	F	G		H	Approx. Weight	
			Female NPT (in.)	(RF or RJ) ANSI Standard Except Thickness	(in.)	NPT (in.)	Flange (in.)	(in.)	(in.)	RF or RJ (in.)	RF or RJ (in.)	Class 150# RF or RJ (in.)	Class 300# RF or RJ (in.)	RF or RJ (in.)	Threaded Outlet (lbs.)	Flanged Outlet (lbs.)
1/2	19096M	1/2 - 150	1	1 - 150	6	2	4-7/8	15-5/8	3-3/4	7/8	7/16	1-1/16	—	1/2	13	16
		1/2 - 300		1 - 150	6			15-5/8		1	7/16	1-1/16	—		14	17
		1/2 - 600		1 - 150	6			15-5/8		1	7/16	1-1/16			14	17
		1/2 - 900		1 - 300	6-1/2			16-1/8		1-1/2	5/8	—	1-3/16		18-1/4	22-3/4
		1/2 - 1500		1 - 300	6-1/2			16-1/8		1-1/2	5/8	—	1-3/16		18-1/4	22-3/4
3/4	19096M	3/4 - 150	1	1 - 150	6-1/4	2	4-7/8	15-7/8	3-3/4	1	1/2	1-1/16	—	1/2	13-3/4	16-3/4
		3/4 - 300		1 - 150	6-1/4			15-7/8		1-1/8	1/2	1-1/16	—		15-1/4	18-1/4
		3/4 - 600		1 - 150	6-1/4			15-7/8		1-1/8	1/2	1-1/16	—		15-1/4	18-1/4
		3/4 - 900		1 - 300	6-3/4			16-3/8		1-5/8	5/8	—	1-3/16		20	23
		3/4 - 1500		1 - 300	6-3/4			16-3/8		1-5/8	5/8	—	1-3/16		20	23
1	19096M	1 - 150	1	1 - 150	6-1/2	2	4-7/8	16-1/8	3-3/4	1-1/16	1/2	1-1/16	—	1/2	14-1/2	17-1/2
		1 - 300		1 - 150	6-1/2			16-1/8		1-3/16	1/2	1-1/16	—		16	19
		1 - 600		1 - 150	6-1/2			16-1/8		1-3/16	1/2	1-1/16	—		16	19
		1 - 900		1 - 300	7-1/2			17-1/8		1-3/4	5/8	—	1-3/16		22	25
		1 - 1500		1 - 300	7-1/2			17-1/8		1-3/4	5/8	—	1-3/16		22	25

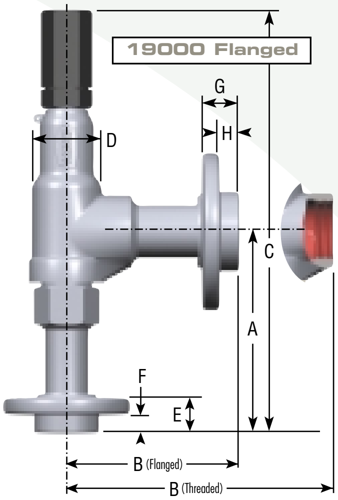


19000 Flanged Connections (Millimeters & Kilograms)

Size (in.)	Type	Inlet (RF or RJ) ANSI Standard Except Thickness	Outlet		A	B		C	D	E	F	G		H	Approx. Weight	
			Female NPT (in.)	(RF or RJ) ANSI Standard Except Thickness	(mm)	NPT (mm)	Flange (mm)	(mm)	(mm)	RF or RJ (mm)	RF or RJ (mm)	Class 150# RF or RJ (mm)	Class 300# RF or RJ (mm)	RF or RJ (mm)	Threaded Outlet (Kg)	Flanged Outlet (Kg)
1/2	19096L 19110L	1/2 - 150	1	1 - 150	152.4	47.6	123.8	333.4	50.8	22.2	11.1	27.0	—	12.7	2.8	4.2
		1/2 - 300								25.4					3.3	4.6
3/4	19096L 19110L	3/4 - 150	1	1 - 150	158.8	47.6	123.8	339.7	50.8	25.4	12.7	27.0	—	12.7	3.2	4.5
		3/4 - 300								28.6					3.9	5.2
1	19096L 19110L	1 - 150	1	1 - 150	165.1	47.6	123.8	346.1	50.8	27.0	12.7	27.0	—	12.7	3.5	4.9
		1 - 300								30.2					4.2	5.6
3/4	19126L	3/4 - 150	1	1 - 150	158.8	47.6	123.8	339.7	50.8	25.4	12.7	27.0	—	12.7	3.4	4.8
		3/4 - 300								28.6					4.1	5.4
1	19126L	1 - 150	1	1 - 150	165.1	47.6	123.8	346.1	50.8	30.2	12.7	27.0	—	12.7	3.7	5.1
		1 - 300													4.4	5.8
1	19226L	1 - 150	1-1/2	1-1/2 - 150	158.8	57.2	155.6	362.0	60.3	27.0	12.7	30.2	—	12.7	4.4	6.7
		1 - 300								30.2					5.1	7.4
1-1/2	19357L	1-1/2 - 150	2	2 - 150	181.0	79.4	155.6	460.4	92.1	30.2	12.7	34.9	—	15.9	10.3	13.7
		1-1/2 - 300								33.3					11.9	15.3
2	19567L	2 - 150	2-1/2	2-1/2 - 150	181.0	79.4	155.6	460.4	92.1	34.9	15.9	38.1	—	15.9	12.1	17.4
		2 - 300								38.1					13.0	18.3
1/2	19096M 19110M	1/2 - 300	1	1 - 150	152.4	50.8	123.8	379.4	65.1	25.4	11.1	27.0	—	12.7	4.1	5.4
		1/2 - 600		1 - 150	152.4			379.4		25.4	11.1	27.0	—		4.1	5.4
		1/2 - 900		1 - 300	165.1			392.1		38.1	15.9	—	30.2		6.0	8.1
		1/2 - 1500		1 - 300	165.1			392.1		38.1	15.9	—	30.2		6.0	8.1
3/4	19096M 19110M	3/4 - 300	1	1 - 150	158.8	50.8	123.8	385.8	65.1	28.6	12.7	27.0	—	12.7	4.6	6.0
		3/4 - 600		1 - 150	158.8			385.8		28.6	12.7	27.0	—		4.6	6.0
		3/4 - 900		1 - 300	171.5			398.5		41.3	15.9	—	30.2		6.1	8.2
		3/4 - 1500		1 - 300	171.5			398.5		41.3	15.9	—	30.2		6.1	8.2
1	19096M 19110M	1 - 300	1	1 - 150	165.1	50.8	123.8	392.1	65.1	30.2	12.7	27.0	—	12.7	5.0	6.4
		1 - 600		1 - 150	165.1			392.1		30.2	12.7	27.0	—		5.0	6.4
		1 - 900		1 - 300	190.5			417.5		44.5	15.9	—	30.2		7.0	9.1
		1 - 1500		1 - 300	190.5			417.5		44.5	15.9	—	30.2		7.0	9.1
3/4	19126M	3/4 - 300	1	1 - 150	158.8	50.8	123.8	385.8	65.1	28.6	12.7	27.0	—	12.7	4.6	6.0
		3/4 - 600		1 - 150	158.8			385.8		28.6	12.7	27.0	—		4.6	6.0
		3/4 - 900		1 - 300	171.5			398.5		41.3	15.9	—	30.2		6.1	8.2
		3/4 - 1500		1 - 300	171.5			398.5		41.3	15.9	—	30.2		6.1	8.2
1	19126M	1 - 300	1	1 - 150	165.1	50.8	123.8	392.1	65.1	30.2	12.7	27.0		12.7	5.0	6.4
		1 - 600		1 - 150	165.1			392.1		30.2	12.7	27.0			5.0	6.4
		1 - 900		1 - 300	190.5			417.5		44.5	15.9	—	30.2		7.1	9.2
		1 - 1500		1 - 300	190.5			417.5		44.5	15.9	—	30.2		7.1	9.2

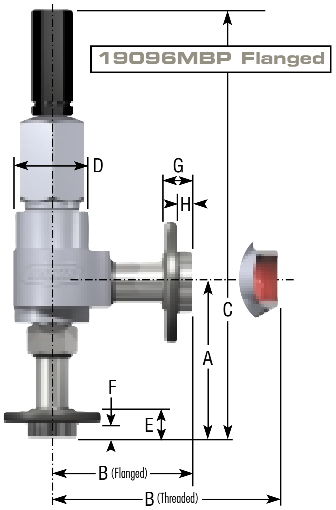
19000 Flanged Connections (Millimeters & Kilograms)

Size (in.)	Type	Inlet (RF or RJ) ANSI Standard Except Thickness	Outlet		A	B		C	D	E	F	G		H	Approx. Weight	
			Female NPT (in.)	(RF or RJ) ANSI Standard Except Thickness	(mm)	NPT (mm)	Flange (mm)	(mm)	(mm)	RF or RJ (mm)	RF or RJ (mm)	Class 150# RF or RJ (mm)	Class 300# RF or RJ (mm)	RF or RJ (mm)	Threaded Outlet (Kg)	Flanged Outlet (Kg)
1	19226M	1 - 300	1-1/2	1-1/2 - 150	158.8	60.3	155.6	396.9	79.4	30.2	12.7	30.2	—	12.7	7.3	9.5
		1 - 600		1-1/2 - 150	158.8			396.9		30.2	12.7	30.2	—		7.3	9.5
		1 - 900		1-1/2 - 300	184.2			422.3		44.5	15.9	—	33.3		9.3	13.2
		1 - 1500		1-1/2 - 300	184.2			422.3		44.5	15.9	—	33.3		9.3	13.2
1-1/2	19357M	1-1/2 - 300	2	2 - 150	181.0	79.4	155.6	506.4	117.5	33.3	12.7	34.9		15.9	17.4	20.8
		1-1/2 - 600		2 - 150	181.0			506.4		34.9	12.7	34.9			17.4	20.8
		1-1/2 - 900		2 - 300	209.6			535.0		47.6	15.9	—	38.1		21.2	25.5
		1-1/2 - 1500		2 - 300	209.6			535.0		47.6	15.9	—	38.1		21.2	25.5
2	19567M	2 - 300	2-1/2	2-1/2 - 150	181.0	79.4	155.6	506.4	117.5	38.1	15.9	38.1	—	15.9	18.0	23.2
		2 - 600		2-1/2 - 150	181.0			506.4		41.3	15.9	38.1	—		18.5	23.7
		2 - 900		2-1/2 - 300	209.6			535.0		54.0	15.9	—	41.3		25.1	31.2
		2 - 1500		2-1/2 - 300	209.6			535.0		54.0	15.9	—	41.3		25.1	31.2
3/4	19096H/ 19110H	3/4 - 1500	1	1 - 300	165.1	60.3	158.8	396.9	79.4	41.3	15.9	—	30.2	12.7	8.4	10.4
		3/4 - 2500			165.1			396.9		47.6	15.9	—	30.2		9.4	11.5
3/4	19126H	3/4 - 1500	1	1 - 300	165.1	79.4	158.8	484.2	114.3	41.3	15.9	—	30.2	12.7	16.8	18.8
		3/4 - 2500			165.1			484.2		47.6	15.9	—	30.2		17.7	19.7
1	19226H	1 - 1500	1-1/2	1-1/2 - 300	184.2	79.4	155.6	415.9	114.3	44.5	15.9	—	33.3	12.7	17.7	21.3
		1 - 2500			184.2			415.9		50.8	15.9	—	33.3		19.7	23.4



19096MBP Flanged Connections (Millimeters & Kilograms)

Size (in.)	Type	Inlet (RF or RJ) ANSI Standard Except Thickness	Outlet		A	B		C	D	E	F	G		H	Approx. Weight	
			Female NPT (in.)	(RF or RJ) ANSI Standard Except Thickness	(mm)	NPT (mm)	Flange (mm)	(mm)	(mm)	RF or RJ (mm)	RF or RJ (mm)	Class 150# RF or RJ (mm)	Class 300# RF or RJ (mm)	RF or RJ (mm)	Threaded Outlet (Kg)	Flanged Outlet (Kg)
1/2	19096M	1/2 - 150	1	1 - 150	152.4	50.8	123.8	396.9	95.3	22.2	11.1	27.0	—	12.7	5.9	7.3
		1/2 - 300		1 - 150	152.4			396.9		25.4	11.1	27.0	—		6.4	7.7
		1/2 - 600		1 - 150	152.4			396.9		25.4	11.1	27.0	—		6.4	7.7
		1/2 - 900		1 - 300	165.1			409.6		38.1	15.9	—	30.2		8.3	10.3
		1/2 - 1500		1 - 300	165.1			409.6		38.1	15.9	—	30.2		8.3	10.3
3/4	19096M	3/4 - 150	1	1 - 150	158.8	50.8	123.8	403.2	95.3	25.4	12.7	27.0	—	12.7	6.2	7.6
		3/4 - 300		1 - 150	158.8			403.2		28.6	12.7	27.0	—		6.9	8.3
		3/4 - 600		1 - 150	158.8			403.2		28.6	12.7	27.0	—		6.9	8.3
		3/4 - 900		1 - 300	171.5			415.9		41.3	15.9	—	30.2		9.1	10.4
		3/4 - 1500		1 - 300	171.5			415.9		41.3	15.9	—	30.2		9.1	10.4
1	19096M	1 - 150	1	1 - 150	165.1	50.8	123.8	409.6	95.3	27.0	12.7	27.0	—	12.7	6.5	7.9
		1 - 300		1 - 150	165.1			409.6		30.2	12.7	27.0	—		7.3	8.6
		1 - 600		1 - 150	165.1			409.6		30.2	12.7	27.0	—		7.3	8.6
		1 - 900		1 - 300	190.5			435.0		44.5	15.9	—	30.2		10.0	11.3
		1 - 1500		1 - 300	190.5			435.0		44.5	15.9	—	30.2		10.0	11.3



O-Ring Selection Procedure

In addition to the rating of the valve based on materials and temperatures, it is possible that if the valve is equipped with O-Rings (soft seats), the O-Ring may limit the range of valve application.

The following selection process is simple and straight forward and should yield a satisfactory valve selection.

Use the following steps in the O-Ring selection process:

1. Refer to the Technical Information section in this catalog to select appropriate O-Ring material for service media.
2. Refer to "Table A" (O-Ring Selection - Durometer). Using the valve set pressure, determine the durometer hardness which will be needed.
3. Refer to "Table B". Utilizing the material selected and the durometer hardness selected check the temperature limits of the material.
4. If the selected material is not adequate, select another material and repeat the procedure.

NOTE: For fire applications use the operating temperature when selecting a material.

O-Ring Selection - Durometer
Table A

Valve Type	O-Ring Durometer			Teflon	
	50[1] Set Press. (psig)	70[1] Set Press. (psig)	90[2] Set Press. (psig)	-300 to 200°F Set Press. (psig)	201 to 500°F Set Press. (psig)
19096	15 to 300	100 to 500	300 to 2500	1400 to 5000	15 to 5000
19110	15 to 300	100 to 500	300 to 2500	1400 to 5000	15 to 5000
19126	15 to 250	30 to 500	250 to 2250	1000 to 6000	15 to 6000
19226	15 to 200	15 to 450	200 to 2000	1000 to 6000	15 to 6000
19357	15 to 150	15 to 400	150 to 1500	–	15 to 1500
19567	15 to 150	15 to 400	100 to 1000	–	15 to 1000

NOTES: 1 Maximum set pressure for silicone compounds is half of the maximum value.
2 The E9 62-90D O-Ring can be used in steam service to a lower pressure limit of 15 psig.

O-Ring Temperature Limits
Table B

Material	Durometer	Description	Temperature Limits	
			°F	°C
Nitrile	50	N299-50 OR N1009-50	-45 to +225°	-43 to +107°
	70	N674-70	-40 to +250°	-40 to +121°
	90	N552-90	-40 to +350°	-40 to +177°
	70[4]	N1173-70	-25 to +300°	-31 to +149°
Ethylene/Propylene	50	E981-50	-65 to +212°	-53 to +100°
	70	E603-70	-65 to +212°	-53 to +100°
	75 & 80[2]	E740-75 & E515-80	-70 to +250°	-57 to +121°
	90	E962-90[1]	-70 to +500°	-57 to +260°
	75	E962-75	-60 to +250/400°	-51 to +121/204°
Fluorocarbon	50	V986-50	-15 to +400°	-26 to +204°
	75	V747-75 OR V884-75	-15 to +400°	-26 to +204°
	90	V894-90 OR V709-90	-15 to +400°	-26 to +204°
Neoprene	50	C267-50	-45 to +300°	-43 to +149°
	70	C944-70 OR C873-70	-45 to +300°	-43 to +149°
Silicone	50	S595-50	-65 to +437°	-53 to +225°
	70	S604-70	-65 to +437°	-53 to +225°
Teflon	N/A	Teflon	-300 to +500°	-184 to +260°
Kalrez[3]	82	1050LF	-42 to +550°	-41 to +288°
Kalrez[3]	75	4079	-58 to +600°	-50 to +315°
Kalrez[3]	91	3018	-35 to +550°	-37 to +288°
Kalrez[3]	65	1058	-40 to +500°	-40 to +260°

NOTES: 1 EPR962-90D can be used in steam service to a lower pressure limit of 15 psig.
2 Set Pressure Ranges per "Table B" For durometer shall apply to these compounds (For Nuclear Service, Radiation Environment.)
3 Consult Factory before selecting. (4079 - Not for use in hot water or steam applications.)
4 Consult Factory before using. For use with Freon 134A/Ester Oil Service.

General Information

19000 & 19096MBP Series

These ratings apply to threaded or socket weld end connections.

When the valves are supplied with flanged connections the flange ratings may govern the range of valve pressure/temperature rating.

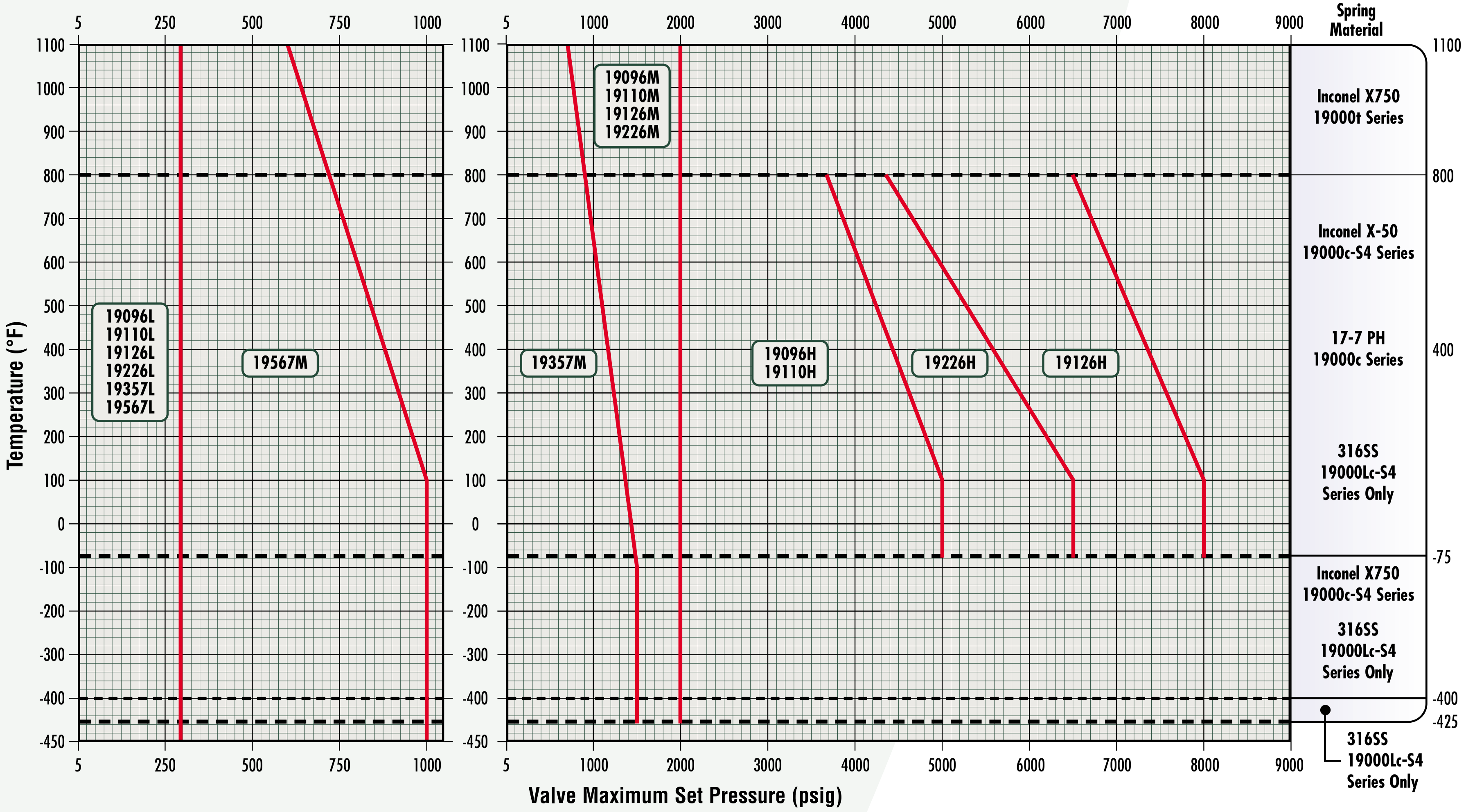
When selecting valves for back pressure applications the following limits apply:

- Constant back pressure - 400 psig
- Variable back pressure (superimposed or built-up) - 400 psig or 10% of set pressure whichever is smaller.

Valves with set pressures less than 15 psig cannot be stamped with the ASME Code stamp.

NOTE: When soft seats are used Elastometer material may govern the valve pressure/temperature rating.

Pressure / Temperature Rating of 19000 Series Valves



ORIFICE CAPACITIES - AIR (USCS Units) ASME B & PVC, Section VIII

Set Pressure plus 10% overpressure or 3 psig, whichever is greater. SCFM Air @ 60°F.

Set Press. (psig)	Orifice Area (sq. in.)					
	19096 & MBP .096[1]	19110 .110	19126 .126	19226 .226	19357 .357	19567 .567
15	51	58	66	119	188	299
20	58	66	77	137	217	344
30	74	84	97	174	274	436
40	91	104	119	214	338	536
50	108	123	142	254	401	637
60	125	143	164	294	464	737
70	142	162	186	334	528	838
80	159	182	209	374	591	938
90	176	201	231	414	654	1039
100	193	221	253	454	717	1139
120	227	260	298	534	844	1340
140	261	299	343	614	971	1541
160	295	338	387	695	1097	1743
180	329	377	432	775	1224	1944
200	363	416	477	855	1350	2145
220	397	455	521	935	1477	2346
240	431	494	566	1015	1603	2547
260	465	533	611	1095	1730	2748
280	499	572	655	1175	1857	2949
300	533	611	700	1255	1983	3150
320	567	650	745	1336	2110	3351
340	601	689	789	1416	2236	3552
360	635	728	834	1496	2363	3753
380	669	767	879	1576	2489	3954
400	704	806	923	1656	2616	4155
420	737	845	968	1736	2743	4356
440	772	884	1013	1816	2869	4557
460	806	923	1057	1896	2996	4758
480	840	962	1102	1977	3122	4959
500	874	1001	1147	2057	3249	5160
600	1044	1196	1370	2457	3882	6165
700	1214	1391	1593	2858	4514	7170
750	1299	1489	1705	3058	4831	7673
800	1384	1586	1817	3259	5147	8175
900	1554	1781	2040	3659	5780	9180
1000	1725	1976	2264	4060	6413	10186
1100	1895	2171	2487	4460	7046	-
1200	2065	2366	2710	4861	7679	-
1300	2235	2561	2934	5262	8312	-
1400	2405	2756	3157	5662	8945	-
1500	2575	2951	3380	6063	9577	-
1600	2745	3146	3603	6463	-	-
1700	2915	3341	3827	6864	-	-
1800	3086	3536	4050	7264	-	-
1900	3256	3731	4273	7665	-	-
2000	3426	3926	4497	8066	-	-
2500	4277	4901	5614	10069	-	-
3000	5128	5876	6731	12072	-	-
3500	5979	6851	7848	14076	-	-
4000	6830	7826	8964	16078	-	-
4500	7681	8801	10081	18082	-	-
5000	8532	9776	11198	20085	-	-
5500	-	-	12315	22088	-	-
6000	-	-	13432	24091	-	-
6400	-	-	14325	25694	-	-
6500	-	-	14548	-	-	-
7000	-	-	15665	-	-	-
7500	-	-	16782	-	-	-
8000	-	-	17899	-	-	-

SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.

NOTE 1: 19096MBP set pressure limit 50 to 2000 psig.

ORIFICE CAPACITIES - STEAM
(USCS Units) ASME B & PVC, Section VIII

Set Pressure plus 10% overpressure
or 3 psig, whichever is greater,
lbs. per hour saturated steam

Set Press. (psig)	Orifice Area (Sq. in.)					
	19096 & MBP .096[1]	19110 .110	19126 .126	19226 .226	19357 .357	19567 .567
15	142	162	186	334	527	838
20	164	187	215	385	609	967
30	207	237	272	487	770	1223
40	255	292	334	600	948	1505
50	303	346	397	712	1125	1787
60	350	401	460	825	1303	2069
70	398	456	522	937	1480	2351
80	446	510	585	1049	1658	2633
90	494	565	648	1162	1835	2915
100	541	620	710	1274	2013	3197
120	637	729	836	1499	2368	3761
140	732	839	961	1724	2723	4325
160	828	948	1086	1949	3078	4889
180	923	1057	1212	2174	3434	5453
200	1019	1167	1337	2398	3789	6017
220	1114	1276	1463	2623	4144	6581
240	1210	1386	1588	2848	4499	7145
260	1305	1495	1713	3073	4854	7709
280	1401	1605	1839	3298	5209	8273
300	1496	1714	1964	3523	5564	8837
320	1592	1824	2089	3747	5919	9401
340	1687	1933	2215	3972	6275	9966
360	1783	2043	2340	4197	6630	10530
380	1878	2152	2465	4422	6985	11094
400	1974	2262	2591	4647	7340	11658
420	2069	2371	2716	4871	7695	12222
440	2165	2480	2841	5096	8050	12786
460	2260	2590	2967	5321	8405	13350
480	2356	2699	3092	5546	8761	13914
500	2451	2809	3217	5771	9116	14478
600	2929	3356	3844	6895	10891	17298
700	3406	3903	4471	8019	12667	20118
750	3645	4177	4784	8581	13555	21528
800	3884	4450	5097	9143	14443	22938
900	4361	4997	5724	10267	16218	25759
1000	4839	5544	6351	11391	17994	28579
1100	5316	6091	6978	12515	19770	-
1200	5794	6639	7604	13639	21545	-
1300	6271	7186	8230	14763	23321	-
1400	6748	7733	8857	15887	25096	-
1423	6858	7859	9002	16146	25505	-
1500	7261	8320	9530	17093	27001	-
1600	7792	8928	10227	18343	-	-
1700	8334	9549	10938	19619	-	-
1800	8888	10184	11665	20923	-	-
1900	9455	10835	12410	22260	-	-
2000	10039	11503	13176	23634	-	-
2500	13285	15222	17437	31275	-	-
2903*	16611	19034	21803	39106	-	

* 2903 psig is maximum allowable set pressure for steam. 3000 psig capacities are provided for interpolation purposes only.
SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.
NOTE 1: 19096MBP set pressure limit 50 to 1528 psig saturated steam.

ORIFICE CAPACITIES - WATER *(USCS Units)* ASME B & PVC, Section VIII

Set Pressure plus 10% overpressure
or 3 psig, whichever is greater,
zero psig back pressure, GPM water @ 70°F.

Set Press. (psig)	Orifice Area (sq. in.)					
	19096 & MBP .096[1]	19110 .110	19126 .126	19226 .226	19357 .357	19567 .567
15	10	11	14	25	39	62
20	12	13	15	28	44	70
30	14	16	19	33	52	83
40	16	18	21	38	61	96
50	18	20	24	43	68	108
60	20	22	26	47	74	118
70	22	24	28	51	80	127
80	23	26	30	54	86	136
90	24	28	32	58	91	144
100	26	29	34	61	96	152
120	28	32	37	66	105	167
140	30	34	40	72	113	180
160	33	37	43	77	121	192
180	35	39	45	81	128	201
200	36	41	48	86	135	215
220	38	43	50	90	142	226
240	40	45	52	94	148	236
260	42	47	54	98	154	245
280	43	49	57	101	160	254
300	45	51	59	105	166	263
320	46	52	60	108	171	272
340	47	54	62	112	177	280
360	49	56	64	115	182	289
380	50	57	66	118	187	296
400	51	59	68	121	192	304
420	53	60	69	124	196	312
440	54	62	71	127	201	319
460	55	63	72	130	205	326
480	56	64	74	133	210	333
500	58	66	76	136	214	340
600	63	72	83	148	235	373
700	68	78	89	160	253	402
750	71	81	93	166	262	416
800	73	83	96	171	271	430
900	77	89	101	182	287	456
1000	81	93	107	192	303	481
1100	85	98	112	201	318	-
1200	89	102	117	210	332	-
1300	93	106	122	219	345	-
1400	96	110	126	227	358	-
1500	100	114	131	235	371	-
1600	103	118	135	242	-	-
1700	106	122	139	249	-	-
1800	109	125	143	257	-	-
1900	112	129	147	264	-	-
2000	115	132	151	271	-	-
2500	129	148	169	303	-	-
3000	141	162	185	332	-	-
3500	152	175	200	359	-	-
4000	163	187	214	383	-	-
4500	173	199	227	407	-	-
5000	182	208	239	429	-	-
5500	-	-	251	450	-	-
6000	-	-	262	470	-	-
6400	-	-	270	485	-	-
6500	-	-	272	-	-	-
7000	-	-	283	-	-	-
7500	-	-	293	-	-	-
8000	-	-	302	-	-	-

SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.
NOTE 1: 19096MBP set pressure limit 50 to 2000 psig.

820000

Bronze - Liquid Safety Relief Valve

Consolidated®

Table of Contents

Introduction

The 820000 Series **Consolidated** safety relief valve provides performance characteristics that meet the liquid service applications of various plant operating systems in today's industrial markets. This liquid service design is in compliance with ASME B & PVC Code, Section VIII requirements as well as proposed European (CEN) standards for safety valves.

Blowdown Performance is typically less than 15% on incompressible applications. This performance minimizes the loss of process fluids during an overpressure excursion and assists in the reduction of operating costs.

Seat Design provides for leak-tight seats during system operation and after cycling, during a pressure-relieving mode. Product loss due to seat leakage is virtually eliminated, resulting in savings from the cost of lost product.

A Simple Design that is easily maintained contributes to reduced maintenance costs.

820000

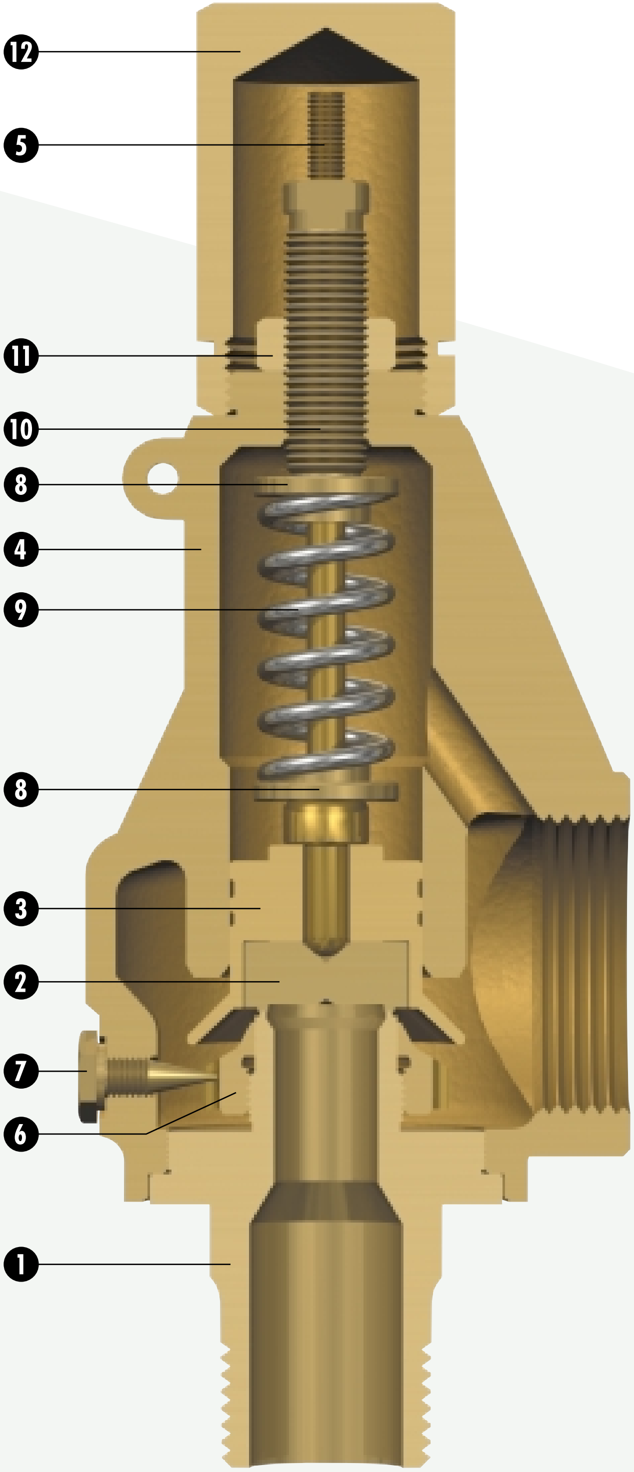
Scope of Design

The bronze safety relief valve is available in inlet sizes ranging from 1/2" through 2" in both threaded and flanged inlet connections, and 1" through 2-1/2" threaded outlet connections. Liquid opening pressure ranges from 15 psig to 500 psig with a temperature limit of 400°F.

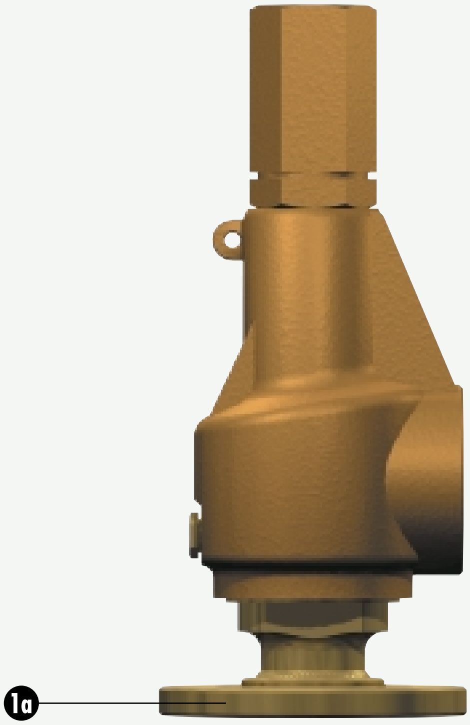
Unless otherwise specified, the valve is always supplied with a threaded cap. Exceptions are applications where ASME requires levers for water service over 140°F.

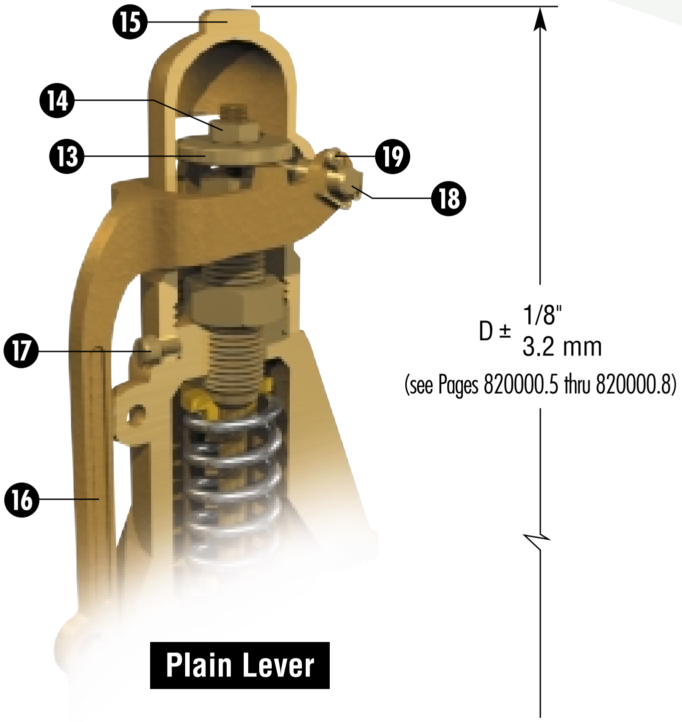
Valve Size	Valve Type	Inlet Pressure & Temperature Limits	Actual (ASME) Orifice Area		Standard Connections		Back Pressure Limit
			[sq. in.]	[sq. cm]	INLET	OUTLET	
1/2" x 1" 3/4" x 1"	820121c	500 psi to 400°F (204.4°C)	.121	.78	Male Threaded	Female Threaded	50 psig
3/4" x 1-1/2" 1" x 1-1/2"	820216c	500 psig to 400°F (204.4°C)	.216	1.39	Male Threaded	Female Threaded	50 psig
1" x 1-1/2" 1-1/4" x 1-1/2"	820332c	500 psig to 400°F (204.4°C)	.332	2.14	Male Threaded	Female Threaded	50 psig
1-1/2" x 2-1/2" 2" x 2-1/2"	820857c	500 psig to 400°F (204.4°C)	.857	5.53	Male Threaded	Female Threaded	50 psig

Materials

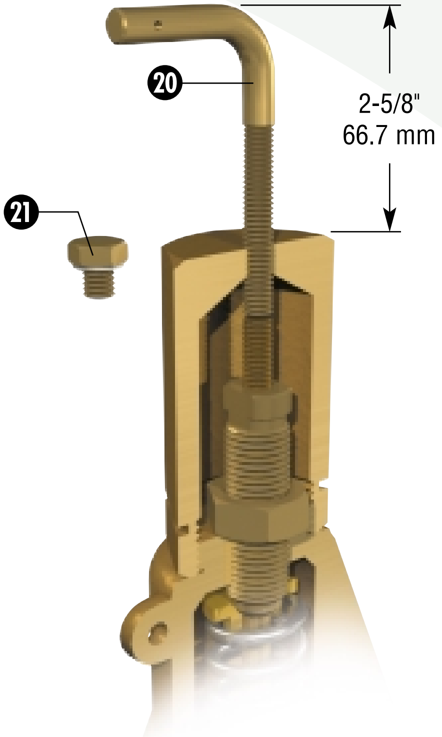


	Part	Material
1	Base	ASTM B283 Alloy C46400 Brass
1a	Flange	ASTM B62 Alloy C83600 Bronze
2	Disc	Brass
3	Disc Holder	Brass
4	Bonnet	ASTM B584 Alloy C87400 Bronze
5	Spindle	Brass
6	Adjusting Ring	Brass
7	Adjusting Ring Pin	Brass
8	Spring Washer	Brass
9	Spring	Stainless Steel
10	Adjusting Screw	Brass
11	Adjusting Screw Locknut	Brass
12	Screwed Cap	Brass

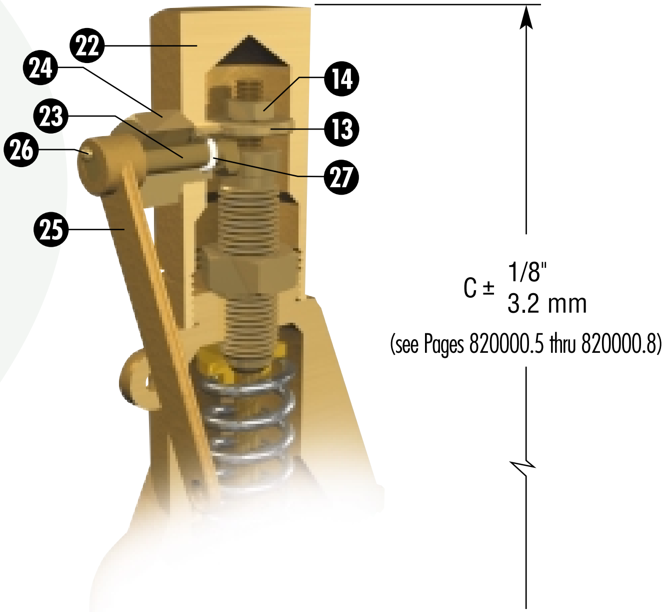




Plain Lever



Cap with Gag



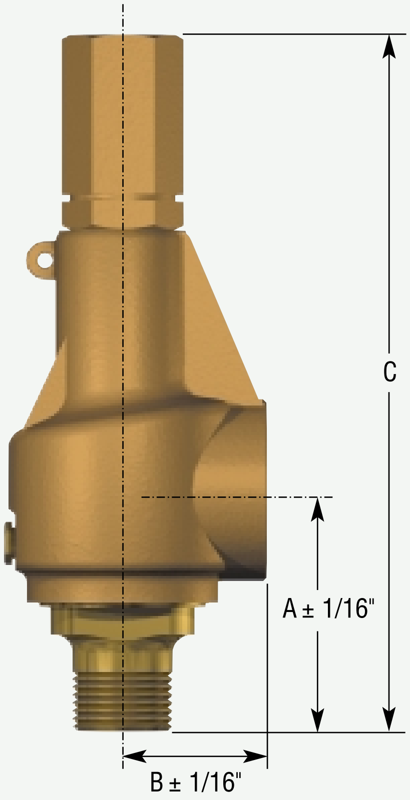
Packed Lever

	Part	Material
13	Release Nut	Brass
14	Release Locknut	Brass
15	Plain Cap	Bronze
16	Plain Lever	Bronze
17	Cap Screw	Brass
18	Lever Pin	Brass
19	Cotter Pin	Brass
20	Gag Bolt	Brass
21	Sealing Plug	Brass
22	Packed Cap	Brass
23	Cam Shaft	Brass
24	Bushing	Brass
25	Lever	Bronze
26	Drive Pin	Stainless Steel
27	O-Ring	Viton

Dimensions & Weights

820000 Series Valves - Threaded End Connections
USCS Dimensions (in.) and Weights (lbs.)

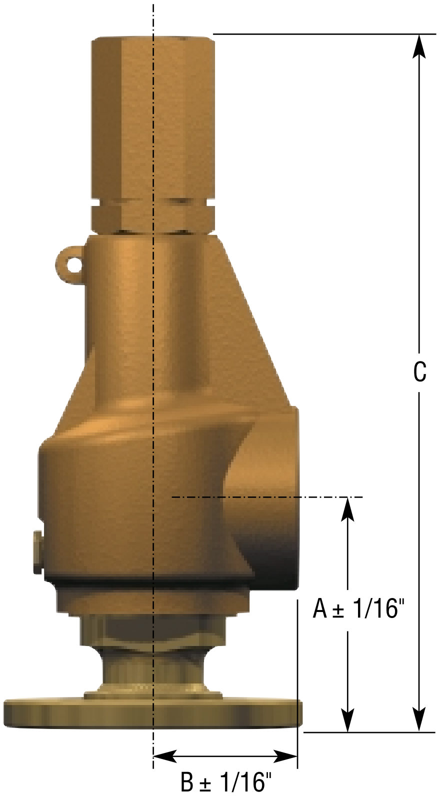
Size	Type	A	B	C	D	Approx. Weight
1/2 MNPT x 1 FNPT	820121	2-1/4	1-1/2	6-7/8	6-15/16	2.9
3/4 MNPT x 1 FNPT	820121	2-5/16	1-1/2	6-15/16	7	2.9
3/4 MNPT x 1-1/2 FNPT	820216	2-5/8	1-3/4	7-3/16	7-1/4	3.8
1 MNPT x 1-1/2 FNPT	820216	2-3/4	1-3/4	7-5/16	7-3/8	3.8
1 MNPT x 1-1/2 FNPT	820332	2-15/16	1-7/8	8-15/16	8-15/16	5
1-1/4 MNPT x 1-1/2 FNPT	820332	3-1/8	1-7/8	9-1/8	9-1/8	5
1-1/2 MNPT x 2-1/2 FNPT	820857	3-9/16	3	11-3/4	11-9/16	12
2 MNPT x 2-1/2 FNPT	820857	3-11/16	3	11-7/8	11-11/16	12



Dimensions & Weights

**820000 Series Valves - Flanged End Connections
USCS Dimensions (in.) and Weights (lbs.)**

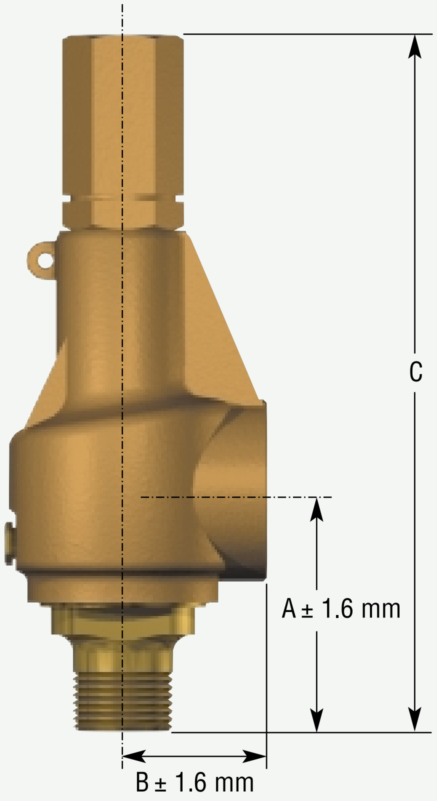
Size	Type	A	B	C	D	Approx. Weight
1-150 #FF x 1-1/2 FNPT	820216	2-3/4	1-3/4	7-5/16	7-3/8	4.9
1-300 #FF x 1-1/2 FNPT	820216	2-3/4	1-3/4	7-5/16	7-3/8	5.9
1-150 #FF x 1-1/2 FNPT	820332	2-15/16	1-7/8	8-15/16	8-15/16	7
1-300 #FF x 1-1/2 FNPT	820332	2-15/16	1-7/8	8-15/16	8-15/16	8
1-1/2-150 #FF x 2-1/2 FNPT	820857	3-3/4	3	11-15/16	11-3/4	15
1-1/2-300 #FF x 2-1/2 FNPT	820857	3-3/4	3	11-15/16	11-3/4	18.5
2-150 #FF x 2-1/2 FNPT	820857	3-11/16	3	12-1/8	11-15/16	17
2-300 #FF x 2-1/2 FNPT	820857	3-11/16	3	12-1/4	12-1/16	19



Dimensions & Weights

820000 Series Valves - Threaded End Connections
Metric Dimensions (mm) and Weights (kg)

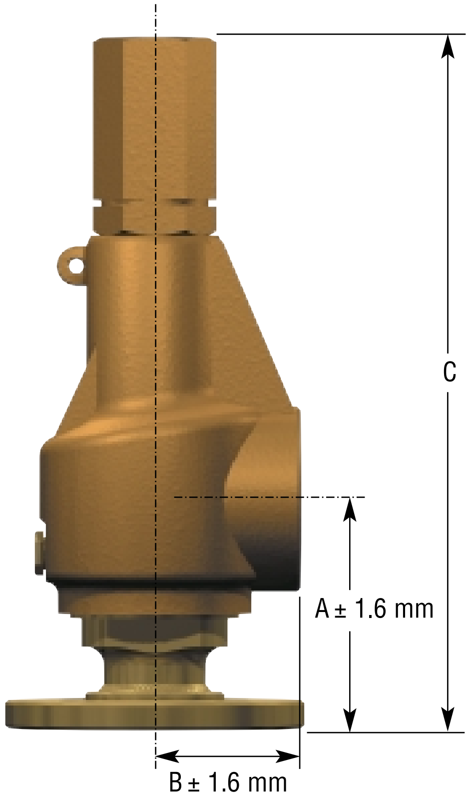
Size	Type	A	B	C	D	Approx. Weight
1/2 MNPT x 1 FNPT	820121	57.2	38.1	174.6	176.2	1.3
3/4 MNPT x 1 FNPT	820121	58.7	38.1	176.2	177.8	1.3
3/4 MNPT x 1-1/2 FNPT	820216	66.7	44.5	182.6	184.2	1.8
1 MNPT x 1-1/2 FNPT	820216	69.9	44.5	185.7	187.3	1.8
1 MNPT x 1-1/2 FNPT	820332	74.6	47.6	227	227	2.3
1-1/4 MNPT x 1-1/2 FNPT	820332	79.4	47.6	231.8	231.8	2.3
1-1/2 MNPT x 2-1/2 FNPT	820857	90.5	76.2	298.5	293.7	5.4
2 MNPT x 2-1/2 FNPT	820857	93.7	76.2	301.6	296.9	5.4



Dimensions & Weights

**820000 Series Valves - Threaded End Connections
Metric Dimensions (mm) and Weights (kg)**

Size	Type	A	B	C	D	Approx. Weight
1-150 #FF x 1-1/2 FNPT	820216	69.9	44.5	185.7	187.3	2.2
1-300 #FF x 1-1/2 FNPT	820216	69.9	44.5	185.7	187.3	2.7
1-150 #FF x 1-1/2 FNPT	820332	74.6	47.6	227	227	3.2
1-300 #FF x 1-1/2 FNPT	820332	74.6	47.6	227	227	3.6
1-1/2-150 #FF x 2-1/2 FNPT	820857	95.3	76.2	303.2	298.5	6.8
1-1/2-300 #FF x 2-1/2 FNPT	820857	95.3	76.2	303.2	298.5	8.4
2-150 #FF x 2-1/2 FNPT	820857	93.7	76.2	308	303.2	7.7
2-300 #FF x 2-1/2 FNPT	820857	93.7	76.2	311.2	306.4	8.6



Orifice Capacities

ORIFICE CAPACITIES - WATER
***(USCS Units)* ASME B & PVC, Section VIII**

Gallons per minute @ 70°F at 10% overpressure, zero psig back pressure
Set Pressure plus 10% overpressure or 3 psi, whichever is greater

	Valve Size / Orifice Area (sq. in.)			
Set Press. (psig)	**1/2" & 3/4" (0.121)**	**3/4" & 1" (0.216)**	**1" & 1-1/4" (0.332)**	**1-1/2" & 2" (0.857)**
15	14.79	26.40	40.57	104.73
20	16.71	29.84	45.86	118.39
30	20.02	35.74	54.93	141.80
40	23.12	41.27	63.43	163.74
50	25.85	46.14	70.92	183.07
60	28.31	50.55	77.69	200.54
70	30.58	54.59	83.91	216.61
80	32.69	58.36	89.71	231.57
90	34.68	61.90	95.15	245.61
100	36.55	65.25	100.30	258.90
120	40.04	71.48	109.87	283.61
140	43.25	77.21	118.67	306.33
160	46.24	82.54	126.87	327.48
180	49.04	87.55	134.56	347.35
200	51.70	92.28	141.84	366.14
220	54.22	96.79	148.76	384.01
240	56.63	101.09	155.38	401.08
260	58.94	105.22	161.72	417.46
280	61.17	109.19	167.83	433.22
300	63.31	113.02	173.72	448.43
320	65.39	116.73	179.42	463.13
340	67.40	120.32	184.94	477.39
360	69.36	123.81	190.30	491.23
380	71.26	127.20	195.51	504.69
400	73.11	130.51	200.59	517.80
420	74.91	133.73	205.55	530.58
440	76.68	136.88	210.38	543.07
460	78.40	139.95	215.11	555.28
480	80.09	142.96	219.74	567.22
500	81.74	145.91	224.27	578.92

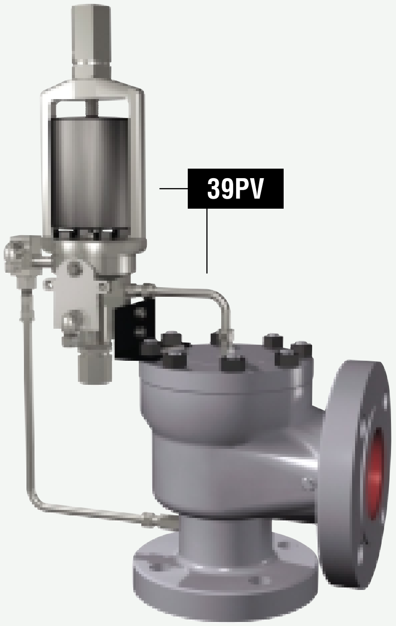
Agency Review

3900 MPV™

Pilot Operated Safety Relief Valve

Consolidated®

Table of Contents



3900 MPV

3900 Flanged Valves comply with:

- ASME B & PVC, Section VIII, Division I
- NACE MR0175
- D.O.T. Subchapter D Parts 192 and 195
- ISO 4126-4
- API 520, API 526, and API 527
- ANSI B16.34

Standard Features	39PV Pop Pilot	39MV Modulating Pilot
Convertible valve action	To Modulating	To Pop
Full Lift	at Set Pressure	110% of Set Pressure
Adjustable blowdown	2% to 7%	2% to 7%
Leak tight seats at % of set pressure	95% to 98%	96% to 99%
Main valve seat tight to set point	Yes	Yes
Field test connection	Yes	Yes
Gas, liquid and steam service (ASME B & PVC, Section VIII)	Yes	Yes
Non-Flowing pilot	Yes	Yes
Pilot construction entirely stainless steel	Yes	Yes
Set point repeatability to within +/-2%	Yes	Yes
100 micron filter protects pilot	Yes	Yes
Designed for ease of maintenance	Yes	Yes

3900 Flanged Series Overview

Consolidated, world leader in providing safety and safety relief valve solutions, offers the new **Consolidated** Modular Pilot Valve (MPV), a pilot operated safety relief valve. The 39MPV is a unique pilot valve design; combining top performance, capabilities and features within an economical, modular assembly. **Consolidated** has accomplished this feat by successfully designing an optimized safety "system" that offers versatility of application, yet provides cost effective standardization. Proven concepts and principles refined from over 100 years of successful design and application experience have been integrated into the **Consolidated** MPV, resulting in the production of a new and highly reliable pilot operated safety relief valve which is easy to operate and maintain.

Global concern for the environment continues to expand. The need to improve the operational efficiency of all types of process plants is worldwide. The need for relief valves that provide bubble tight operation and precise opening and closing pressures is increasing due to this trend. **Consolidated** Pilot Operated Safety Relief Valves offer high quality production products, performance characteristics and features that are consistent with today's industry demands.

The combining of our pilots into one unique design provides major benefits. This new design pilot valve is suitable for incompressible and compressible applications including steam. Adapting to various applications will require only the appropriate selection of soft goods and options to meet the service conditions.

Versatility

The **Consolidated** MPV is the FIRST true modular pilot operated safety relief valve design that combines pop and modulating functions within a single assembly suitable for incompressible and compressible fluids including steam. **Consolidated** MPV pilot operated safety relief valves meet API 526 requirements. For higher capacity requirements, full bore sizes are available up to 69.94 sq. inches, some with dual outlets. Available pressure class ratings are ANSI Class 150 to Class 1500.

Total Service

The MPV is manufactured by **Consolidated**, a TOTAL solutions provider of pressure relief products offering unmatched application expertise and after sales support on a world wide basis.

Introduction

Consolidated 39MPV Series Pilot Operated Safety Relief Valves are designed to provide reliable protection for a broad range of pressurized systems applications. The operating characteristics and design of pilot actuated relief valves differ significantly from spring loaded pressure relief valves. It is extremely important that the user recognizes the merits of each design and select valves based on a valid comparison. The **Consolidated** pressure relief valve designs meet the needs of most applications found in the markets we currently serve.

Consolidated strives to provide the best available information, data and assistance to its customers in the selection and application of our products. It is impractical, however, for **Consolidated** personnel to be trained in all systems and processes in which our products might be used. Ultimate responsibility remains with the customer as the process owner or designer.

The **Consolidated** 3900 series pilot operated safety relief valve is supplied with a non-flowing pilot valve. This single pilot design is suitable for both incompressible and compressible applications and performs equally well on liquid, vapor or two-phase flow services. The set pressure will not require adjustment if the service condition changes.

Because of its modular design, the 39PV (pop pilot) can be converted to a 39MV (modulator pilot). This makes the **Consolidated** 39PV and 39MV pilot valve the most versatile pilot valve on the market.

Product types covered in subsequent pages are noted below.

Product Type	Pilot Type	Service	Description
3900	39PV	gas/liquid	pop action - non flowing
3900	39MV	gas/liquid	modulating - non flowing
3900	39PVSS	steam	pop action - non flowing
3900	39MVSS	steam	modulating - non flowing

3900 Flanged Series Overview

Pressure Limits[1]

Product Type	Pilot Type	Minimum (psig)	Maximum (psig)	Service
3900	39PV	15	3750	gas/liquid
3900	39MV	15	3750	gas/liquid
3900	39PVSS	15	750	steam
3900	39MVSS	15	750	steam

Temperature Limits[1 & 2]

Product Type	Pilot Type	Minimum (°F)	Maximum (°F)	Service
3900	39PV	-40	505	gas/liquid
3900	39MV	-40	505	gas/liquid
3900	39PVSS	212	505	steam
3900	39MVSS	212	505	steam

Soft Goods Guide[3]

Service	Material	Pilot Valve and Modulator		Main Valve	
		Temperature Range (°F)	Pressure Range (psig)	Temperature Range (°F)	Pressure Range (psig)
liquid/gas	nitrile (Buna N)	-40 to 250	15 to 3750	-40 to 250	15 to 1500
liquid/gas	fluorocarbon (Viton)	-15 to 400	15 to 3750	-15 to 400	15 to 1500
liquid/gas	ethylene propylene	-40 to 400	15 to 3750	-40 to 500	15 to 1500
liquid/gas	Kalrez®	-40 to 400	15 to 3750	-40 to 505	15 to 1500
liquid/gas	Teflon	212 to 505	50 to 3750	-40 to 505	50 to 3750
liquid/gas	neoprene	N/A	N/A	-45 to 300	15 to 800
liquid/gas	silicone	N/A	N/A	-40 to 437	15 to 400
liquid/gas	Chemraz®	N/A	N/A	-20 to 450	15 to 1500
steam	ethylene propylene	212 to 500	15 to 49	212 to 500	15 to 49
steam	Teflon®	212 to 505	50 to 3750	212 to 505	50 to 750

NOTES: 1 The above table is general in nature and is to be used as a guideline only.
2 Refer to the “Pressure/Temperature” Chart on page 3900.55 for actual pressure limits at a given temperature by pressure class and materials of construction.
3 Refer to the “Soft Goods Selection” Chart on page 3900.9 for material selection for a given pressure, temperature, fluid type, durometer hardness, and orifice size.

3900 Flanged Series Overview

Options

Options	39PV	39MV
Manual Blowdown Valve (standard for steam service)	Yes	Yes
Backflow Preventer	Yes	Yes
Remote Sensing	Yes	Yes
Remote Pilot Mounting	Yes	Yes
Optional Sensing Line	Yes	Yes
Dual Pilots	Yes	Yes
Dual Filters	Yes	Yes
Pressure Differential Switch	Yes	Yes
Bonnet (vented)	Yes	Yes
Metal Spring Cover (encloses yoke & spring)	Yes	Yes
High Capacity Line Filter (with flush valve)	Yes	Yes
Remote Actuated Blowdown	Yes	Yes

Applications

Options	39PV	39MV
Type		
Pop Action - Non Flowing	Yes	No
Modulating - Non Flowing	No	Yes
Media		
Air, Gas	Yes	Yes
Vapor	Yes	Yes
Dirty Vapor (filter required)	Yes	Yes
Steam	Yes	Yes
Liquid	Yes	Yes
Operational Conditions		
Icing	Yes	Yes
Pulsations	Yes	Yes
Reduces Water Hammer (when valve closes)	Yes	Yes
Operational Performance		
Pressure Range: 15 - 3750 (Gas/Liquid/Steam)	Yes	Yes
15 - 750 (Steam)	Yes	Yes
Blowdown: 3%		Yes
5%	Yes	
Main Valve Seat Tightness:		
Bubble tight at 99% of set pressure	Yes	Yes
* Back Pressure (vent piped to main valve outlet):		
Variable - % of Set Pressure	15%	65%
Constant - % of Set Pressure	**	65%
* Back Pressure (with pilot vented to atmosphere):		
Variable - % of Set Pressure	65%	65%
Constant - % of Set Pressure	65%	65%
* Back Pressure (with pilot vented to body bowl):		
Variable - % of Set Pressure	15%	65%
Constant - % of Set Pressure	65%	65%
* Back Pressure (vent not piped to main valve outlet):	***	***

NOTES: * Review the outlet flange rating and review the capacity correction factor.
** A cold differential test pressure (CDTP) must be applied for a 39PV with constant back pressure over 15% of set pressure.
*** Contact factory for permissible backpressure limits when pilot vent is piped to valve outlet.

Valve Selection

Inlet x Outlet Size Combinations - Standard Bore

Valve Size (in.) & Type	Orifices	Inlet Flange Size (in.) & Class	Outlet Flange Size (in.) & Class	Outlet Type
1 - 3905	D,E,F	1 - 150	2 - 150	Single
1 - 3910	D,E,F	1 - 300	2 - 150	Single
1 - 3912	D,E,F	1 - 600	2 - 150	Single
1 - 3914	D,E,F	1 - 900	2 - 300	Single
1 - 3916	D,E,F	1 - 1500	2 - 300	Single
1-1/2 - 3905	D,E,F	1-1/2 - 150	2 - 150	Single
1-1/2 - 3910	D,E,F	1-1/2 - 300	2 - 150	Single
1-1/2 - 3912	D,E,F	1-1/2 - 600	2 - 150	Single
1-1/2 - 3914	D,E,F	1-1/2 - 900	2 - 300	Single
1-1/2 - 3916	D,E,F	1-1/2 - 1500	2 - 300	Single
1-1/2 - 3905	G,H	1-1/2 - 150	3 - 150	Single
1-1/2 - 3910	G,H	1-1/2 - 300	3 - 150	Single
1-1/2 - 3912	G,H	1-1/2 - 600	3 - 150	Single
1-1/2 - 3914	G,H	1-1/2 - 900	3 - 300	Single
1-1/2- 3916	G,H	1-1/2 - 1500	3 - 300	Single
2 - 3905	G,H,J	2 - 150	3 - 150	Single
2 - 3910	G,H,J	2 - 300	3 - 150	Single
2 - 3912	G,H,J	2 - 600	3 - 150	Single
2 - 3914	G,H,J	2 - 900	3 - 300	Single
2 - 3916	G,H,J	2 - 1500	3 - 300	Single
3 - 3905	J,K,L	3 - 150	4 - 150	Single
3 - 3910	J,K,L	3 - 300	4 - 150	Single
3 - 3912	J,K,L	3 - 600	4 - 150	Single
3 - 3914	J,K,L	3 - 900	4 - 300	Single
3 - 3916	J,K,L	3 - 1500	4 - 300	Single
4 - 3905	L,M,N,P	4 - 150	6 - 150	Single
4 - 3910	L,M,N,P	4 - 300	6 - 150	Single
4 - 3912	L,M,N,P	4 - 600	6 - 150	Single
4 - 3914	L,M,N,P	4 - 900	6 - 300	Single
4 - 3916	L,M,N,P	4 - 1500	6 - 300	Single
6 - 3905	Q,R	6 - 150	8 - 150	Single
6 - 3910	Q,R	6 - 300	8 - 150	Single
6 - 3912	Q,R	6 - 600	8 - 150	Single
8 - 3905	T	8 - 150	10 - 150	Single
8 - 3910	T	8 - 300	10 - 150	Single
8 - 3912	T	8 - 600	10 - 150	Single

3900 Standard Bore Orifice Area (Sq. in.)[1]

ASME	0.0129	0.2279	0.3568	0.5849	0.9127	1.496	2.138	2.853	3.6	4.34	6.38	11.05	16	26
API	0.110	0.196	0.307	0.503	0.785	1.287	1.838	3.317	4.186	5.047	7.417	12.85	18.6	30.21
ORIFICE	D	E	F	G	H	J	K	L	M	N	P	Q	R	T

NOTE 1 The center line to face dimensions and the Inlet/Outlet combinations of the 3900 meet API Standard 527-1995 for pilot operated valves.

Valve Selection

Inlet x Outlet Size Combinations - Full Bore

Valve Size (in.) & Type	Orifices	Inlet Flange Size (in.) & Class	Outlet Flange Size (in.) & Class	Outlet Type
1-1/2 - 3905	1-1/2 FB	1-1/2 - 150	2 - 150	Single
1-1/2 - 3910	1-1/2 FB	1-1/2 - 300	2 - 150	Single
1-1/2 - 3912	1-1/2 FB	1-1/2 - 600	2 - 150	Single
1-1/2 - 3914	1-1/2 FB	1-1/2 - 900	2 - 300	Single
1-1/2 - 3916	1-1/2 FB	1-1/2 - 1500	2 - 300	Single
2 - 3905	2 FB	2 - 150	3 - 150	Single
2 - 3910	2 FB	2 - 300	3 - 150	Single
2 - 3912	2 FB	2 - 600	3 - 150	Single
2 - 3914	2 FB	2 - 900	3 - 300	Single
2 - 3916	2 FB	2 - 1500	3 - 300	Single
3 - 3905	3 FB	3 - 150	4 - 150	Single
3 - 3910	3 FB	3 - 300	4 - 150	Single
3 - 3912	3 FB	3 - 600	4 - 150	Single
3 - 3914	3 FB	3 - 900	4 - 300	Single
3 - 3916	3 FB	3 - 1500	4 - 300	Single
4 - 3905	4 FB	4 - 150	6 - 150	Single
4 - 3910	4 FB	4 - 300	6 - 150	Single
4 - 3912	4 FB	4 - 600	6 - 150	Single
4 - 3914	4 FB	4 - 900	6 - 300	Single
6 - 3905	6 FB	6 - 150	8 - 150	Double
6 - 3910	6 FB	6 - 300	8 - 150	Double
6 - 3912	6 FB	6 - 600	8 - 150	Double
8 - 3905	8 FB	8 - 150	10 - 150	Double
8 - 3910	8 FB	8 - 300	10 - 150	Double
8 - 3912	8 FB	8 - 600	10 - 150	Double
10 - 3905	10 FB	10 - 150	10 - 150	Double
10 - 3910	10 FB	10 - 300	10 - 150	Double

3900 Standard Full Bore Orifice Area (Sq. in.)

ASME ORIFICE	1.622	2.764	6.321	10.76	24.95	44.18	69.94
	1.5" FB	2" FB	3" FB	4" FB	6" FB	8" FB	10" FB

3900 Materials Overview

The main valve has six basic components. Assembly and disassembly are accomplished through top entry. This means that as long as there is no pressure in the system, routine maintenance, such as replacement of O-Rings and seals, may be done with the valve in place, virtually eliminating the need for cranes and additional manpower.

Base

The base is cast with integral flanges. It forms the main structure and is a pressure boundary component since it will be exposed to process media. To ensure integrity and reliability, all base castings are produced to the latest addition to the ASME Boiler & Pressure Vessel Codes. The standard materials are Grade WCC carbon steel, and Grade CF8M 316 stainless steel. Other materials such as Monel, Hastelloy, and additional code-approved materials are available to satisfy more demanding requirements. The discharge side of the body is drilled and tapped for pilot venting. If the pilot is vented to the atmosphere, a pipe plug is installed to secure this area.

Nozzle

The 316 stainless steel nozzle performs two functions: First, it forms the lower sealing surface. Second, the nozzle controls the capacity. The orifice is machined into the nozzle ensuring that rated flow capacities will be obtained should an overpressure condition occur. The nozzle is threaded or bolted into the body and sealed with an O-Ring. By threading or bolting the nozzle it may be removed easily for repair or replacement.

Guide

This one piece guide of 316 stainless steel ensures true alignment of the disc and nozzle for positive, bubble tight sealing. The heavy guide construction is designed to prevent warping or egging when the valve is in service.

Disc

The disc is 316 stainless steel. An O-Ring (part 10) is used for isolating the dome chamber when used on air, gas or liquid service. A spring energized Teflon® seal (part 17) is used on the top side of the disc for steam service. A graphite impregnated Teflon® guide ring (or rings) (part 16) provides a low coefficient of friction for the guiding function between the disc and guide. An O-Ring seat (part 12) performs the primary sealing function for the disc to ensure bubble tightness. The metal-to-metal stop for the seat allows the valve to still function, even if the O-Ring is damaged or destroyed.

Two unique features distinguish the CONSOLIDATED O-Ring seat seal safety relief valve from any other design. These are the 50 degree metal-to-metal load bearing seats and the slotted O-Ring retainer.

There are three essentials to a tighter and more secure seal:

1. **Concentric Alignment**
   The nozzle bore and O-Ring retainer are both machined to an angle of 50 degrees. This ensures that as the valve disc opens and closes the O-Ring is aligned concentrically against the lip of the nozzle. Close tolerance between the nozzle and the body also helps to ensure a tight seal when the valve is closed.
2. **Maximum Sealing Force**
   On the back side of the O-Ring retainer, there are two small slots. When the valve is closed; process media enters between the machined seat of the nozzle and the O-Ring retainer, and proceeds up the slots behind the O-Ring. This pressure forces the O-Ring against the lip of the nozzle and the curved recess of the disc. As the pressure within the valve rises to set point, the O-Ring is pressed tightly against the nozzle to maintain maximum sealing force until valve set pressure is reached.
3. **O-Ring Retention**
   When the valve opens, the pressure behind the O-Ring escapes from these same two slots on the O-Ring retainer. This prevents the O-Ring from being ejected. Additionally, the O-Ring encapsulating retainer prevents the O-Ring from being ejected by the high velocity, low pressure discharge inside the upper valve body.

Cover Plate

The cover plate secures the guide and seals the main body. Each cover plate is drilled and tapped for eye bolts which are used for ease of assembly or disassembly of the main valve and for handling the assembled valve.

Sensing Tube

The sensing tube is machined from 316 stainless hex bar stock and is threaded into the main body at a location below the nozzle. The sensing tube picks up media pressure and feeds this pressure through the sensing line to the pilot. To ensure proper orientation, one side of the hex is marked UP. This marking is to be oriented upward when the valve is sitting on its inlet flange. The pilot valve can also be installed in applications where remote sensing of pressure is used to actuate the pilot. In this case, the sensing tube is installed at the desired sensing location and connected by the sensing line to the pilot. The sensing tube port in the main valve is then sealed with a pipe plug.

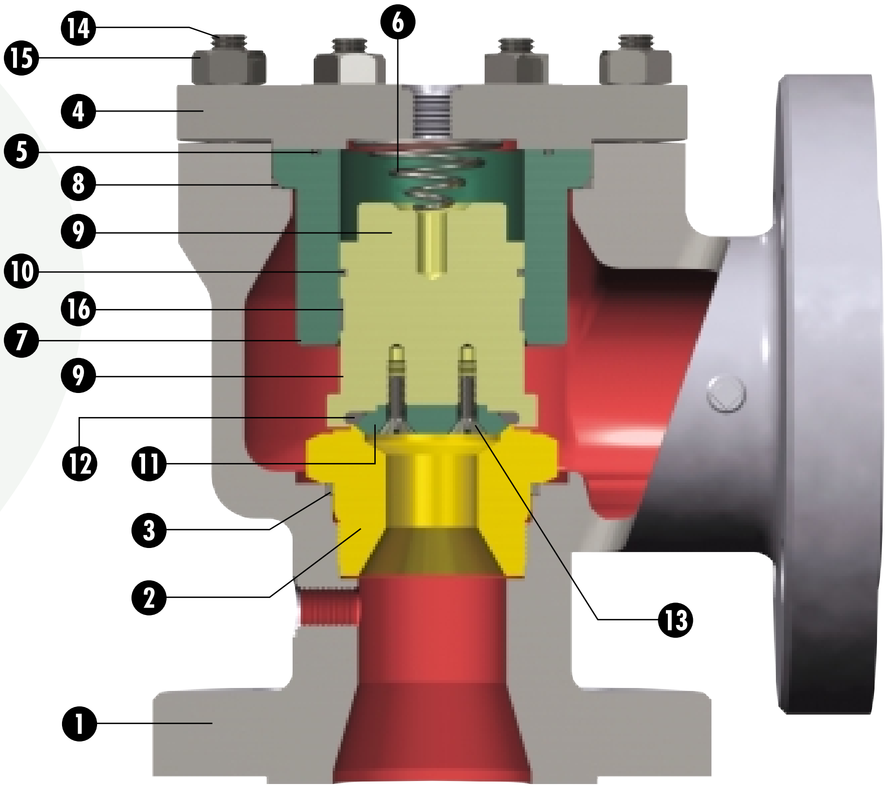
Other

The remaining parts: studs, nuts, spring, nameplate, and lead seal complete the assembly of the main valve. A wire and lead seal are affixed to the pilot to protect the pilot valve adjustments.

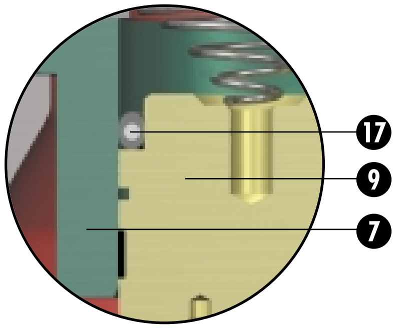
Main Valve Materials[3]

	Part	Standard Material	Entirely Stainless (S4)	NACE (SG1) - Internal Service Only
1	Base	ASME SA216 WCC Carbon Steel	ASME SA351CF8M Stainless Steel	ASME SA216 WCC Carbon Steel
2	Nozzle	316 SS	316 SS	316 SS
3	Nozzle O-Ring	Teflon®	Teflon®	Teflon®
4	Cover Plate	ASME SA516-70 Carbon Steel	ASME SA240 316 Stainless Steel	ASME SA516-70 Carbon Steel
5	Cover Plate O-Ring	Teflon®	Teflon®	Teflon®
6	Spring	Inconel X750	Inconel X750	Inconel X750
7	Guide	316 SS	316 SS	316 SS
8	Guide O-Ring	Teflon®	Teflon®	Teflon®
9	Disc	316 SS	316 SS	316 SS
10	Disc O-Ring[1]	Select - See Chart pg. 3900.9	Select - See Chart pg. 3900.9	Select - See Chart pg. 3900.9
11	O-Ring Retainer	316 SS	316 SS	316 SS
12	O-Ring Seat	Select - See Chart pg. 3900.9	Select - See Chart pg. 3900.9	Select - See Chart pg. 3900.9
13	Lock Screw	304 SS	316 SS	304 SS
14A*	Cap Screw - (Inlet sizes 1" & 2")	SA193 B7 Alloy Steel	SA193 B8M Alloy Steel	SA193 B7 Alloy Steel
14B	Stud (Inlet size 3" & above)	SA193 B7 Alloy Steel	SA193 B8M Alloy Steel	SA193 B7 Alloy Steel
15	Nut (Inlet size 3" & above)	SA194 2H Alloy Steel	SA194 8M Alloy Steel	SA194 2H Alloy Steel
16	Guide Ring(s)	Teflon®	Teflon®	Teflon®
17	Disc Seal or Disc Upper O-Ring[2]	Select - See Chart pg. 3900.9	Select - See Chart pg. 3900.9	Select - See Chart pg. 3900.9

NOTES: 1 Disc O-Ring (10) is not required for steam service.
2 Disc Seal (17) is provided for steam service and when O-Ring Seat (12) is Teflon®.
3 Main base assemblies can be provided in special materials. Contact the factor for availability.
* Not shown.



Liquid, Gas, & Air Service
Except when O-Ring seat (12) is Teflon® and steam service below 50 psig



Steam Service
50 psig and above

Liquid, Gas and Air Service
when O-Ring Seat (12) is Teflon®

Soft Goods Selection Chart

3900 Soft Goods Selection Chart

Component	Description	Service		
		Liquid/Gas[3]	Steam	
		15 to 3750 psig	15 to 49 psig	50 to 3750 psig
Main Valve	Nozzle O-Ring	**Teflon®**	**Teflon®**	Teflon®
	Cover Plate O-Ring	**Teflon®**	Teflon®	Teflon®
	Guide O-Ring	Teflon®	Teflon®	Teflon®
	Disc O-Ring	SELECT[1]	Not Required	Not Required
	O-Ring Seat	SELECT[2]	ethylene/propylene 90	Teflon®
	Guide Ring	Teflon®	Teflon®	Teflon®
	Disc Seal or Disc Upper O-Ring	SELECT[1]	ethylene/propylene 90	Teflon energized seal
Pilot Valve	Adjuster Bottom O-Ring	**SELECT**	ethylene/propylene 90	Teflon®
	Adjuster Top O-Ring	**SELECT**	ethylene/propylene 90	Teflon®
	Insert O-Ring	**SELECT**	ethylene/propylene 90	Teflon®
	Base O-Ring	**SELECT**	ethylene/propylene 90	Teflon®
	Piston Spring Seal	Teflon®	Teflon®	Teflon®
	Adjuster Top Spring Seal	Teflon®	Teflon®	Teflon®
	Insert Spring Seal	Teflon®	Teflon®	Teflon®
Modulator	Base O-Ring	**SELECT**	ethylene/propylene 90	Teflon®
	Stop O-Ring	**SELECT**	ethylene/propylene 90	Teflon®
	Seat O-Ring	**SELECT**	ethylene/propylene 90	Teflon®
	Piston Bottom O-Ring	**SELECT**	ethylene/propylene 90	Teflon®
	Piston Bottom Spring Seal	Teflon®	Teflon®	Teflon®
	Piston Top Spring Seal	Teflon®	Teflon®	Teflon®

NOTES: 1 Disc O-Ring (10) or Disc Upper O-Ring (17) shall be one of the same material and durometer as that selected for the O-Ring Seat (12).
2 When Teflon® is selected for O-Ring Seat (12) the Disc Seal (17) shall be a Teflon® energized seal.
3 Select soft good using charts for fluid, pressure and temperature. See selection instructions below.

Soft Goods selection for liquid and gas service is accomplished as follows:

A) Material Selection

- Refer to Technical Information Section, O-Ring Selection beginning on page TI.22.
- Locate valve fluid and read the applicable O-Ring material.
- For fluids not listed, the customer must specify the O-Ring material.

B) Main Valve Pressure Limits

- Refer to Table 1 on page 3900.10.
- Locate the valve orifice and select the durometer for the required set pressure.

C) Main Valve Temperature Limits

- Refer to Table 2 on page 3900.10.
- Locate the material and durometer and verify the temperature limits.
- If temperature limits are exceeded, repeat Steps A & B.
- If an O-Ring cannot be selected, contact the factory.

D) Pilot Valve Pressure and Temperature Limits

- Refer to Table 3 on page 3900.10.
- Locate the service and review the pressure and temperature ranges, then select the material and durometer.

Pressure and Temperature Limits

Main Valve and Pilot Valve/Modulator

Table 1 - Main Valve Pressure Limits (psig)[1]

Inlet Size (in.)	Orifice	Durometer						Teflon®[3]			
		50		70 - 75[2]		90		-40°F to +200°F		+201°F to +505°F	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1	D, E, F	N/A	N/A	15	800	200	1500	1000	3750	50	3750
1-1/2	D, E, F	N/A	N/A	15	800	200	1500	1000	3750	50	3750
1-1/2	G, H	N/A	N/A	15	780	150	1500	1000	3750	50	3750
2	G, H, J	N/A	N/A	15	780	150	1500	1000	3750	50	3750
3	J, K, L	N/A	N/A	15	580	150	1500	1000	3750	50	3750
4	L, M, N, P	N/A	N/A	15	580	75	1500	1000	3750	50	3750
6	Q, R	N/A	N/A	15	420	60	600	600	1500	50	1500
8	T	N/A	N/A	15	200	30	300	300	1500	50	1500
3	Full Bore	N/A	N/A	15	580	75	1500	1000	1500	50	1500
4	Full Bore	N/A	N/A	15	580	75	1500	1000	1500	50	1500
6	Full Bore	N/A	N/A	15	200	30	300	300	1500	50	1500
8	Full Bore	N/A	N/A	15	200	30	300	300	1500	50	1500
10	Full Bore	N/A	N/A	15	200	30	300	300	750	50	750

NOTES: 1 Disc O-Ring will be of the same material and durometer as that selected for the Seat O-Ring.
2 Maximum set pressure for silicone compounds is half of the maximum value.
3 When Teflon® material is selected for the Seat O-Ring a Teflon® energized seal will be provided for the Disc Seal.

Table 2 - Main Valve Temperature Limits (°F)

Material	Durometer	NOTES	Temperature Limits	
			Min.	Max.
Nitrile (Buna-N)	70	2	-40	250
	90		-40	250
Ethylene/Propylene	70		-65	212
	90		-40	500
Fluorocarbon (Viton)	75		-15	400
	90		-15	400
Neoprene	70		-40	300
Silicone	70		-40	437
Teflon®	N/A		-40	505
Kalrez®	82	1	-40	505
	75	1	-40	505
	91	1	-35	505
Chemraz®	75	1	-20	450
	90	1	-20	450

NOTES: 1 Consult factory concerning the use of Kalrez® and Chemraz®.
2 Standard O-Ring Material

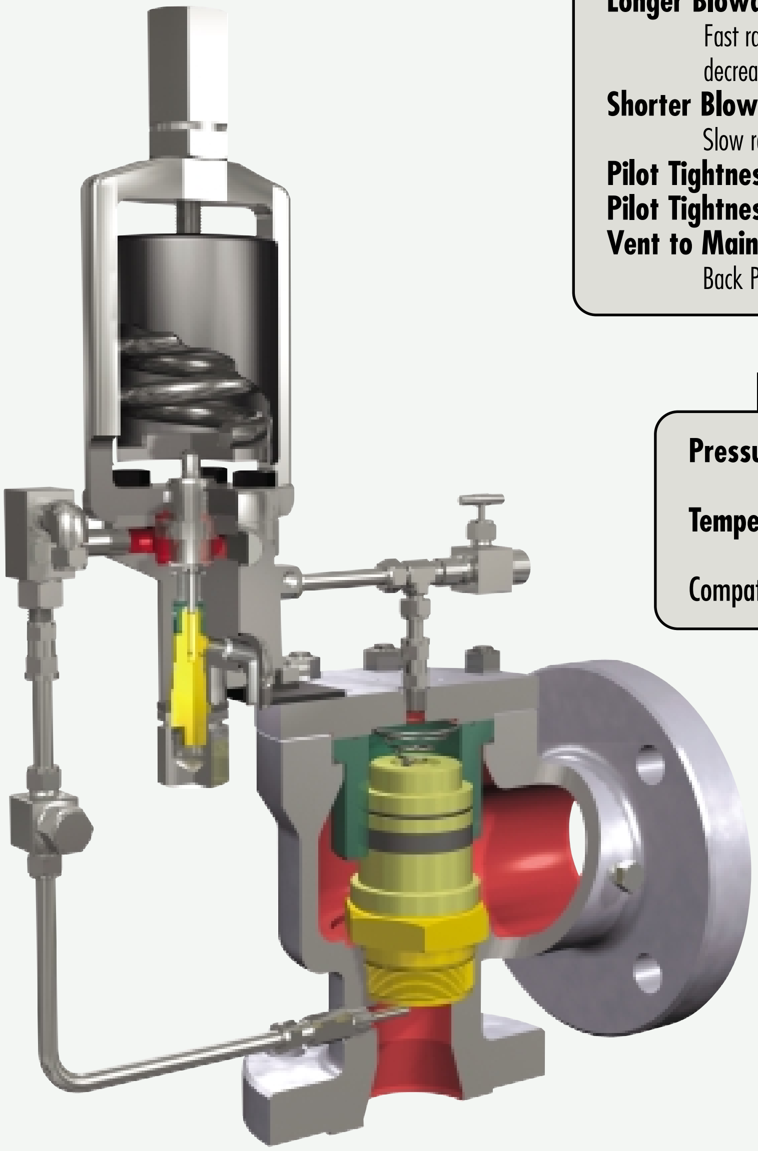
Table 3 - Pilot Valve and Modulator Pressure/Temperature Limits

Service	O-Ring Material[2]	Durometer	Temperature Limit (°F)		Pressure Limit (psig)	
			Min.	Max.	Min.	Max.
Liquid / Gas	Nitrile (Buna-N)[3]	70	-40	250	15	3750
Liquid / Gas	Fluorocarbon (Viton)	75	-15	400	15	3750
Liquid / Gas	Ethylene / Propylene	70	-40	400	15	3750
Liquid / Gas	Kalrez®[1]	—	-40	400	15	3750
Liquid / Gas	Teflon®	N/A	212	505	50	3750
Steam	Ethylene / Propylene	90	212	500	15	49
Steam	Teflon®	N/A	212	505	50	750

NOTES: 1 Consult factory concerning the use of Kalrez®.
2 Other materials are on application. Consult factory for availability of other materials.
3 Standard O-Ring Material

Pop Pilot (PV) - Operating Principles and Performance

The **CONSOLIDATED** MPV™ (Modular Pilot Valve) Pilot Operated Safety Relief Valve is offered as both a non-flowing pop pilot and a non-flowing modulating pilot within a single assembly. The unique modular design construction allows for an open yoke or vented bonnet and easy field conversion from one configuration to the other. The pilot valve operates by sensing system pressure and using this pressure to control the closing force on the main valve disc. Increasing inlet valve pressure results in increased closing force until the pilot valve opens. Pressure is relieved at a designated set point as process media is allowed to discharge through the main valve. Use of the pop pilot configuration will result in a main valve disc "pop" action from the seated position to 100% open. When the overpressure condition is relieved, the main valve disc will reseat due to the increased media pressure directed through the pilot valve to the top of the valve disc (dome).



Pop Pilot Performance

Pilot Tightness: 98% of set point

Blowdown: 2% to 5%, or 2psi (whichever is greater) depending upon ramp rate.

Longer Blowdown Results from:
Fast ramp up increasing the set point or fast ramp down decreasing the reseat point.

Shorter Blowdown Results from:
Slow ramp up or slow ramp down.

Pilot Tightness after Main Valve Pop: 95% of set point

Pilot Tightness after Pilot Reseats: 98% of set point

Vent to Main Valve Outlet if:
Back Pressure is constant or no back pressure

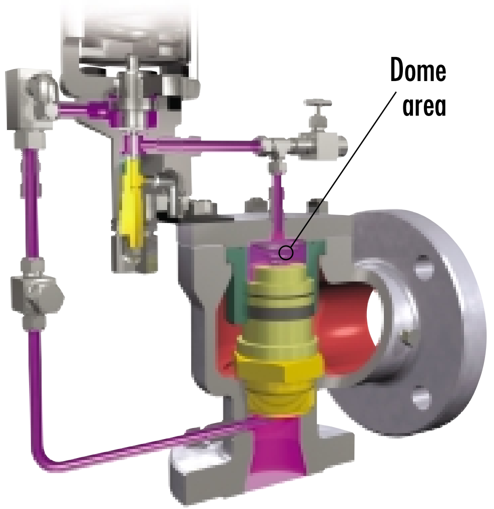
Common Characteristics

Pressure Ranges: 15 psig - 3750 psig (liquid or gas)
15 psig - 750 psig (steam)

Temperature Range: -40°F to 505°F

Compatible for liquid, gas, or steam service

Pop Pilot Operation

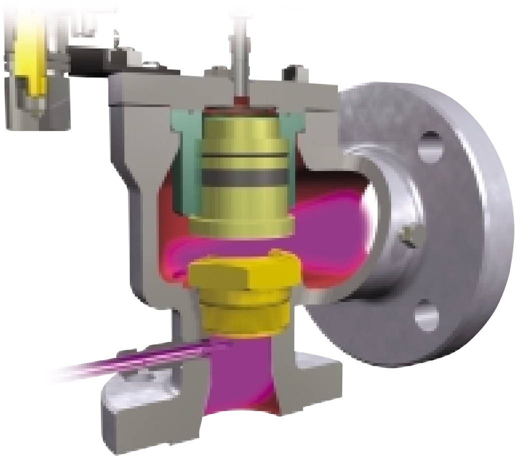


PV Valve Closed (Normal Position)

System pressure from the main valve inlet is fed to the dome area by the pilot through interconnecting tubing. This equalizes the pressure on the top of the disc with inlet pressure on the seating surface (bottom) of the disc. Since the area of the top of the disc is larger than the area of the seating surface, the differential area results in a net downward force keeping the main valve tightly closed.

PV Valve Open (Relieving Position)

As inlet pressure increases, the pilot piston strokes and seals off the main valve inlet pressure from the dome pressure. The pilot simultaneously opens the vent seal to relieve the dome pressure to atmospheric pressure.



Discharge Through Main Valve

The main valve disc is allowed to lift off the seat as the fluid force overcomes the now removed pressure load above the main valve disc. The valve discharges to relieve system pressure.

Return to Normal Position

When the discharging main valve reduces the inlet pressure to the preset blowdown pressure of the pilot, the pilot piston closes the vent seal. Simultaneously, the inlet seal is reopened in the pilot. The main valve inlet pressure is again allowed to enter the dome above the main valve disc. As the dome pressure equalizes with the inlet pressure, the downward force created by the differential areas of the disc closes the main valve.

3900 Series Type 39PV Pilot

Pop Action, Non-Flowing
For Set Pressures 15 psig to 3750 psig

3900 with

39PV Pop Action

	Part	Material[1]
1	Main Base	SA351 Grade CF8M Stainless Steel
2	Adjuster Cap	316 SS
3	Adjuster Top	316 SS
4	Adjuster Bottom	316 SS
5	Adjuster Lock Nut	316 SS
6	Compression Screw	316 SS
7	Compression Screw Lock Nut	316 SS
8	Spring Washer	316 SS
9	Spring[1]	Chrome Steel (Phosphated)
10	Insert Top	316 SS
11	Insert Bottom	316 SS
12	Main Piston	316 SS
13	Compression Screw Cap	316 SS
14	Yoke Cap Screw	316 SS
15	Adjuster Bottom O-Ring	Select
16	Adjuster Top O-Ring	Select
17	Insert O-Ring	Select
18	Main Base O-Ring	Select
19	Yoke	SA351 Grade CF8M Stainless Steel
20	Main Piston Spring Seal	Teflon®
21	Adjuster Top Spring Seal	Teflon®
22	Insert Spring Seal	Teflon®
23	Field Test Connector	-
	- Ball	316 SS
	- Seat O-Ring	Select
	- Plug O-Ring	Select
	- Base	316 SS
	- Plug	316 SS
	- Tube Filter	316 SS
24	Vent Assembly/Bug Screen	-
	- Male Elbow	316 SS
	- Screen	304 SS
25	Vent Assembly	-
	- Male Elbow	316 SS
	- Screen	304 SS
26	Pipe Plug	316 SS
36	Spring Cover	Peek (Polyetheretherketone)
47	Vent Assembly	-
	- Male Elbow	316 SS
	- Screen	304 SS
48	Top Plate	316 SS
49	Set Screw	316 SS
50	Bonnet	SA351 Grade CF8M Stainless Steel

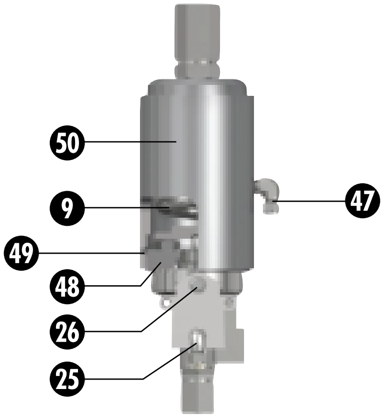
NOTE: 1 Pilot valves are available in materials other than those shown above. Refer to the 2900 section of this catalog for alternate materials of construction.

Description

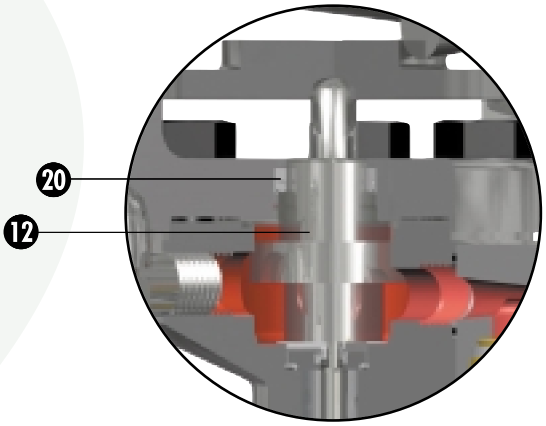
The **Consolidated** 39PV pop action non-flowing pilot provides excellent performance with full lift at set pressure with minimal blowdown. Buna N o-rings and 316 stainless steel construction throughout are standard.

The pilot is non-flowing at full open, improving its capabilities to handle dirty conditions and reduce icing problems. There are two unique features of the 39PV. It has the ability to be used on liquid, gas or steam service without any adjustments. The 39PV pop action pilot may be converted to the 39MV modulating pilot by simply installing the Modulator Assembly. This simple, modular design allows for easier maintenance and fewer spare parts.

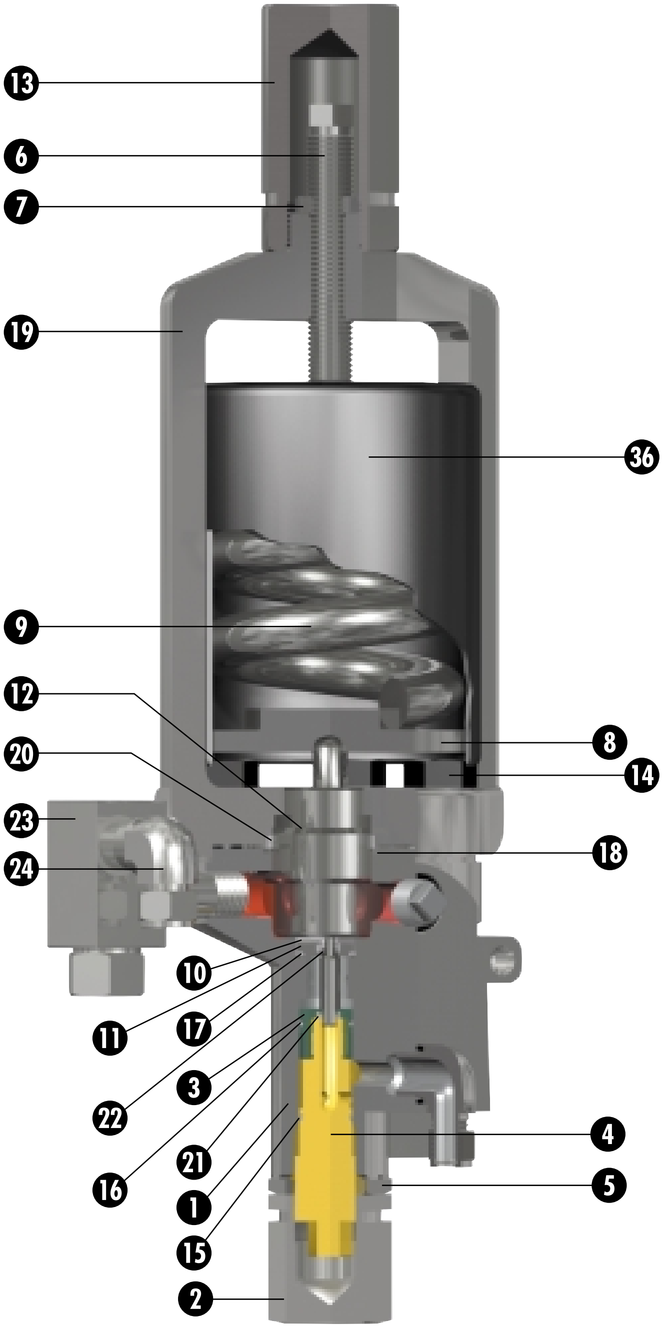
Set pressures are field adjustable, and testing is easily performed using the standard field test connection. Manual blowdown, sensing line filter, backflow preventer, and remote sensing are available as options.



BONNET OPTION



HIGH PRESSURE



Modulating Pilot (MV) - Operating Principles and Performance

The Consolidated MPV (Modular Pilot Valve) Pilot Operated Safety Relief Valve is also offered as a non-flowing modulating pilot design, using a unique modular configuration which allows for easy field conversion from pop operation to modulating operation. The modulating pilot operation is very similar to the pop pilot operation with the added ability to hold a percentage of system pressure above the main valve disc, producing a modulating action. Increasing system pressure results in reduced closing force due to venting through the pilot valve. Pressure relief begins at a designated set point as process media is discharged through the main valve. However, the actual lift of the main valve disc is based on the specific system overpressure condition instead of "popping" instantaneously to the 100% open position as with the pop pilot. This "modulating" action results in improved operating efficiencies through reduced media loss and lower emissions.

Modulating Pilot Performance

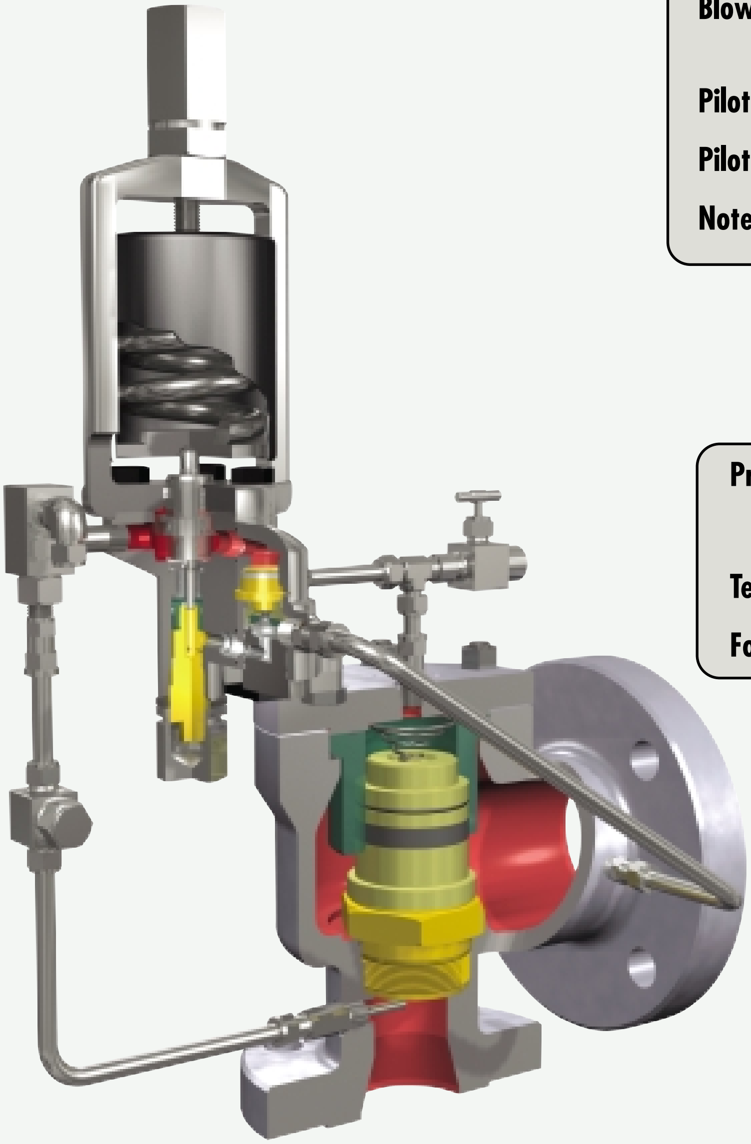
Pilot Tightness: 99% of set point

Blowdown: 1% to 4%, or 2 psi (whichever is greater) depending upon ramp rate.

Pilot Tightness after Pop: 96% of set point

Pilot Tightness after Reseat: 99% of set point

Note: Tightness is defined as zero bubbles per minute.



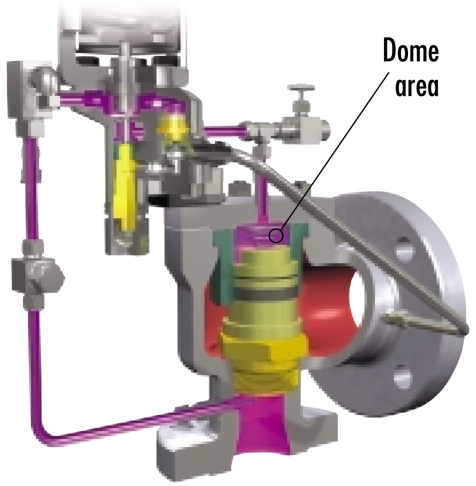
Common Characteristics

Pressure Ranges: 15 psig - 3750 psig (liquid or gas)
15 psig - 750 psig (steam)

Temperature Range: -40°F to 505°F

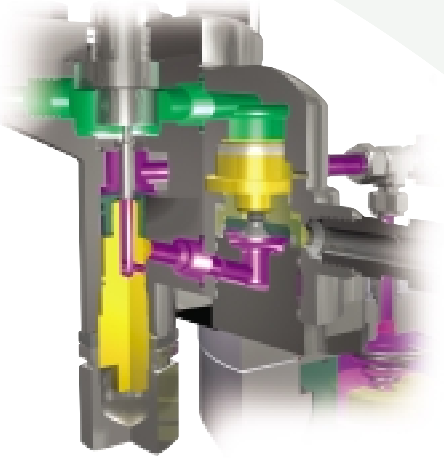
For liquid, gas, or steam service

Modulating Pilot Operation



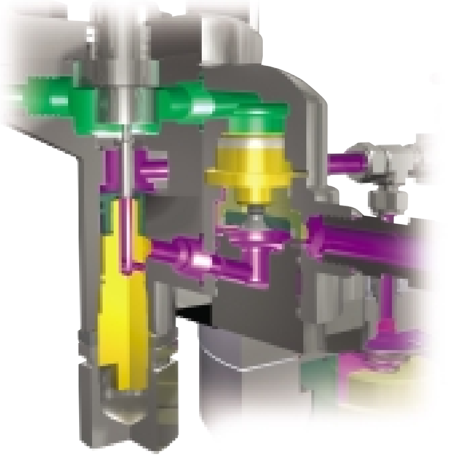
MV Valve Closed (Normal Position)

System pressure from the main valve inlet is fed to the dome area by the pilot through interconnecting tubing. This equalizes the pressure on the top of the disc with inlet pressure on the seating surface (bottom) of the disc. Since the area of the top of the disc is larger than the area of the seating surface, the differential area results in a net downward force keeping the main valve tightly closed.



Modulating Position

As inlet pressure increases, the pilot piston strokes and seals off the main valve inlet pressure from the dome pressure. The pilot simultaneously opens the vent seal to relieve the dome pressure to the bottom of the modulator piston. The modulator piston has a differential area with the smaller area being on top. The top of this piston always sees the main valve inlet pressure. When the dome pressure is applied to the bottom of the modulator piston, there is a net upward force. This is due to both pressures being equal (at this point), and the lower area is larger than the upper area. The modulator relieves pressure from the dome to the atmosphere until force from the inlet pressure on top of the modulator piston is sufficient to move it to the closed position. A certain amount of pressure remains in the dome. This pressure is controlled by the differential area in the modulator. Since the dome pressure has not been dropped to atmospheric pressure, the main valve only partially opens at the set point. The modulator piston will remain closed until the main valve disc is forced into higher lift by increasing inlet pressure. As this occurs, the modulator piston may relieve further pressure from the dome as necessary to achieve the required main disc lift within 10% overpressure.



MV Fully Open

As the inlet pressure increases further, the net upward force on the main valve increases, allowing the main valve to relieve more pressure. The disc obtains full lift (full capacity) within 10% of set pressure.

Return to Normal Position

When the discharging valve reduces the inlet pressure to the pre-set blowdown pressure of the pilot, the pilot piston closes the vent seal. Simultaneously, the inlet seal is reopened in the pilot. The main valve inlet pressure is again allowed to enter the dome above the main valve disc. As the dome pressure equalizes with the inlet pressure, the downward force created by the differential areas of the disc closes the main valve.

3900 Series Type 39MV Pilot

Modulating Action, Non-Flowing
For Set Pressures 15 psig to 3750 psig

3900 with
39MV Modulating Action

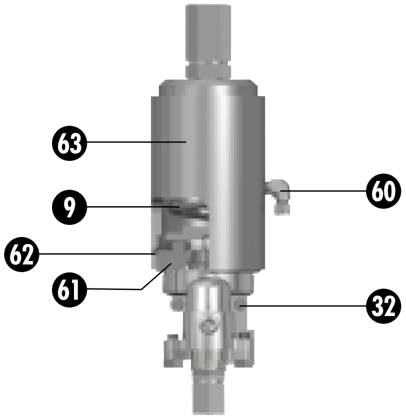
	Part	Material[1]
1	Main Base	SA351 Grade CF8M Stainless Steel
2	Adjuster Cap	316 SS
3	Adjuster Top	316 SS
4	Adjuster Bottom	316 SS
5	Adjuster Lock Nut	316 SS
6	Compression Screw	316 SS
7	Compression Screw Lock Nut	316 SS
8	Spring Washer	316 SS
9	Spring[1]	Chrome Steel (Phosphated)
10	Insert Top	316 SS
11	Insert Bottom	316 SS
12	Main Piston	316 SS
13	Compression Screw Cap	316 SS
14	Yoke Cap Screw	316 SS
15	Adjuster Bottom O-Ring	Select
16	Adjuster Top O-Ring	Select
17	Insert O-Ring	Select
18	Main Base O-Ring	Select
19	Yoke	SA351 Grade CF8M Stainless Steel
20	Main Piston Spring Seal	Teflon®
21	Adjuster Top Spring Seal	Teflon®
22	Insert Spring Seal	Teflon®
23	Field Test Connector	-
	- Ball	316 SS
	- Seat O-Ring	Select
	- Plug O-Ring	Select
	- Base	316 SS
	- Plug	316 SS
	- Tube Filter	316 SS
24	Vent Assembly/Bug Screen	
	- Male Elbow	316 SS
	- Screen	304 SS
25	Modulator Base	SA351 Grade CF8M Stainless Steel
26	Modulator Stop	SA351 Grade CF8M Stainless Steel
27	Modulator Piston Top	316 SS
28	Modulator Piston Bottom	316 SS
29	O-Ring Retainer	316 SS
30	Retainer Lock Screw	316 SS
31	Modulator Cap Screw	316 SS
32	Socket Head Cap Screw	316 SS
33	Modulator Base O-Ring	Select
34	Modulator Stop O-Ring	Select
35	Modulator Seat O-Ring	Select
36	Modulator Piston Bottom O-Ring	Select
37	Piston Bottom Spring Seal	Teflon®
38	Piston Top Spring Seal	Teflon®
49	Spring Cover	Peek (Polyetheretherketone)
60	Vent Assembly	-
	- Male Elbow	316 SS
	- Screen	304 SS
61	Top Plate	316 SS
62	Set Screw	316 SS
63	Bonnet	SA351 Grade CF8M Stainless Steel

NOTE: 1 Pilot valves are available in materials other than those shown above. Refer to the 2900 section of this catalog for alternate materials of construction.

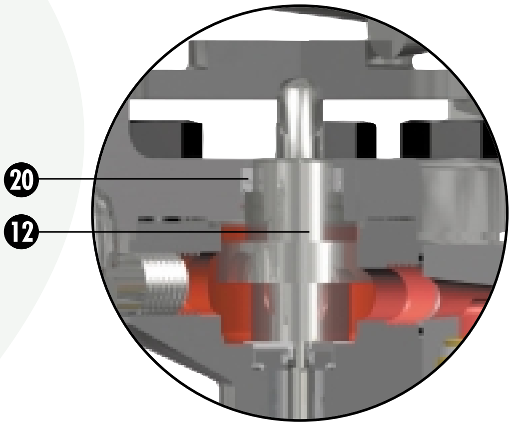
Description

The Consolidated 39MV Pilot Operated Safety Relief Valve is a non-flowing modulating pilot valve that provides exceptional performance and stable operation. The 39MV design controls the attached main valve so as to relieve only enough system pressure to control the system upset, thereby minimizing the media lost. This patented technology is the latest advancement in pilot design within the pressure range of 15 psig to 3750 psig for vapor, liquid and steam service. The 39MV design is the only non-flowing modulating valve of its kind available with adjustable blowdown.

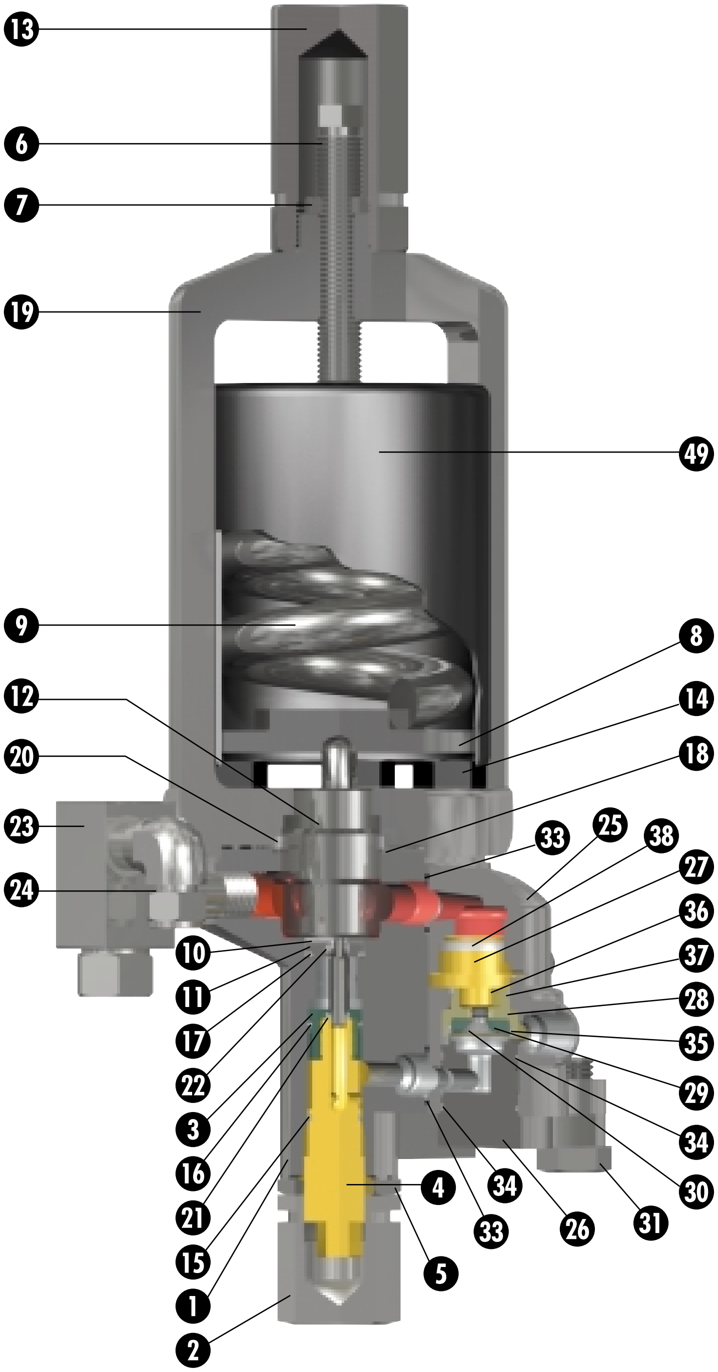
This unique modulator is a simple addition to the 39PV pop action design. The simplicity of design allows for easier maintenance and for lower spare parts inventory.



BONNET OPTION



HIGH PRESSURE



Options and Accessories

Manual Blowdown Valve

An optional manual blowdown valve is available for relieving the pilot operated safety relief valve. Consult factory for applications requiring a pneumatic or electrical solenoid blowdown valve which may be connected to a distant location, such as an operator station, for remote actuation. The blowdown valve is ported directly to the main dome area, so that the media in the dome is vented when the blowdown valve is actuated, thus allowing the main valve to open.

For all applications on air, water over 140°F, or steam service, ASME Section VIII - Division 1 requires each pressure relief valve to have a lifting device such as a blowdown valve or a means of connecting or applying pressure to the pilot to verify that the moving parts essential to good operation are free to move. (Reference UG 136(a)(3)).

The lifting lever or blowdown valve may be omitted under Code Case 2203. All orders for pressure relief valves without levers or blowdown valves for steam, air and water over 140°F must state specifically that the valves are being purchased per Code Case 2203. The purchaser is responsible for obtaining jurisdictional authorization for use of Code Case 2203.

Field Test Connection

A 1/4" FNPT field test connection is standard on all pilot valve types. This allows the stroking of the valve with an auxiliary media, e.g. air or nitrogen. An internal check valve is present in the field test connection isolating the inlet media from the test media and at the same time, allowing the valve to open normally in the event of a system overpressurization during a field test.

Filters

Filter options are available for dirty applications. These filters are installed in the pilot inlet sensing line.

For the 39PV and 39MV, an optional sensing line filter is available. This filter has a 316 stainless steel body, Teflon® seals, and a 40-50 micron stainless steel filter element. This filter is standard for steam service.

Other high capacity filter options include: (1) a carbon steel cadmium coated filter body with a 35 micron stainless steel element, (2) a stainless steel filter body, and (3) an entirely stainless steel filter arrangement. The O-Ring in the filters for steam service will be Teflon®. These filters may be equipped with a manually operated needle valve which allows for purging the filtered material while the valve is in operation.

All filter elements are stainless steel, and all filters, including carbon steel, conform to NACE Standard MR0175.

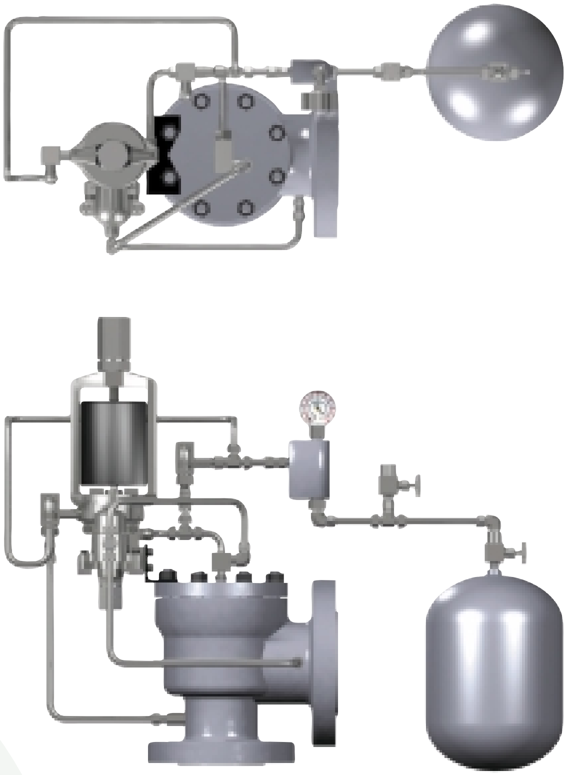
A dual filter arrangement is available for applications in which the customer is unsure of the filter maintenance requirements. In these cases, a preventive maintenance program may be developed by monitoring the filters, without taking the valve off line.

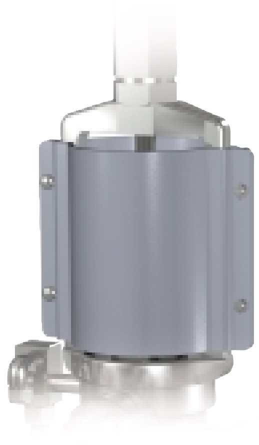
Backflow Preventer

When the pilot operated safety relief valve is not vented directly to atmosphere, it is possible to build up back pressure in the discharge line. This is typical in situations where several valves manifold into a common discharge header. Should the discharge line pressure exceed the valve inlet pressure, it could cause the piston to lift and allow reverse flow through the main valve. This situation can be eliminated through the use of the Backflow Preventer.

Pilot Valve Tester

The pilot valve test indicator is available for the modulating and pop action pilot valves. The valve test indicator measures the set pressure of the pilot, while maintaining pressure on the main valve dome area; thereby, allowing only the pilot to actuate. The system shown below is available for remote or local testing.





Spring Cover (optional)

Spring Cover

An optional metal spring cover that fits over the yoke arms.

Bonnet

A vented Bonnet that replaces the Yoke provides protection of personnel. The bonnet will protect the spring from external debris and weather conditions (See page 3900.14 or 3900.18).

Pressure Differential Switch

Electrical: A pressure differential switch is available which may be wired to an operator station or some other remote location. The switch will provide a signal that indicates when the main valve is opening. The standard pressure differential switch is a single pole, double throw, rate at 5 amps and 30 volts DC with a NEMA 4 enclosure. (For other configurations, consult the factory.)

Pneumatic: For applications that do not permit an electrical differential switch, an option is available to provide pneumatic signal to indicate when the main valve opens.

Remote Pilot Mounting

The 39PV and 39MV pilots can be mounted separately from the main valve. Remote pilot mounting will allow heating or cooling the pilot in case ambient conditions are outside the scope of the pilot. It will also enable the user to group several pilots together for control of ambient conditions in a smaller space. In addition, this promotes easier maintenance.

Dual Pilots

A dual pilot arrangement is available for applications in which the pilot valve O-Rings require monitoring and/or maintenance more often than the main valve. In this installation, the pilot valves may be alternated for maintenance, without bringing the system down.

NOTE: For all option and accessory material variations, contact the factory.

Remote Sensing

The pilot valve inlet may be piped to a location remote from the main valve. In this application, the customer may pipe the inlet sensing line to some location other than where the main valve is located and where the pressure will be relieved (for tubing size and maximum length, consult factory for recommendations.)

Dirty Service Option

Severe dirty service, precipitation and viscous fluid problems can be solved using the dirty service option offered on the 3900 POSRV. A dirty service option can be added to the standard pilot valve. The kit contains a 316 SS chamber, an isolation seal and an extended pilot piston. The module is positioned at the top of the pilot valve body and below the pilot valve yoke. Crucial valve components such as the modulator, dome assembly, vent, and inlet seals never come in contact with the dirty system media. The process media pressure still controls the set pressure and blowdown of the POSRV.

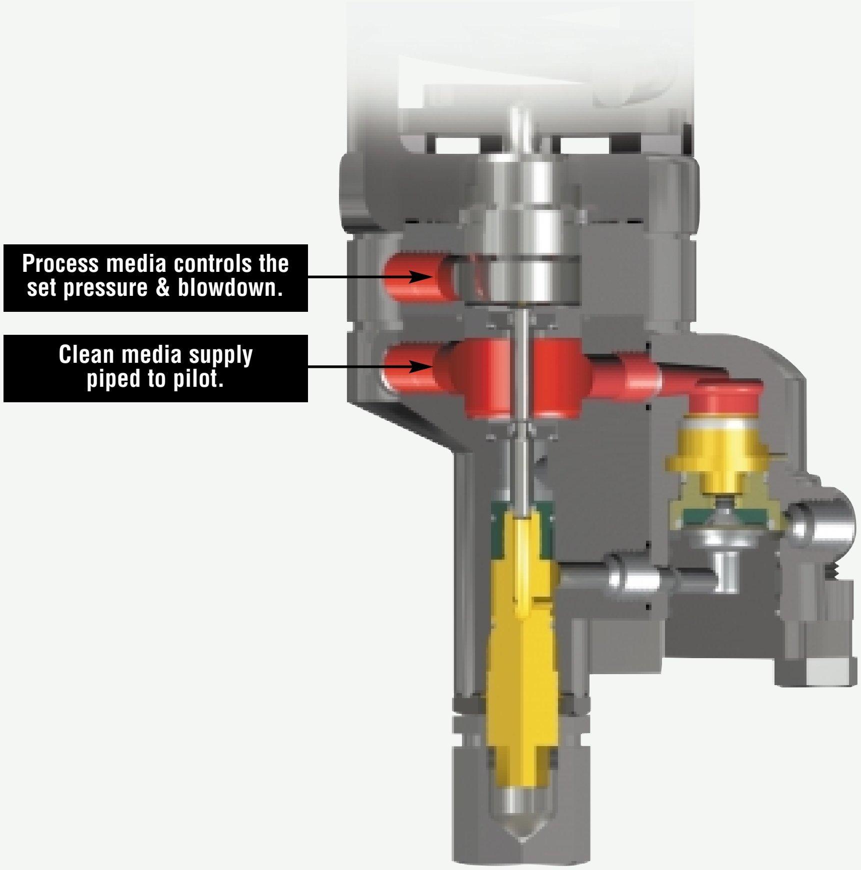
For applications requiring the main valve to relieve the dirty fluid, an alternate clean media supply is piped to the pilot. The alternate clean media must be set at the same pressure as the set pressure of the pilot valve, but cannot exceed 3750 psig, which is the design limit of the pilot valve. In the event that the alternate clean media supply is lost, the main valve will fail in the open position.

For applications requiring the main valve to relieve clean fluid upstream of the dirty process in order to maintain the dirty process pressure at safe levels, the dirty process pressure is supplied to the dirty service module. The sensing line from the main valve and the connection to the main valve dome is connected to the pilot in the normal manner. The pilot is set to operate at the design pressure of the dirty process. When the dirty process pressure reaches the set to open pressure of the pilot, the pilot is stroked by the increase in the dirty process pressure and the pilot performs the block and bleed operations to effect opening of the main valve. When the dirty process pressure reaches the set to close pressure of the pilot, the pilot is stroked by the reduction in the dirty process pressure and the pilot performs the block and bleed operations to effect the closing of the main valve.

The dirty service module is a closed chamber. The flow of dirty process media to the pilot valve is only that volume required to stroke the pilot in response to increasing dirty process pressure. The limited volume of flowing dirty media entering the pilot makes plugging of the module an unlikely possibility. However, if plugging of the module is a concern, the module can be filled with a compatible clean liquid and a siphon tube can be fitted in the connection line between the pilot module and the dirty process.

The dirty service option can provide some cost savings in material selection for corrosive service. It is possible that only the material of construction for the dirty service option will need to be upgraded. The remaining parts in contact with clean media could use standard materials of construction.

NOTE: For special material options on the dirty service option consult the factory.



MPV Dirty Service Pilot

Alternate Piping Arrangements

39PV with Pilot Valve Vented to Atmosphere

	Main Valve	
	Single Outlet	Double Outlet
Standard Field Test Connection	3900.23	3900.26
Manual Blowdown	3900.23	3900.26
Pilot Supply Filter	3900.24	3900.27
Backflow Preventer	3900.24	3900.27
Manual Blowdown and Pilot Supply Filter	3900.25	3900.28
Backflow Preventer, Manual Blowdown and Pilot Supply Filter	3900.25	3900.28

39MV with Pilot Valve Vented to Atmosphere

Standard Field Test Connection	3900.29	3900.32
Manual Blowdown	3900.29	3900.32
Pilot Supply Filter	3900.30	3900.33
Backflow Preventer	3900.30	3900.33
Manual Blowdown and Pilot Supply Filter	3900.31	3900.34
Backflow Preventer, Manual Blowdown and Pilot Supply Filter	3900.31	3900.34

39 PV with Pilot Valve Vented to Body Bowl

Standard Field Test Connection	3900.35	3900.38
Manual Blowdown	3900.35	3900.38
Pilot Supply Filter	3900.36	3900.39
Backflow Preventer	3900.36	3900.39
Manual Blowdown and Pilot Supply Filter	3900.37	3900.40
Backflow Preventer, Manual Blowdown and Pilot Supply Filter	3900.37	3900.40

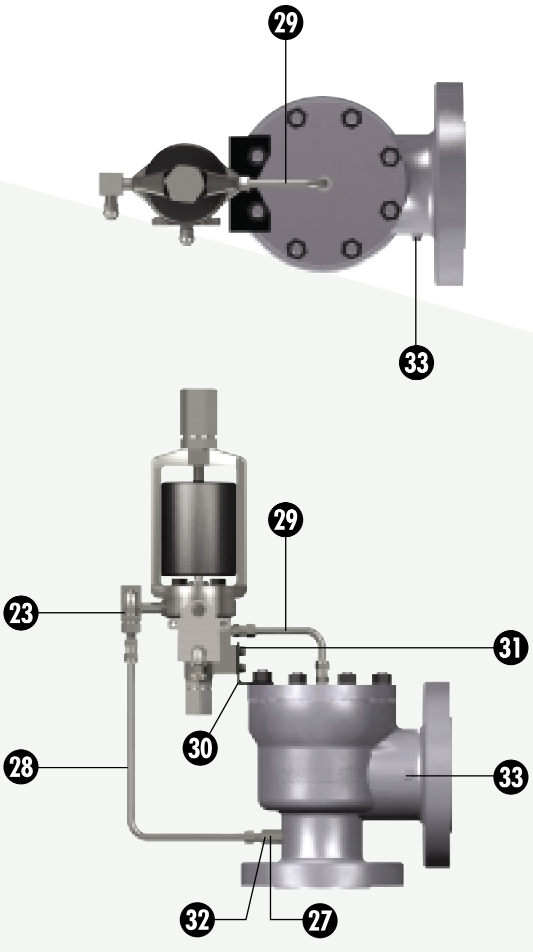
39 MV with Pilot Valve Vented to Body Bowl

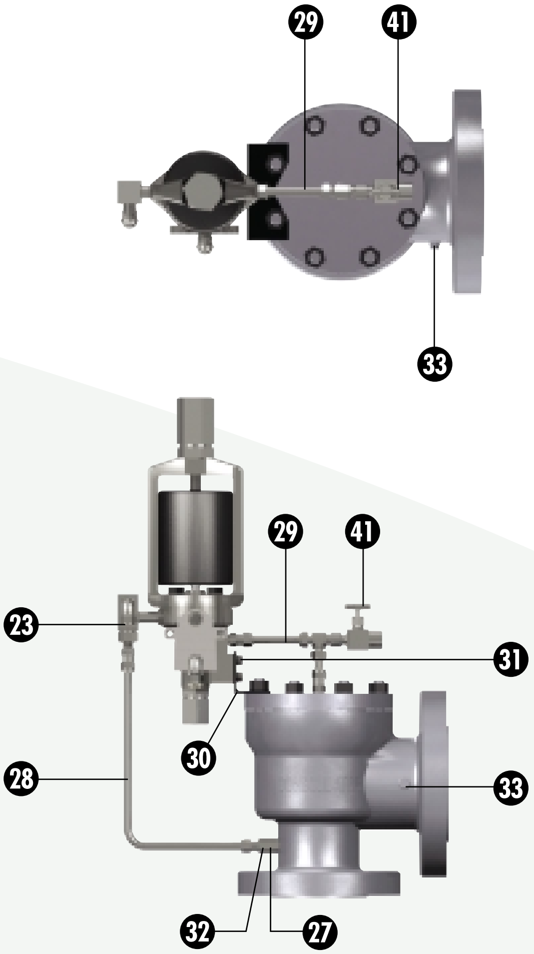
Standard Field Test Connection	3900.41	3900.44
Manual Blowdown	3900.41	3900.44
Pilot Supply Filter	3900.42	3900.45
Backflow Preventer	3900.42	3900.45
Manual Blowdown and Pilot Supply Filter	3900.43	3900.46
Backflow Preventer, Manual Blowdown and Pilot Supply Filter	3900.43	3900.46

Alternate Piping Arrangements

3900 Series Type 39PV Pilot with Single Outlet

[Pilot Vented to Atmosphere]





Pilot Valve w/ Standard Field Test Connection
(Standard For All Media Applications)

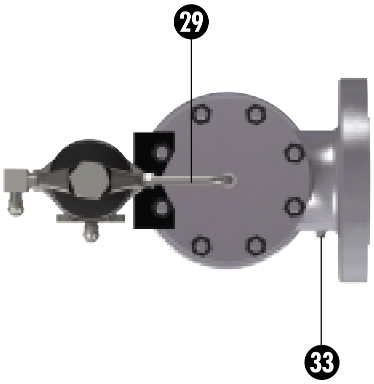
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
33	Pipe Plug	Carbon Steel

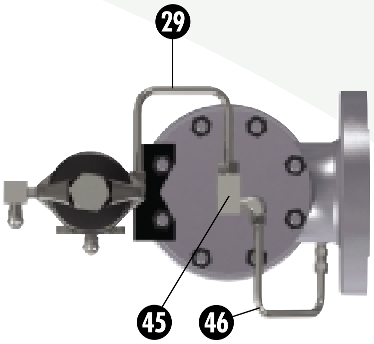
Pilot Valve w/ Manual Blowdown
(Optional For All Media Applications)

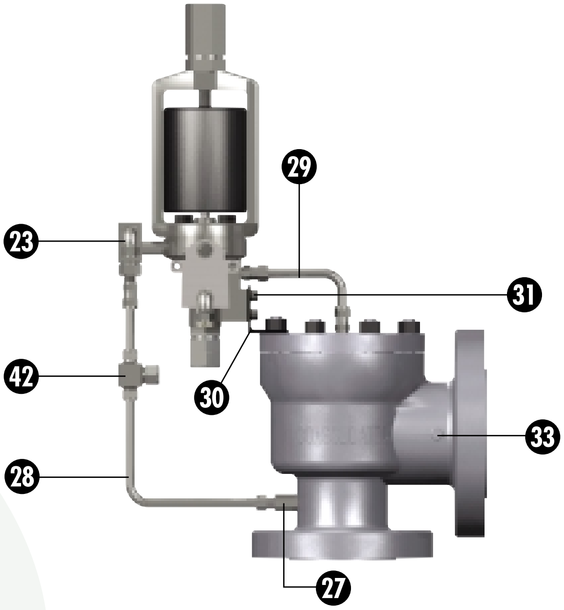
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
33	Pipe Plug	Carbon Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel

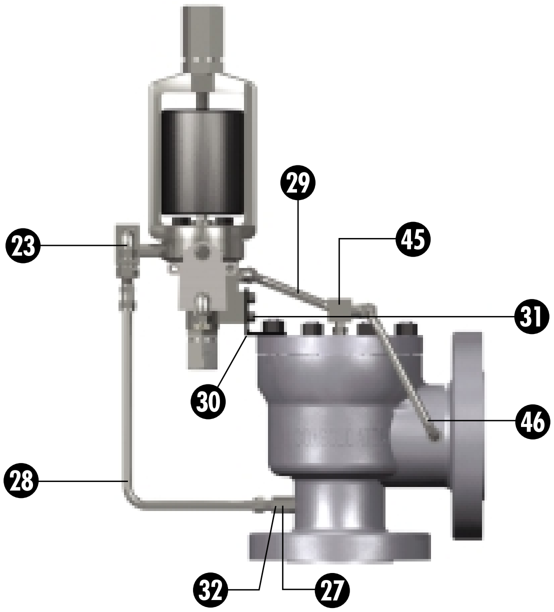
39MPV Series Type 39PV Pilot with Single Outlet

[Pilot Vented to Atmosphere]









Pilot Valve w/ Pilot Supply Filter (Optional For All Media Applications)

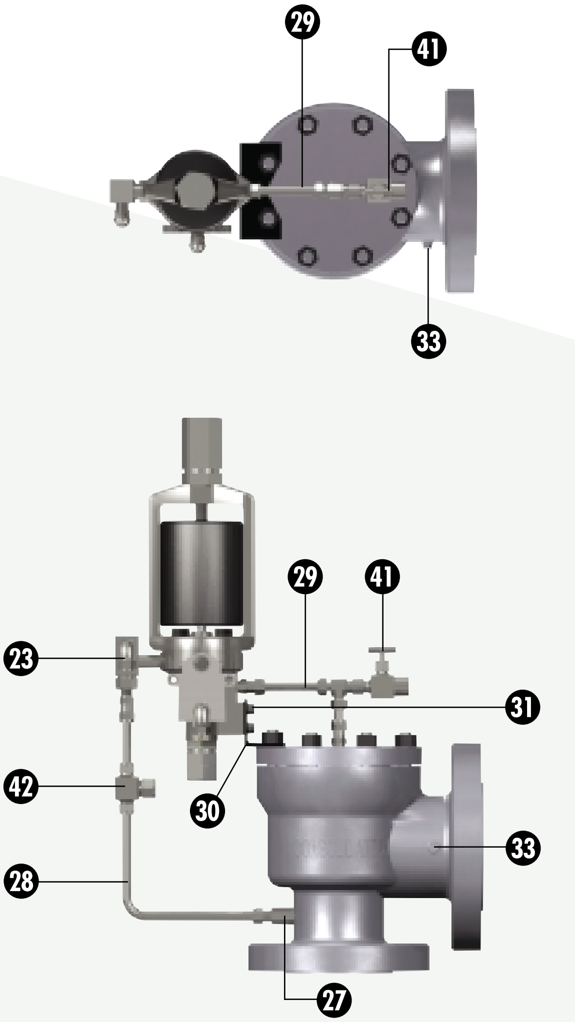
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
42	Pilot Supply Filter	316 Stainless Steel

Pilot Valve w/ Backflow Preventer (Optional For Liquid & Gas Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
45	Backflow Preventer	316 Stainless Steel
46	Backflow Preventer Line	316 Stainless Steel

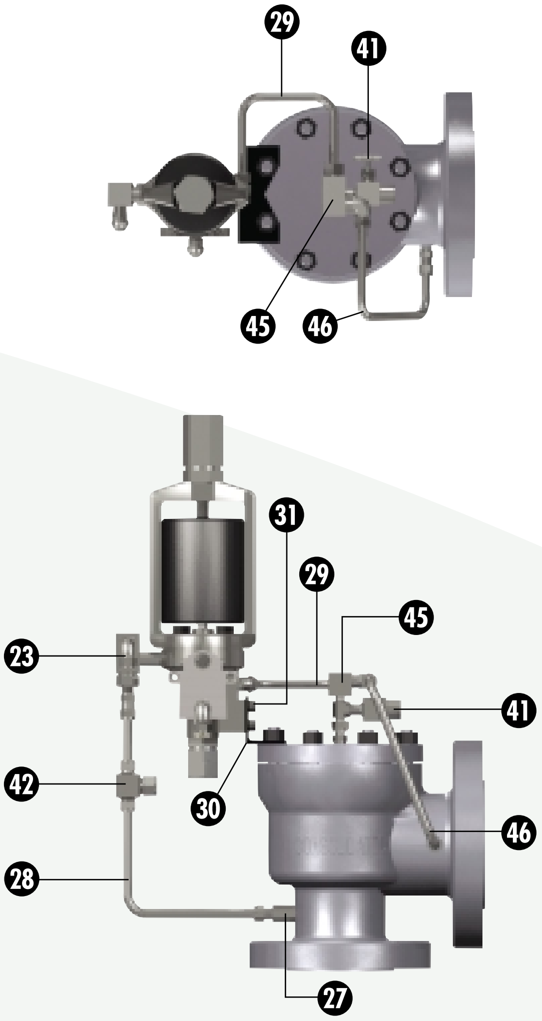
39MPV Series Type 39PV Pilot with Single Outlet

[Pilot Vented to Atmosphere]



**Pilot Valve w/ Manual Blowdown & Pilot Supply Filter
(Standard for Steam Applications)
(Optional for Liquid & Gas Applications)**

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel

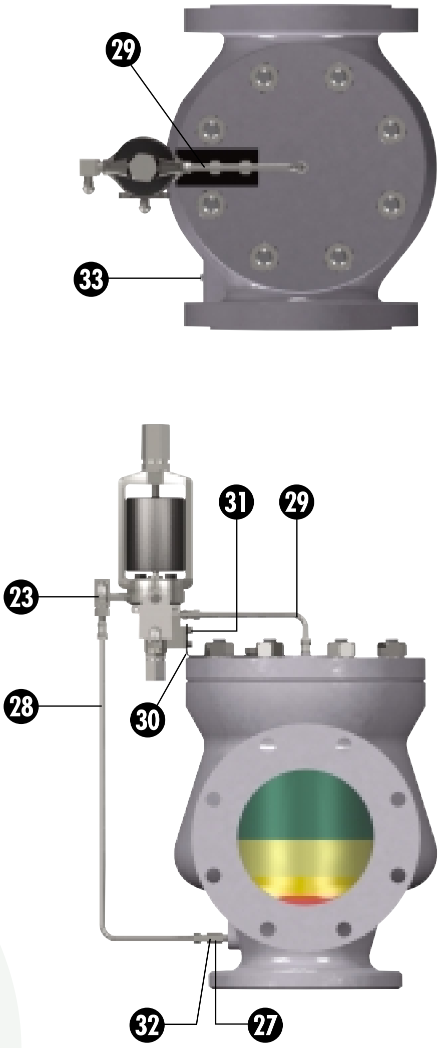


**Pilot Valve w/ Manual Blowdown &
Pilot Supply Filter & Backflow Preventer
(Optional For Steam Applications)**

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel
45	Backflow Preventer	316 Stainless Steel
46	Backflow Preventer Line	316 Stainless Steel

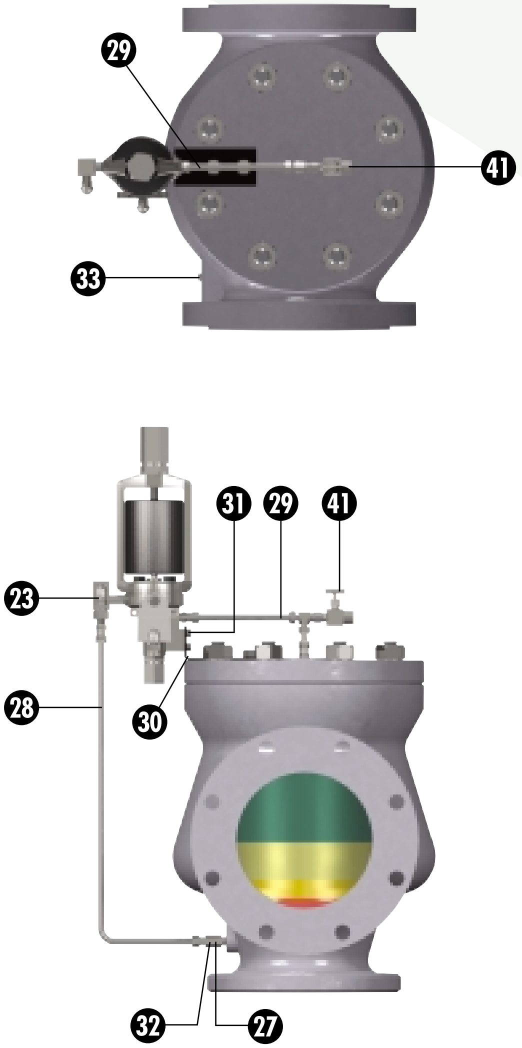
39MPV Series Type 39PV Pilot with Double Outlet

[Pilot Vented to Atmosphere]



Pilot Valve w/ Field Test Connection
(Standard For All Media Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
33	Pipe Plug	Carbon Steel

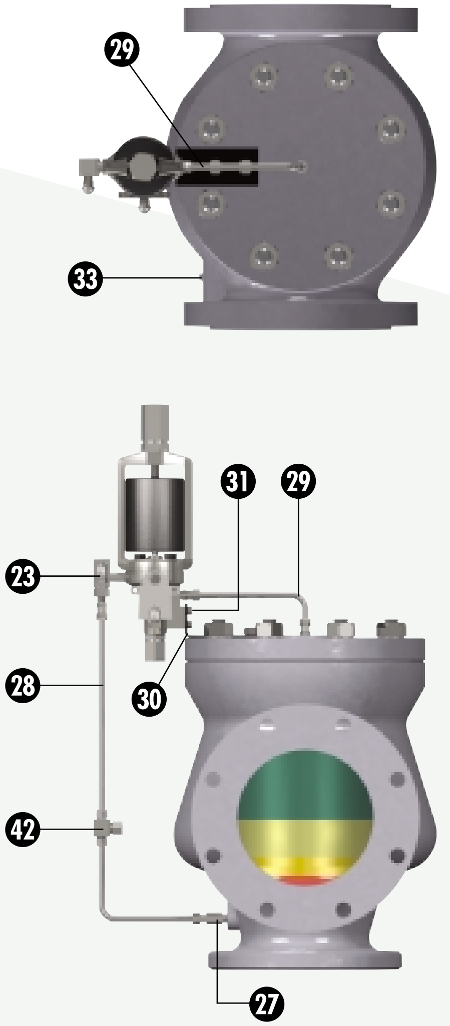


Pilot Valve w/ Manual Blowdown
(Optional For Liquid & Gas Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
33	Pipe Plug	Carbon Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel

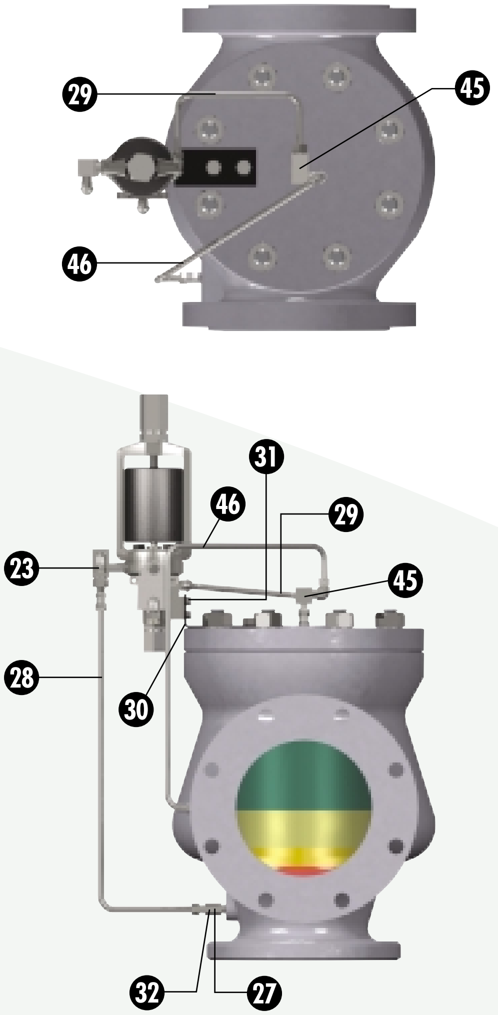
39MPV Series Type 39PV Pilot with Double Outlet

[Pilot Vented to Atmosphere]



Pilot Valve w/ Pilot Supply Filter
(Optional For All Media Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
42	Pilot Supply Filter	316 Stainless Steel

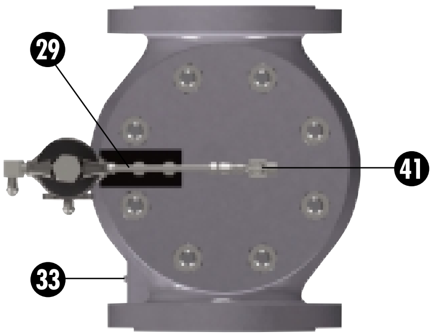


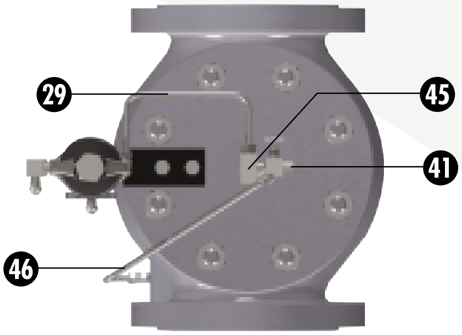
Pilot Valve w/ Backflow Preventer
(Optional For Liquid & Gas Applications)

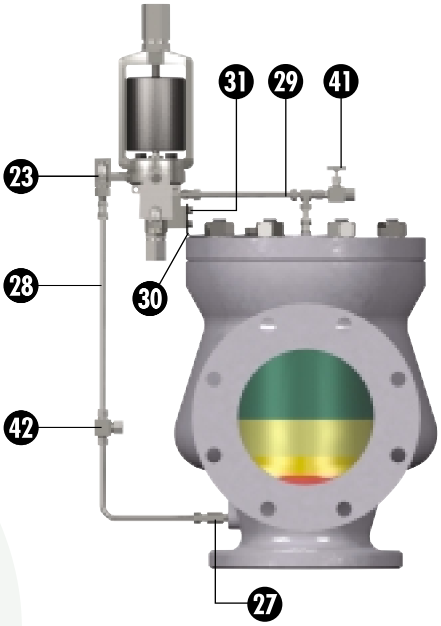
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
45	Backflow Preventer	316 Stainless Steel
46	Backflow Preventer Line	316 Stainless Steel

39MPV Series Type 39PV Pilot with Double Outlet

[Pilot Vented to Atmosphere]

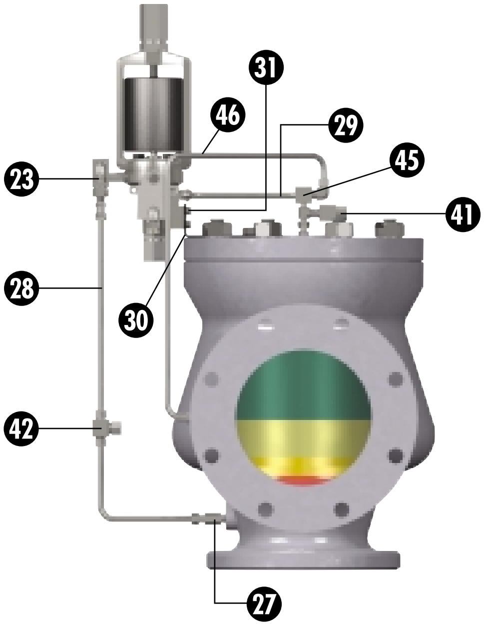






Pilot Valve w/ Manual Blowdown & Pilot Supply Filter
(Standard for Steam Applications)
(Optional for Liquid & Gas Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel

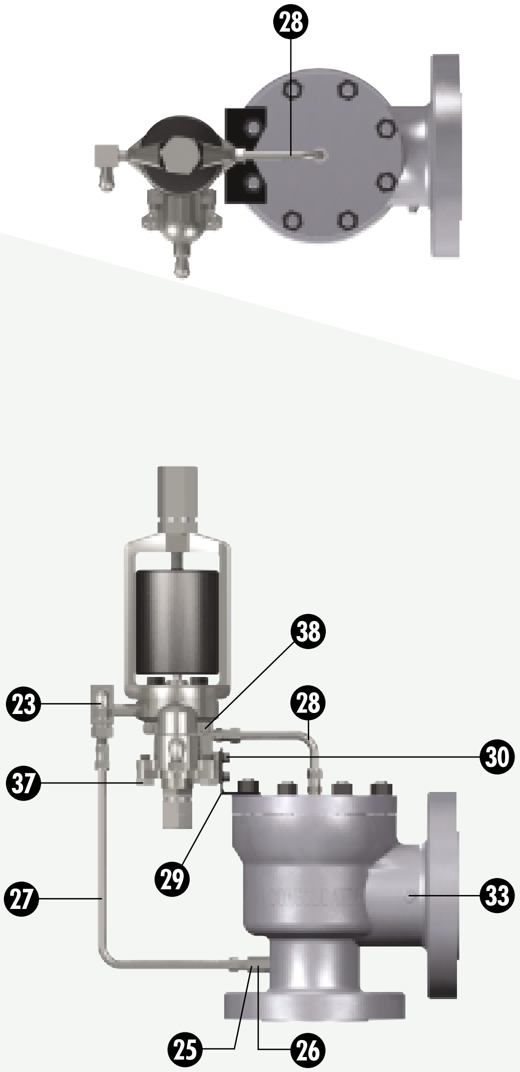


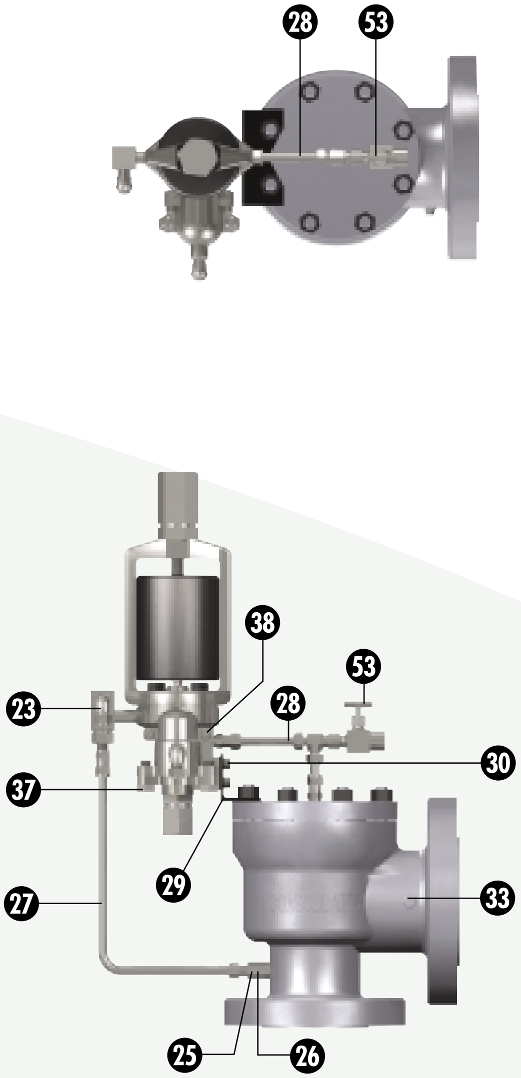
Pilot Valve w/ Manual Blowdown &
Pilot Supply Filter & Backflow Preventer
(Optional For Steam Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel
45	Backflow Preventer	316 Stainless Steel
46	Backflow Preventer Line	316 Stainless Steel

39MPV Series Type 39MV Pilot with Single Outlet

[Pilot Vented to Atmosphere]





Pilot Valve w/ Standard Field Test Connection
(Standard for All Media Applications)

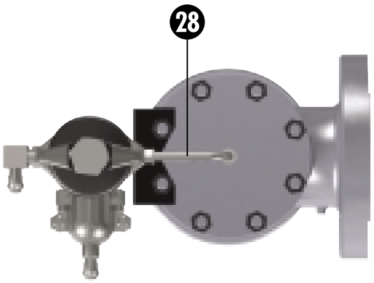
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel

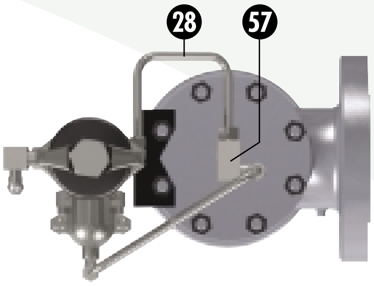
Pilot Valve w/ Manual Blowdown
(Optional for All Media Applications)

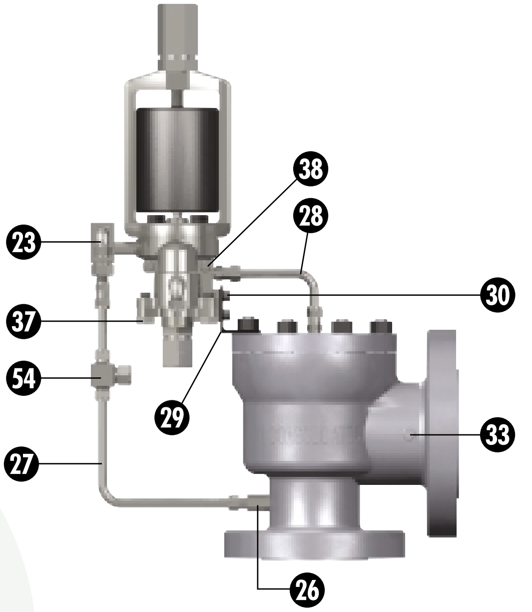
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel

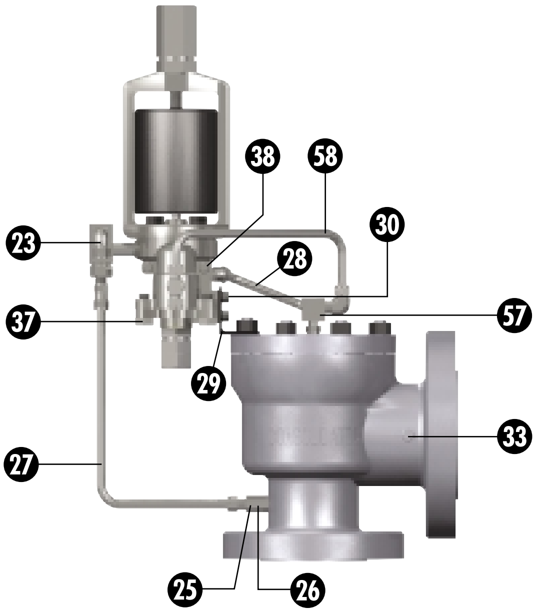
39MPV Series Type 39MV Pilot with Single Outlet

[Pilot Vented to Atmosphere]









Pilot Valve w/ Pilot Supply Filter
(Optional for All Media Applications)

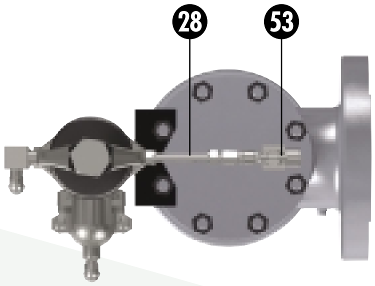
	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel

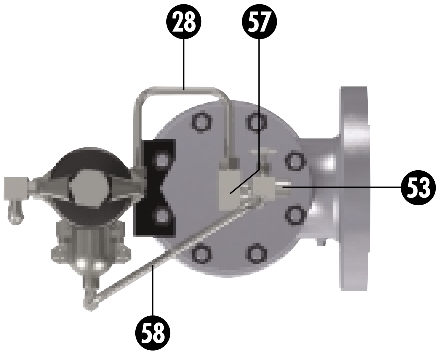
Pilot Valve w/ Backflow Preventer
(Optional for Liquid & Gas Applications)

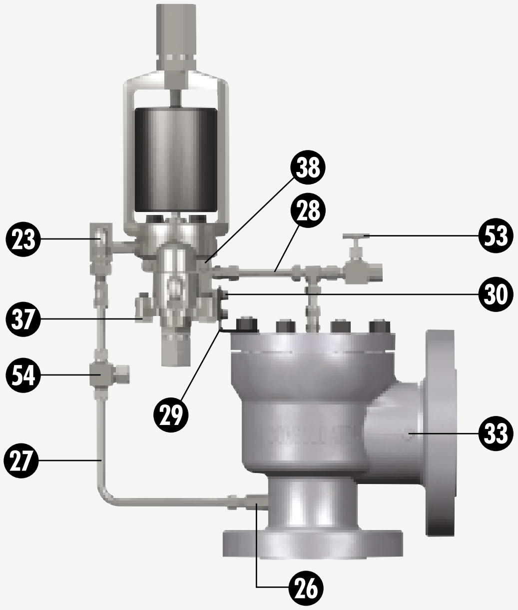
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
57	Backflow Preventer	316 Stainless Steel
58	Backflow Preventer Line	316 Stainless Steel

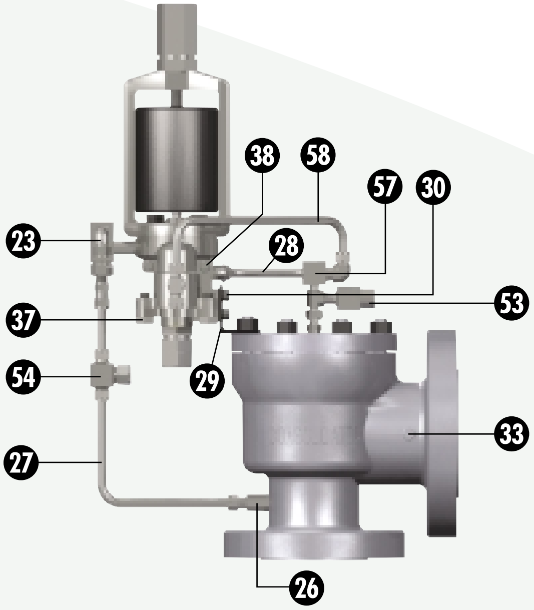
39MPV Series Type 39MV Pilot with Single Outlet

[Pilot Vented to Atmosphere]









Pilot Valve w/ Manual Blowdown & Pilot Supply Filter
(Standard for Steam Applications)
(Optional for Liquid & Gas Applications)

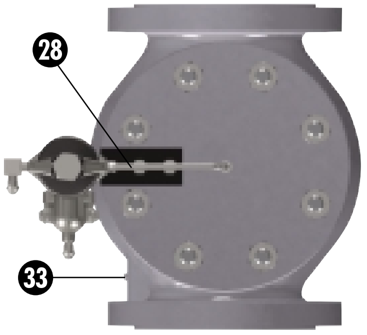
	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel

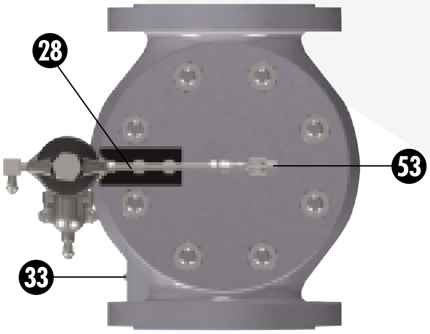
Pilot Valve w/ Manual Blowdown &
Pilot Supply Filter & Backflow Preventer
(Optional For Steam Applications)

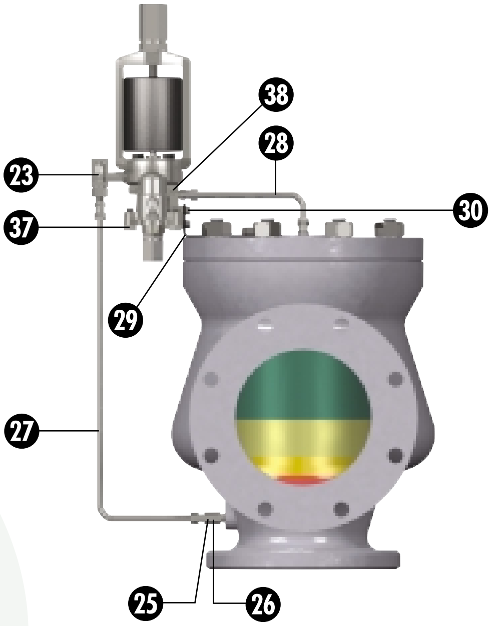
	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel
57	Backflow Preventer	316 Stainless Steel
58	Backflow Preventer Line	316 Stainless Steel

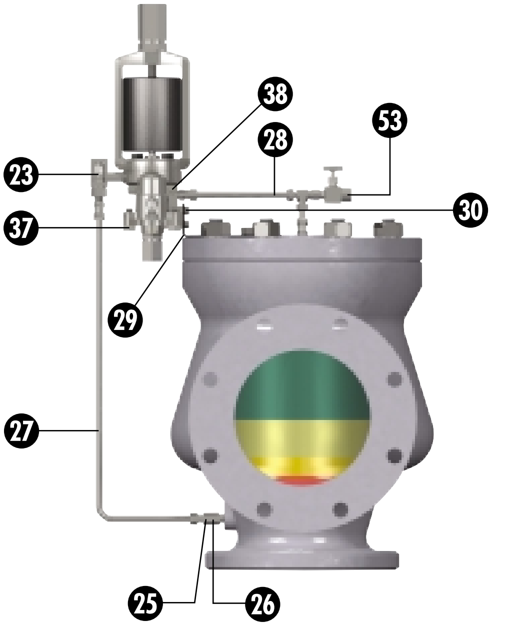
39MPV Series Type 39MV Pilot with Double Outlet

[Pilot Vented to Atmosphere]









Pilot Valve w/ Field Test Connection
(Standard for All Media Applications)

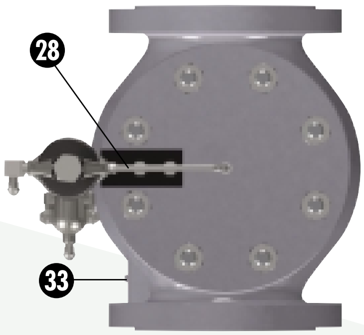
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel

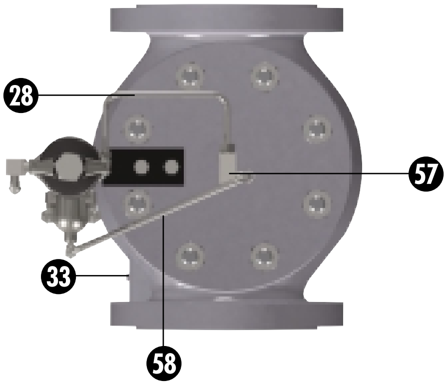
Pilot Valve w/ Manual Blowdown
(Optional for All Media Applications)

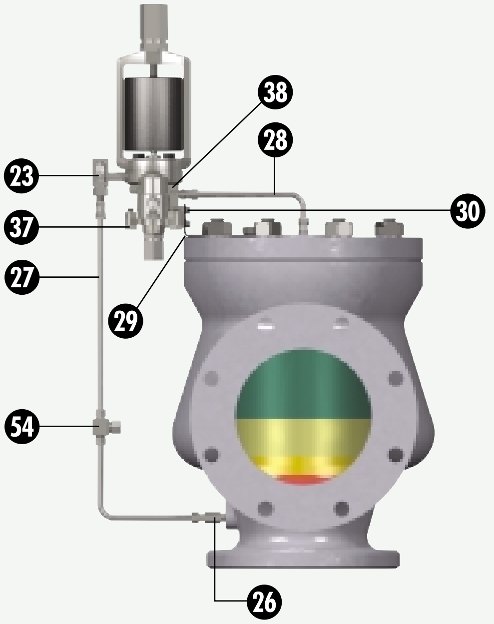
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel

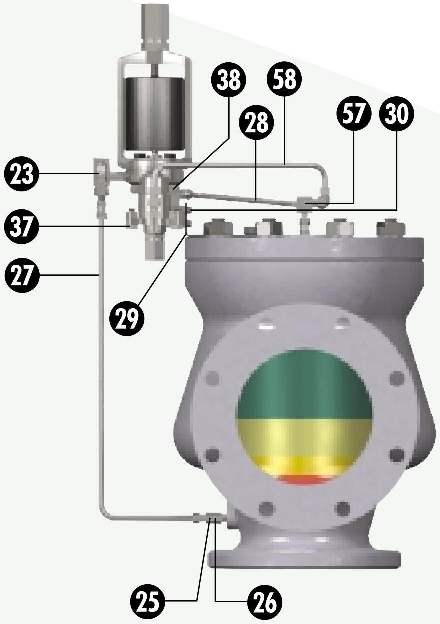
39MPV Series Type 39MV Pilot with Double Outlet

[Pilot Vented to Atmosphere]









Pilot Valve w/ Pilot Supply Filter
(Optional for All Media Applications)

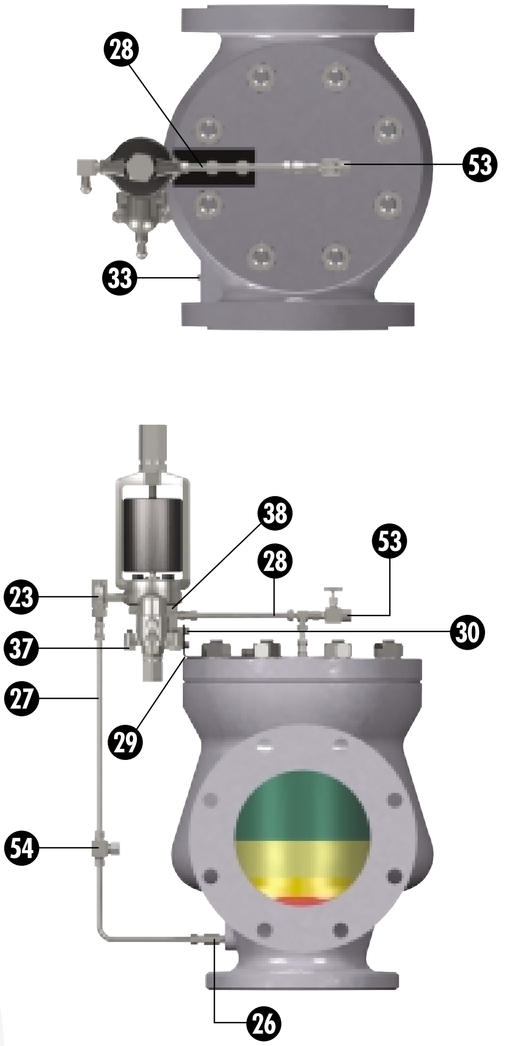
	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel

Pilot Valve w/ Backflow Preventer
(Optional for Liquid & Gas Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
57	Backflow Preventer	316 Stainless Steel
58	Backflow Preventer Line	316 Stainless Steel

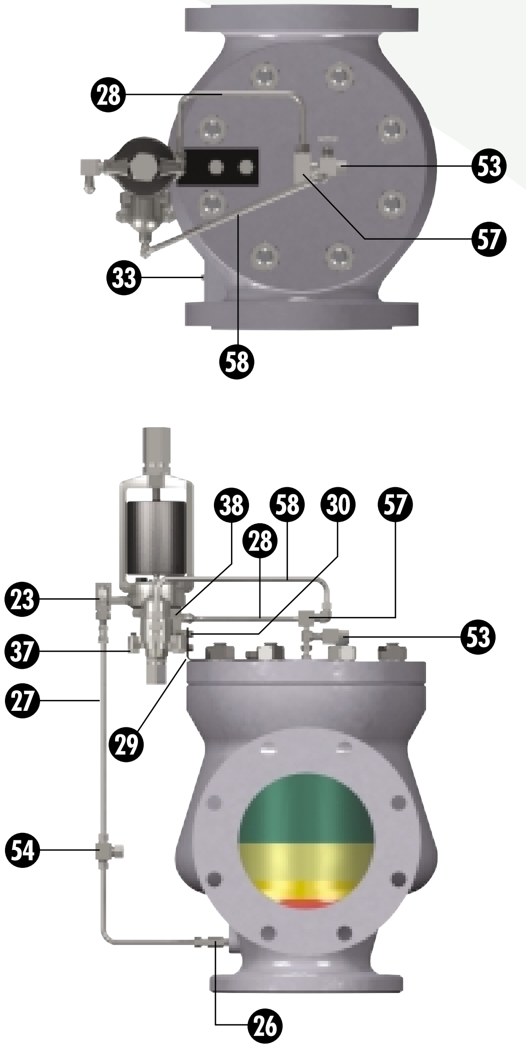
39MPV Series Type 39MV Pilot with Double Outlet

[Pilot Vented to Atmosphere]



**Pilot Valve w/ Manual Blowdown & Pilot Supply Filter
(Standard for Steam Applications)
(Optional for Liquid & Gas Applications)**

	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel



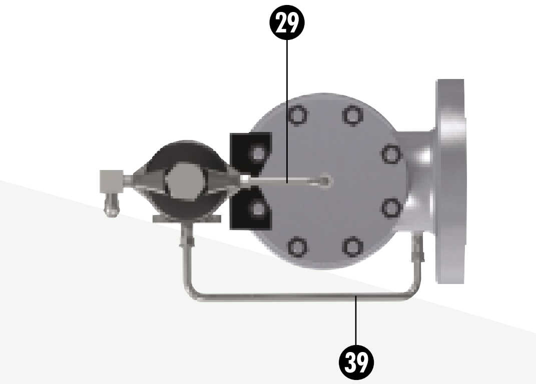
**Pilot Valve w/ Manual Blowdown &
Pilot Supply Filter & Backflow Preventer
(Optional for Steam Applications)**

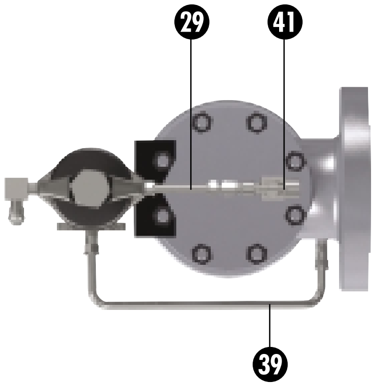
	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
33	Pipe Plug	Carbon Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel
57	Backflow Preventer	316 Stainless Steel
58	Backflow Preventer Line	316 Stainless Steel

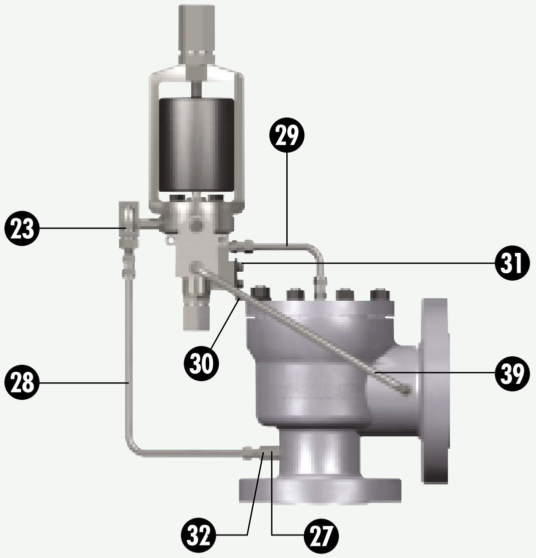
Alternate Piping Arrangements

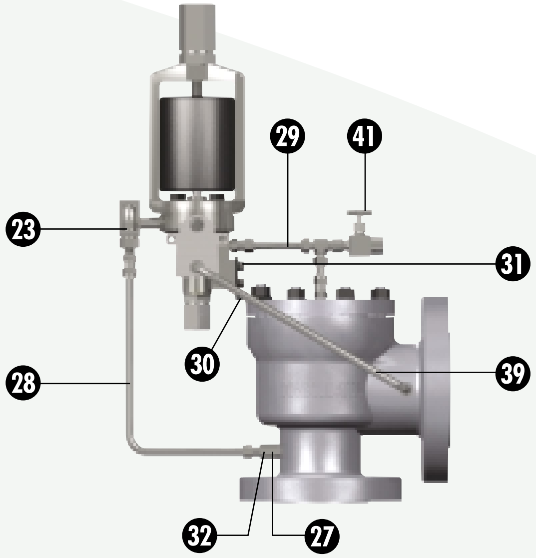
3900 Series Type 39PV Pilot with Single Outlet

[Pilot Vented to Body Bowl]









Pilot Valve w/ Standard Field Test Connection
(Standard For All Media Applications)

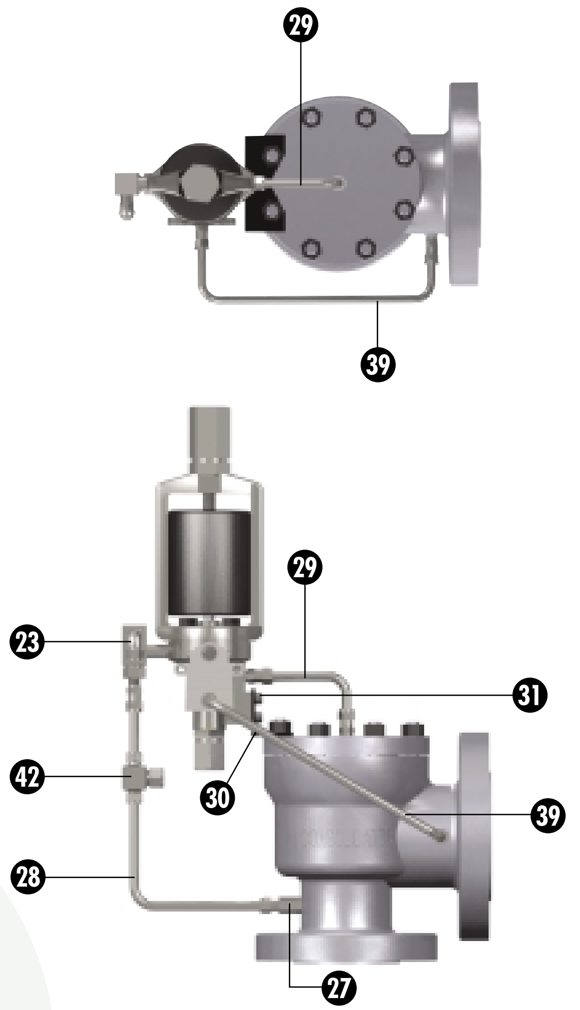
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
39	Discharge Line	316 Stainless Steel

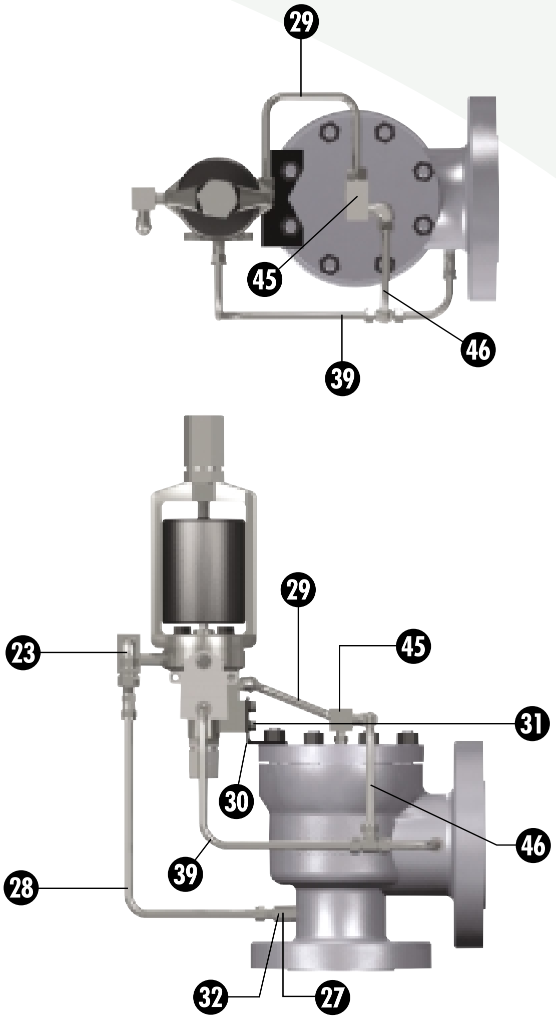
Pilot Valve w/ Manual Blowdown
(Optional For All Media Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel

39MPV Series Type 39PV Pilot with Single Outlet

[Pilot Vented to Body Bowl]





Pilot Valve w/ Pilot Supply Filter
(Optional For All Media Applications)

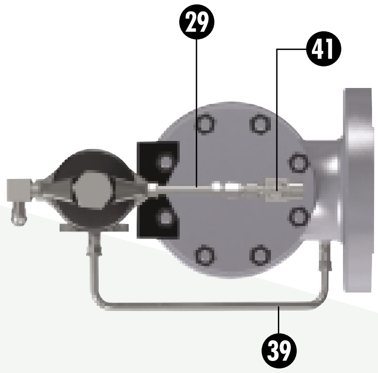
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel

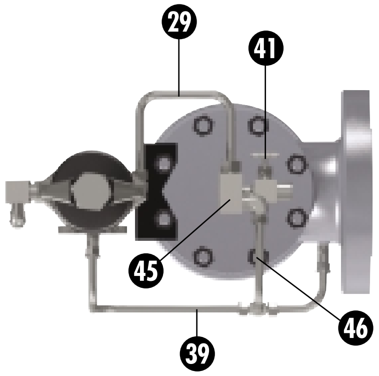
Pilot Valve w/ Backflow Preventer
(Optional For Liquid & Gas Applications)

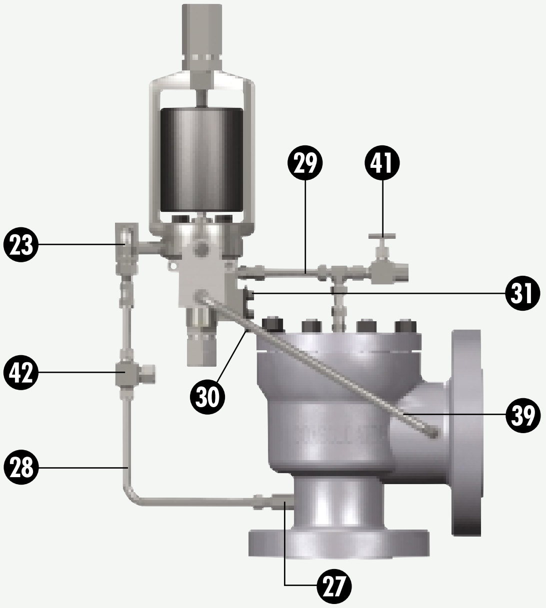
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
45	Backflow Preventer	316 Stainless Steel
46	Backflow Preventer Line	316 Stainless Steel

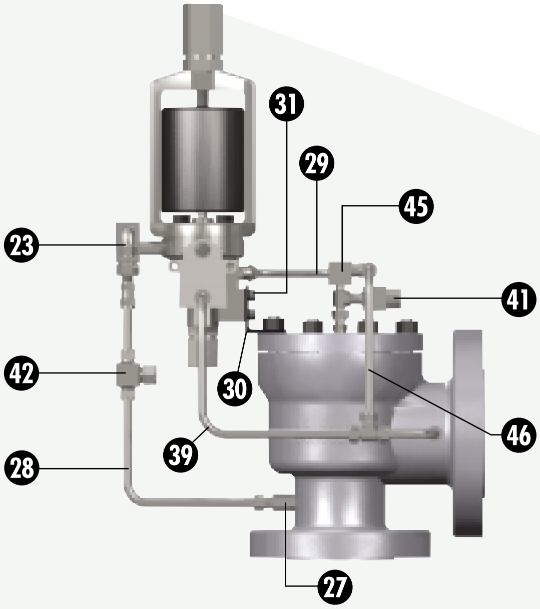
39MPV Series Type 39PV Pilot with Single Outlet

[Pilot Vented to Body Bowl]









Pilot Valve w/ Manual Blowdown & Pilot Supply Filter
(Standard for Steam Applications)
(Optional for Liquid & Gas Applications)

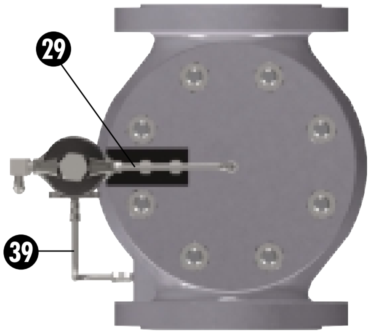
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel

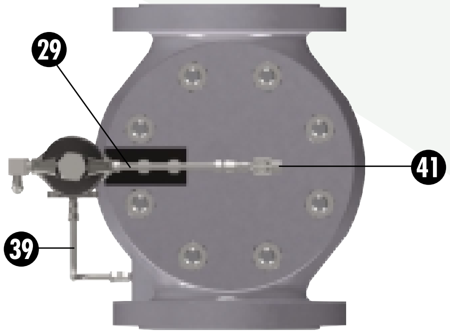
Pilot Valve w/ Manual Blowdown &
Pilot Supply Filter & Backflow Preventer
(Optional For Steam Applications)

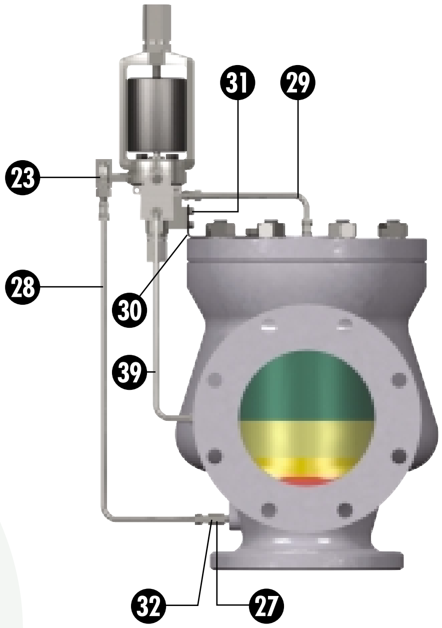
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel
45	Backflow Preventer	316 Stainless Steel
46	Backflow Preventer Line	316 Stainless Steel

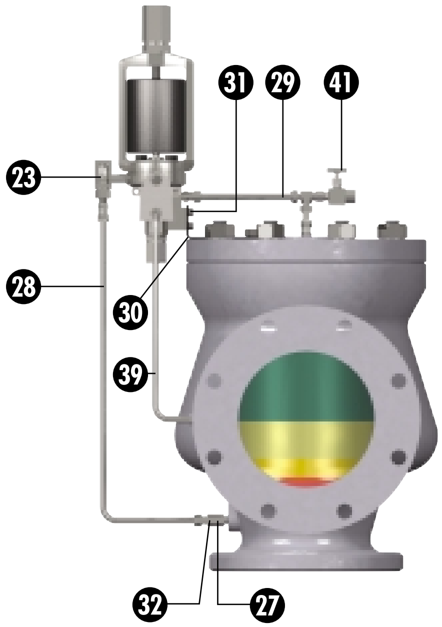
39MPV Series Type 39PV Pilot with Double Outlet

[Pilot Vented to Body Bowl]









Pilot Valve w/ Field Test Connection
(Standard For All Media Applications)

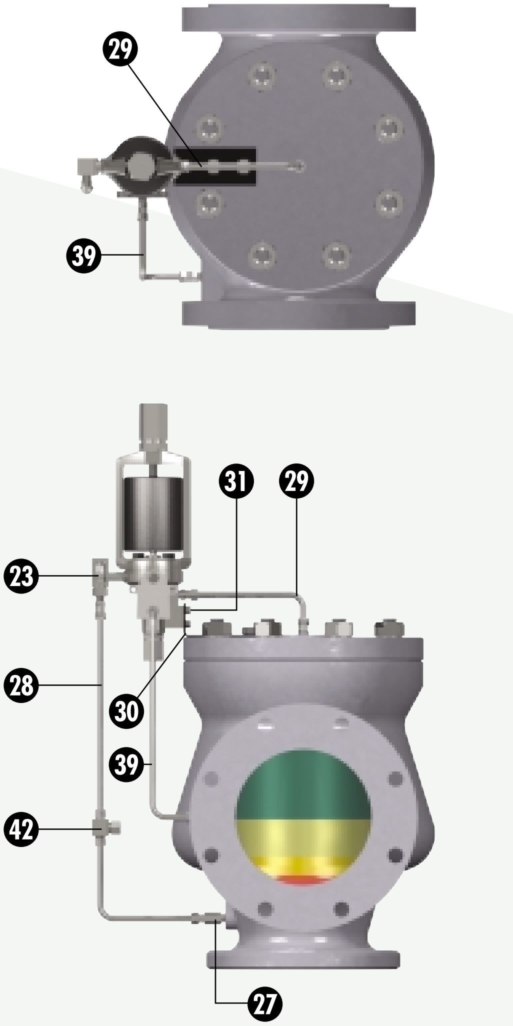
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
39	Discharge Line	316 Stainless Steel

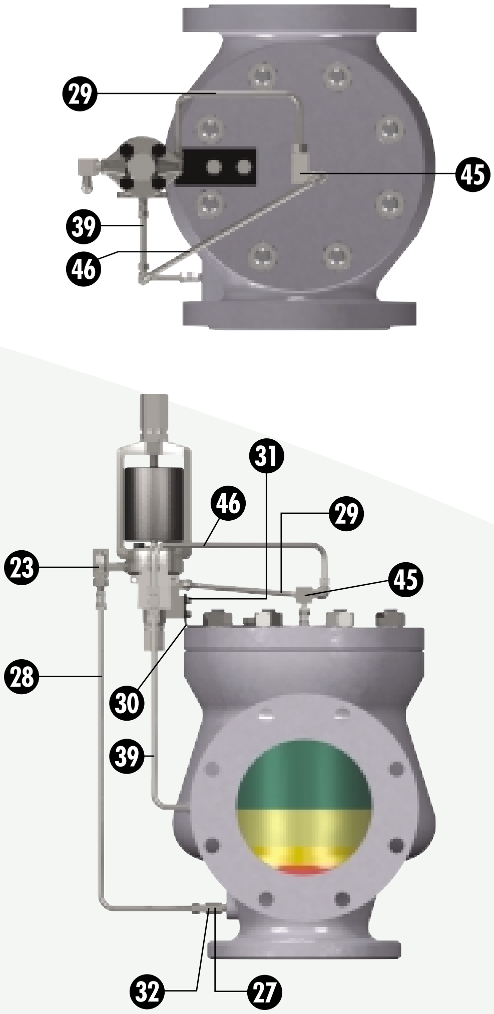
Pilot Valve w/ Manual Blowdown
(Optional For Liquid & Gas Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel

39MPV Series Type 39PV Pilot with Double Outlet

[Pilot Vented to Body Bowl]





Pilot Valve w/ Pilot Supply Filter
(Optional For All Media Applications)

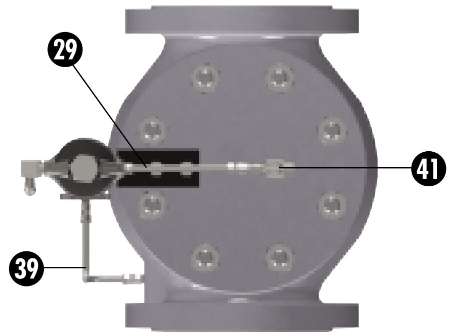
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel

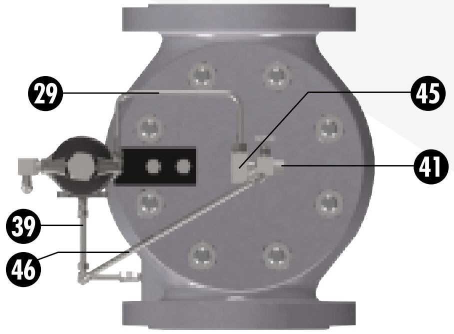
Pilot Valve w/ Backflow Preventer
(Optional For Liquid & Gas Applications)

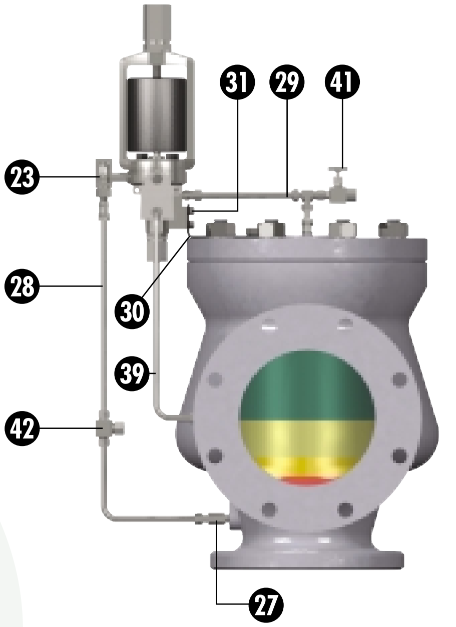
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
32	Plug Filter	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
45	Backflow Preventer	316 Stainless Steel
46	Backflow Preventer Line	316 Stainless Steel

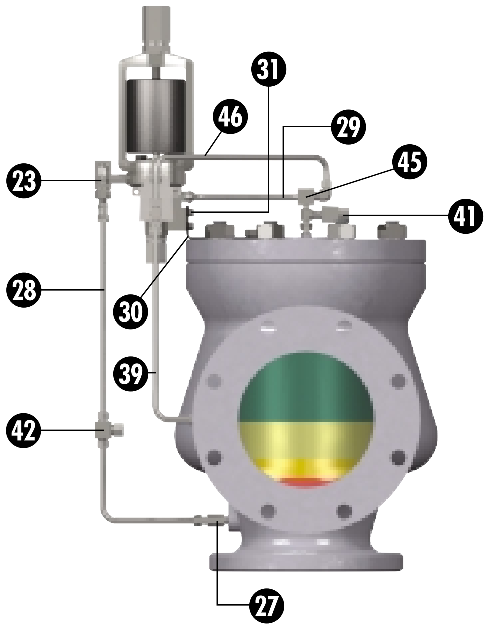
39MPV Series Type 39PV Pilot with Double Outlet

[Pilot Vented to Body Bowl]









Pilot Valve w/ Manual Blowdown & Pilot Supply Filter
(Standard for Steam Applications)
(Optional for Liquid & Gas Applications)

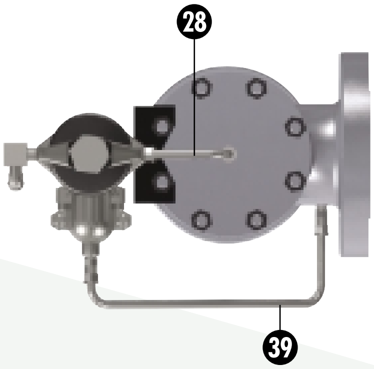
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel

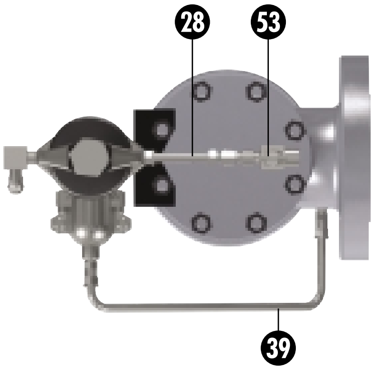
Pilot Valve w/ Manual Blowdown &
Pilot Supply Filter &Backflow Preventer
(Optional For Steam Applications)

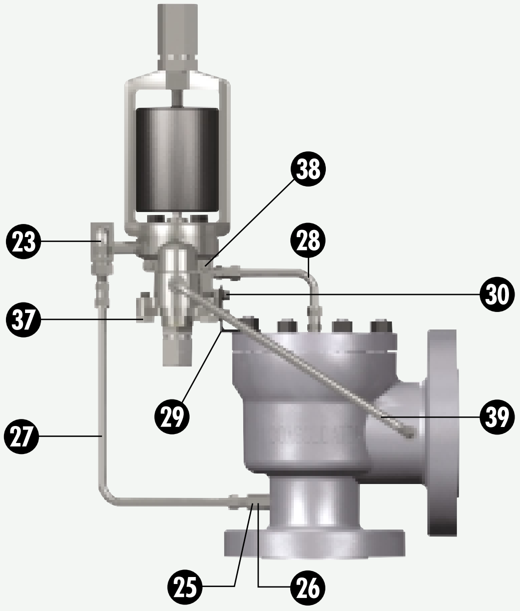
	Part	Material
23	Field Test Connection	316 Stainless Steel
27	Sensing Tube	316 Stainless Steel
28	Sensing Line	316 Stainless Steel
29	Dome Line	316 Stainless Steel
30	Bracket	Carbon Steel
31	Bracket Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
41	Needle Valve (Manual Blowdown)	316 Stainless Steel
42	Pilot Supply Filter	316 Stainless Steel
45	Backflow Preventer	316 Stainless Steel
46	Backflow Preventer Line	316 Stainless Steel

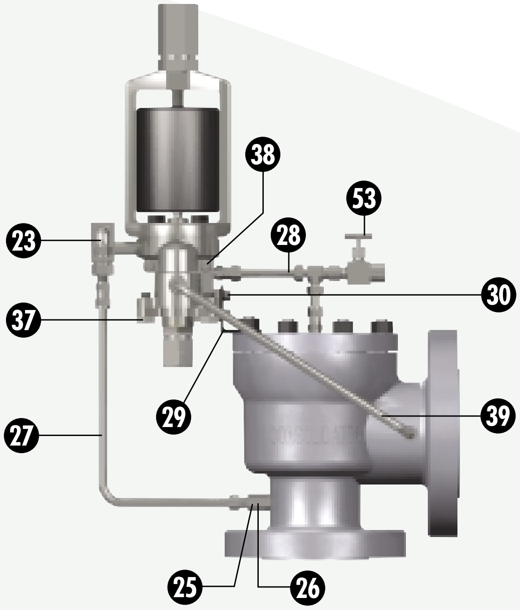
39MPV Series Type 39MV Pilot with Single Outlet

[Pilot Vented to Body Bowl]









Pilot Valve w/ Standard Field Test Connection
(Standard for All Media Applications)

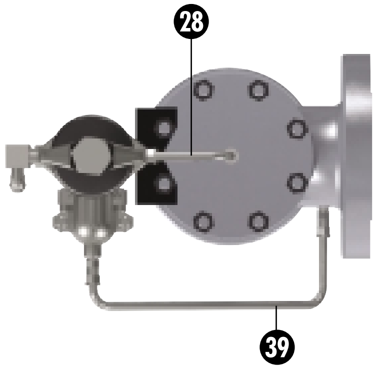
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel

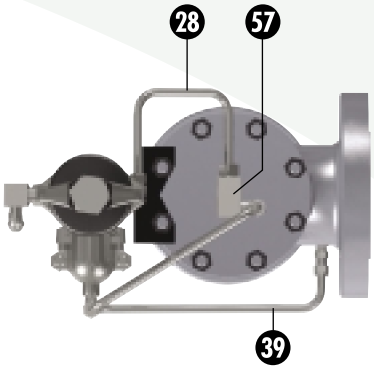
Pilot Valve w/ Manual Blowdown
(Optional for All Media Applications)

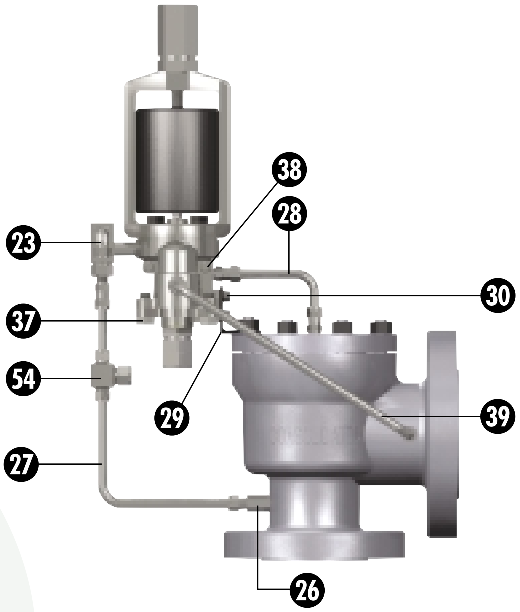
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel

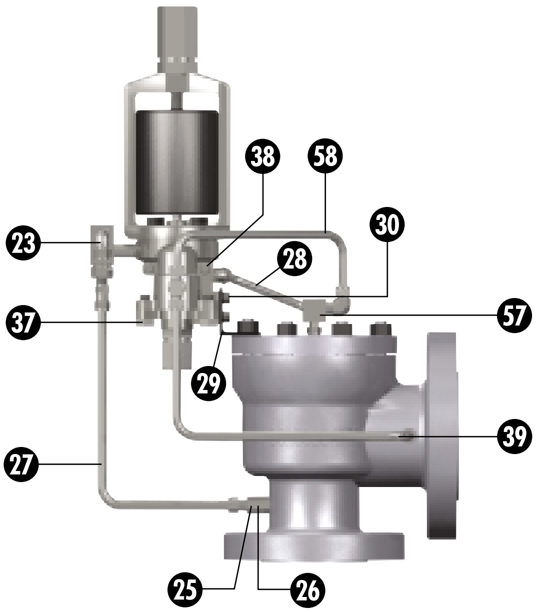
39MPV Series Type 39MV Pilot with Single Outlet

[Pilot Vented to Body Bowl]









Pilot Valve w/ Pilot Supply Filter
(Optional for All Media Applications)

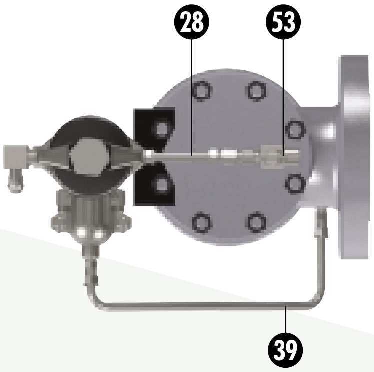
	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel

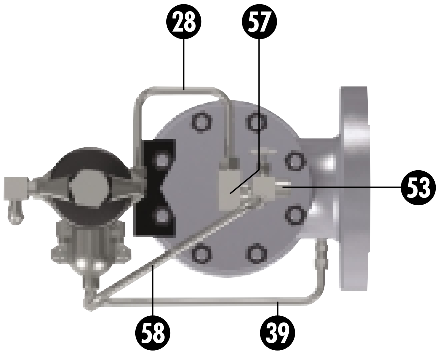
Pilot Valve w/ Backflow Preventer
(Optional for Liquid & Gas Applications)

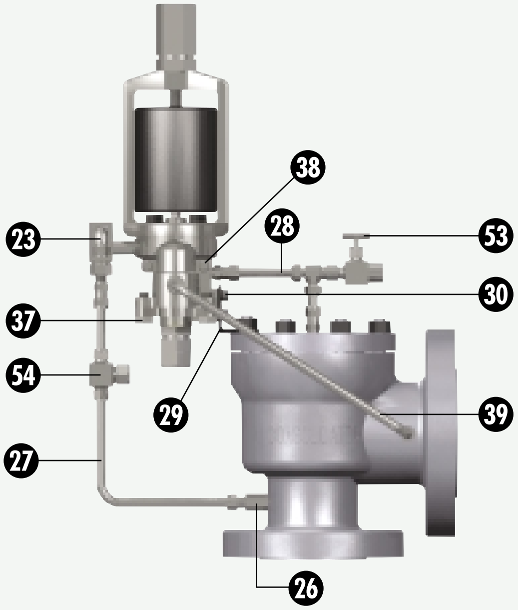
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
57	Backflow Preventer	316 Stainless Steel
58	Backflow Preventer Line	316 Stainless Steel

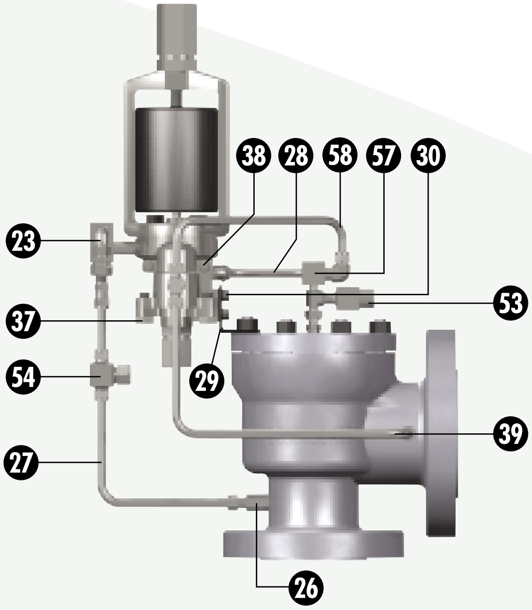
39MPV Series Type 39MV Pilot with Single Outlet

[Pilot Vented to Body Bowl]









Pilot Valve w/ Manual Blowdown & Pilot Supply Filter
(Standard for Steam Applications)
(Optional for Liquid & Gas Applications)

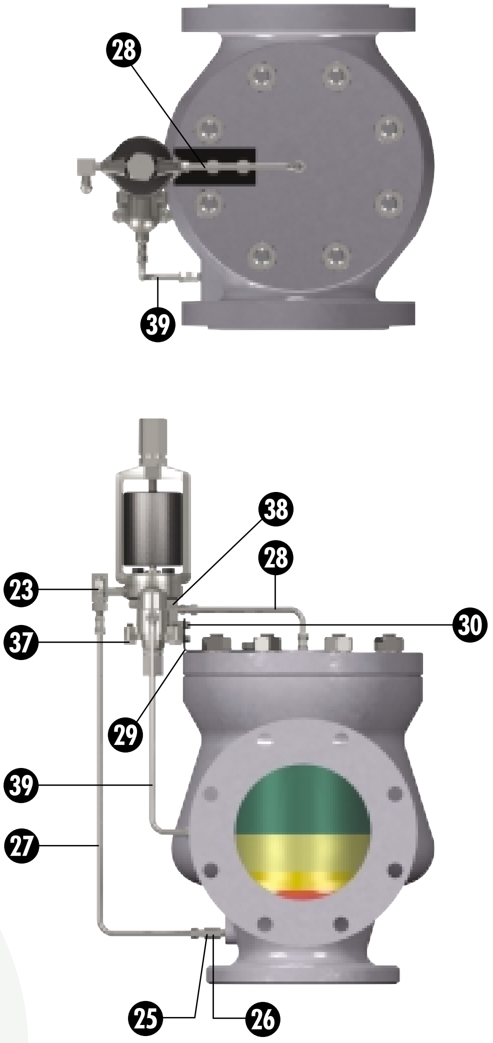
	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel

Pilot Valve w/ Manual Blowdown & Pilot Supply Filter & Backflow Preventer
(Optional For Steam Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel
57	Backflow Preventer	316 Stainless Steel
58	Backflow Preventer Line	316 Stainless Steel

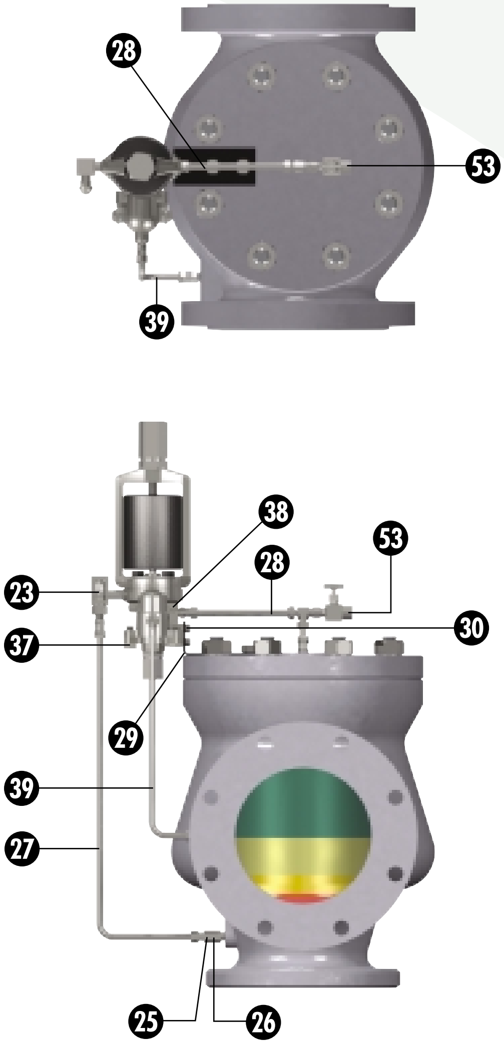
39MPV Series Type 39MV Pilot with Double Outlet

[Pilot Vented to Body Bowl]



Pilot Valve w/ Field Test Connection
(Standard for All Media Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel

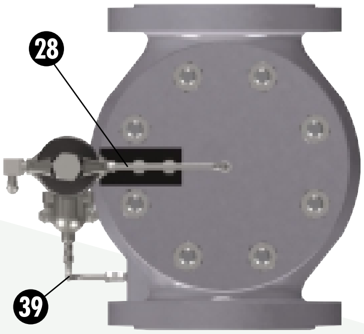


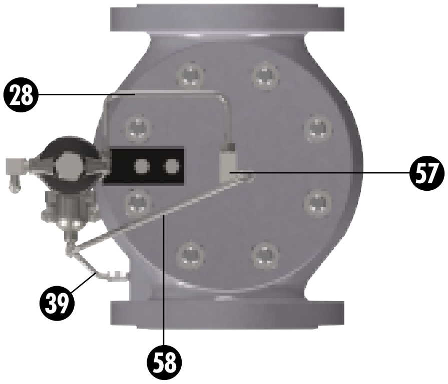
Pilot Valve w/ Manual Blowdown
(Optional for All Media Applications)

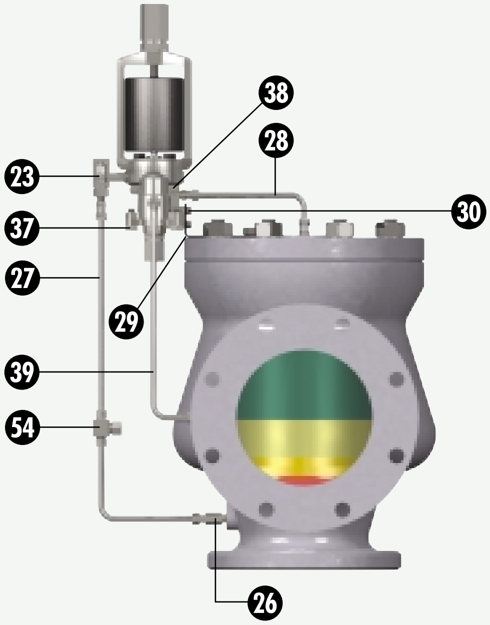
	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel

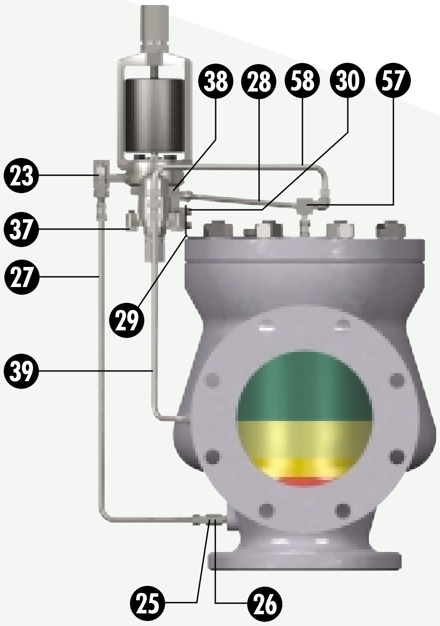
39MPV Series Type 39MV Pilot with Double Outlet

[Pilot Vented to Body Bowl]









Pilot Valve w/ Pilot Supply Filter
(Optional for All Media Applications)

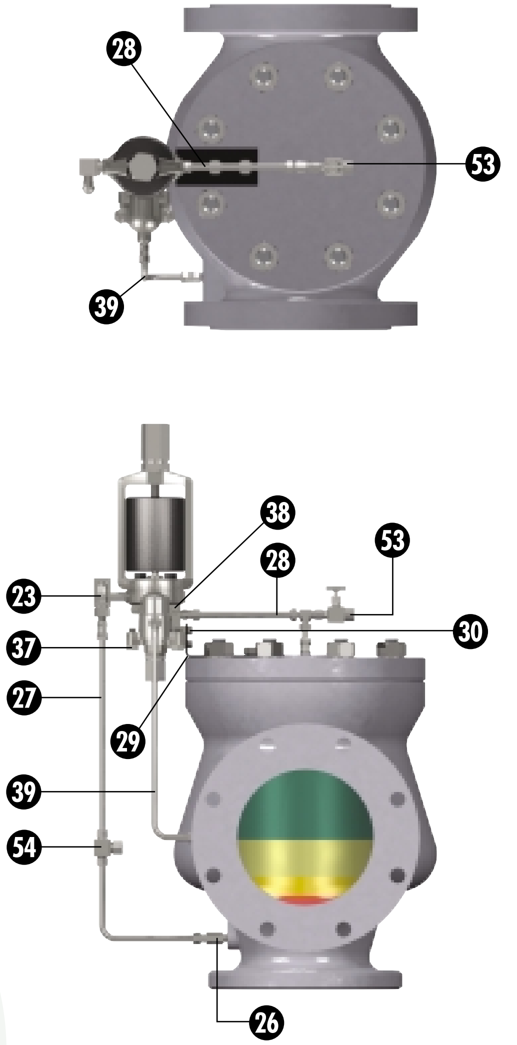
	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel

Pilot Valve w/ Backflow Preventer
(Optional for Liquid & Gas Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
25	Plug Filter	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
57	Backflow Preventer	316 Stainless Steel
58	Backflow Preventer Line	316 Stainless Steel

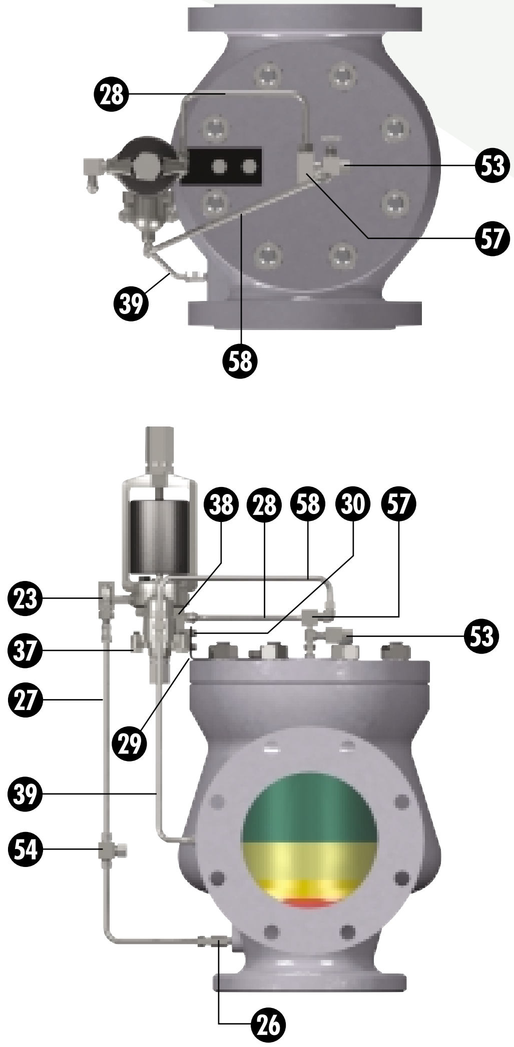
39MPV Series Type 39MV Pilot with Double Outlet

[Pilot Vented to Body Bowl]



Pilot Valve w/ Manual Blowdown & Pilot Supply Filter
(Standard for Steam Applications)
(Optional for Liquid & Gas Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel

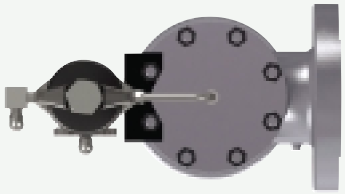


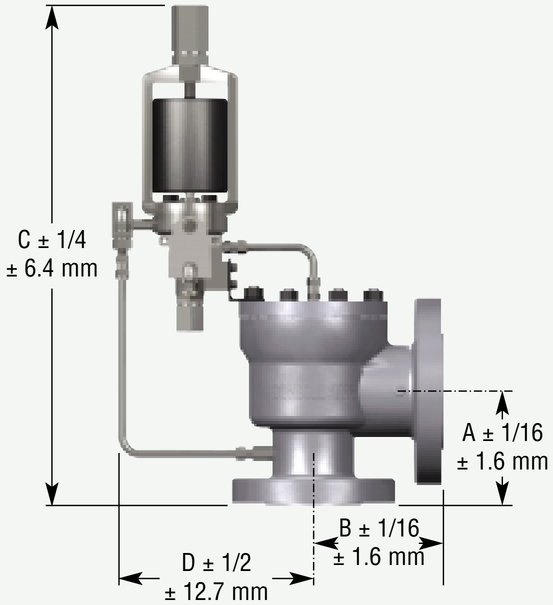
Pilot Valve w/ Manual Blowdown &
Pilot Supply Filter & Backflow Preventer
(Optional For Steam Applications)

	Part	Material
23	Field Test Connection	316 Stainless Steel
26	Sensing Tube	316 Stainless Steel
27	Sensing Line	316 Stainless Steel
28	Dome Line	316 Stainless Steel
29	Bracket	Carbon Steel
30	Bracket Cap Screw	316 Stainless Steel
37	Mod. Cap Screw	316 Stainless Steel
38	Soc. Head Cap Screw	316 Stainless Steel
39	Discharge Line	316 Stainless Steel
53	Needle Valve (Manual Blowdown)	316 Stainless Steel
54	Pilot Supply Filter	316 Stainless Steel
57	Backflow Preventer	316 Stainless Steel
58	Backflow Preventer Line	316 Stainless Steel

3900 Dimensions & Weights Index

39MPV Series Type 39PV Pilot Single Outlet, Standard Bore & Full Bore*





39PV w/ Single Outlet - Standard Bore

*See page 3900.49 for full bore single outlet dimensions and weights.

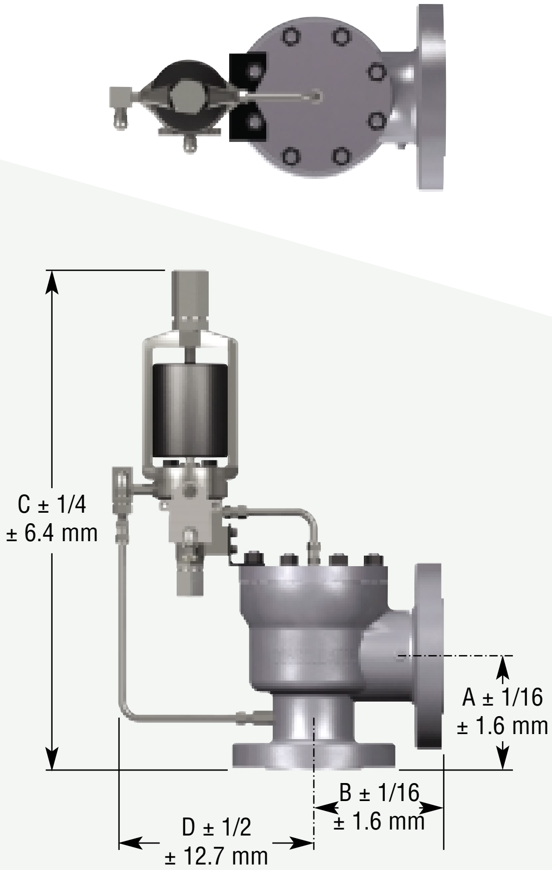
NOTE: All weights listed in this document are approximations.

39MPV Series Type 39PV - Dimensions & Weights

Single Outlet, Standard Bore

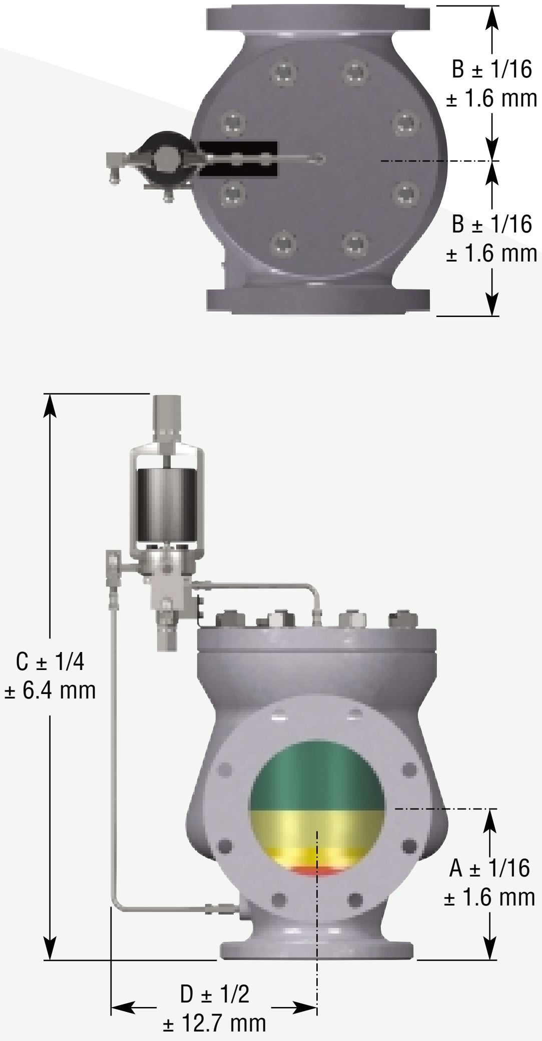
Valve Size (in.) & Type	ORIFICES	INLET FLANGE Size (in.) & Class	OUTLET FLANGE Size (in.) & Class	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	WEIGHT lb. (kg)
1 - 3905	D,E,F	1 - 150	2 - 150	4-1/8 (104.8)	4-1/2 (114.3)	21-3/16 (538.2)	8-1/2 (215.9)	39 (17.7)
1 - 3910	D,E,F	1 - 300	2 - 150	4-3/8 (111.1)	4-1/2 (114.3)	21-7/16 (544.5)	8-1/2 (215.9)	40 (18.1)
1 - 3912	D,E,F	1 - 600	2 - 150	4-3/8 (111.1)	4-1/2 (114.3)	21-7/16 (544.5)	8-1/2 (215.9)	43 (19.5)
1 - 3914	D,E,F	1 - 900	2 - 300	4-15/16 (125.4)	4-3/4 (120.7)	22 (558.8)	8-1/2 (215.9)	49 (22.2)
1 - 3916	D,E,F	1 - 1500	2 - 300	4-15/16 (125.4)	4-3/4 (120.7)	22 (558.8)	8-1/2 (215.9)	49 (22.2)
1-1/2 - 3905	D,E,F	1-1/2 - 150	2 - 150	4-7/8 (123.8)	4-3/4 (120.7)	21-15/16 (557.2)	8-1/2 (215.9)	46 (20.9)
1-1/2 - 3910	D,E,F	1-1/2 - 300	2 - 150	4-7/8 (123.8)	4-3/4 (120.7)	21-15/16 (557.2)	8-1/2 (215.9)	47 (21.3)
1-1/2 - 3912	D,E,F	1-1/2 - 600	2 - 150	4-7/8 (123.8)	4-3/4 (120.7)	21-15/16 (557.2)	8-1/2 (215.9)	48 (21.8)
1-1/2 - 3914	D,E,F	1-1/2 - 900	2 - 300	5-7/8 (149.2)	5-1/2 (139.7)	22-15/16 (582.6)	8-1/2 (215.9)	61 (27.7)
1-1/2 - 3916	D,E,F	1-1/2 - 1500	2 - 300	5-7/8 (149.2)	5-1/2 (139.7)	22-15/16 (582.6)	8-1/2 (215.9)	61 (27.7)
1-1/2 - 3905	G,H	1-1/2 - 150	3 - 150	5-1/8 (130.2)	4-7/8 (123.8)	23-5/16 (592.1)	9-5/16 (236.5)	53 (24.0)
1-1/2 - 3910	G,H	1-1/2 - 300	3 - 150	5-1/8 (130.2)	4-7/8 (123.8)	23-5/16 (592.1)	9-5/16 (236.5)	55 (24.9)
1-1/2 - 3912	G,H	1-1/2 - 600	3 - 150	5-1/8 (130.2)	4-7/8 (123.8)	23-5/16 (592.1)	9-5/16 (236.5)	57 (25.9)
1-1/2 - 3914	G,H	1-1/2 - 900	3 - 300	6-3/8 (161.9)	6-3/4 (171.5)	24-9/16 (623.9)	9-5/16 (236.5)	66 (29.9)
1-1/2 - 3916	G,H	1-1/2 - 1500	3 - 300	6-3/8 (161.9)	6-3/4 (171.5)	24-9/16 (623.9)	9-5/16 (236.5)	66 (29.9)
2 - 3905	G,H,J	2 - 150	3 - 150	5-3/8 (136.5)	4-7/8 (123.8)	23-9/16 (598.5)	9-5/16 (236.5)	53 (24.0)
2 - 3910	G,H,J	2 - 300	3 - 150	5-3/8 (136.5)	4-7/8 (123.8)	23-9/16 (598.5)	9-5/16 (236.5)	55 (24.9)
2 - 3912	G,H,J	2 - 600	3 - 150	5-3/8 (136.5)	4-7/8 (123.8)	23-9/16 (598.5)	9-5/16 (236.5)	57 (25.9)
2 - 3914	G,H,J	2 - 900	3 - 300	6-9/16 (166.7)	6-3/4 (171.5)	24-3/4 (628.7)	9-5/16 (236.5)	80 (36.3)
2 - 3916	G,H,J	2 - 1500	3 - 300	6-9/16 (166.7)	6-3/4 (171.5)	24-3/4 (628.7)	9-5/16 (236.5)	80 (36.3)
3 - 3905	J,K,L	3 - 150	4 - 150	6-1/8 (155.6)	6-3/8 (161.9)	25-1/8 (638.2)	9-3/4 (247.7)	80 (36.3)
3 - 3910	J,K,L	3 - 300	4 - 150	6-1/8 (155.6)	6-3/8 (161.9)	25-1/8 (638.2)	9-3/4 (247.7)	83 (37.6)
3 - 3912	J,K,L	3 - 600	4 - 150	6-3/8 (161.9)	6-3/8 (161.9)	25-3/8 (644.5)	9-3/4 (247.7)	87 (39.5)
3 - 3914	J,K,L	3 - 900	4 - 300	7-1/2 (190.5)	7-1/8 (181.0)	26-13/16 (681.0)	9-13/16 (249.2)	140 (63.5)
3 - 3916	J,K,L	3 - 1500	4 - 300	7-1/2 (190.5)	7-1/8 (181.0)	26-13/16 (681.0)	9-13/16 (249.2)	157 (71.2)
4 - 3905	L,M,N,P	4 - 150	6 - 150	7-3/4 (196.9)	8-1/4 (209.6)	28-1/2 (723.9)	11-7/16 (290.5)	191 (86.6)
4 - 3910	L,M,N,P	4 - 300	6 - 150	7-3/4 (196.9)	8-1/4 (209.6)	28-1/2 (723.9)	11-7/16 (290.5)	199 (90.3)
4 - 3912	L,M,N,P	4 - 600	6 - 150	7-3/4 (196.9)	8-1/4 (209.6)	28-1/2 (723.9)	11-7/16 (290.5)	206 (93.4)
4 - 3914	L,M,N,P	4 - 900	6 - 300	9-13/16 (249.2)	9-3/16 (233.4)	31-1/16 (789.0)	11-3/8 (288.9)	240 (108.9)
4 - 3916	L,M,N,P	4 - 1500	6 - 300	9-13/16 (249.2)	9-3/16 (233.4)	31-1/16 (789.0)	11-3/8 (288.9)	259 (117.5)
6 - 3905	Q,R	6 - 150	8 - 150	9-7/16 (239.7)	9-1/2 (241.3)	31-15/16 (811.2)	12-5/16 (312.7)	348 (157.9)
6 - 3910	Q,R	6 - 300	8 - 150	9-7/16 (239.7)	9-1/2 (241.3)	31-15/16 (811.2)	12-5/16 (312.7)	367 (166.5)
6 - 3912	Q,R	6 - 600	8 - 150	9-11/16 (246.1)	9-1/2 (241.3)	32-3/16 (817.6)	12-5/16 (312.7)	415.7 (188.6)
8 - 3905	T	8 - 150	10 - 150	10-7/8 (276.2)	11 (279.4)	35-7/16 (900.1)	13-1/4 (336.6)	516.7 (234.4)
8 - 3910	T	8 - 300	10 - 150	10-7/8 (276.2)	11 (279.4)	35-7/16 (900.1)	13-1/4 (336.6)	544.7 (247.1)
8 - 3912	T	8 - 600	10 - 150	11-11/16 (296.9)	11 (279.4)	36-1/4 (920.8)	13-1/4 (336.6)	601 (272.6)

39MPV Series Type 39PV Pilot Full Bore



39PV w/ Single Outlet - Full Bore

NOTE: All weights listed in this document are approximations.



39PV w/ Double Outlet - Full Bore

NOTE: All weights listed in this document are approximations.

39MPV Series Type 39PV - Dimensions & Weights
Single Outlet, Full Bore

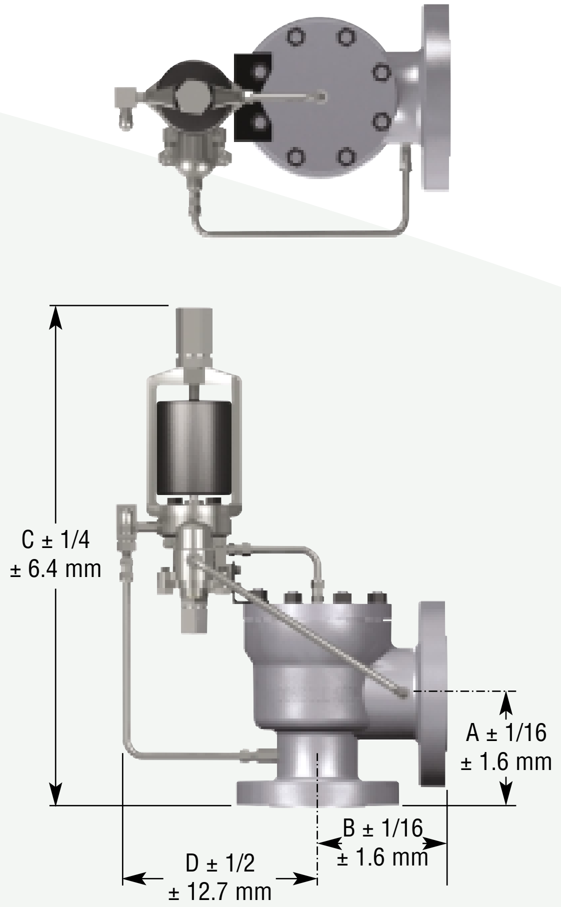
Valve Size (in.) & Type	ORIFICES	INLET FLANGE Size (in.) & Class	OUTLET FLANGE Size (in.) & Class	OUTLET TYPE	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	WEIGHT lb. (kg)
3 - 3905B	3" Full Bore	3 - 150	4 - 150	Single	5-9/16 (141.3)	7 (177.8)	28-3/8 (720.7)	11-7/16 (290.5)	191 (86.6)
3 - 3910B	3" Full Bore	3 - 300	4 - 150	Single	5-13/16 (147.6)	7 (177.8)	28-5/8 (727.1)	11-7/16 (290.5)	199 (90.3)
3 - 3912B	3" Full Bore	3 - 600	4 - 150	Single	6-1/8 (155.6)	7 (177.8)	28-15/16 (735.0)	11-7/16 (290.5)	206 (93.4)
4 - 3905B	4" Full Bore	4 - 150	6 - 150	Single	6-15/16 (176.2)	7-3/8 (187.3)	28-11/16 (728.7)	11-7/16 (290.5)	191 (86.6)
4 - 3910B	4" Full Bore	4 - 300	6 - 150	Single	7-7/16 (188.9)	7-3/8 (187.3)	29-3/16 (741.4)	11-7/16 (290.5)	199 (90.3)
4 - 3912B	4" Full Bore	4 - 600	6 - 150	Single	7-15/16 (201.6)	7-3/8 (187.3)	29-11/16 (754.1)	11-7/16 (290.5)	206 (93.4)

NOTE: For Dimensions For 1-1/2" & 2" Full Bore Valves, Contact Factory.

39MPV Series Type 39PV - Dimensions & Weights
Double Outlet, Full Bore

Valve Size (in.) & Type	ORIFICES	INLET FLANGE Size (in.) & Class	OUTLET FLANGE Size (in.) & Class	OUTLET TYPE	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	WEIGHT lb. (kg)
6 - 3905B	6" Full Bore	6 - 150	8 - 150	Double	8-7/8 (225.4)	8-1/4 (209.6)	34-7/16 (874.7)	13-1/4 (336.6)	516.7 (234.4)
6 - 3910B	6" Full Bore	6 - 300	8 - 150	Double	9-5/16 (236.5)	8-1/4 (209.6)	34-7/8 (885.8)	13-1/4 (336.6)	544.7 (247.1)
6 - 3912B	6" Full Bore	6 - 600	8 - 150	Double	10 (254.0)	8-1/4 (209.6)	35-9/16 (903.3)	13-1/4 (336.6)	601.0 (272.6)
8 - 3905B	8" Full Bore	8 - 150	10 - 150	Double	10-1/4 (260.4)	11-1/16 (281.0)	37-5/8 (955.7)	14-5/8 (371.5)	975.2 (442.4)
8 - 3910B	8" Full Bore	8 - 300	10 - 150	Double	10-15/16 (277.8)	11-1/16 (281.0)	38-5/16 (973.1)	14-5/8 (371.5)	985.2 (446.9)
8 - 3912B	8" Full Bore	8 - 600	10 - 150	Double	11-3/4 (298.5)	11-1/16 (281.0)	39-1/8 (993.8)	14-5/8 (371.5)	1005.2 (456.0)
10 - 3905B	10" Full Bore	10 - 150	10 - 150	Double	10-1/4 (260.4)	12-3/4 (323.9)	40-1/2 (1028.7)	16-1/16 (408.0)	1282.2 (581.6)
10 - 3910B	10" Full Bore	10 - 300	10 - 150	Double	10-15/16 (277.8)	12-3/4 (323.9)	41-3/16 (1046.2)	16-1/16 (408.0)	1292.2 (586.1)

39MPV Series Type 39MV Pilot Single Outlet, Standard Bore and Full Bore



39MV w/ Single Outlet - Standard Bore

*See page 3900.53 for full bore single outlet dimensions and weights.

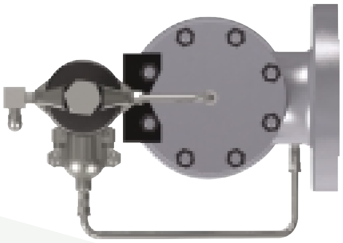
NOTE: All weights listed in this document are approximations.

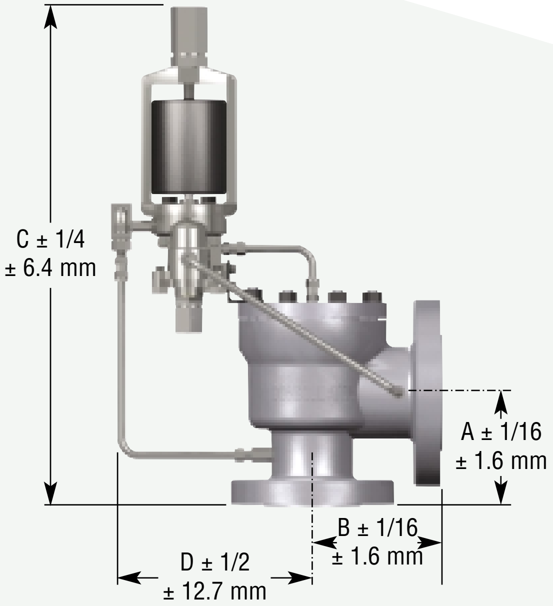
39MPV Series Type 39MV - Dimensions & Weights

Single Outlet, Standard Bore

Valve Size (in.) & Type	ORIFICES	INLET FLANGE Size (in.) & Class	OUTLET FLANGE Size (in.) & Class	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	WEIGHT lb. (kg)
1 - 3905	D,E,F	1 - 150	2 - 150	4-1/8 (104.8)	4-1/2 (114.3)	21-3/16 (538.2)	8-1/2 (215.9)	42 (19.1)
1 - 3910	D,E,F	1 - 300	2 - 150	4-3/8 (111.1)	4-1/2 (114.3)	21-7/16 (544.5)	8-1/2 (215.9)	43 (19.5)
1 - 3912	D,E,F	1 - 600	2 - 150	4-3/8 (111.1)	4-1/2 (114.3)	21-7/16 (544.5)	8-1/2 (215.9)	46 (20.9)
1 - 3914	D,E,F	1 - 900	2 - 300	4-15/16 (125.4)	4-3/4 (120.7)	22 (558.8)	8-1/2 (215.9)	52 (23.6)
1 - 3916	D,E,F	1 - 1500	2 - 300	4-15/16 (125.4)	4-3/4 (120.7)	22 (558.8)	8-1/2 (215.9)	52 (23.6)
1-1/2 - 3905	D,E,F	1-1/2 - 150	2 - 150	4-7/8 (123.8)	4-3/4 (120.7)	21-15/16 (557.2)	8-1/2 (215.9)	48.4 (22.0)
1-1/2 - 3910	D,E,F	1-1/2 - 300	2 - 150	4-7/8 (123.8)	4-3/4 (120.7)	21-15/16 (557.2)	8-1/2 (215.9)	50.0 (22.7)
1-1/2 - 3912	D,E,F	1-1/2 - 600	2 - 150	4-7/8 (123.8)	4-3/4 (120.7)	21-15/16 (557.2)	8-1/2 (215.9)	50.2 (22.8)
1-1/2 - 3914	D,E,F	1-1/2 - 900	2 - 300	5-7/8 (149.2)	5-1/2 (139.7)	22-15/16 (582.6)	8-1/2 (215.9)	63.2 (28.7)
1-1/2 - 3916	D,E,F	1-1/2 - 1500	2 - 300	5-7/8 (149.2)	5-1/2 (139.7)	22-15/16 (582.6)	8-1/2 (215.9)	63.2 (28.7)
1-1/2 - 3905	G,H	1-1/2 - 150	3 - 150	5-1/8 (130.2)	4-7/8 (123.8)	23-5/16 (592.1)	9-5/16 (236.5)	56 (25.4)
1-1/2 - 3910	G,H	1-1/2 - 300	3 - 150	5-1/8 (130.2)	4-7/8 (123.8)	23-5/16 (592.1)	9-5/16 (236.5)	58 (26.3)
1-1/2 - 3912	G,H	1-1/2 - 600	3 - 150	5-1/8 (130.2)	4-7/8 (123.8)	23-5/16 (592.1)	9-5/16 (236.5)	60 (27.2)
1-1/2 - 3914	G,H	1-1/2 - 900	3 - 300	6-3/8 (161.9)	6-3/4 (171.5)	24-9/16 (623.9)	9-5/16 (236.5)	69 (31.3)
1-1/2 - 3916	G,H	1-1/2 - 1500	3 - 300	6-3/8 (161.9)	6-3/4 (171.5)	24-9/16 (623.9)	9-5/16 (236.5)	69 (31.3)
2 - 3905	G,H,J	2 - 150	3 - 150	5-3/8 (136.5)	4-7/8 (123.8)	23-9/16 (598.5)	9-5/16 (236.5)	56 (25.4)
2 - 3910	G,H,J	2 - 300	3 - 150	5-3/8 (136.5)	4-7/8 (123.8)	23-9/16 (598.5)	9-5/16 (236.5)	58 (26.3)
2 - 3912	G,H,J	2 - 600	3 - 150	5-3/8 (136.5)	4-7/8 (123.8)	23-9/16 (598.5)	9-5/16 (236.5)	60 (27.2)
2 - 3914	G,H,J	2 - 900	3 - 300	6-9/16 (166.7)	6-3/4 (171.5)	24-3/4 (628.7)	9-5/16 (236.5)	83 (37.6)
2 - 3916	G,H,J	2 - 1500	3 - 300	6-9/16 (166.7)	6-3/4 (171.5)	24-3/4 (628.7)	9-5/16 (236.5)	83 (37.6)
3 - 3905	J,K,L	3 - 150	4 - 150	6-1/8 (155.6)	6-3/8 (161.9)	25-1/8 (638.2)	9-3/4 (247.7)	83 (37.6)
3 - 3910	J,K,L	3 - 300	4 - 150	6-1/8 (155.6)	6-3/8 (161.9)	25-1/8 (638.2)	9-3/4 (247.7)	86 (39.0)
3 - 3912	J,K,L	3 - 600	4 - 150	6-3/8 (161.9)	6-3/8 (161.9)	25-3/8 (644.5)	9-3/4 (247.7)	90 (40.8)
3 - 3914	J,K,L	3 - 900	4 - 300	7-1/2 (190.5)	7-1/8 (181.0)	26-13/16 (681.0)	9-13/16 (249.2)	143 (64.9)
3 - 3916	J,K,L	3 - 1500	4 - 300	7-1/2 (190.5)	7-1/8 (181.0)	26-13/16 (681.0)	9-13/16 (249.2)	160 (72.6)
4 - 3905	L,M,N,P	4 - 150	6 - 150	7-3/4 (196.9)	8-1/4 (209.6)	28-1/2 (723.9)	11-7/16 (290.5)	194 (88.0)
4 - 3910	L,M,N,P	4 - 300	6 - 150	7-3/4 (196.9)	8-1/4 (209.6)	28-1/2 (723.9)	11-7/16 (290.5)	202 (91.6)
4 - 3912	L,M,N,P	4 - 600	6 - 150	7-3/4 (196.9)	8-1/4 (209.6)	28-1/2 (723.9)	11-7/16 (290.5)	209 (94.8)
4 - 3914	L,M,N,P	4 - 900	6 - 300	9-13/16 (249.2)	9-3/16 (233.4)	31-1/16 (789.0)	11-3/8 (288.9)	243 (110.2)
4 - 3916	L,M,N,P	4 - 1500	6 - 300	9-13/16 (249.2)	9-3/16 (233.4)	31-1/16 (789.0)	11-3/8 (288.9)	262 (118.8)
6 - 3905	Q,R	6 - 150	8 - 150	9-7/16 (239.7)	9-1/2 (241.3)	31-15/16 (811.2)	12-5/16 (312.7)	351 (159.2)
6 - 3910	Q,R	6 - 300	8 - 150	9-7/16 (239.7)	9-1/2 (241.3)	31-15/16 (811.2)	12-5/16 (312.7)	370 (167.8)
6 - 3912	Q,R	6 - 600	8 - 150	9-11/16 (246.1)	9-1/2 (241.3)	32-3/16 (817.6)	12-5/16 (312.7)	418.7 (189.9)
8 - 3905	T	8 - 150	10 - 150	10-7/8 (276.2)	11 (279.4)	35-7/16 (900.1)	13-1/4 (336.6)	519.7 (235.7)
8 - 3910	T	8 - 300	10 - 150	10-7/8 (276.2)	11 (279.4)	35-7/16 (900.1)	13-1/4 (336.6)	547.7 (248.4)
8 - 3912	T	8 - 600	10 - 150	11-11/16 (296.9)	11 (279.4)	36-1/4 (920.8)	13-1/4 (336.6)	604 (274.0)

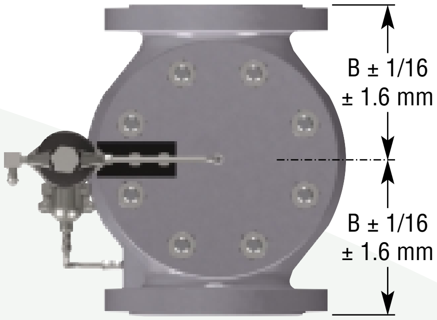
39MPV Series Type 39MV Pilot Full Bore

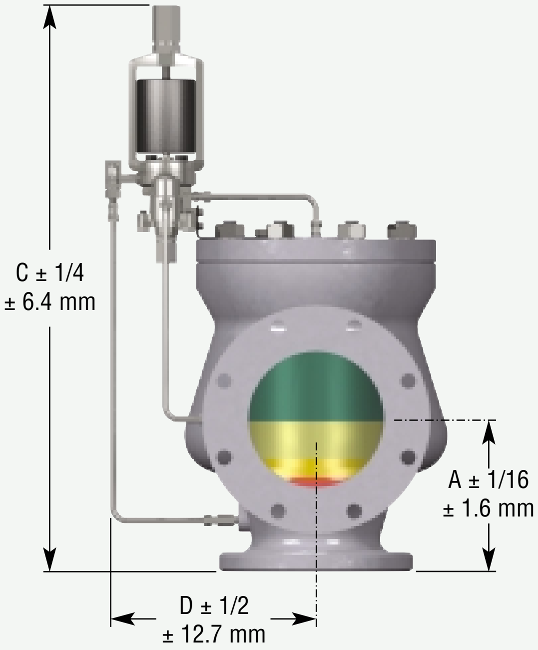




39MV w/ Single Outlet - Full Bore

NOTE: All weights listed in this document are approximations.





39MV w/ Double Outlet - Full Bore

NOTE: All weights listed in this document are approximations.

39MPV Series Type 39MV - Dimensions & Weights

Single Outlet, Full Bore

Valve Size (in.) & Type	ORIFICES	INLET FLANGE Size (in.) & Class	OUTLET FLANGE Size (in.) & Class	OUTLET TYPE	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	WEIGHT lb. (kg)
3 - 3905B	3" Full Bore	3 - 150	4 - 150	Single	5-9/16 (141.3)	7 (177.8)	28-3/8 (720.7)	11-7/16 (290.5)	194 (88.0)
3 - 3910B	3" Full Bore	3 - 300	4 - 150	Single	5-13/16 (147.6)	7 (177.8)	28-5/8 (727.1)	11-7/16 (290.5)	202 (91.6)
3 - 3912B	3" Full Bore	3 - 600	4 - 150	Single	6-1/8 (155.6)	7 (177.8)	28-15/16 (735.0)	11-7/16 (290.5)	209 (94.8)
4 - 3905B	4" Full Bore	4 - 150	6 - 150	Single	6-15/16 (176.2)	7-3/8 (187.3)	28-11/16 (728.7)	11-7/16 (290.5)	194 (88.0)
4 - 3910B	4" Full Bore	4 - 300	6 - 150	Single	7-7/16 (188.9)	7-3/8 (187.3)	29-3/16 (741.4)	11-7/16 (290.5)	202 (91.6)
4 - 3912B	4" Full Bore	4 - 600	6 - 150	Single	7-15/16 (201.6)	7-3/8 (187.3)	29-11/16 (754.1)	11-7/16 (290.5)	209 (94.8)

Note: For Dimensions For 1-1/2" & 2" Full Bore Valves, Contact Factory.

39MPV Series Type 39MV - Dimensions & Weights

Double Outlet, Full Bore

Valve Size (in.) & Type	ORIFICES	INLET FLANGE Size (in.) & Class	OUTLET FLANGE Size (in.) & Class	OUTLET TYPE	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	WEIGHT lb. (kg)
6 - 3905B	6" Full Bore	6 - 150	8 - 150	Double	8-7/8 (225.4)	8-1/4 (209.6)	34-7/16 (874.7)	13-1/4 (336.6)	519.7 (235.7)
6 - 3910B	6" Full Bore	6 - 300	8 - 150	Double	9-5/16 (236.5)	8-1/4 (209.6)	34-7/8 (885.8)	13-1/4 (336.6)	547.7 (248.4)
6 - 3912B	6" Full Bore	6 - 600	8 - 150	Double	10 (254.0)	8-1/4 (209.6)	35-9/16 (903.3)	13-1/4 (336.6)	604 (274.0)
8 - 3905B	8" Full Bore	8 - 150	10 - 150	Double	10-1/4 (260.4)	11-1/16 (281.0)	37-5/8 (955.7)	14-5/8 (371.5)	978.2 (443.7)
8 - 3910B	8" Full Bore	8 - 300	10 - 150	Double	10-15/16 (277.8)	11-1/16 (281.0)	38-5/16 (973.1)	14-5/8 (371.5)	988.2 (448.2)
8 - 3912B	8" Full Bore	8 - 600	10 - 150	Double	11-3/4 (298.5)	11-1/16 (281.0)	39-1/8 (993.8)	14-5/8 (371.5)	1008.2 (457.3)
10 - 3905B	10" Full Bore	10 - 150	10 - 150	Double	10-1/4 (260.4)	12-3/4 (323.9)	40-1/2 (1028.7)	16-1/16 (408.0)	1285.2 (583.0)
10 - 3910B	10" Full Bore	10 - 300	10 - 150	Double	10-15/16 (277.8)	12-3/4 (323.9)	41-3/16 (1046.2)	16-1/16 (408.0)	1295.2 (587.5)

USCS Pressure - Temperature Rating Charts

	SA216 WCC Carbon Steel					SA351 CF8M Stainless Steel				
Type	**3905**	**3910**	**3912**	**3914**	**3916**	**3905**	**3910**	**3912**	**3914**	**3916**
Pressure Class From -20°F to:	**150**	**300**	**600**	**900**	**1500**	**150**	**300**	**600**	**900**	**1500**
100	290	750	1500	2250	3750	275	720	1440	2160	3600
110	287	750	1500	2250	3750	272	710	1420	2130	3550
120	284	750	1500	2250	3750	268	700	1400	2100	3499
130	281	750	1500	2250	3750	265	690	1380	2070	3449
140	278	750	1500	2250	3750	261	680	1360	2040	3398
150	275	750	1500	2250	3750	258	670	1340	2010	3348
160	272	750	1500	2250	3750	254	660	1320	1980	3297
170	269	750	1500	2250	3750	251	650	1300	1950	3247
180	266	750	1500	2250	3750	247	640	1280	1920	3196
190	263	750	1500	2250	3750	244	630	1260	1890	3146
200	260	750	1500	2250	3750	240	620	1240	1860	3095
210	257	748	1496	2244	3739	238	614	1228	1842	3065
220	254	746	1491	2237	3728	235	608	1216	1824	3035
230	251	744	1487	2231	3717	233	602	1204	1806	3005
240	248	742	1482	2224	3706	230	596	1192	1788	2975
250	245	740	1478	2218	3695	228	590	1180	1770	2945
260	242	738	1473	2211	3684	225	584	1168	1752	2915
270	239	736	1469	2205	3673	223	578	1156	1735	2885
280	236	734	1464	2198	3662	220	572	1144	1716	2855
290	233	732	1460	2192	3651	218	566	1132	1698	2825
300	230	730	1455	2185	3640	215	560	1120	1680	2795
310	227	728	1451	2178	3629	213	556	1111	1666	2773
320	224	725	1446	2171	3618	211	551	1102	1652	2750
330	221	723	1442	2164	3607	209	547	1093	1638	2728
340	218	720	1437	2157	3596	207	542	1084	1624	2705
350	215	718	1433	2150	3585	205	538	1075	1610	2683
360	212	715	1428	2143	3574	203	533	1066	1596	2660
370	209	713	1424	2136	3563	201	529	1058	1582	2638
380	206	710	1419	2129	3552	199	524	1048	1568	2615
390	203	708	1415	2122	3541	197	520	1039	1554	2593
400	200	705	1410	2115	3530	195	515	1030	1540	2570
505	168	662	1324	1986	3310	168	478	952	1431	2383

Series 3905 - 3916 Type PV & MV Pilots
STANDARD BORE - ORIFICE CAPACITIES - AIR
(USCS Units)

Capacities based on set pressure plus 10%
or 3 psi overpressure, whichever is greater.
Capacities in standard cubic feet per minute @ 60°F.

	Orifice Area (Sq. in.)													
Set Press. (psig)	D 0.1279	E 0.2279	F 0.3568	G 0.5849	H 0.9127	J 1.496	K 2.138	L 3.317	M 4.186	N 5.047	P 7.417	Q 12.85	R 18.6	T 30.21
15	67	120	188	308	481	788	1126	1748	2205	2659	3908	6771	9801	15920
20	77	138	216	355	554	908	1299	2015	2543	3066	4506	7807	11300	18354
30	98	175	274	449	701	1150	1643	2549	3217	3879	5701	9877	14298	23222
40	121	215	337	553	863	1415	2022	3137	3959	4774	7016	12155	17595	28578
50	143	256	400	657	1025	1680	2401	3725	4701	5669	8331	14433	20892	33933
60	166	296	464	760	1187	1945	2780	4313	5444	6563	9646	16711	24189	39288
70	189	336	527	864	1348	2210	3159	4901	6186	7458	10960	18989	27486	44644
80	211	377	590	968	1510	2476	3538	5489	6928	8353	12275	21267	30784	49999
90	234	417	653	1071	1672	2741	3917	6077	7670	9247	13590	23545	34081	55354
100	257	458	717	1175	1834	3006	4296	6665	8412	10142	14905	25823	37378	60710
120	302	538	843	1382	2157	3536	5054	7841	9896	11931	17534	30379	43973	71420
140	347	619	970	1590	2481	4067	5812	9017	11380	13721	20164	34935	50567	82131
160	393	700	1096	1797	2804	4597	6570	10193	12864	15510	22794	39491	57162	92842
180	438	781	1223	2004	3128	5127	7328	11369	14348	17300	25423	44046	63756	103552
200	483	862	1349	2212	3452	5658	8086	12545	15832	19089	28053	48602	70351	114263
220	529	942	1476	2419	3775	6188	8844	13721	17316	20878	30683	53158	76945	124974
240	574	1023	1602	2627	4099	6719	9602	14898	18801	22668	33312	57714	83539	135685
260	619	1104	1729	2834	4422	7249	10360	16074	20285	24457	35942	62270	90134	146395
280	665	1185	1855	3041	4746	7779	11118	17250	21769	26246	38571	66826	96728	157106
300	710	1266	1982	3249	5070	8310	11876	18426	23253	28036	41201	71382	103323	167817
320	755	1346	2108	3456	5393	8840	12634	19602	24737	29825	43831	75937	109917	178527
340	801	1427	2235	3663	5717	9371	13392	20778	26221	31614	46460	80493	116512	189238
360	846	1508	2361	3871	6040	9901	14150	21954	27705	33404	49090	85049	123106	199949
380	891	1589	2488	4078	6364	10431	14908	23130	29189	35193	51720	89605	129701	210659
400	937	1670	2614	4286	6688	10962	15666	24306	30673	36983	54349	94161	136295	221370
420	982	1750	2741	4493	7011	11492	16424	25482	32158	38772	56979	98717	142890	232081
440	1027	1831	2867	4700	7335	12023	17182	26658	33642	40561	59609	103273	149484	242791
460	1073	1912	2994	4908	7658	12553	17940	27834	35126	42351	62238	107828	156079	253502
480	1118	1993	3120	5115	7982	13083	18698	29010	36610	44140	64868	112384	162673	264213
500	1163	2074	3247	5322	8306	13614	19456	30186	38094	45929	67497	116940	169268	274924
600	1390	2478	3879	6359	9923	16266	23246	36066	45515	54876	80646	139719	202240	328477
700	1617	2882	4512	7396	11541	18918	27036	41946	52935	63823	93794	162499	235212	382031
750	1730	3084	4828	7915	12350	20244	28931	44886	56645	68297	100368	173888	251698	408807
800	1844	3286	5144	8433	13159	21570	30826	47826	60356	72770	106942	185278	268185	435584
900	2070	3690	5777	9470	14777	24222	34616	53706	67776	81717	120090	208057	301157	489137
1000	2297	4094	6409	10507	16395	26874	38407	59586	75197	90664	133238	230836	334129	542691
1100	2524	4498	7042	11544	18013	29526	42197	65466	82617	99611	146386	253616	367102	596244
1200	2751	4902	7674	12580	19631	32178	45987	71346	90038	108557	159535	276395	400074	649798
1300	2977	5306	8307	13617	21249	34830	49777	77226	97458	117504	172683	299174	433046	703351
1400	3204	5710	8939	14654	22867	37482	53567	83106	104879	126451	185831	321954	466019	756905
1500	3431	6114	9572	15691	24485	40133	57357	88986	112299	135398	198979	344733	498991	810458
1600	3658	6518	10204	16728	26103	42785	61147	94866	119720	144345	212127	—	—	—
1700	3884	6922	10837	17765	27721	45437	64937	100746	127141	153292	225275	—	—	—
1800	4111	7326	11469	18802	29339	48089	68727	106627	134561	162238	238424	—	—	—
1900	4338	7730	12102	19838	30957	50741	72517	112507	141982	171185	251572	—	—	—
2000	4564	8134	12734	20875	32575	53393	76307	118387	149402	180132	264720	—	—	—
2500	5698	10154	15897	26060	40664	66653	95257	147787	186505	224866	330461	—	—	—
3000	6832	12174	19059	31244	48754	79913	114207	177187	223608	269601	396202	—	—	—
3750	8532	15204	23803	39020	60889	99803	142633	221288	279262	336702	494813	—	—	—

APPROVED: ASME Boiler & Pressure Vessel Code, Section VIII (for set pressure 15 psig and above).
CERTIFIED: National Board of Boiler and Pressure Vessel Inspectors.

Series 3905 - 3916 Type PV & MV Pilots
FULL BORE - ORIFICE CAPACITIES - AIR
(USCS Units)

Capacities based on set pressure plus 10%
or 3 psi overpressure, whichever is greater.
Capacities in standard cubic feet per minute @ 60°F.

Set Press. (psig)	Orifice Area (Sq. in.)						
	1.5" FB	2" FB	3" FB	4" FB	6" FB	8" FB	10" FB
	1.622	2.764	6.321	10.76	24.95	44.18	69.94
15	854	1456	3331	5670	13148	23281	36856
20	985	1679	3840	6537	15158	26841	42492
30	1246	2124	4859	8271	19179	33961	53763
40	1534	2614	5979	10178	23602	41793	66161
50	1821	3104	7100	12086	28025	49625	78560
60	2109	3594	8220	13993	32448	57457	90958
70	2397	4084	9341	15901	36870	65288	103356
80	2684	4574	10461	17808	41293	73120	115755
90	2972	5064	11582	19715	45716	80952	128153
100	3259	5554	12702	21623	50139	88784	140551
120	3834	6534	14943	25438	58985	104448	165348
140	4409	7514	17184	29253	67831	120111	190145
160	4984	8494	19425	33067	76677	135775	214941
180	5559	9474	21666	36882	85522	151438	239738
200	6134	10454	23908	40697	94368	167102	264534
220	6710	11434	26149	44512	103214	182766	289331
240	7285	12414	28390	48327	112060	198429	314128
260	7860	13394	30631	52142	120906	214093	338924
280	8435	14374	32872	55957	129751	229757	363721
300	9010	15354	35113	59772	138597	245420	388517
320	9585	16334	37354	63586	147443	261084	413314
340	10160	17314	39595	67401	156289	276748	438111
360	10735	18293	41836	71216	165135	292411	462907
380	11310	19273	44077	75031	173980	308075	487704
400	11885	20253	46318	78846	182826	323738	512501
420	12460	21233	48559	82661	191672	339402	537297
440	13035	22213	50800	86476	200518	355066	562094
460	13610	23193	53041	90290	209364	370729	586890
480	14185	24173	55282	94105	218209	386393	611687
500	14760	25153	57523	97920	227055	402057	636484
600	17636	30053	68729	116995	271284	480375	760467
700	20511	34953	79934	136069	315513	558693	884450
750	21949	37403	85537	145606	337628	597852	946441
800	23386	39852	91139	155143	359742	637011	—
900	26262	44752	102344	174217	403971	715329	—
1000	29137	49652	113550	193292	448200	793647	—
1100	32012	54552	124755	212366	492429	871966	—
1200	34888	59451	135960	231440	536659	950284	—
1300	37763	64351	147166	250515	580888	1028602	—
1400	40638	69251	158371	269589	625117	1106920	—
1500	43514	74151	169576	288663	669346	1185238	—
1600	46389	79051	180781	307738	—	—	—
1700	49264	83950	191987	326812	—	—	—
1800	52140	88850	203192	345886	—	—	—
1900	55015	93750	214397	364961	—	—	—
2000	57890	98650	225603	384035	—	—	—
2500	72267	123148	281629	479407	—	—	—
3000	86644	147647	337655	574778	—	—	—
3750	108209	184395	421695	717836	—	—	—

APPROVED: ASME Boiler & Pressure Vessel Code, Section VIII (for set pressure 15 psig and above).
CERTIFIED: National Board of Boiler and Pressure Vessel Inspectors.

Series 3905 - 3916 Type PV & MV Pilots
STANDARD BORE - ORIFICE CAPACITIES - WATER
(USCS Units)

Capacities based on set pressure plus 10%
or 3 psi overpressure, whichever is greater.
Capacities in gallons of water per minute @ 70°F,
and 0 psig back pressure.

	Orifice Area (Sq. in.)													
Set Press. (psig)	**D** 0.1279	**E** 0.2279	**F** 0.3568	**G** 0.5849	**H** 0.9127	**J** 1.496	**K** 2.138	**L** 3.317	**M** 4.186	**N** 5.047	**P** 7.417	**Q** 12.85	**R** 18.6	**T** 30.21
15	15	27	42	70	109	179	256	397	501	604	888	1539	2228	3618
20	17	30	48	79	123	202	289	449	566	683	1004	1740	2518	4090
30	20	37	57	94	148	242	346	538	678	818	1203	2084	3016	4899
40	24	42	66	109	170	280	400	621	784	945	1389	2406	3483	5657
50	26	47	74	122	191	313	447	694	876	1056	1553	2690	3894	6325
60	29	52	81	134	209	343	490	760	960	1157	1701	2947	4266	6929
70	31	56	88	144	226	370	529	821	1037	1250	1837	3183	4608	7484
80	33	60	94	154	241	396	566	878	1108	1336	1964	3403	4926	8001
90	35	64	100	164	256	420	600	931	1176	1417	2083	3609	5225	8486
100	37	67	105	173	270	443	633	982	1239	1494	2196	3805	5507	8945
120	41	73	115	189	296	485	693	1076	1357	1637	2406	4168	6033	9799
140	44	79	125	204	319	524	749	1162	1466	1768	2598	4502	6517	10584
160	47	85	133	219	341	560	800	1242	1567	1890	2778	4813	6966	11315
180	50	90	141	232	362	594	849	1317	1663	2005	2946	5105	7389	12002
200	53	95	149	244	382	626	895	1389	1753	2113	3106	5381	7789	12651
220	56	100	156	256	400	657	939	1456	1838	2216	3257	5644	8169	13268
240	58	104	163	268	418	686	980	1521	1920	2315	3402	5894	8532	13858
260	61	108	170	279	435	714	1020	1583	1998	2409	3541	6135	8881	14424
280	63	112	176	289	452	741	1059	1643	2074	2500	3675	6367	9216	14969
300	65	116	183	300	468	767	1096	1701	2147	2588	3804	6590	9539	15494
320	67	120	189	309	483	792	1132	1757	2217	2673	3928	6806	9852	16002
340	69	124	194	319	498	816	1167	1811	2285	2755	4049	7016	10156	16495
360	71	128	200	328	512	840	1201	1863	2351	2835	4167	7219	10450	16973
380	73	131	206	337	526	863	1234	1914	2416	2913	4281	7417	10736	17438
400	75	135	211	346	540	886	1266	1964	2479	2989	4392	7610	11015	17891
420	77	138	216	355	553	907	1297	2013	2540	3062	4501	7798	11287	18333
440	79	141	221	363	566	929	1328	2060	2600	3134	4607	7981	11553	18764
460	81	144	226	371	579	950	1357	2106	2658	3205	4710	8161	11813	19186
480	83	147	231	379	592	970	1387	2152	2715	3274	4811	8336	12067	19599
500	84	150	236	387	604	990	1415	2196	2771	3341	4911	8508	12315	20003
600	92	165	258	424	662	1085	1550	2406	3036	3660	5379	9320	13491	21912
700	100	178	279	458	715	1172	1675	2598	3279	3954	5810	10067	14572	23668
750	103	184	289	474	740	1213	1733	2690	3394	4092	6014	10420	15083	24499
800	107	190	298	489	764	1253	1790	2778	3506	4227	6212	10762	15578	25302
900	113	202	317	519	810	1329	1899	2946	3718	4483	6589	11415	16523	26837
1000	119	213	334	547	854	1400	2002	3106	3919	4726	6945	12032	17417	28289
1100	125	223	350	574	896	1469	2099	3257	4111	4956	7284	12620	18267	29669
1200	131	233	366	600	936	1534	2193	3402	4294	5177	7608	13181	19079	30989
1300	136	243	380	624	974	1597	2282	3541	4469	5388	7919	13719	19858	32254
1400	141	252	395	648	1011	1657	2368	3675	4638	5592	8217	14237	20608	33472
1500	146	261	409	670	1046	1715	2452	3804	4800	5788	8506	14737	21331	34647
1600	151	269	422	692	1081	1772	2532	3928	4958	5978	8785	—	—	—
1700	156	278	435	714	1114	1826	2610	4049	5110	6162	9055	—	—	—
1800	160	286	448	734	1146	1879	2686	4167	5259	6340	9318	—	—	—
1900	165	294	460	755	1178	1931	2759	4281	5403	6514	9573	—	—	—
2000	169	301	472	774	1208	1981	2831	4392	5543	6683	9822	—	—	—
2500	189	337	528	866	1351	2215	3165	4911	6197	7472	10981	—	—	—
3000	207	369	578	948	1480	2426	3467	5379	6789	8185	12029	—	—	—
3750	231	413	647	1060	1655	2712	3877	6014	7590	9152	13449	—	—	—

APPROVED: ASME Boiler & Pressure Vessel Code, Section VIII (for set pressure 15 psig and above).
CERTIFIED: National Board of Boiler and Pressure Vessel Inspectors.

Series 3905 - 3916 Type PV & MV Pilots
FULL BORE - ORIFICE CAPACITIES - WATER
(USCS Units)

Capacities based on set pressure plus 10%
or 3 psi overpressure, whichever is greater.
Capacities in gallons of water per minute @ 70° F,
and 0 psig back pressure.

Set Press. (psig)	Orifice Area (Sq. in.)						
	1.5" FB 1.622	2" FB 2.764	3" FB 6.321	4" FB 10.76	6" FB 24.95	8" FB 44.18	10" FB 69.94
15	194	331	757	1288	2988	5292	8377
20	219	374	855	1457	3378	5982	9470
30	263	448	1025	1745	4046	7165	11343
40	303	517	1183	2015	4672	8274	13098
50	339	578	1323	2253	5224	9250	14644
60	372	634	1449	2468	5722	10133	16042
70	401	684	1566	2665	6181	10945	17327
80	429	732	1674	2849	6608	11701	18524
90	455	776	1775	3022	7009	12411	19647
100	480	818	1871	3186	7388	13082	20710
120	526	896	2050	3490	8093	14331	22687
140	568	968	2214	3770	8741	15479	24505
160	607	1035	2367	4030	9345	16548	26197
180	644	1098	2511	4274	9912	17552	27786
200	679	1157	2647	4506	10448	18501	29289
220	712	1214	2776	4726	10958	19404	30718
240	744	1268	2899	4936	11445	20267	32084
260	774	1319	3018	5137	11913	21095	33395
280	803	1369	3132	5331	12362	21891	34655
300	831	1417	3242	5518	12796	22659	35872
320	859	1464	3348	5699	13216	23402	37048
340	885	1509	3451	5875	13626	24123	38188
360	911	1553	3551	6045	14018	24822	39295
380	936	1595	3648	6211	14402	25502	40372
400	960	1637	3743	6372	14776	26165	41421
420	984	1677	3836	6529	15141	26811	42444
440	1007	1716	3926	6683	15497	27442	43443
460	1030	1755	4014	6833	15845	28059	44419
480	1052	1793	4100	6980	16186	28662	45374
500	1074	1830	4185	7124	16520	29253	46310
600	1176	2004	4584	7804	18097	32045	50730
700	1270	2165	4952	8430	19547	34613	54795
750	1315	2241	5126	8725	20233	35828	56718
800	1358	2315	5294	9012	20897	37003	—
900	1440	2455	5615	9558	22164	39247	—
1000	1518	2588	5919	10075	23363	41370	—
1100	1593	2714	6208	10567	24503	43390	—
1200	1663	2835	6484	11037	25593	45319	—
1300	1731	2951	6748	11488	26638	47170	—
1400	1797	3062	7003	11921	27644	48950	—
1500	1860	3170	7249	12340	28614	50668	—
1600	1921	3273	7487	12745	—	—	—
1700	1980	3374	7717	13137	—	—	—
1800	2037	3472	7941	13518	—	—	—
1900	2093	3567	8158	13888	—	—	—
2000	2148	3660	8370	14249	—	—	—
2500	2401	4092	9358	15931	—	—	—
3000	2630	4483	10252	17451	—	—	—
3750	2941	5012	11462	19511	—	—	—

APPROVED: ASME Boiler & Pressure Vessel Code, Section VIII (for set pressure 15 psig and above).
CERTIFIED: National Board of Boiler and Pressure Vessel Inspectors.

Series 3905 - 3916 Type PV & MV Pilots
STANDARD BORE - ORIFICE CAPACITIES - STEAM
(USCS Units)

Capacities based on set pressure plus 10%
or 3 psi overpressure, whichever is greater.
Capacities in pounds per hour saturated steam.

Set Press. (psig)	Orifice Area (Sq. in.)													
	D 0.1279	**E** 0.2279	**F** 0.3568	**G** 0.5849	**H** 0.9127	**J** 1.496	**K** 2.138	**L** 3.317	**M** 4.186	**N** 5.047	**P** 7.417	**Q** 12.85	**R** 18.6	**T** 30.21
15	189	337	527	864	1349	2212	3161	4904	6189	7462	10966	19000	27501	44668
20	218	388	608	997	1555	2550	3644	5654	7135	8603	12643	21905	31707	51498
30	275	491	769	1261	1968	3226	4611	7154	9028	10885	15997	27715	40117	65158
40	339	604	947	1552	2422	3970	5674	8804	11110	13395	19686	34107	49368	80184
50	403	718	1124	1843	2876	4714	6738	10453	13192	15906	23375	40498	58620	95210
60	466	831	1302	2134	3330	5458	7801	12103	15274	18416	27064	46889	67871	110236
70	530	945	1479	2425	3784	6203	8865	13753	17356	20926	30753	53281	77123	125262
80	593	1058	1656	2716	4238	6947	9928	15403	19438	23437	34443	59672	86374	140288
90	657	1171	1834	3007	4692	7691	10991	17053	21520	25947	38132	66064	95625	155314
100	721	1285	2011	3298	5146	8435	12055	18703	23603	28457	41821	72455	104877	170340
120	848	1511	2366	3879	6054	9923	14182	22002	27767	33478	49199	85238	123380	200393
140	975	1738	2721	4461	6962	11411	16308	25302	31931	38499	56577	98021	141882	230445
160	1102	1965	3076	5043	7870	12899	18435	28602	36095	43519	63955	110804	160385	260497
180	1230	2191	3431	5625	8778	14388	20562	31901	40259	48540	71334	123586	178888	290549
200	1357	2418	3786	6207	9686	15876	22689	35201	44423	53560	78712	136369	197391	320601
220	1484	2645	4141	6789	10593	17364	24816	38501	48587	58581	86090	149152	215894	350653
240	1611	2872	4496	7370	11501	18852	26943	41800	52751	63602	93468	161935	234396	380705
260	1739	3098	4851	7952	12409	20340	29069	45100	56916	68622	100847	174718	252899	410757
280	1866	3325	5206	8534	13317	21828	31196	48400	61080	73643	108225	187501	271402	440810
300	1993	3552	5561	9116	14225	23317	33323	51699	65244	78664	115603	200284	289905	470862
320	2120	3778	5916	9698	15133	24805	35450	54999	69408	83684	122981	213066	308408	500914
340	2248	4005	6271	10280	16041	26293	37577	58299	73572	88705	130360	225849	326910	530966
360	2375	4232	6626	10862	16949	27781	39704	61598	77736	93725	137738	238632	345413	561018
380	2502	4459	6980	11443	17857	29269	41830	64898	81900	98746	145116	251415	363916	591070
400	2629	4685	7335	12025	18765	30758	43957	68198	86064	103767	152494	264198	382419	621122
420	2756	4912	7690	12607	19673	32246	46084	71497	90229	108787	159873	276981	400922	651174
440	2884	5139	8045	13189	20581	33734	48211	74797	94393	113808	167251	289763	419424	681227
460	3011	5365	8400	13771	21489	35222	50338	78097	98557	118829	174629	302546	437927	711279
480	3138	5592	8755	14353	22397	36710	52465	81396	102721	123849	182007	315329	456430	741331
500	3265	5819	9110	14934	23304	38198	54591	84696	106885	128870	189386	328112	474933	771383
600	3902	6952	10885	17844	27844	45639	65225	101194	127706	153973	226277	392026	567447	921644
700	4538	8086	12659	20753	32384	53080	75860	117693	148526	179076	263168	455940	659961	1071904
750	4856	8653	13547	22207	34654	56801	81177	125942	158937	191628	281614	487898	706218	1147034

APPROVED: ASME Boiler & Pressure Vessel Code, Section VIII (for set pressure 15 psig and above).
CERTIFIED: National Board of Boiler and Pressure Vessel Inspectors.

Series 3905 - 3916 Type PV & MV Pilots
FULL BORE - ORIFICE CAPACITIES - STEAM
(USCS Units)

Capacities based on set pressure plus 10%
or 3 psi overpressure, whichever is greater.
Capacities in pounds per hour saturated steam.

	Orifice Area (Sq. in.)						
Set Press. (psig)	**1.5" FB** 1.622	**2" FB** 2.764	**3" FB** 6.321	**4" FB** 10.76	**6" FB** 24.95	**8" FB** 44.18	**10" FB** 69.94
15	2398	4086	9346	15909	36891	65324	103413
20	2765	4711	10775	18342	42531	75312	119225
30	3498	5961	13633	23207	53813	95289	150850
40	4305	7336	16777	28559	66223	117264	185637
50	5111	8711	19921	33911	78633	139238	220424
60	5918	10085	23065	39263	91042	161213	255211
70	6725	11460	26209	44615	103452	183187	289999
80	7532	12835	29353	49967	115862	205162	324786
90	8339	14210	32497	55319	128272	227137	359573
100	9145	15585	35641	60670	140682	249111	394360
120	10759	18334	41929	71374	165501	293060	463935
140	12372	21084	48217	82078	190321	337009	533509
160	13986	23833	54505	92782	215140	380958	603084
180	15599	26583	60793	103486	239960	424908	672658
200	17213	29332	67081	114189	264780	468857	742233
220	18826	32082	73369	124893	289599	512806	811807
240	20440	34831	79657	135597	314419	556755	881382
260	22053	37581	85945	146301	339239	600704	950956
280	23667	40331	92233	157004	364058	644653	1020531
300	25281	43080	98521	167708	388878	688602	1090105
320	26894	45830	104809	178412	413697	732551	1159680
340	28508	48579	111096	189116	438517	776501	1229254
360	30121	51329	117384	199819	463337	820450	1298829
380	31735	54078	123672	210523	488156	864399	1368403
400	33348	56828	129960	221227	512976	908348	1437978
420	34962	59577	136248	231931	537795	952297	1507552
440	36575	62327	142536	242635	562615	996246	1577127
460	38189	65077	148824	253338	587435	1040195	1646701
480	39802	67826	155112	264042	612254	1084144	1716276
500	41416	70576	161400	274746	637074	1128093	1785850
600	49483	84323	192840	328265	761172	1347839	2133723
700	57551	98071	224280	381784	885270	1567585	2481595
750	61585	104945	240000	408543	947319	1677457	2655531

APPROVED: ASME Boiler & Pressure Vessel Code, Section VIII (for set pressure 15 psig and above).
CERTIFIED: National Board of Boiler and Pressure Vessel Inspectors.

Valve Installation

Valve Connections

The **Consolidated** 39MPV Series flanged valves are equipped with ANSI B16.5 flanges. For other standards, contact the factory for your needs.

The facing on raised flanges is a spiral finish, 125 to 250 micro inch roughness (R_a).

All flange drilling straddles the centerlines of the valve.

Handling and Storage

Safety relief valves should be handled carefully. The internal parts of a pilot operated safety relief valve are precision machined and fitted together to maintain perfect alignment. Rough handling may damage the external tubing, pilot, and main valve seats or may cause misalignment sufficient to incur leakage or erratic operation. Safety relief valves are shipped with a protective covering over the inlet and the outlet. This is to prevent damage to the flanged surfaces and to prevent entry of foreign material into the valve. If the valves are to be stored before installation, the protective covering should be left intact until installation. A clean, dry storage area is recommended. Valves should always be protected with a suitable covering to prevent entry of foreign material.

Inlet Piping

Pilot operated safety relief valves must be installed in a vertical upright position. The inlet piping to the valve should be short and direct from the vessel or equipment being protected. The connection to the vessel should be provided with a radius to permit smooth flow to the valve. Sharp corners should be avoided. Should this not be practical, then the inlet should be swaged out at least one additional pipe diameter.

In any event, the pressure drop from the vessel to the valve should not exceed 3% of set pressure when the valve is flowing full capacity. In no event should the inlet piping be smaller in diameter than the inlet connection of the valve.

Outlet Piping

Alignment of the internal parts of a pilot operated safety relief valve is important to ensure proper operation. Although the valve body will withstand a considerable mechanical load, unsupported discharge piping should not impose loads any higher than that stated in the Technical Information section of this catalog, consisting of more than a companion flange, long radius elbow and a short vertical pipe. Care should be taken to ensure thermal expansion of piping and supports does not produce strains on the valve. Spring supports are recommended where necessary to avoid this condition. The discharge piping should be designed to allow for vessel expansion as well as expansion of the discharge pipe itself. This is particularly important on long discharge lines.

Consideration should be given to discharge pipe movement resulting from wind loads. Any oscillation of the discharge piping introduces stress distortion in the valve body, and the resultant movement of the internal parts may cause leakage.

In-House Review

13900

Safety Relief Valve

Consolidated®

Table of Contents

Introduction

The Consolidated 13900 pilot operated safety relief valve series is designed to contribute to the overall efficiency and profitability of plant operations.

For system applications that require the releasing of large discharge capacities, the Consolidated 13900 valve series provides maximum reliable working economy and a simple efficient valve design. It also features a valve configuration that facilitates valve installation and in-line valve maintenance.

Greater Total System Efficiency

The main valve can handle extremely large relieving capacities, in excess of 3,000,000 lbs of steam per hour. It has a seven to one discharge capacity over "T" type orifice, and a two to one discharge capacity over "W" type orifice.

Improved Design

The total valve external configuration is considerably smaller in size, and the valve is lighter in weight than a comparable spring loaded valve. Because of these features, less space is required for valve installation.

A simple, efficient, and reliable direct acting valve design with few components, eliminates the need for excessive spare parts inventory and reduces maintenance time.

Easy Installation and Maintenance

Valve configuration is considerably smaller in size and lighter in weight than a comparable spring loaded valve. This facilitates ease of installation, field handling, testing, and valve maintenance.

Valve maintenance is relatively simple and straight forward. The simple valve design means fewer parts and a reduction in required parts inventory. Fewer valve parts mean that less can go wrong, malfunctions can be readily diagnosed, and maintenance cost and process downtime can be kept to a minimum.

To facilitate valve maintenance, all main valve components are removable through the top bonnet of the valve. The pilot valve can be field tested and repaired without breaking inlet and outlet piping connections on the main valve. The pilot valve opening and closing is easily adjusted on a small test facility.

Description

The 13900 pilot operated safety valve is an ASME Section VIII approved valve intended for use on compressible fluids. The valve design is simple. It consists of a small conventional, fail-safe pilot safety valve and main valve.

Overcompression of the main valve seat O-Ring, located between the disc and bushing, is eliminated by the metal-to-metal contact bearing surfaces between the disc and bushing. O-Ring seal blowout is eliminated by removing the pressure from behind the O-Ring via two small slots when the valve is open and flowing. A condensate drain hole in the disc facilitates drainage of any accumulated moisture in the upper disc cavity.

The spring loaded U-shaped Teflon® guide seal provides increased seat tightness as system pressure increases. The teflon material minimizes friction on the main disc and allows for reliable, dependable, and repeatable disc action. The seal spring load insures sealing at all times.

Teflon® guide rings eliminate metal-to-metal contact between the disc and guide, and eliminates friction. Main valve disc action is repeatable and reliable.

The pilot valve action directly controls the pressure forces on the main valve disc and eliminates the need for a transfer valve. System pressure which actuates the pilot valve is transmitted through a simple, full flow design sensing tube. The sensing tube eliminates small orifice control parts and their possible clogging characteristics and is enclosed within the valve body which protects it from damage and freezing.

Pilot valve blowdown adjustment can be set independently of the main valve. Adjustment and setting can be made prior to installing on the main valve.

The pilot valve disc is a metal seated design that is easily serviced and provides a seat tightness to 95% of set pressure.

The main unloading valve has a large orifice up to 200 sq. inches, which reduces the number of valves required for overpressure protection. Installation costs for additional header nozzles and exhaust lines are eliminated.

The O-Ring seat seal design and the spring loaded Teflon® rings assure tightness, valve integrity, and facilitates valve maintenance.

Application

The 13900 pilot operated safety relief valve is designed for steam applications where pressures range from 50 psig to 300 psig and temperature ranges from 250°F (121°C) to 550°F (288°C). The temperature limit is applied to the valve to insure that the Teflon® seal rings will maintain sealing integrity.

The 13900 valve can be used on any compressible fluid within the pressure and temperature limits of the valve provided the fluid media exhibits characteristics similar to saturated steam. For applications other than steam, the open lift lever cap should be reviewed for adequacy. If another cap design is required, it should be so stated.

The 13900 series of valves are available in four sizes, 114, 143, 176, and 200 sq. in. For all sizes except the 200 the largest possible relieving capacity is supplied for the valve inlet size specified.

For those applications where discharge pressures at the valve outlet exceeds 10% of the pilot valve set pressure, or where economics dictate that higher discharge pressures be required, the pilot valve can be exhausted separately and the discharge pressure of the main valve can be allowed to increase above the limit of 10% of the pilot valve set pressure.

Typical valve applications include, boiler feed pump turbines, flash tanks, steam lines and deareators.

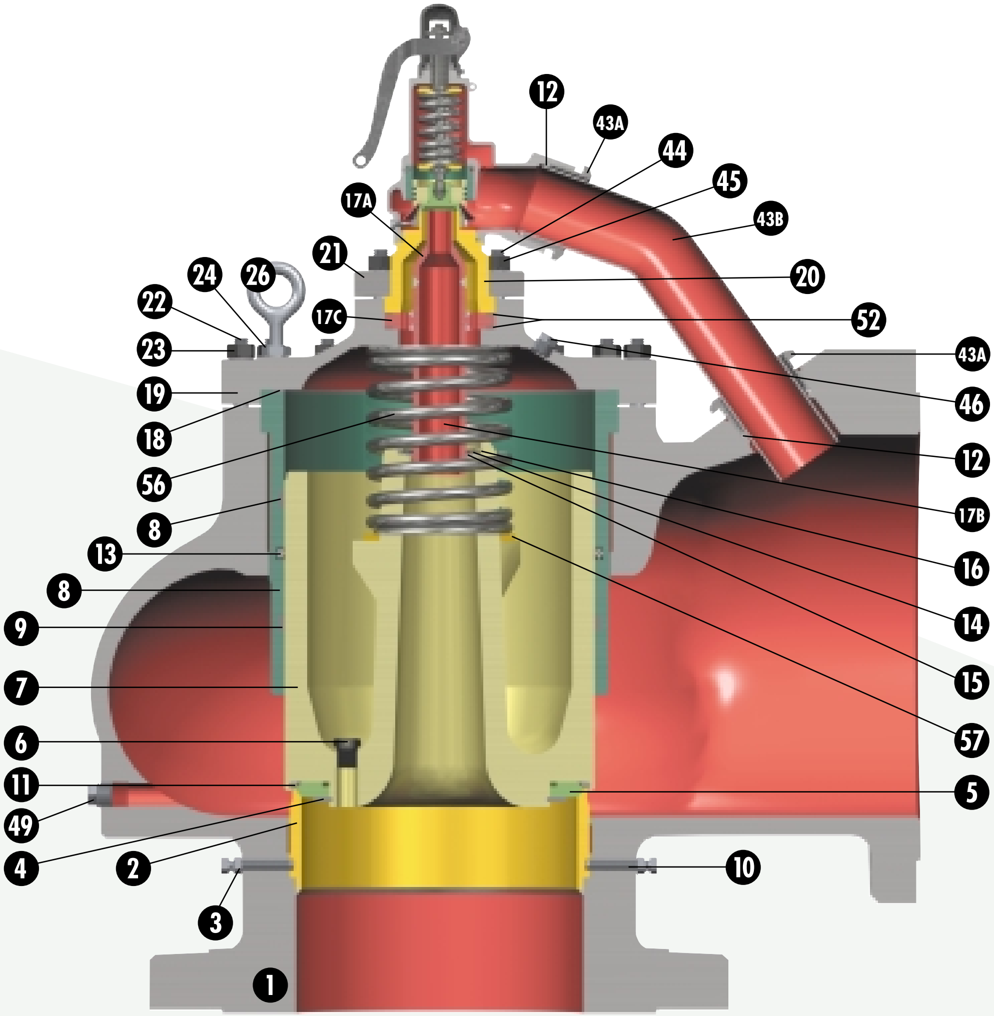
CAUTION: These valves are not to be used on power boilers.

13900 Scope of Design

Valve Type	Orifice Area	Inlet ANSI B16.5	Outlet ANSI B16.5	Inlet Pressure / Temperature Limits
13906-114	114.0 sq. in.	16" 300# R.F.	18" 150# R.F.[2]	50 psig - 300 psig 250°F - 550°F
13906-143	143.1 sq. in.	18" 300# R.F.	22" 150# R.F.[1]	50 psig - 300 psig 250°F - 550°F
13906-176	176.7 sq. in.	20" 300# R.F.	24" 150# R.F.	50 psig - 300 psig 250°F - 550°F
13906-200	201.0 sq. in.	20" 300# R.F.	24" 150# R.F.	50 psig - 300 psig 250°F - 550°F

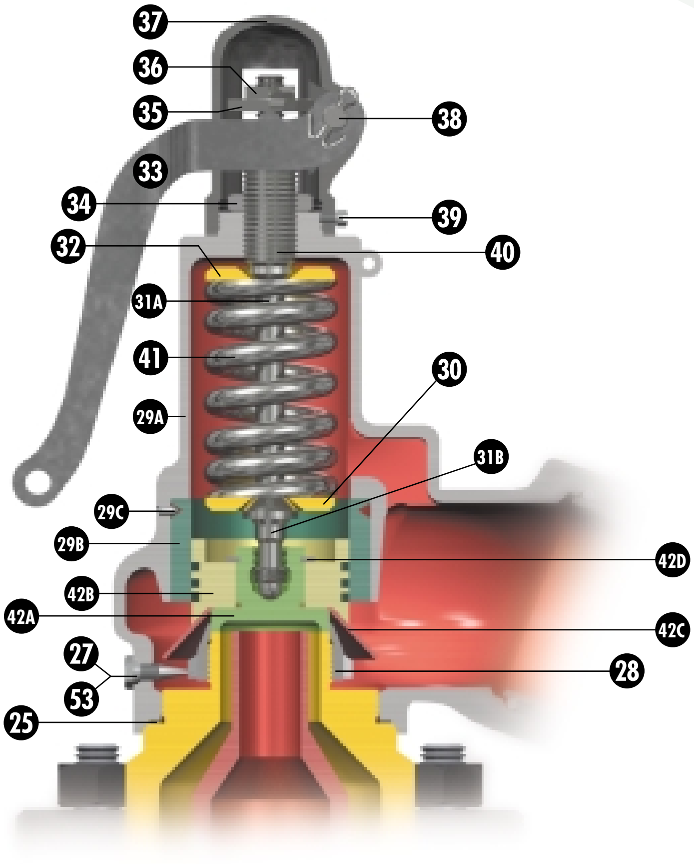
[1] 22" 150# flange is not covered by ANSI B16.5. Drilling is (20) 1-3/8 dia. holes on a 27-1/4 dia. bolt circle.

[2] Two holes on outlet drilling are tapped and threaded 1-1/8 - 7UNC - 2B TH'D, 1-1/2 deep.



	Part	Material
1	Main Base	SA216 Grade WCC Carbon Steel
2	Seat Bushing	CPF8M Stainless Steel
3	Seat Bushing Screw Jam Nut	Carbon Steel (Cadmium Plated)
4	Retainer Lock Ring	Carbon Steel (Nickel Plated)
5	O-Ring Retainer	410 Cond. A Stainless Steel
6	Disc Drain Plug	316 SS
7	Main Disc	CA6NM Stainless Steel
8	Main Guide	CA15 Stainless Steel
9	Back-up Ring	Teflon (Glass Filled)
10	Seat Bushing Retainer Screw	416 Cond. A Stainless Steel
11	O-Ring Seat Seal	Teflon
12	Discharge Fitting Seal	Teflon
13	Guide Seal	Virgin Teflon Cover Elgiloy Spring
14	Floating Washer	410 Cond. T Stainless Steel
15	Floating Washer Retainer	410 Cond. T Stainless Steel
16	Floating Washer Retainer Lock Ring	PH15-7MO Stainless Steel
	Sensing Tube Assembly	
17A	Upper Tube	304 SS
17B	Lower Tube	TP304 Stainless Steel
17C	Tube Flange	1020 Carbon Steel

	Part	Material
18	Bonnet Gasket	304SS Nobestos Filled
19	Bonnet	SA216 Grade WCC Carbon Steel
20	Pilot Base	304 SS
21	Pilot Base Flange	SA105 Carbon Steel
22	Base Stud	B7 Alloy Steel
23	Base Stud Nut	2H Steel
24	Eye Bolt Lock Nut	Carbon Steel
25	Pilot Bonnet Gasket	Soft Iron
26	Eye Bolt	Carbon Steel
27	Adjusting Ring Pin	416 Cond. A Stainless Steel
28	Adjusting Ring	CA15 Stainless Steel
	Pilot Bonnet Assembly	
29A	Bonnet	SA216 Grade WCC Carbon Steel
29B	Guide	316L SS
29C	Pin	304 SS
30	Bottom Spring Washer	Carbon Steel (Zinc Plated)
	Spindle Assembly	
31A	Spindle	1213 Carbon Steel
31B	Spindle Collar	410 Cond. T Stainless Steel
32	Top Spring Washer	1213 Carbon Steel



	Part	Material
33	Lever	Malleable Iron
34	Compression Screw Locknut	1213 Carbon Steel
35	Release Nut	410 Cond. T Stainless Steel
36	Release Locknut	Carbon Steel
37	Cap	Malleable Iron
38	Lever Pin	Steel (Zinc Plated)
39	Cap Lock Screw	Carbon Steel
40	Compression Screw	416 SS
41	Spring: 250°F - 400°F	Chrome Alloy
	Spring: 401°F - 550°F	Inconel
42	Pilot Disc Assembly	
42A	Disc	410 Cond. T Stainless Steel
42B	Disc Holder	304 SS
42C	Disc Collar	304 SS
42D	Retainer Ring	PH15-7MO Stainless Steel

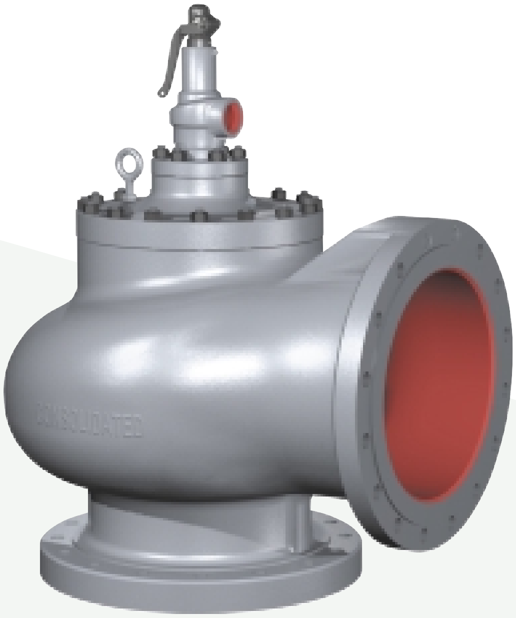
	Part	Material
	Discharge Tube Assembly	
43A	Fitting	SA105 Carbon Steel
43B	Discharge Tube	SA105 Carbon Steel
44	Bonnet Stud	B7 Alloy Steel
45	Bonnet Stud Nut	2H Steel
46	Main Bonnet Plug	304 SS
49	Main Base Plug	304 SS
52	Sensing Tube Flange Gasket	304SS Nobestos Filled
53	Adjusting Ring Pin Gasket	Soft Iron
56	Disc Spring	EHW Tungsten
57	Disc Spring Ring	410 Cond. A Stainless Steel

Standard Options

The CONSOLIDATED 13900 Series Valves are available with the following options:

Omit Pilot Discharge Piping

Pilot Valve Vent to area other than main valve outlet.



Dump Valve Design

Rather than having a spring loaded safety valve as its pilot valve, which opens automatically at the pre-determined set pressure, the dump valve has a pilot which is operated by an electrical signal so that the valve may be opened at any time independently of the steam pressure.

13900 Series - Dimensions & Weights - (USCS Units)

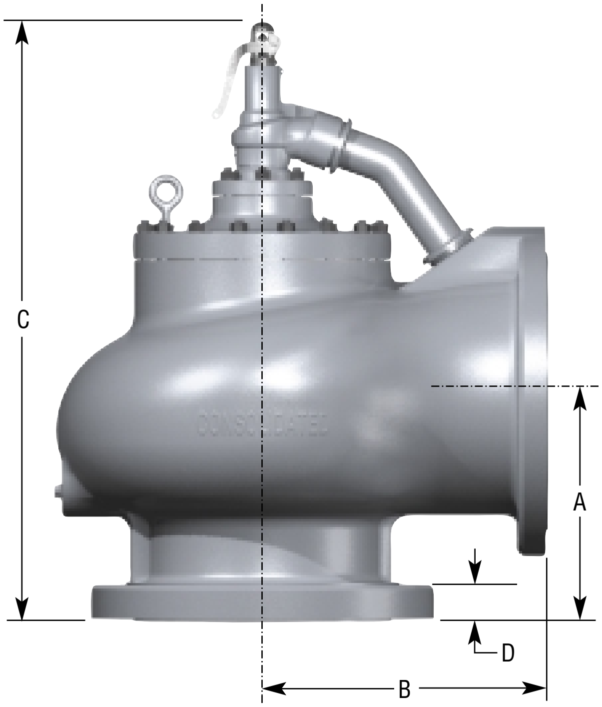
Dimensions (Inches) and Weights (pounds)

Size	Type	A	B	C	D	Weight
16 x 18	13906-114	17	21	48	2-1/4	1900
18 x 22	13906-143	18	22	49-1/2	2-3/8	2500
20 x 24	13906-176	20	25	54	2-1/2	3850
20 x 24	13906-200	20	25	54	2-1/2	3850

13900 Series - Dimensions & Weights - (Metric Units)

Dimensions (Millimeters) and Weights (Kilograms)

Size	Type	A	B	C	D	Weight
16 x 18	13906-114	431.8	533.4	1219.2	57.2	861.8
18 x 22	13906-143	457.2	558.8	1257.3	60.3	1134.0
20 x 24	13906-176	508.0	635.0	1371.6	63.5	1746.0
20 x 24	13906-200	508.0	635.0	1371.6	63.5	1746.0



Series 13900 Pilot Operated Safety Relief Valves
ORIFICE CAPACITIES - STEAM
(USCS Units)

Capacities based on Set Pressure Plus 10% or
3 psi overpressure, whichever is greater.
Capacities in Pounds per Hour saturated steam.

Set Press. - psig	114.0 sq. in.	143.1 sq. in.	176.7 sq. in.	201.0 sq. in.
50	358876	450483	556257	613274
60	415513	521578	644046	710061
70	472151	592673	731834	806847
80	528788	663768	819622	903634
90	585426	734863	907410	1000420
100	642063	805958	995198	1097207
120	755338	948149	1170775	1290780
140	868613	1090339	1346351	1484353
160	981888	1232529	1521927	1677926
180	1095164	1374719	1697504	1871499
200	1208439	1516909	1873080	2065072
220	1321714	1659099	2048656	2258645
240	1434989	1801289	2224233	2452218
260	1548264	1943479	2399809	2645791
280	1661539	2085669	2575386	2839364
300	1774814	2227859	2750962	3032937

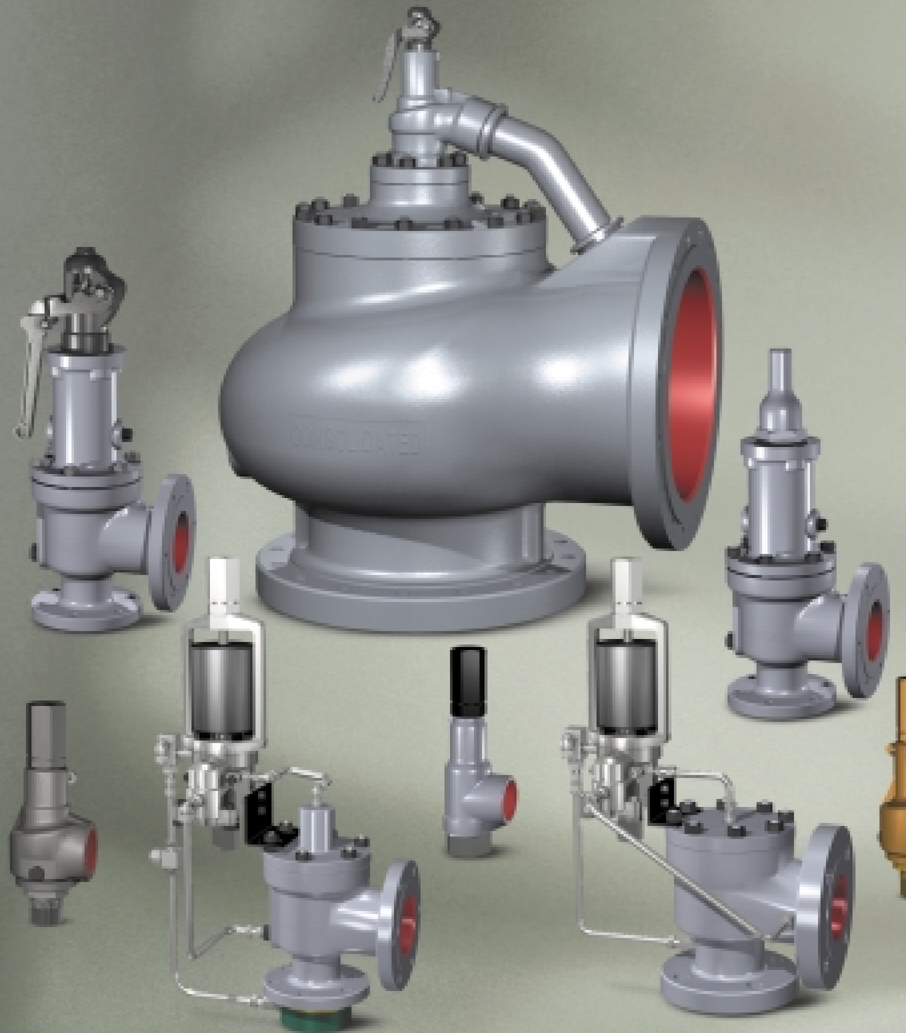
Series 13900 Pilot Operated Safety Relief Valves
ORIFICE CAPACITIES - AIR
(USCS Units)

Capacities based on Set Pressure Plus 10% or
3 psi overpressure, whichever is greater.
Capacities in standard Cubic Feet per Minute Air @ 60°F.

Set Press. - psig	114.0 sq. in.	143.1 sq. in.	176.7 sq. in.	201.0 sq. in.
50	127904	160554	198252	218573
60	148090	185892	229540	253068
70	168276	211231	260828	287563
80	188462	236569	292116	322058
90	208648	261908	323404	356553
100	228834	287246	354692	391048
120	269205	337924	417268	460039
140	309577	388601	479844	529029
160	349949	439278	542421	598019
180	390320	489955	604997	667009
200	430692	540632	667573	735999
220	471064	591309	730149	804990
240	511435	641986	792725	873980
260	551807	692663	855301	942970
280	592179	743340	917877	1011960
300	632550	794017	980453	1080950

Codes & Standards

Safety Relief Valve



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The following codes and standards that are applicable to the design, selection and use of pressure relief valves. Some of these are applicable to specific industries, such as those set up by the American Petroleum Institute (API), American Gas Association (AGA), American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME) and Manufacturers Standardization Society of the Valve and Fittings Industry (MSS). Other codes and standards may apply depending on the country in which pressure relief valves will be installed. When specifying pressure relief valves consideration must be given to local codes that apply to a specific industry and the application in question.

Product intended for installation within the United States and those countries that recognize these standards the following is listing organizations that supply standards that are applicable to pressure relief valves:

American National Standards Institute

11 West 42nd Street, New York, NY 10036
(212) 642-4900
(212) 764-3274
http://www.ansi.org

American Gas Association

1515 Wilson Boulevard Suite 100, Arlington, VA 22209
(703) 841-8400
http://www.aga.org

American Petroleum Institute

1220 L Street Northwest Suite 900, Washington, DC 20005
(202) 682-8000
http://api-ec.api.org

American Society of Mechanical Engineers

3 Park Avenue Fl 21, New York, NY 10016
(212) 591-7000
http://www.asme.org

Manufacturers Standardization Society of Valve and Fittings Industry

127 Park Street Northeast, Vienna, VA 22180
(703) 281-6613
http://www.mss-hq.com

NACE International - The Corrosion Society

1440 South Creek Drive
Houston, Texas 77084-4906
281-228-6200
http://nace.org

National Board of Boiler and Pressure Vessel Inspectors

1055 Crupper Avenue
Columbus, OH 43229
614-888-8320
http://www.nationalboard.org

NFPA (National Fire Protection Association)

1 Batterymarch Park Quincy, MA 02269-9101
Telephone: (617) 770-3000
http://www.nfpa.org

U.S. Department of Transportation Library

400 7th St. SW, Room 2200
Washington, DC 20590
202-366-0746
http://www.dot.gov

Final Revision 4

Technical Information

Safety Relief Valve

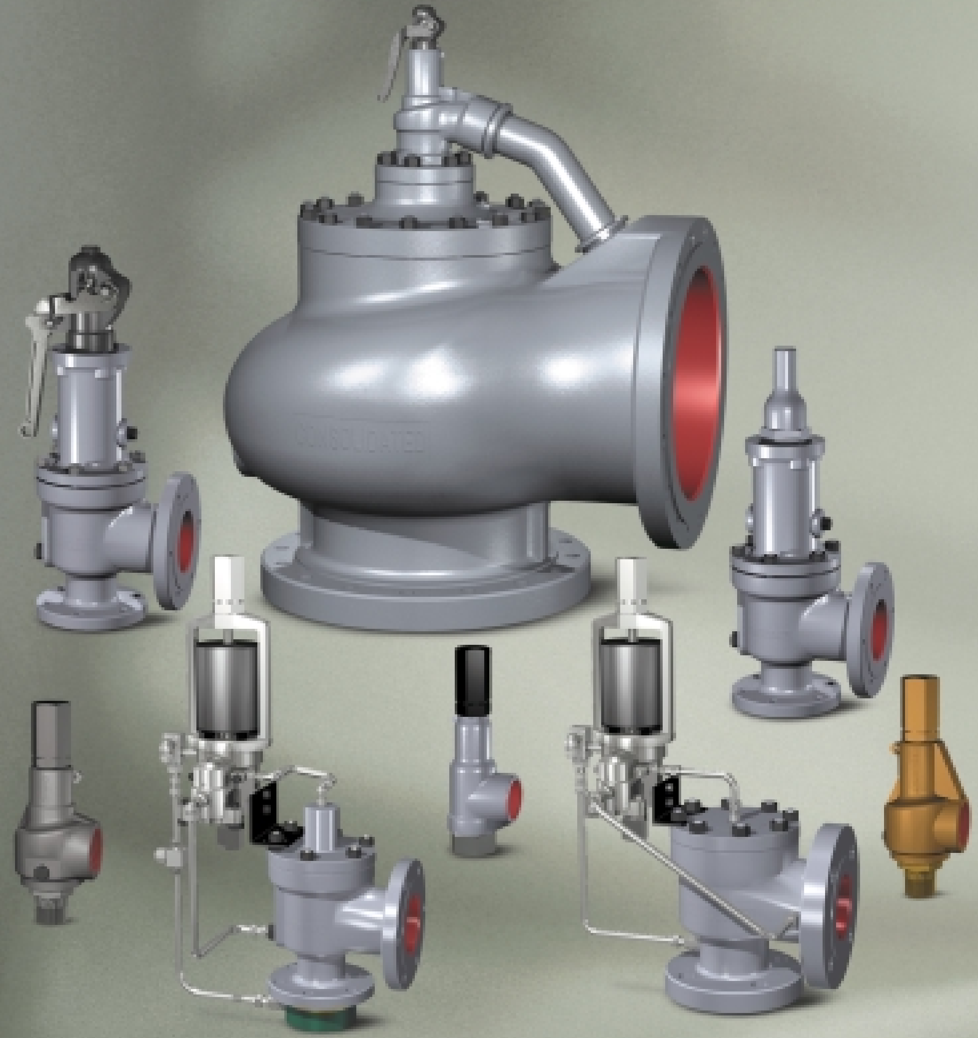

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Table of Contents

Equivalents and Conversion Factors

Pressure (psi = pounds per square inch)

kPa x 0.145 = psi
bar x 14.504 = psi
Atmosphere x 14.7 = psi
Inches of mercury x 0.4912 = psi
Kilograms per square centimeter x 14.22 = psi
Atmosphere x 1.033 = kilograms per square centimeter
Inches of mercury x 0.0345 = kilograms per square centimeter

Dimensions

Centimeters x 0.3937 = inches
Centimeters x 0.01 = meters
Cubic inches x 16.39 = cubic centimeters
Feet x 0.3048 = meters
Inches x 25.4 = millimeters
Feet x 12 = inches
Meters x 100 = centimeters
Meters x 39.37 = inches
Yards x 0.9144 = meters
Square inches x 6.4516 = square centimeters
Square inches x 645.16 = square millimeters

Weights

Pound x 0.4536 = kilogram
Kilograms x 35.27 = ounces
Pounds x 0.0005 = short tons (2000 lbs)
Pounds x 0.000454 = metric tons
Pounds x 16 = ounces
Tons (metric) x 1.102 = short tons (2000 lbs)
Short tons x 907.2 = kilograms

Temperature

$$\frac{t_f - 32}{1.8} = t_c\text{, Celsius}$$

$$1.8t_c + 32 = t_f\text{, Fahrenheit}$$

Flowrate (All gallons are U.S. unless otherwise noted)

Pounds per hour x 0.4536 = kilogram per hour
Kilograms per minute x 132.3 = pounds per hour
Barrels per day x 0.0292 = gallons per minute
Cubic feet per second x 448.833 = gallons per minute
Cubic meters per hour x 4.4 = gallons per minute

Gallons of liquid per minute x 500 x specific gravity = pounds per hour of liquid (70°F)

Liters per hour x 0.0044 = gallons per minute
Pounds per hour x 6.32 / molecular weight = cubic feet per minute

Pounds per hour liquid x 0.002 / specific gravity = gallons per minute of liquid (70°F)

Tons (metric) per day x 91.8 = pounds per hour
Gallons per minute x 0.06309 = liters per second
Gallons per minute x 3.7854 = liters per minute
Gallons per minute x 0.2271 = cubic meters per hour
Gallons per minute x 500 = pounds per hour

SCFM (Standard Cubic Feet Per Minute) x 1.608 = normal cubic meter per hour (760 mmHG and 0°C)

SCFM x 0.02679 = normal cubic meter per minute (760 mmHG and 0°C)

SCFM x 1.699 = cubic meters per hour (101 kPa and 16°C)

SCFM x 1.725 = cubic meters per hour (1 ATM and 20°C)

Volumes (All gallons are U.S. unless otherwise noted)

Cubic centimeters x 0.06102 = cubic inches
Cubic feet x 7.48055 = gallons
Cubic meters x 264.17 = gallons
Gallons x 231 = cubic inches
Gallons (Imperial) x 277.4 = cubic inches
Gallons x 3785 = cubic centimeters
Gallons x 0.833 = gallons (Imperial)
Gallons x 3.785 = liters
Liters x 1000 = cubic centimeters
Liters x 0.2642 = gallons
Barrels (petroleum) x 42 = gallons

Other

Foot pounds x 0.001286 = BTU
Gallons of water x 8.345 = pounds (70°F)
Horsepower (boiler) x 34.5 = pounds water per hour evaporation
Specific Gravity (gas or vapor) x 28.97 = molecular weight

Use of SI Units

The ASME Code has adopted the following practice for the use of “English” and Metric Units. A reprint of that statement is given below:

It is the policy of ASME Council that SI units of measurement be included in all papers, publications, and revisions of ASME Codes and Standards. In accordance with this policy, each ASME Policy Board, Technical Division, or Committee has the option of giving preference to U.S. customary or SI Units.

When U.S. customary units are given preference, the SI equivalent shall be given in parentheses or in a supplementary table. When preference is given to SI units, the U.S. customary units may be omitted or given in parentheses. Each Transactions Journal has specific instructions as to which of these options to use. This manual illustrates use of the second option: SI (U.S. customary).

For complete details regarding SI usage, consult ASME Guide SI-1, “ASME Orientation and Guide for Use of SI (Metric) Units”, available from the ASME Order Department.

Terminology For Safety Relief Valves

Accumulation

Accumulation is the pressure increase over the maximum allowable working pressure of the vessel during discharge through the pressure relief valve, expressed as a percentage of that pressure, or actual pressure units.

Back Pressure

Back pressure is the pressure on the discharge side of a safety relief valve. (Also see “Built-Up Back Pressure” and “Superimposed Back Pressure”, below).

Blowdown

Blowdown is the difference between set pressure and reseating pressure of a pressure relief valve, expressed as a percentage of the set pressure, or actual pressure units.

Built-Up Back Pressure

Built-up back pressure is pressure which develops at the valve outlet as a result of flow, after the safety relief valve has been opened.

Chatter

Chatter is the abnormal, rapid reciprocating motion of the movable parts of a valve in which the disc contacts the seat.

Closing Pressure

Closing pressure is the point at which the valve re-closes. Closing pressure on a test stand may differ from the blowdown, which is the closing pressure under actual service conditions.

Cold Differential Test Pressure (CDTP)

Cold differential test pressure is the set pressure at which the valve is adjusted to open on the test stand. This pressure includes the corrections for back pressure and/or temperature service conditions. (CDPT replaces former term CDS. For Consolidated series 1900 setting instructions, refer to maintenance manual CON-2).

Differential Between Operating and Set Pressures

Valves in process service will generally give best results if the operating pressure does not exceed 90% of the set pressure. However, on pump and compressor discharge lines, the differential required between the operating and set pressures may be greater because of pressure pulsations coming from a reciprocating piston. It is recommended that the valve be set as high above the operating pressure as possible.

Flutter

Flutter is the abnormal, rapid reciprocating motion of the movable parts of a valve in which the disc does not contact the seat.

Lift

Lift is the actual travel of the disc away from the closed position when a valve is relieving.

Maximum Allowable Working Pressure

Maximum allowable working pressure is the maximum gauge pressure permissible in a vessel at a designated temperature. A vessel may not be operated above this pressure, or its equivalent, at any metal temperature other than that used in its design. Consequently, for that metal temperature, it is the highest pressure at which the primary safety relief valve is set to open.

Operating Pressure

The operating pressure is the gauge pressure to which the vessel is normally subjected in service.

Overpressure

Overpressure is a pressure increase over the set pressure of the primary relieving device. Overpressure is similar to accumulation when the relieving device is set at the maximum allowable working pressure of the vessel. Normally, overpressure is expressed as a percentage of set pressure.

Rated Capacity

Rated capacity is the percentage of measured flow at an authorized percent overpressure permitted by the applicable code. Rated capacity is generally expressed in pounds per hour (lb/hr), kilograms per hour (kg/hr) for vapors; standard cubic feet per minute (SCFM), normal cubic meters per minute (LNCM/min) or m^3/min for gasses; and in gallons per minute (GPM), or liters per minute (L/min) for liquids.

Relief Valve

A relief valve is an automatic pressure-relieving device, actuated by static pressure upstream from the valve. This type of valve is used primarily for liquid service.

Safety Relief Valve

A safety relief valve is an automatic pressure-relieving device which may be used as either a safety or relief valve, depending upon application.

Safety Valve

A safety valve is an automatic pressure-relieving device actuated by the static pressure upstream of the valve, and characterized by rapid opening or pop action. This type of valve is used for steam, gas or vapor service.

Seat Tightness Pressure

Seat tightness pressure is the specified inlet static pressure at which a quantitative seat leakage test is performed in accordance with a standard procedure.

Set Pressure

Set pressure is the gauge pressure at the valve inlet, for which the safety relief valve has been adjusted to open under service conditions. In liquid service, set pressure is determined by the inlet pressure at which the valve starts to discharge. In gas or vapor service, the set pressure is determined by the inlet pressure at which the valve pops.

Simmer

Simmer is characterized by the audible passage of a gas or vapor across the seating surfaces just prior to “pop”. The difference between this “start to open pressure” and the set pressure is simmer, and is generally expressed as a percentage of set pressure.

Superimposed Back Pressure

Superimposed back pressure is the pressure in the discharge header before the safety relief valve opens. This can be further defined as follows:

Constant Superimposed

This type of back pressure remains essentially at a fixed value (constant) and exists (superimposed) continuously prior to and during opening of the valve. (e.g., 20 psig/1.38 bar).

Variable Superimposed

This type of back pressure varies or changes over a range from a minimum to a maximum, or vice versa. (e.g., 0 to 20 psig/1.38 bar). The actual back pressure at any specific time depends on conditions in the piping system to which the outlet of the valve is connected.

Valve Trim

Valve trim includes the nozzle and disc.

Reaction Forces Due to Valve Discharge (Gases & Vapors)

A thrust is exerted on a pressure relief valve when it is discharging. This thrust is equal to the mass flow rate times exit velocity, plus outlet flange area, times the difference between exit pressure and atmospheric pressure. This thrust, acting opposite to the direction of flow, may be significant, particularly when relieving gases or vapors. Although **Consolidated** safety relief valves are designed to withstand this thrust, stresses developed in piping or equipment should be investigated. It is especially important when the valve is discharging to atmosphere through an unsupported stack.

Consolidated's sizing program SRVS provides valve specific calculation of reaction forces.

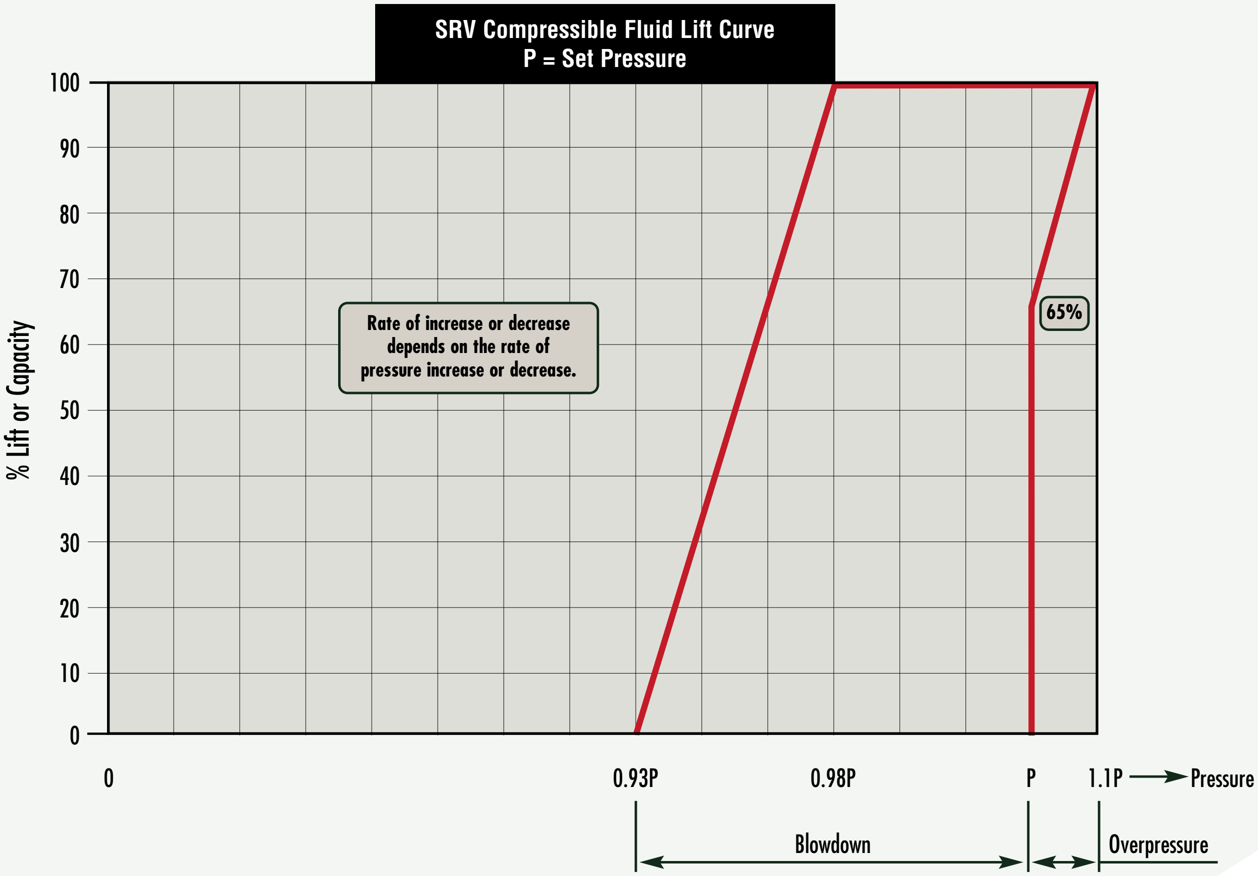
Determination of outlet reaction forces is the resposnsibility of the designer of vessel and/or piping.

Reaction force information obtained from SRVS is for technical advice and assistance only. No obligation or liability for this advice and assistance is assumed. Use of the valve specific information is at the buyer's risk.

Lift and Closing Curves for Safety Relief Valves

For various reasons, information is needed concerning the response of the valve lift with respect to pressure beneath the valve. The following information supplies general data.

Chart 6, below, applies to 1900, 1982, 1990, 19000 and 820000 series valves on compressible fluids. These valves achieve approximately 65% of their total rated lift at opening pressure and achieve full rated lift at 10% overpressure.



Valves Used in Combination with Rupture Disks Valves for Closed Water Heaters

Pressure Relief Valves Used in Combination with Rupture Disks

In all pressurized systems, the overpressure relief can be handled with a variety of mechanisms which include pressure relief valves, rupture disks or combinations of the two devices.

The following guidelines apply when pressure relief valves are used in combination with rupture disks.

ASME B & PVC, Section VIII Rules:

Paragraph UG-132 of the ASME Code ***does*** permit the use of rupture disks. The use of rupture disks at the valve inlet, in combination with pressure relief valves, will fall into one of the two following categories:

(1) The rupture disk is ***not*** capacity certified in combination with the pressure relief valve.

(a) In that case, the ASME stamped rated capacity of the pressure relief valve must be multiplied by 0.9 (reducing the valve's rated capacity). Therefore, only 90% of the valve capacity can be used as credit in determining available relieving capacity for the system.

(2) The rupture disk is capacity certified in combination with the pressure relief valve.

(a) It is permitted to use a combination capacity factor determined by tests conducted under ASME rules. The ASME stamped rated capacity of the pressure relief valve must be multiplied by this factor when determining allowable relieving capacity of the valve/rupture disk combination. The capacity calculated using the combination capacity factor is to be used in valve sizing requirements.

(b) Each rupture disk design must be tested in combination with each pressure relief valve design so that a combination capacity factor can be determined. Factors are valid for only the materials tested.

Other ASME B & PVC, Section VIII Guidelines:

(1) Pressure relief valves used in combination with rupture disks are to be marked with the capacity established under 2(a) above. The markings may be placed on the valve or the rupture disk device. The markings shall include the following:

(a) Name of the valve Manufacturer

(b) Design or type number of the valve

(c) Name of the rupture disk Manufacturer

(d) Design or type number of the rupture disk

(e) Capacity or combination capacity factor

(f) Name of the organization responsible for this marking (this could be the valve Manufacturer, rupture disk Manufacturer, vessel user, or vessel Manufacturer).

(2) The space between the rupture disk and pressure relief valve shall be provided with a pressure gauge, a try cock, free vent or suitable telltale indicator. This arrangement permits detection of disk rupture or leakage.

Safety Relief Valves for Closed Water Heaters

Heat exchangers, which utilize tubes as a method of transferring heat, present unique sizing problems. The tube side (flow through the tubes) is generally not a problem area, but the shell side sizing can be complicated by the fact that tube ruptures can occur.

The following techniques apply to valve sizing on shell sides of heat exchangers:

(1) When pressure, temperature and flow conditions are specified, valves will be sized in accordance with ASME B & PVC, Section VIII rules. For flashing water, valves will be sized on the basis of estimating back pressure due to flashing. That back pressure will be used in calculations for required orifice area calculations.

(2) When it is stated that valves are to be sized in accordance with the Heat Exchanger Institute Standard for Closed Feedwater Heaters, Section 6, specifications must supply all appropriate information to allow verification of sizing. If valve sizing under HEI guidelines results in valves smaller than that stated in (1), the sizing must be resolved before an ASME Code stamp is allowed on the valve nameplate.

(3) The following information is necessary to ensure proper sizing:

(a) Set pressure or shell design pressure

(b) Normal operating temperature

(c) Relieving temperature at the valve inlet in event of tube rupture

(d) Shell design temperature

(e) Relieving capacity required at relieving temperature (GPM or lb/hr)

(f) Back pressure condition
- at normal conditions
- at relieving conditions

(g) Specify percentage of flashing occurring

(h) Specify the valves to have "UV" symbols stamped on the nameplate and the capacity indicated in "GPM" at 70°F

(i) Liquid trim components to be installed in the valve

Seat Tightness of Pressure Relief Valves (Reprint of API RP 527)

Section 1 - Scope

This standard describes methods of determining the seat tightness of metal and soft seated pressure relief valves, including those of conventional, bellows, and pilot operating designs.

The maximum acceptable leakage rates are defined for pressure relief valves with set pressures from 15 pounds per square inch gauge (103 kilopascals gauge) to 6,000 pounds per square inch gauge (41,379 kilopascals gauge). If greater seat tightness is required, the purchaser shall specify it in the purchase order.

The test medium for determining the seat tightness - air, steam, or water shall be the same as that used for determining the set pressure of the valve.

For dual service valves, the test medium - air, steam, or water - shall be the same as the primary relieving medium.

To ensure safety, the procedures outlined in this standard shall be performed by persons experienced in the use and functions of pressure relief valves.

Section 2 - Testing with Air

2.1 Test Apparatus

A test arrangement for determining seat tightness with air is shown in Figure 1. Leakage shall be measured using a tube with an outside diameter 5⁄16 inch (7.9 millimeters) and a wall thickness of 0.035 inch (0.89 millimeter). The tube end shall be cut square and smooth. The tube opening shall be ½ inch (12.7 millimeters) below the surface of the water. The tube shall be perpendicular to the surface of the water.

Arrangement shall be made to safely relieve or contain body pressure in case the valve accidentally pops (see Figure 2).

2.2 Procedure

2.2.1 Test Medium

The test medium shall be air (or nitrogen) near ambient temperature.

2.2.2 Test Configuration

The valve shall be vertically mounted on the test stand, and the test apparatus shall be attached to the valve outlet, as shown in Figure 1. All openings - including but not limited to caps, drain holes, vents, and outlets shall be closed.

2.2.3 Test Pressure

For a valve whose set pressure is greater than 50 pounds per square inch gauge (345 kilopascals gauge), the leakage rate in bubbles per minute shall be determined with the test pressure at the valve inlet held at 90% of the set pressure. For a valve set at 50 pounds per square inch gauge (345 kilopascals gauge) or less, the test pressure shall be held at 5 pounds per square inch (34.5 kilopascals) less than the set pressure.

2.2.4 Leakage Test

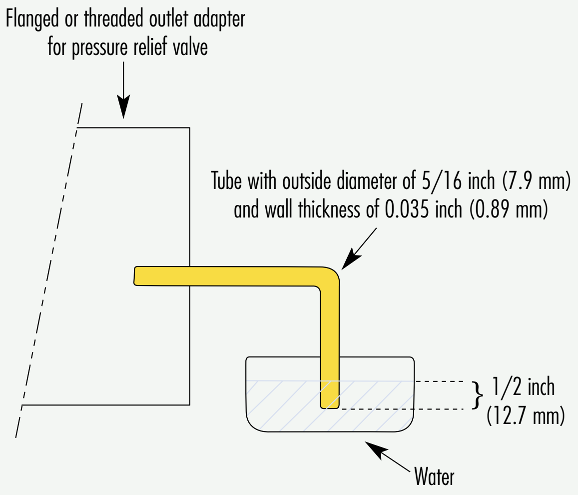
Before the leakage test, the set pressure shall be demonstrated, and all valve body joints and fittings should be checked with a suitable solution to ensure that all joints are tight.

Before the bubble count, the test pressure shall be applied for at least one minute for a valve whose nominal pipe size is two inches (50 millimeters) or smaller; two minutes for a valve whose nominal pipe size is 2½, 3 or 4 inches (65, 80, or 100 millimeters); and five minutes for a valve whose nominal pipe size is six inches (150 millimeters) or larger. The valve shall then be observed for leakage for at least one minute.

2.3 Acceptance Criteria

For a valve with a metal seat, the leakage rate in bubbles per minute shall not exceed the appropriate value in Table 1. For a soft seated valve, there shall be no leakage for one minute (zero bubbles per minute).

Fig. 1 - Apparatus to Test Seat Tightness with Air

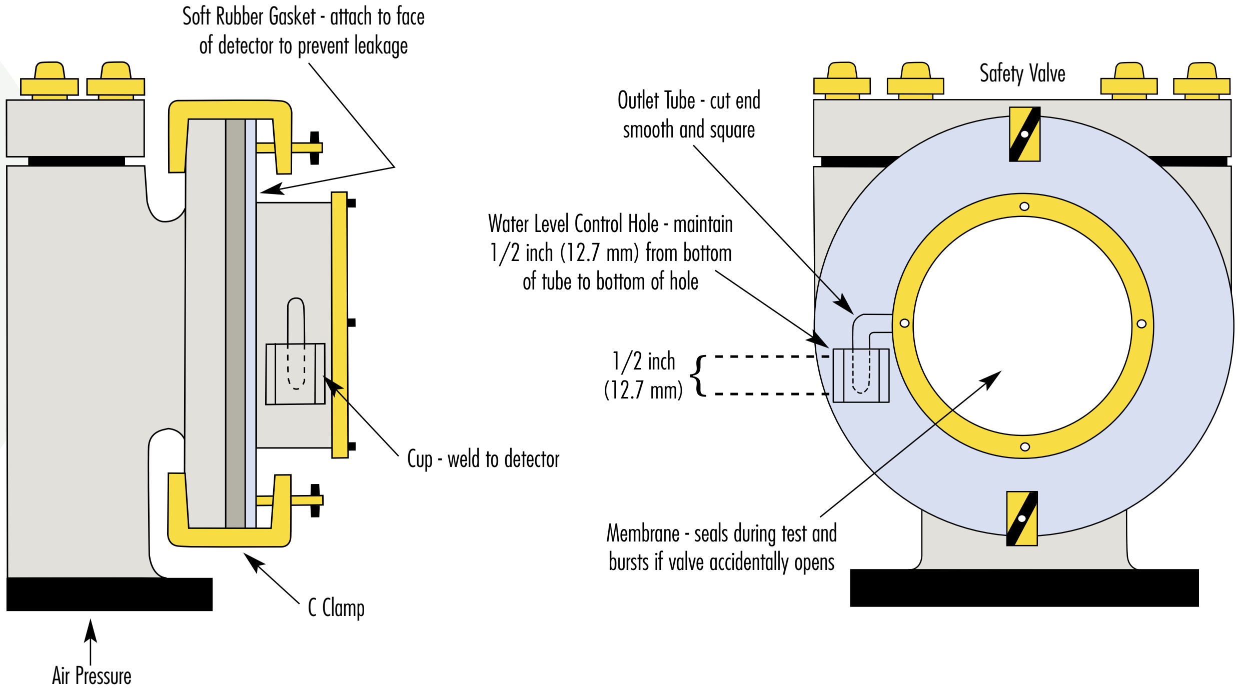


NOTE: See Figure 2 for an example of a device to relieve body pressure in case the valve accidentally pops.

Table 1 - Air Test - Maximum Seat Leakage Rates for Metal-Seated Pressure Relief Valves

Set Pressure at 60°F (15.6°C)		Effective Orifice Sizes 0.307 Inch and Smaller			Effective Orifice Sizes Larger than 0.307 Inch		
			Approximate Leakage per 24 Hours			Approximate Leakage per 24 Hours	
Pounds per Square Inch Gauge	Megapascals	Leakage Rate (bubbles per minute)	Standard Cubic Feet	Standard Cubic Meters	Leakage Rate (bubbles per minute)	Standard Cubic Feet	Standard Cubic Meters
15 - 1000	0.103 - 6.896	40	0.60	0.017	20	0.30	0.0085
1500	10.3	60	0.90	0.026	30	0.45	0.013
2000	13.0	80	1.20	0.034	40	0.60	0.017
2500	17.2	100	1.50	0.043	50	0.75	0.021
3000	20.7	100	1.50	0.043	60	0.90	0.026
4000	27.6	100	1.50	0.043	80	1.20	0.034
5000	38.5	100	1.50	0.043	100	1.50	0.043
6000	41.4	100	1.50	0.043	100	1.50	0.043

Fig. 2 - Air Test - Device to Relieve Body Pressure Caused by Accidental Popping of the Valve



Section 3 - Testing with Steam

3.1 Procedure

3.1.1 Test Medium
The test medium shall be saturated steam.

3.1.2 Test Configuration
The valve shall be vertically mounted on the steam test stand.

3.1.3 Test Pressure
For a valve whose set pressure is greater than 50 pounds per square inch gauge (345 kilopascals gauge), the seat tightness shall be determined with the test pressure at the valve inlet held at 90 percent of the set pressure. For a valve set at 50 pounds per square inch gauge (345 kilopascals gauge) or less, the test pressure shall be held at five pounds per square inch (34.5 kilopascals) less than set pressure.

3.1.4 Leakage Test
Before starting the seat tightness test, the set pressure shall be demonstrated, and the set pressure shall be held for at least three minutes. Any condensate in the body bowl shall be removed before the seat tightness test. Air (or nitrogen) may be used to dry condensate.

After any condensate has been removed, the inlet pressure shall be increased to the test pressure. Tightness shall then be checked visually using a black background. The valve shall then be observed for leakage for at least one minute.

3.2 Acceptance Criteria

For both metal and soft seated valves, there shall be no audible or visible leakage for one minute.

Section 4 - Testing with Water

4.1 Procedure

4.1.1 Test Medium
The test medium shall be water near ambient temperature.

4.1.2 Test Configuration
The valve shall be vertically mounted on the water test stand.

4.1.3 Test Pressure
For a valve whose set pressure is greater than 50 pounds per square inch gauge (345 kilopascals gauge), the seat tightness shall be determined with the test pressure at the valve inlet held at 90 percent of the set pressure. For a valve set at 50 pounds per square inch gauge (345 kilopascals gauge) or less, the test pressure shall be held at 5 pounds per square inch (34.5 kilopascals) less than the set pressure.

4.1.4 Leakage Test
Before starting the seat tightness test, the set pressure shall be demonstrated, and the outlet body bowl shall be filled with water, which shall be allowed to stabilize with no visible flow from the valve outlet. The inlet pressure shall then be increased to the test pressure. The valve shall then be observed for one minute at the test pressure.

4.2 Acceptance Criteria

For a metal seated valve whose inlet has a nominal pipe size of one inch or larger, the leakage rate shall not exceed 10 cubic centimeters per hour per inch of nominal inlet size. For a metal seated valve whose inlet has a nominal pipe size of less than one inch, the leakage rate shall not exceed 10 cubic centimeters per hour. For soft seated valves, there shall be no leakage for one minute.

Section 5 - Testing with Air - Another Method

5.1 Type of Valve to be Tested

Valves with open bonnets - bonnets that cannot be readily sealed, as specified in 2.2.2 - may be tested in accordance with this section instead of Section 2.

This alternative method shall not be used to test valves in which air bubbles can travel to the open bonnet through any passageway inside the valve guide without being observed at the valve outlet.

5.2 Procedure

5.2.1 Test Medium
The test medium shall be air (or nitrogen)near ambient temperature.

5.2.2 Test Configuration
The valve shall be vertically mounted on the air test stand. The valve outlet shall be partially sealed with water to about ½ inch (12.7 millimeters) above the nozzle's seating surface.

5.2.3 Test Pressure
For a valve whose set pressure is greater than 50 pounds per square inch gauge (345 kilopascals gauge), the leakage rate in bubbles per minute shall be determined with the test pressure at the valve inlet held at 90 percent of the set pressure. For a valve set at 50 pounds per square inch gauge (345 kilopascals gauge) or less, the test pressure shall be held at five pounds per square inch (34.5 kilopascals) less than the set pressure.

5.2.4 Leakage Test
Before starting the seat tightness test, the set pressure shall be demonstrated, and the outlet body bowl shall be filled with water to the level of the partial seal. The inlet pressure shall then be increased to the test pressure and held at this pressure for one minute before the bubble count. The valve shall then be observed for leakage for at least one minute.

Caution: When looking for leakage, the observer shall use a mirror or some other indirect means of observation so that the observer's face is not in line with the outlet of the valve, in case the valve accidentally pops.

5.3 Acceptance Criteria

For a valve with a metal seat, the leakage rate in bubbles per minute shall not exceed 50% of the appropriate value in Table 1. For a soft-seated valve, there shall be no leakage for one minute (zero bubbles per minute).

Allowable Piping Loads for 1900 Flanged Safety Relief Valves

Exhaust piping loads on the valve outlet should be minimized and preferably be a value of zero.

Since most installations will include exhaust piping, we have tabulated allowable piping loads on our 1900 flanged safety relief valves in Table 2 (page TI.11). It is the user's responsibility to ensure that inlet piping to the valve and the attachment to a pressure vessel can adequately support the load (F_V) plus other effects of pressure and temperature.

The allowable load (F_V) is the vertical force shown in Figure 3. It is assumed that (F_V) acts through the centerline of the valve outlet and body. The limiting value of (F_V) is not based on the maximum allowable stresses of material in the valve body. (F_V) is based on the structural rigidity of the body which could cause the valve to leak if a given amount of strain is exceeded.

The allowable load (F_V) applies up to the limit of set pressure for each valve type.

The allowable load (F_V) is based on the valve maintaining API-527 tightness, i.e., leakage point is 90% of set pressure. If the leak tightness pressure required is higher than 90%, then allowable piping loads must be derated in accordance with the following:

Leak Tightness Pressure as a % of Set Pressure	Derating Factor for Value Given in Table 2
90%	1.0
91%	0.9
92%	0.8
93%	0.7
94%	0.6
95%	0.5

In addition to the above, the valve allowable load (F_V) must also be derated as a result of high temperature effects. The allowable piping loads must be derated in accordance with Figure 4.

The effects of required valve tightness and temperature are additive and must be included. Example:

(1)1905K, set pressure 200 psig, 92% seat tightness, relieving temperature 500˚F.

(2) Allowable load (F_V) = 500
Derating for tightness = 500 (0.8) = 400 lb.
Derating for temperature = 400 (.98) = 392 lb.

(3) That valve should not be subject to a force exceeding 392 lb. when installed under the stated conditions.

Fig. 3 - Vertical Force F_V

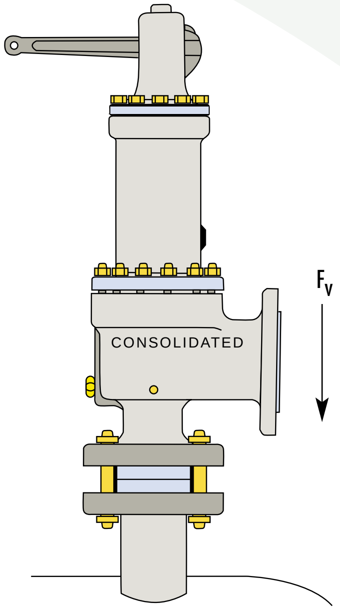
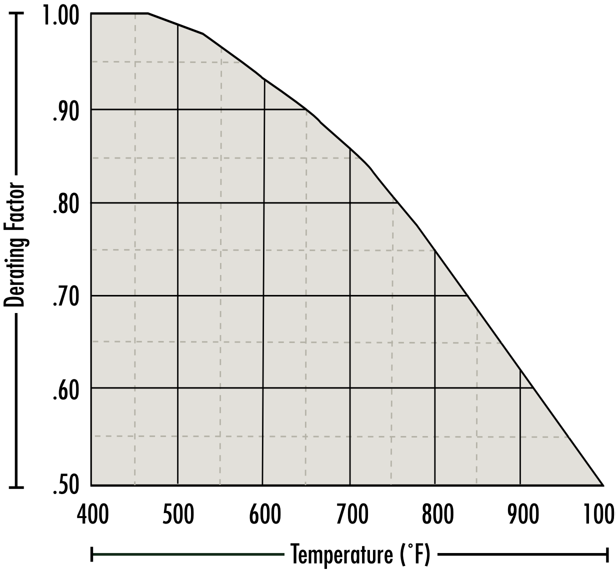


Fig. 4 - Temperature Derating Factor



Allowable Piping Loads for:
1900 Flanged Safety Relief Valves

Table 2

Orifice															
D		E		F		G		H		J		K		L	
Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load
1905	85	1905	85	1905	150	1905	150	1905	150	1905	250	1905	500	1905	500
1906	85	1906	85	1906	150	1906	150	1906	150	1906	250	1906	500	1906	500
1910	85	1910	85	1910	150	1910	150	1910	260	1910	500	1910	600	1910	800
1912	85	1912	85	1912	150	1912	150	1912	260	1912	500	1912	600	1912	800
1914	158	1914	158	1914	158	1914	158	1914	330	1914	800	1914	800	1914	1000
1916	158	1916	158	1916	158	1916	158	1916	330	1916	800	1916	800		
1918	230	1918	230	1918	230	1918	230								

Orifice															
M		N		P		Q		R		T		V		W	
Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load
1905	1000	1905	1000	1905	1000	1905	1200	1905	1200	1905	2400	1905	3300	1905	5300
1906	1000	1906	1000	1906	1000	1906	1200	1906	1200	1906	2400	1906	3300	1906	5300
1910	1200	1910	1200	1910	1200	1910	1500	1910	1500	1910	2400	1910	3300	1910	5300
1912	1500	1912	1500	1912	1500	1912	2000	1912	2000						

Allowable Piping Loads for:
19000 and 820000 Threaded Safety Relief Valves

Valves with threaded base-to-bonnet joints should not have discharge piping installed that would induce a torsional load when the valve relieves. All discharge piping should be parallel to the vertical axis of the valve.

The maximum allowable vetical piping loads that can be applied at the outlet face and not adversely affect the performance of the 19000 and 820000 series valves are as follows:

Valve Type	Maximum Load (lb)
19096L, M	411
19126L, M	
19110L, M	
19226L, M	427
19096H - 19110H	427
19126H - 19226H	4232
19357L, M	1072
19567L, M	1072
1/2" or 3/4" 820121	261
3/4" or 1" or 820216	405
1" or 1-1/4" 8203332	440
1-1/2" or 2" 820857	782

Allowable Piping Loads for:
Pilot Operated 3900 Flanged Safety Relief Valves

Exhaust piping loads on the valve outlet should be minimized, and preferably be a value of zero. This will be the total allowed load on the single outlet valves and the total allowable differential load between the two outlets on the dual outlet valves.

Since most installations will include exhaust piping, allowable piping loads are tabulated for the 3900 flanged safety relief valves in Table 3 and Table 4. It is the user's responsibility to ensure that inlet piping to the valve and the attachment to a pressure vessel can adequately support the load F_v

The allowable load (F_V) is the vertical force at the valve outlet. It is assumed that F_v acts through the centerline of the valve outlet and body. The limiting value of F_V is not based on the maximum allowable stresses of material in the valve body. F_V is based on the structural rigidity of the body.

The allowable load (F_V) applies up to the limit of set pressure for each valve type.

Table 3 - Standard Bore Piping Loads

Orifice													
D		E		F		G		H		J		K	
Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load
3905	150	3905	150	3905	150	3905	150	3905	150	3905	250	3905	250
3910	150	3910	150	3910	150	3910	260	3910	260	3910	500	3910	500
3912	150	3912	150	3912	150	3912	260	3912	260	3912	500	3912	500
3914	158	3914	158	3914	158	3914	330	3914	330	3914	800	3914	800
3916	158	3916	158	3916	158	3916	330	3916	330	3916	800	3916	800

Orifice													
L		M		N		P		Q		R		T	
Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load
3905	500	3905	1000	3905	150	3905	150	3905	1200	3905	1200	3905	2400
3910	800	3910	1200	3910	150	3910	260	3910	1500	3910	1500	3910	2400
3912	800	3912	1500	3912	150	3912	260	3912	2000	3912	2000	3912	3000
3914	1100	3914	1800	3914	158	3914	330						
3916	1100	3916	1800	3916	158	3916	330						

Table 4 - Full Bore Piping Loads

Orifice									
3 x 4		4 x 6		6 x 8 x 8		8 x 10 x 10		10 x 10 x 10	
Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load	Valve Type	F_V (lb) Max. Load
3905	500	3905	1000	3905	2400	3905	2400	3905	3600
3910	800	3910	1200	3910	2400	3910	2400	3910	3600
3912	800	3912	1500	3912	3000	3912	3000		

Temperatures Used in Selecting Pressure Relief Valves

In all safety relief valve protected pressurized systems, the possibility exists to have elevated temperatures present. Generally, temperatures in such situations can be categorized as stated below:

(1) Operating Temperature

This is the temperature normally found in the system and exists by virtue of the processes in the system. It is normally fairly constant when averaged over a period of time.

(2) Relieving Temperature

This is the temperature that exists in the system at the time that the pressure relief valve opens in response to a system pressure increase. It generally results from some type of system upset condition. This temperature is usually higher than operating temperature, but may be higher or lower than design temperature.

(3) Design Temperature

This is the specified temperature for which the structural components of the system must be designed. The value of this temperature level is based on several factors including the length of time at which various temperature levels are expected to occur. It may be higher or lower than relieving temperature.

In determining proper valve selection, temperature is one of the variables used both for structural considerations and valve sizing. The following guidelines are provided for use in temperature considerations and determining a valve selection.

(A) Capacities should be based upon the relieving temperature and flowing pressures.

If the relieving temperature is not given, the maximum of the temperatures given should be used.

(B) The CDTP (cold differential test pressure) should be based upon the operating temperature.

If the operating temperature is not given, the CDTP should be based on the lower of the temperatures given.

The nameplate should be stamped with the temperature used to calculate the CDTP.

(C) For the selection of springs, bellows and O-Ring materials, the most critical of the operating or relieving temperature is used, except in the case of fire-sizing. If only the design temperature is given, it should be used.

For fire-sizing, the operating temperature is used to select the materials for the bellows, springs and O-Rings. If the operating temperature is not given, the minimum of the temperatures given should be used.

This is the temperature which is used to select the "t" or "c" design valve.

(D) The flange rating should be based upon the design temperature (reference ASME Section VIII, UG-20, UG-21). If the design temperature is not given, the most critical of the temperatures given should be used.

When conditions are not clear about which temperatures are to be used, additional guidance should be requested.

Flange Finishes and Natural Frequency

Flange Finishes

Standard Raised Face Flange Finish

(a) CONSOLIDATED's standard flange face finish is 125 to 250 micro inch roughness (Ra). A spiral finish having 24 to 40 grooves per inch is machined using a cutting tool with a minimum radius of .062". The resultant finish is 125 to 250 Ra with a minimum of torn surface when compared with the visual comparison standard.

(b) Acceptance of finish is based on use (visual and tactile) of the Rubert 119 comparator. In accordance with ASME/ANSI B16.5, the finish of contact faces of valves will be judged by visual comparison with Ra standards (see ANSI B46.1) and not by instruments having stylus tracers and electronic amplification.

NOTE: Ra, AARH, AA and CLA are the same.

Nonstandard Designations

(a) When a finish other than CONSOLIDATED's standard is desired, the customer should supply the following information:

(1) Finish: serrated or smooth

(2) Serrations: spiral or concentric

(3) For smooth finish specify roughness, e.g., 63 Ra

(4) Acceptance standard, e.g., Rubert 119 comparator

References

(a) ASME/ANSI B16.5 - 1996, Pipe Flanges and Flanged Fittings

(b) ASME/ANSI B16.34 - 1996, Valves - Flanged, Threaded, and Buttwelding End

(c) ASME/ANSI B46.1 - 1985, Surface Texture

Natural Frequency of Pressure Relief Valves

All piping and mechanical systems exhibit a characteristic known as a natural frequency. This natural frequency is determined in many ways, but actually subjecting the valve to a test on a vibrating table is the most reliable.

In general, valves with lower natural frequencies indicate a relatively flexible product in its structural design. Valves which have a high natural frequency are indicative of valves with a stiff structural design.

It is not advisable to install a valve on a system header where the valve and the piping system both have the same natural frequency. This would eventually lead to major vibration problems causing the valve to open at a very low set pressure and leak continuously. Usually, valve natural frequencies are much higher than the natural frequency of the piping system on which they are installed, so problems related to natural frequency of the valve are not common.

Valve Installation

General

Valve Connections

1900 flanged valves are equipped with ANSI B16.5 flanges and comply with ANSI/API STD 526. For other standards, contact CONSOLIDATED for your needs.

The facing on raised flanges is a spiral finish, 125 to 250 micro inch roughness (Ra).

All flange drillings straddle the centerlines of the valve.

19000 valves are supplied with threaded, socket weld or flanged connections. 820000 valves are supplied with threaded or flanged connections. Centerline to face dimensions are consistent with good installation practices. These flanges also comply with B16.5

Handling and Storage

The internal parts of safety relief valves are precision machined and fitted together to maintain perfect alignment. Rough handling may damage the seats or cause misalignment sufficient to incur leakage or erratic operation. Safety relief valves should be handled carefully. Safety relief valves are shipped with a protective covering over the inlet and the outlet to prevent damage to the flanged surfaces and to prevent entry of foreign material into the valve. If the valves are to be stored before installation, the protective covering should be left intact until installation. Furthermore, clean, dry covered storage is recommended. If this is not practical, valves should at least be protected with a suitable covering to prevent entry of foreign material.

Inlet Piping

The safety relief valve should be installed in a vertical upright position. The inlet piping to the valve should be short and direct from the vessel or equipment being protected. The connection to the vessel should be provided with a radius to permit smooth flow to the valve. Sharp corners should be avoided. Should this not be practical, then the inlet should be wedged out at least one additional pipe diameter.

In any event, the pressure drop from the vessel to the valve should not exceed 3% when the valve is flowing full capacity. In no event should the inlet piping be smaller in diameter than the inlet connection of the valve.

Outlet Piping

Alignment of the internal parts of a safety relief valve is important to ensure proper operation. Although the valve body will withstand a considerable mechanical load, unsupported discharge piping should not involve loads any higher than that stated in the Piping Loads section of this catalog. They should also avoid loads consisting of more than a companion flange, long radius elbow and a short vertical pipe. Care should be taken to ensure thermal expansion of piping and support does not produce strains in a valve. Spring supports are recommended where this may be the case. The discharge piping should be designed to allow for vessel expansion as well as expansion of the discharge pipe itself. This is particularly important on long discharge lines.

Consideration should be given to discharge pipe movement resulting from wind loads. A continual oscillation of the discharge piping introduces stress distortion in the valve body. The resultant movement of the internal parts may cause leakage.

Where possible, drains should be piped away to prevent the collection of water or corrosive liquid in the valve body. Attention should be given to the support of the drainage piping.

When two or more valves are piped to discharge into a common header, the built-up back pressure resulting from the opening of one (or more) valve(s) may cause a superimposed back pressure in the remaining valves connected to the header. This back pressure will increase the set pressure of the remaining valves by the amount of the back pressure, unless the bonnet is vented. Under these conditions, use of bellows valves is recommended. Bellows valves may also permit use of a smaller size manifold.

It is recommended that the smaller orifice valve be set at the lower set pressure and that it be installed upstream of other valves.

API Recommended Practice for the Design and Installation of Pressure Relieving Systems in Refineries

(Excerpts from API RP 520 Part II)

1. General

1.1 Scope

This recommended practice is intended to cover methods of installation for pressure relieving devices. Pressure relief valves or rupture disks may be used independently or in combination with each other to provide the required protection against excessive overpressure. As used in this recommended practice, the term *pressure relief valve* includes safety relief valves used in compressible fluid service and relief valves used in liquid service. This recommended practice covers gas, vapor, and liquid service; it does not cover special applications that require unusual installation considerations.

2. Inlet Piping

2.1 General Requirements

For general requirements of inlet piping, see Fig. 5 and Fig. 6.

2.1.1 Flow and Stress Considerations

The valve inlet piping should be designed to provide for proper valve performance. This requires design consideration of the flow induced pressure drop in the inlet piping. Excessive pressure losses in the piping system between the protected vessel and the pressure relief valve will adversely affect the valve performance. In addition, the effect of stresses derived from both valve operation and externally applied loads must be considered. For more complete piping design guidelines, see ASME B31.1 or B31.3.

2.1.2 Vibration Considerations

Vibrations in inlet piping systems may cause leakage in the seats of pressure relief valves or fatigue failure of the piping; under certain conditions, both results may occur.

Most vibrations that occur in inlet piping systems are random and complex. These vibrations may cause the seat on the valve disk to slide back and forth across the seat on the valve nozzle, resulting in damage to the seating surfaces; they may cause actual separation of the seating surfaces; or they may cause premature fatigue failure of certain valve parts.

Regardless of the amplitude, high-frequency vibrations are more detrimental to the tightness of the pressure relief valve than are low-frequency movements. This effect can be minimized by providing greater pressure differentials between the operating pressure and the set pressure, particularly under high-frequency conditions.

2.2 Pressure Drop Limitations and Piping Configurations

For pressure drop limitations and piping configurations, see Figures 5 - 8.

Fig.5 - Typical Pressure Relief Valve Without a Stop Valve

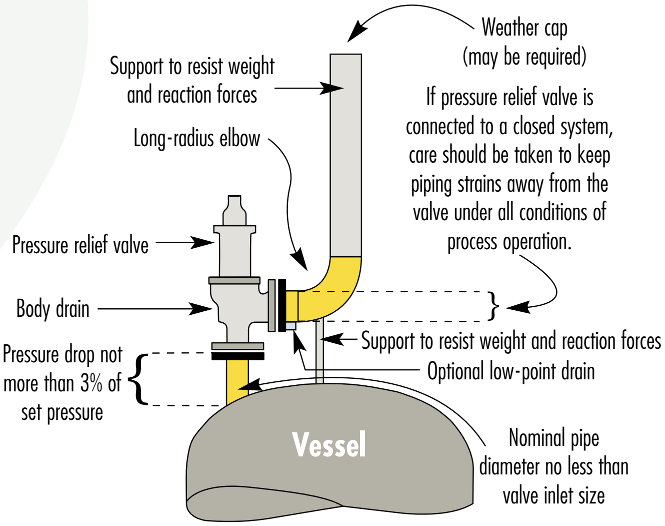
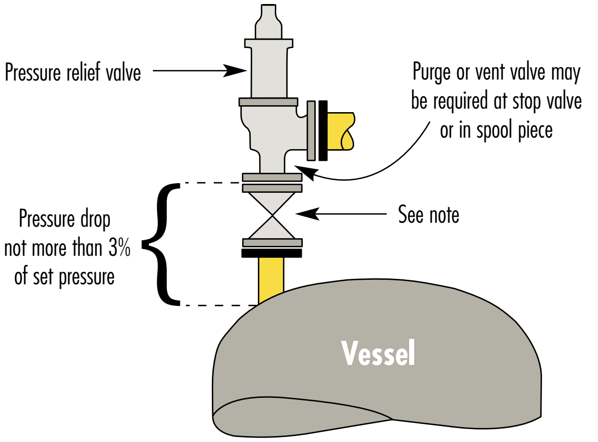


Fig. 6 - Typical Pressure Relief Valve With a Stop Valve



NOTE: The stop valve must have a full port area greater than or equal to the inlet size of the pressure relief valve. The stop valve should be used only as permitted by the applicable codes.

2.2.1 Pressure Loss at the Valve Inlet

Excessive pressure loss due to friction at the inlet of a pressure relief valve will cause rapid opening and closing of the valve, or chattering. Chattering may result in lowered capacity and damage to the seating surfaces. Pressure loss is caused by friction within, or entering into, the inlet piping of the pressure relief valve.

2.2.2 Size and Length of Inlet Piping

The inlet piping between the protected equipment and the inlet flange of the pressure relief valve should be designed so that the total pressure loss does not exceed 3% of the set pressure of the valve. The pressure loss should be calculated using the maximum rated capacity of the pressure relief valve. Pressure losses can be reduced materially by rounding the entrance to the inlet piping or by using larger inlet piping.

The nominal size of the inlet piping must be the same as or larger than the nominal size of the valve inlet flange.

When a rupture disk device is used in combination with a pressure relief valve, the pressure drop calculation must include the additional pressure drop developed by the disk.

Pilot operated valves can tolerate higher inlet pipe pressure losses when the pilot senses the system's pressure at a point that is not affected by the inlet pipe pressure drop (see Figure 9). The reduced capacity of the main valve, caused by the increased pressure drop, should not be reduced below the capacity required to protect the equipment or system.

2.2.3 Configuration of Inlet Piping

The installation of a pressure relief valve at the end of a long horizontal inlet pipe through which there is normally no flow should be avoided. Foreign matter may accumulate, or liquid may be trapped, creating interference with the valve's operation or requiring more frequent valve maintenance.

2.3 Inlet Stresses that Originate from Discharge Piping

Improper design or construction of the discharge piping from a pressure relief valve can set up stresses that will be transferred to the valve and its inlet piping. These stresses may cause the valve to leak or malfunction. The valve Manufacturer should be consulted about permissible loads and moments.

2.3.1 Thermal Stresses

Fluid flowing from the discharge of a pressure relieving device may cause a change in the temperature of the discharge piping. A change in temperature may also be caused by prolonged exposure to the sun or to heat radiated from nearby equipment. Any change in the temperature of the discharge piping will cause a change in the length of the piping and may cause stresses that will be transmitted to the pressure relieving device and its inlet piping. The pressure relieving device should be isolated from piping stresses through proper support, anchoring, or flexibility of the discharge piping. Fixed supports should not be used because they may cause stresses in the pressure relief valve as a result of thermal changes.

2.3.2 Mechanical Stresses

Discharge piping should be independently supported and carefully aligned. Discharge piping that is supported by only the pressure relief valve will induce stresses in the pressure relief valve and the inlet piping. Forced alignment of the discharge piping will also induce such stresses.

Fig. 7 - Typical Pressure Relief Valve Mounted on a Process Line

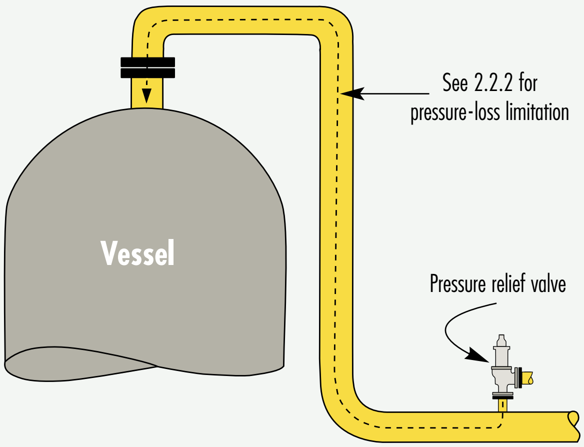
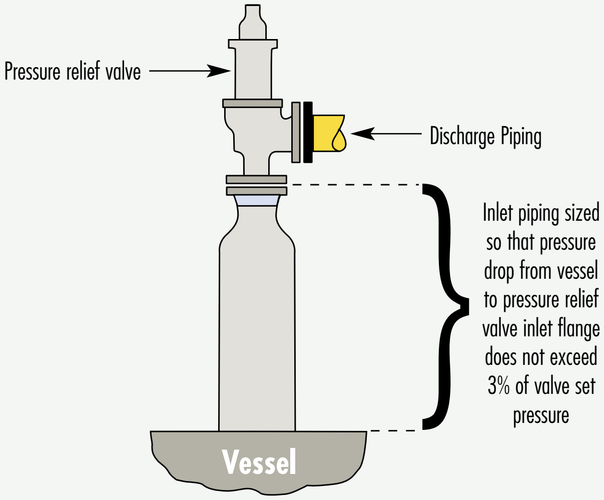


Fig. 8 - Typical Pressure Relief Valve Mounted on a Long Inlet Pipe



2.6 Rupture Disks

A rupture disk device may be used as the sole pressure relieving device, or it may be installed between the pressure relief valve and the vessel or on the outlet side of the valve. For ASME Code applications, the capacity of a pressure relief valve used in combination with a rupture disk mounted as shown in Figure 10 must be derated by 20% unless that particular combination has a capacity factor derived from testing and certified by ASME.

When a rupture disk device is used downstream from the valve or between the pressure relief valve and the protected vessel, a pressure gauge, try cock, free vent, or suitable telltale indicator should be provided to permit detection of disk rupture or leakage. Unless this requirement is complied with, the user is cautioned that any pressure buildup between the rupture disk and the pressure relief valve will increase the opening pressure of the device (see Figure 10).

Only rupture disks that have a non-fragmenting design may be used beneath a pressure relief valve.

When reverse buckling disks are used in liquid service, some Manufacturers recommend a vapor space that is required to provide the dynamic energy necessary to ensure complete rupture and full opening of the disk.

2.7 Process Laterals

Process laterals should generally not be connected to the inlet piping of pressure relief valves. Exceptions should be analyzed carefully to ensure that the allowable pressure drop at the inlet of the pressure relief valve is not exceeded under simultaneous conditions of rated flow through the pressure relief valve and maximum possible flow through the process lateral (see Figure 11).

2.8 Pressure Relief Valve Inlets

Inlets of pressure relief valves should not be located where excessive turbulence is present (see Figure 12). The branch entrance where the lateral outlet nozzle joins the main run should have a well rounded, smooth corner that minimizes turbulence and resistance to flow.

3. Discharge Piping

3.1 General Requirements

The discharge piping installation must provide for proper valve performance and adequate drainage, with consideration given to the effect of back pressure on the particular design of the valve. Consideration should be given to the type of discharge system used, the design of the pressure relief valve, and the set pressure relationship of the valves in the system.

Auto-refrigeration during discharge can severely cool the outlet of the valve and the discharge piping. Materials must be selected to avoid sensitivity to brittle fracture.

3.2 Safe Disposal of Relieving Fluids

For a comprehensive source of information about the safe disposal of various relieving fluids, see API RP 521.

3.3 Back Pressure Limitations and Sizing of Pipe

When discharging piping is designed, the combined effect of superimposed and built-up back pressure on the operating characteristics of the valves should be considered. The discharge piping system should be designed so that the amount of back pressure does not exceed the value established by the pressure relief valve that has the lowest back pressure limitation in the system.

Fig.9 - Typical Pilot Operated Pressure Relief Valve Installation

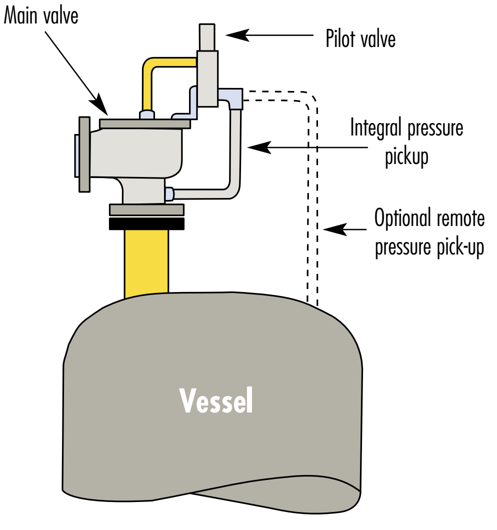
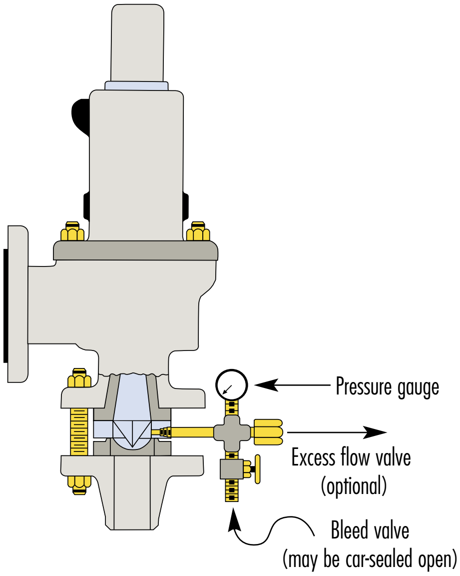


Fig. 10 - Typical Rupture Disk Assembly Installed in Combination with a Pressure Relief Valve



In every case, the nominal discharge pipe should be as large as or larger than the nominal size of the pressure relief valve outlet flange; in the case of long discharge piping, the pipe size must sometimes be much larger.

Sizing of discharge piping for vapor or gas service is covered in API RP 521.

3.4 Stresses that Originate from Discharge Piping

The effects of stresses that originate from discharge piping are discussed in 2.3.1 and 2.3.2.

4. Bonnet or Pilot Vent Piping

4.1 Conventional Valves

Following are two types of conventional valves:

a) **Closed Bonnet.** The normal closed bonnet valve requires no special precautions except that it should be properly chosen for the particular conditions of installation.

b) **Vented Bonnet.** The location of the valve and the design of the discharge piping system are the main considerations in venting the valve bonnets into the atmosphere.

Considerations must be given to the qualities of the fluids that are discharged to the atmosphere through the bonnet vents, since some fluids may have hazardous properties.

4.2 Balanced Bellows Valves

The bonnets of bellows seal valves should always be vented to ensure proper functioning of the valve and to provide a telltale in the event of a bellows failure. The vent must be designed to avoid plugging caused by ice, insects, or other obstructions. When the fluid is flammable, toxic, or corrosive, the bonnet vent should be piped to a safe location.

4.3 Balanced Piston Valves

The bonnets of balanced piston seal valves should always be vented because of the flow past the piston. Under conditions of normally low back pressure, the flow is small and may possibly be safely discharged to the atmosphere; however, when the valve is operating, the flow will increase as a result of the higher body pressure. This factor must be considered in the design of the bonnet venting.

4.4 Pilot Operated Valves

The pilot is normally vented to the atmosphere under operating conditions, since the discharge during operation is slight. When vent discharge to the atmosphere is not permissible, the pilot should be vented through a supplementary piping system to a safe location. When vent piping is designed, precautions should be taken to avoid the possibility of back pressure on the pilot unless the pilot is of the balanced design.

6. Valve Location and Position

6.1 Inspection and Maintenance

For optimum performance, pressure relief valves must be serviced and maintained regularly. Details for the care and servicing of specific valves are provided in the Manufacturer's maintenance bulletins and in Chapter XVI of the *API Guide for Inspection of Refinery Equipment.*

Pressure relief valves should be located for easy access and removal so that servicing can be properly handled. Sufficient working space should be provided around the valve.

Fig. 11 - Recommended Typical Installation to Avoid Process Laterals Connected to Pressure Relief Valve Inlet Piping

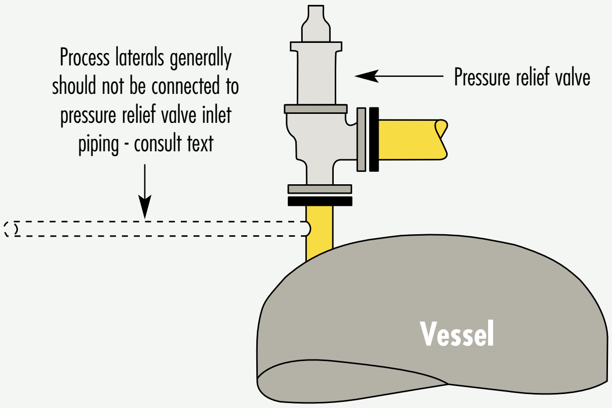
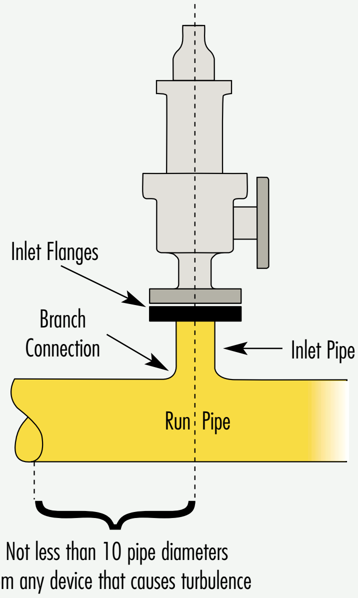


Fig. 12 - Typical Installation Avoiding Excessive Turbulence at Pressure Relief Valve Inlet



6.2 Proximity to Pressure Source

The Pressure relieving device should normally be placed close to the protected equipment so that the valve will be "fed" properly under flowing conditions. For example, where protection of a pressure vessel is involved, mounting the pressure relieving device directly on a nozzle on top of the vessel is strongly recommended; however, on installations that have pressure fluctuations at the pressure source (as with valves on the compressor discharge) that peak close to the set pressure of the valve, the pressure relief valve should be located farther from the source and in a more stable pressure region.

6.3 Proximity to Other Valve Equipment

The valves should be mounted downstream from any of the devices in 6.3.1 through 6.3.3 at a distance sufficient to avoid turbulence (see Figure 12).

6.3.1 Reducing Stations

Pressure relief valves are often used to protect piping downstream from pressure reducing valves, where turbulence usually occurs. Other valves and appurtenances in the system may also be effective in disturbing the flow. This condition cannot be evaluated readily, but turbulence at valve inlets tends to generate instability.

6.3.2 Orifice Plate and Flow Nozzle

Proximity to orifice plates and flow nozzles may cause adverse operation of the pressure relief valves.

6.3.3 Other Valves and Fitting

The use of other fittings, such as elbows, may create turbulent areas that could result in adverse performance of pressure relief valves.

6.4 Mounting Position

Pressure relief valves should be mounted in a vertical upright position. Installing a pressure relief valve in other than a vertical upright position will adversely affect its operation. The valve Manufacturer should be consulted about any other mounting position, since mounting a pressure relief valve in other positions may cause a shift in the set pressure and a reduction in the degree of seat tightness.

6.5 Test or Lifting Levers

Test or lifting levers should be provided on pressure relief valves as required by the applicable code. Where simple levers are provided, they should hang down, and the lifting fork must not contact the lifting nuts on the valve spindle (see Figure 13, Panel A). Uploads caused by the lifting mechanism bearing on the spindle will cause the valve to open below the set pressure.

7. Bolting and Gasketing

7.1 Care in Installation

Before a pressure relief valve is installed, the flanges on the valve and the mounting nozzle should be thoroughly cleaned to remove any foreign material that may cause leakage. Where valves are too heavy for ready lifting by hand, the use of proper handling devices will avoid damage to the flange gasket facing. Ring joint and tongue and groove facing should be handled with extreme care so that the mating sections are not damaged.

7.2 Proper Gasketing and Bolting for Service Requirements

The gasket used must be dimensionally correct for the specific flange, and must fully clear the valve's inlet and outlet openings.

Gaskets, flange facings, and bolting should meet the service requirements for the pressure and temperature involved. This information can be obtained by referring to other national standards and to Manufacturers' technical catalogs.

When a rupture disk device is installed in the pressure relieving system, the flange gasket material and bolting loads may be critical. The disk Manufacturer's instructions should be followed for proper performance.

8. Multiple Pressure Relief Valves with Staggered Settings

8.1 Advantages of Multiple Valves

In many instances, valves are sized to handle the total quantity of fluid that results from a maximum emergency condition; however, during mild system upsets, only a fraction of that amount is discharged through the valve. If the fluid volume under the valve is insufficient to sustain the flow, the valve operation will be cyclic and will result in poor performance. The valve's ability to reseat tightly may be affected. This type of service condition can exist in a pressure reducing station where the requirement for a pressure relief valve is based on the wide open failure of a reducing valve, but under conditions of lesser flow, the pressure relief valve works only at partial capacity.

When capacity variations of the foregoing types are frequently encountered in normal operation, the use of multiple smaller pressure relief devices with staggered settings is recommended. With this arrangement, the pressure relief valve with the lowest setting will be capable of handling minor upsets, and additional valves will be put in operation as the capacity requirement increases.

8.2 Code Requirements for Staggered Settings

For ASME Code applications, one pressure relief device must be set at or below the maximum allowable working pressure of the protected vessel. Additional devices may be set to open at higher pressures, but in no case except under fire conditions should the setting be more than 105% of the maximum allowable working pressure.

When a pressure vessel is exposed to fire or another unexpected source of external heat, any supplemental pressure relieving devices may be set to open at a pressure not more than 110% of the maximum allowable working pressure of that vessel.

9. Preinstallation, Handling, and Inspection

9.1 Storage and Handling of Pressure Relief Valves

Because cleanliness is essential to the satisfactory operation and tightness of a pressure relief valve, precautions should be taken to keep out all foreign materials. Valves should be closed off properly at both inlet and outlet flanges. Particular care should be taken to keep the valve inlet absolutely clean. Valves should preferably be stored indoors or in a location where dirt and other forms of contamination are at a minimum. Valves should not be thrown on a pile or placed on the bare ground while they await installation.

Valves should be handled carefully and should not be subjected to shocks. If attention is not paid to this point, considerable internal damage or misalignment can result, and seat tightness may be adversely affected.

9.2 Inspection and Testing of Pressure Relief Valves

The conditions of all pressure relief valves should be visually inspected before installation. The Manufacturer's instruction manuals should be consulted for details relating to the specific valve. Caution should be taken to ensure that all protective material on the valve flanges and any extraneous materials inside the valve body and nozzle are completely removed. Bonnet shipping plugs must be removed from balanced pressure relief valves. The inlet surface must be cleaned, since foreign materials clinging to the inside of the nozzle will be blown across the seats when the valve is operated. Some of these materials may damage the seats or get trapped between the seats in such a way that they cause leakage. Valves should be tested before installation to confirm their opening pressure setting.

9.3 Inspection of Rupture Disk Devices

All rupture disk devices should be thoroughly inspected before installation. The Manufacturer's instruction manuals should be followed with respect to the specific disk. The seating surfaces of the rupture disk holder must be clean, smooth, and undamaged.

Rupture disks should be checked for physical damage to the seating surfaces or the prebulged disk area. Damaged or dented disks should not be used. The safety heads of bolted construction should be checked for proper torque as recommended by the Manufacturer.

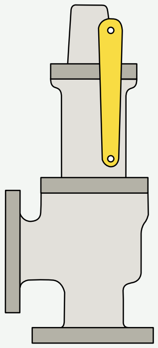
On reverse buckling disks that have knife blade assemblies, the knife blades should be checked for physical damage and sharpness. Nicked or dull blades must not be refurbished or replaced.

9.4 Inspection and Cleaning of Systems Before Installation

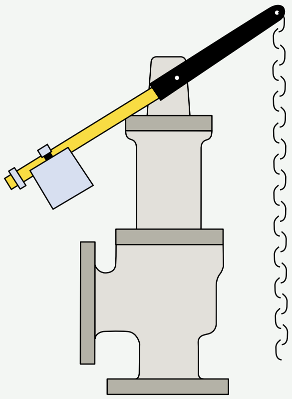
Because foreign materials that pass into and through pressure relief valves are damaging, the systems on which the valves are tested and finally installed must also be inspected and cleaned. New systems in particular are prone to contain welding beads, pipe scale, and other foreign objects that inadvertently get trapped during construction and will destroy the seating surface when the valve opens. Wherever possible, the system should be thoroughly purged before the valve is installed.

The valve should be isolated during pressure testing of the system, either by blanking or closing a stop valve.

Fig. 13 - Typical Positions for Pressure Relief Valve Lifting Lever



Panel A: Remote operation not required



Panel B: Counterbalanced for remote operation

O-Ring Selection

O-Ring Selection Tables - Media

Fluid	Nitrile	Ethylene Propylene	Fluorocarbon	Neoprene	Silicone	Teflon
Acetaldehyde		X			X	X
Acetamide	X	X	X	X	X	X
Acetic acid		X				X
Acetic anhydride		X		X	X	X
Acetone		X				X
Acetophenone		X				X
Acetyl acetone		X				X
Acetyl chloride			X			X
Acetylene	X	X	X	X	X	X
Acetylene tetrabromide		X	X	X		X
Air	X	X	X	X	X	X
Alkazene			X			X
Amines-mixed		X		X		X
Ammonia, gas	X	X		X	X	X
Ammonia, liquid (anhydrous)	X	X		X	X	X
Ammonium hydroxide	X	X		X	X	X
Amyl alcohol	X	X	X	X		X
Amyl borate	X		X	X		X
Amyl chloride			X			X
Amyl chloronaphthalene			X			X
Amyl naphthalene			X			X
Anhydrous ammonia	X	X		X	X	X
Anhydrous hydrazine		X		X		X
Anilene		X				X
Argon	X	X	X	X	X	X
Asphalt	X		X	X		X
ASTM oil	X		X			X
Automatic transmission fluid	X		X	X		X
Beer	X	X	X	X	X	X
Beet sugar liquors	X	X	X	X	X	X
Benzaldehyde		X			X	X
Benzene			X			X
Benzochloride		X	X			X
Benzoic acid		X	X			X
Benzophenone		X	X			X
Benzyl alcohol		X	X	X	X	X
Benzyl benzoate			X			X
Benzyl chloride			X			X
Bleach liquor		X	X	X	X	X
Boric acid	X	X	X	X	X	X
Brake fluid (non-petroleum)		X		X		X
Bromine			X			X
Bromobenzene			X			X
Bromochloro trifluoroethane			X		X	X
Bunker oil	X		X		X	X
Butadiene (monomer)			X			X
Butane	X		X	X		X
Butane, 2, 2-dimethyl	X		X	X		X
Butane, 2, 3-dimethyl	X		X	X		X
Butanol (butyl alcohol)	X	X	X	X	X	X
1-Butene, 2-ethyl	X		X			X
N-butyl acetate		X				X
Butyl alcohol	X	X	X	X	X	X

O-Ring Selection

O-Ring Selection Tables - Media

Fluid	Nitrile	Ethylene Propylene	Fluorocarbon	Neoprene	Silicone	Teflon
Butyl amine or N-butyl amine		X				X
N-butyl benzoate		X	X			X
N-butyl butyrate		X	X			X
Butylene	X		X			X
Butyraldehyde		X				X
Butyric acid		X	X			X
Calcium acetate	X	X		X		X
Calcium bisulfite	X	X	X	X		X
Calcium carbonate	X	X	X	X	X	X
Calcium chloride	X	X	X	X	X	X
Calcium cyanide	X	X		X	X	X
Calcium hydroxide	X	X	X	X	X	X
Calcium hypochlorite	X	X	X	X	X	X
Calcium nitrate	X	X	X	X	X	X
Calcium phosphate	X	X	X	X	X	X
Cane sugar liquors	X	X	X	X	X	X
Carbolic acid phenol		X	X			X
Carbon bisulfide			X	X		X
Carbon dioxide	X	X	X	X	X	X
Carbon disulfide			X			X
Carbon monoxide	X	X	X	X	X	X
Carbon tetrachloride	X		X			X
Carbonic acid	X	X	X	X	X	X
Castor oil	X	X	X	X	X	X
Cetane (hexadecane)	X		X	X		X
Chloracetic acid		X				X
Chlorinated salt brine			X			X
Chlorine, dry			X	X		X
Chlorine dioxide			X			X
Chloroacetone		X				X
Chlorobenzene			X			X
Chlorobromo methane		X	X			X
Chlorobutadiene			X			X
Chlorododecane			X			X
Chloroform			X			X
O-chloronaphthalene		X				X
Chlorotoluene		X				X
Chlorox™	X	X	X	X		X
O-chlorphenol			X			X
Chrome plating solutions		X	X		X	X
Citric acid	X	X	X	X	X	X
Corn oil	X		X		X	X
Cottonseed oil	X	X	X	X	X	X
Crude oil	X		X			X
Cyclohexane	X		X			X
Cyclohexanol	X		X	X		X
Cyclohexanone		X				X
Decalin			X			X
Decane	X		X		X	X
Denatured alcohol	X	X	X	X	X	X
Detergent, water solution	X	X	X	X	X	X
Dexron™	X		X	X		X

O-Ring Selection

O-Ring Selection Tables - Media

Fluid	Nitrile	Ethylene Propylene	Fluorocarbon	Neoprene	Silicone	Teflon
Diacetone		X		X		X
Diacetone alcohol		X		X		X
Dibenzyl ether		X				X
Dibenzyl sebacate		X	X			X
Dibromoethyl benzene			X			X
Dibutyl phthalate		X			X	X
Dibutyl sebacate		X	X		X	X
O-dichlorobenzene			X			X
P-dichlorobenzene			X			X
Dichloro-butane	X		X			X
Diesel oil	X		X			X
Di-ester synthetic lubricants	X		X			X
Diethylamine	X	X		X		X
Diethyl sebacate	X	X	X		X	X
Diethylene glycol	X	X	X	X	X	X
Diisobutylene	X		X			X
Diisopropyl ketone		X		X	X	X
Dimethyl formamide (DMF)	X	X				X
Dimethyl phthalate		X	X			X
Dioctyl phthalate		X	X			X
Dioctyl sebacate		X	X			X
Dioxane		X				X
Dioxolane		X				X
Dipentene	X		X			X
Diphenyl	X	X	X	X	X	X
Diphenyl oxides	X	X	X	X	X	X
Dowtherm, A			X			X
Dowtherm, E			X			X
Epichlorohydrin			X			X
Ethane	X		X	X		X
Ethanol		X		X	X	X
Ethanol amine	X	X		X	X	X
Ethyl acetate-organic ester		X			X	X
Ethyl acetoacetate		X			X	X
Ethyl acrylate		X			X	X
Ethyl alcohol	X	X		X	X	X
Ethyl benzene			X			X
Ethyl benzoate			X			X
Ethyl bromide	X		X			X
Ethyl cellosolve		X				X
Ethyl cellulose	X	X		X	X	X
Ethyl chloride	X		X			X
Ethyl chlorocarbonate		X	X			X
Ethyl chloroform, ATE		X				X
Ethycyclopentane	X		X			X
Ethylene chloride			X			X
Ethylene chlorohydrin		X	X	X		X
Ethylene diamine	X	X		X	X	X
Ethylene dibromide			X			X
Ethylene dichloride			X			X
Ethyl formate		X	X	X		X
Ethylene glycol	X	X	X	X	X	X

O-Ring Selection

O-Ring Selection Tables - Media

Fluid	Nitrile	Ethylene Propylene	Fluorocarbon	Neoprene	Silicone	Teflon
Ethylene trichloride			X			X
Ethyl hexanol	X	X	X	X	X	X
Ethyl mercaptan			X			X
Ethyl oxalate		X	X			X
Ethyl pentachlorobenzene		X				X
Ethyl silicate	X	X	X	X		X
Fatty acids	X		X	X		X
Ferric chloride	X	X	X	X	X	X
Ferric nitrate	X	X	X	X	X	X
Formaldehyde		X			X	X
Freon, 11™	X		X			X
Freon, 12™	X		X	X		X
Freon, 13™	X	X	X	X		X
Freon, 13B1™	X	X	X	X		X
Freon, 14™	X	X	X	X		X
Freon, 22™	X	X		X		X
Freon, 31™				X		X
Freon, 32™				X		X
Freon, 112™	X		X	X		X
Freon, 113™	X		X	X		X
Freon, 114™	X	X	X	X		X
Fuel oil	X		X	X		X
Fuel oil, acidic	X		X	X	X	X
Fuel oil, #6	X		X		X	X
Fumaric acid	X	X	X	X	X	X
Furfural		X				X
Furfuraldehyde		X				X
Furfurl alcohol		X				X
Furyl carbinol		X				X
Gallic acid	X	X	X	X		X
Gasoline	X		X	X		X
Gelatin	X	X	X	X	X	X
Glucose	X	X	X	X	X	X
Glycerine-glycerol	X	X	X	X	X	X
Glycols	X	X	X	X		X
Halothane			X			X
Halowax oil			X			X
Helium	X	X	X	X	X	X
N-Heptane	X		X	X		X
N-Hexaldehyde		X		X	X	X
N-Hexane	X		X	X		X
N-Hexane-1	X		X	X		X
Hexyl alcohol	X		X	X		X
Hydraulic oil, petroleum base	X		X	X	X	X
Hydrazine	X	X		X	X	X
Hydrobromic acid		X	X			X
Hydrocarbons	X		X	X		X
Hydrochloric acid to 158°F	X	X	X	X		X
Hydrocyanic acid	X	X	X	X		X
Hydrofluosilicic acid	X	X	X	X		X
Hydrogen gas	X	X	X	X		X

O-Ring Selection

O-Ring Selection Tables - Media

Fluid	Nitrile	Ethylene Propylene	Fluorocarbon	Neoprene	Silicone	Teflon
Hydrogen peroxide (1)			X			X
Hydrogen sulfide		X		X		X
Hydyne	X	X		X		X
Hypochlorous acid		X	X	X		X
Iodine	X	X	X	X		X
Isobutyl alcohol	X	X	X	X	X	X
Iso-butyl N-butyrate		X	X			X
Isododecane	X		X	X		X
Isooctane	X		X	X		X
Isophorone (ketone)		X				X
Isopropanol	X	X	X	X	X	X
Isopropyl acetate		X				X
Isopropyl alcohol	X	X	X	X	X	X
Isopropyl chloride			X			X
Isopropyl ether	X					X
JP-3 to JP-10			X			X
Kerosene	X		X	X		X
Lactic acid			X			X
Lactones		X				X
Linoleic acid	X		X	X	X	X
Linseed oil	X		X		X	X
Liquid petroleum gas (LPG)	X		X	X		X
Lubricating oils	X		X			X
Lye solutions	X	X	X	X	X	X
Magnesium hydroxide	X	X	X	X		X
Malathion™	X		X			X
Maleic acid			X			X
Maleic anhydride		X				X
Malic acid	X	X	X	X	X	X
Mesityl oxide (ketone)		X				X
Methane	X		X	X		X
Methanol	X	X		X		X
Methyl acetate		X		X		X
Methyl acetoacetate		X			X	X
Methyl acrylate		X		X		X
Methylacrylic acid		X		X		X
Methyl alcohol	X	X		X	X	X
Methyl benzoate			X			X
Methyl bromide	X		X			X
Methyl butyl ketone		X				X
Methyl carbonate			X			X
Methyl chloride			X			X
Methyl chloroformate			X			X
Methylcyclopentane			X			X
Methylene chloride			X			X
Methyl ether	X		X		X	X
Methyl ethyl ketone (MEK)		X				X
Methyl formate		X		X		X
Methyl isopropyl ketone		X				X

O-Ring Selection

O-Ring Selection Tables - Media

Fluid	Nitrile	Ethylene Propylene	Fluorocarbon	Neoprene	Silicone	Teflon
Methyl mercaptan		X				X
N-methyl-2-pyrrolidone		X				X
Methyl oleate		X				X
Methyl salicylate		X				X
Milk	X	X	X	X	X	X
Mineral oils	X		X	X	X	X
Mono bromobenzene			X	X		X
Monochlorobenzene			X			X
Mono ethanolamine		X			X	X
Monomethylaniline		X	X	X		X
Monomethyl hydrazine	X	X		X		X
Monovinyl acetylene	X	X	X	X	X	X
Naptha	X		X			X
Napthalene				X		X
Napthenic acid	X		X			X
Natural gas	X		X	X		X
Neon	X	X	X	X	X	X
Nickel acetate	X	X		X		X
Nickel chloride	X	X	X	X	X	X
Nickel salts	X	X	X	X	X	X
Nickel sulfate	X	X	X	X	X	X
Nitrobenzene		X	X			X
Nitroethane		X		X		X
Nitrogen	X	X	X	X	X	X
Nitromethane		X				X
Nitropropane		X				X
Nitrous oxide	X					X
Octadecane	X		X	X		X
N-octane	X		X			X
Octyl alcohol	X		X	X	X	X
Oleic acid			X			X
Olive oil	X	X	X	X		X
Orthochloro ethylbenzene			X			X
Ortho-dichlorobenzene			X			X
Oxalic acid	X	X	X	X	X	X
Oxygen	X	X	X	X	X	X
Palmitic acid	X	X	X	X		X
Para-dichlorobenzene			X			X
Peanut oil	X	X	X	X	X	X
Pentane	X		X	X		X
N-pentane	X		X	X		X
Perchloroethylene	X		X			X
Petrolatum	X		X	X		X
Petroleum oil			X	X		X
Phenol			X			X
Phenylbenzene			X			X
Phenylhydrazine		X	X			X
Phosphoric acid to 158°F		X	X			X
Phosphorous trichloride		X	X			X
Pinene	X		X			X
Pine oil	X		X			X

O-Ring Selection

O-Ring Selection Tables - Media

Fluid	Nitrile	Ethylene Propylene	Fluorocarbon	Neoprene	Silicone	Teflon
Plating solutions		X	X			X
Potassium acetate	X	X		X		X
Potassuim chloride	X	X	X	X	X	X
Potassium cupro cyanide	X	X	X	X	X	X
Potassium cyanide	X	X	X	X	X	X
Potassium dichromate	X	X	X	X	X	X
Potassium nitrate	X	X	X	X	X	X
Potassium salts	X	X	X	X	X	X
Potassium sulphate	X	X	X	X	X	X
Potassium sulphite	X	X	X	X	X	X
Propane	X		X	X		X
Propane propionitrile	X		X	X		X
Propyl acetate		X		X		X
N-propyl acetone		X				X
Propyl alcohol	X	X	X	X	X	X
Propylene			X			X
Propylene oxide		X				X
Propyl nitrate		X		X		X
Rapeseed oil	X	X	X	X		X
Salicylic acid	X	X	X	X	X	X
Sea (salt) water	X	X	X	X	X	X
Silicone oils	X	X	X	X		X
Silver nitrate	X	X	X	X	X	X
Soap solutions	X	X	X	X	X	X
Sodium acetate	X	X		X		X
Sodium bicarbonate	X	X	X	X	X	X
Sodium borate	X	X	X	X	X	X
Sodium carbonate	X	X	X	X	X	X
Sodium bisulfate or bisulfite	X	X	X	X	X	X
Sodium chloride	X	X	X	X	X	X
Sodium cyanide	X	X		X	X	X
Sodium hydroxide, 3 molar	X	X	X	X	X	X
Sodium hypochlorite	X	X	X	X	X	X
Sodium metaphosphate	X	X	X	X		X
Sodium nitrate	X	X		X		X
Sodium perborate	X	X	X	X	X	X
Sodium peroxide	X	X	X	X		X
Sodium phosphate	X	X	X	X		X
Sodium silicate	X	X	X	X		X
Sodium sulphate	X	X	X	X	X	X
Sodium sulphide and sulfite	X	X	X	X	X	X
Sodium thiosulfate	X	X	X	X	X	X
Soybean oil	X	X	X	X	X	X
Stannic chloride	X	X	X		X	X
Steam		X				X
Stearic acid	X	X		X	X	X
Stoddard solvent	X		X	X		X
Styrene			X			X
Sucrose solutions	X	X	X	X	X	X

O-Ring Selection

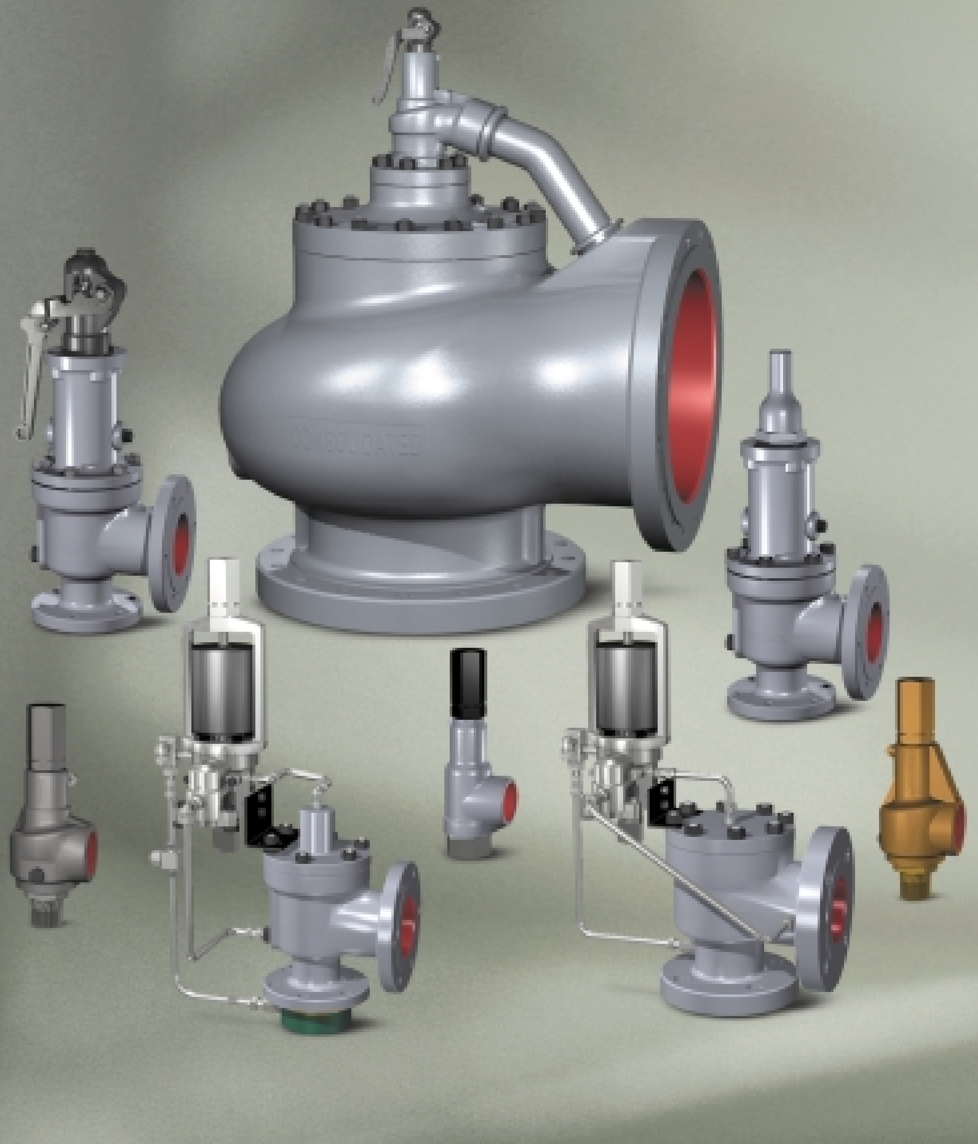
O-Ring Selection Tables - Media

Fluid	Nitrile	Ethylene Propylene	Fluorocarbon	Neoprene	Silicone	Teflon
Sulfur			X	X		X
Sulfur chloride			X			X
Sulfur dioxide		X			X	X
Sulfuric acid to 158°F	X	X	X	X	X	X
Sulfurous acid	X	X	X	X		X
Sulfur trioxide, dry		X	X	X	X	X
Tar, bituminous	X	X	X	X	X	X
Tartaric acid	X	X	X	X	X	X
Terpineol	X		X			X
Tertiary butyl alcohol	X	X	X	X	X	X
P-tertiary butyl catechol		X	X	X		X
Tertiary butyl mercaptan			X			X
Tetrabromoethane			X			X
Tetrabutyl titaniate	X	X	X	X		X
Tetrachoroethane			X			X
Tetrachloroethylene			X			X
Tetrahydrofuran		X				X
Tetralin			X			X
Therminol VP-1, 44, 55, 60, 66			X			X
Toluene			X			X
Toluene diisocyanate		X				X
Triacetin	X	X		X		X
Triaryl phosphate		X	X			X
Tributoxyethyl phosphate		X	X			X
Tributyl mercaptan			X			X
Tributyl phosphate		X				X
Trichloroacetic acid	X	X				X
Trichloroethane			X			X
Trichloroethylene			X			X
Tricresyl phosphate		X	X			X
Triethanol amine		X		X		X
Trifluoroethane			X			X
Trioctyl phosphate		X	X			X
Tripoly phosphate		X	X			X
Tung oil, china wood oil	X		X	X		X
Turpentine	X		X			X
Varnish	X		X			X
Vegetable oil	X		X			X
Vinegar	X	X		X		X
Water	X	X	X	X	X	X
Whiskey and wines	X	X	X	X	X	X
Xylene			X			X
Xylol			X			X
Xenon	X	X	X	X	X	X
Zinc acetate	X	X		X		X
Zinc chloride	X	X	X	X		X
Zinc salts	X	X	X	X	X	X
Zinc sulfate	X	X	X	X	X	X

In-house Review

Valve Sizing

Safety Relief Valve



Consolidated®

Table of Contents

Introduction

API Sizing

API establishes rules for sizing of pressure relief devices in the standard API RP 520. This recommended practice addresses only flanged spring loaded and pilot operated safety relief valves with a D - T orifice. Valves smaller or larger than those with a D - T orifice are not addressed by API RP 520.

The API rules are generic for pressure relief devices, and API recognizes that Manufacturers of pressure relief devices may have criteria such as discharge coefficients and correction factors that differ from those listed in API RP 520. The API RP 520 equations and rules are intended for the estimation of pressure relief device requirements only. Final selection of the pressure relief device is accomplished by using the Manufacturer's specific parameters, which are based on actual testing. The data given in this catalog is specific for **Consolidated** valves.

It is traditional to size and select pressure relief valves specified per API RP 526 for gas, vapor and steam applications using the API RP 520 K_d value of 0.975 and the effective areas of API RP 526. Although the API K_d values exceed the ASME certified K values, the ASME certified areas exceed the effective areas of API RP 526 with the product of the ASME certified K and area exceeding the product of the API RP 520 K_d and API RP 526 effective areas. This allows selection of a **Consolidated** valve series using the API K_d and area while still maintaining compliance with ASME flow certification.

The **Consolidated** 2900 series is a hybrid of the 1900 and 3900 series. The 2900 series meets the dimension requirements for spring loaded valves and the effective areas for both spring loaded and pilot actuated valves per API RP 526. Although the 2900 is not a true API RP 526 pressure relief valve, it may be used as a replacement for API RP 526 spring loaded pressure relief valves.

Flow Coefficient K (Coefficient of Discharge)

The K value has been established at the time valves are certified by ASME and are published for all ASME certified valves in “Pressure Relief Device Certifications” by the National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, Ohio 43229.

Relating to sizing, API RP 526 details an effective discharge area. The sizing formulas listed on page VS.5 are in agreement with those published in API RP 520 for determining the required **Consolidated** valve series. On page VS.7, the equations of page VS.6 are modified to metric units with a units conversion factor K_U. The information listed in Tables 6-8 describing “API Standard Orifice Area” is in accordance with those listed in API RP 526.

Consolidated has elected to use its actual bellows back pressure correction factor for sizing and selection of the appropriate **Consolidated** valve series per API recommendations for using the Manufacturer’s actual parameters. **Consolidated** has elected to use the ASME certified liquid K_d of 0.744 for types 1900 and 2900; and 0.825 is used for type 3900 instead of the API recommended K_d of 0.65, as the ASME certified coefficient pre-dates the API recommended value.

ASME Capacity Calculation

ASME codes establish the certified relieving capacities and corresponding media, which must be stamped on the valve name plates.

Computer Sizing Program Information

Dresser Measurement has a computer sizing program which performs sizing and selection functions. Additionally, it will select materials, configure the complete value and provide a data sheet with a certified drawing including dimensions, weights, and materials.

NOTE: “USCS” indicates the U.S. Customary System Designation, which is similar to English Units.

Formula Symbols

Prior to sizing Safety Relief Valves, the user should understand the symbols used in the sizing and capacity calculation formulas.

A_c	The safety relief valve area required to prevent the vessel or system pressure from exceeding prescribed limits above the vessel or system MAWP. The units used are USCS (in^2) and metric (mm^2).
C	Dimensionless, whole number value determined from an expression of the ratio of specific heats of the gas or vapor (see Tables 4 and 5).
K	Flow Coefficient (K_d x 0.9). Dimensionless ratio of the constant pressure specific heat C_p to the constant volume specific heat C_V. Select the value based on valve type and type of media (refer to sizing formulas for proper values.
K_b	Dimensionless value used to correct for the reduction in the safety relief valve capacity due to the effects of back pressure on conventional and balanced bellows valves. See Figure 3 for balanced bellows valve corrections and Figure 2 for non-bellows valves. Types 1900-30D-1 and E-1 are unbalanced bellows valves and should not be used for any back pressure applications.
K_c	Pressure relief valve - rupture disk combination capacity factor.
K_d	Dimensionless value relating the actual vs. theoretical safety relief valve flow rate.
K_{sh}	Dimensionless value to correct for superheated system. For saturated steam K_{sh} = 1.0 (refer to Table 12.)
K_v	Dimensionless value used to correct for the reduction in the safety relief valve capacity due to viscosity effects for liquid applications (see Figure 4.)
K_u	Dimensionless factor used to adjust for the type of units used in the sizing equation.
K_w	Dimensionless value used to correct for the reduction in the safety relief valve capacity due to back pressure for balanced bellows valves (only when used on liquid applications, see Figure 3.) Types 1900-30D-1 and E-1 are unbalanced bellows valves and should not be used for any back pressure applications (no correction for liquid conventional valves.)
MW	Molecular Weight of the gas or vapor. This value should be obtained from process data (refer to Table 5.)
MAWP	Maximum Allowable Working Pressure
P	The set pressure of the safety relief valve in gauge pressure units.
P_b	The pressure at the outlet of the valve in gauge pressure units. This value is coincident with the rated flowing pressure value.
	The rated flowing pressure at the inlet of the safety relief valve in absolute pressure units (psia). This value is the stamped set pressure of the safety relief valve plus the overpressure plus the atmospheric pressure. Refer to the section “Set Pressure and Overpressure Relationships for Sizing”.
P_2	The pressure at the outlet of the valve in absolute pressure units (psia). This value is coincident with the rated flowing pressure value.
Q	Capacity in volume per time units.
R	Reynolds number. A dimensionless number used in obtaining the viscosity correction factor K_V.
ρ	Density of gas or vapor: ρ, for vapors = (SG) x (Density of Air) ρ, for liquids = (SG) x (Density of Water) Density of Air = 0.0763 lb/ft^3 at 14.7 psia, and 60°F (USCS) Density of Air = 1.2932 kg/m^3 at 760 mm Hg and 0°C (metric) Density of Water = 62.305 lb/ft^3 at 70°F (USCS) Density of Water = 998 kg/m^3 at 20°C (metric)
SG	Specific Gravity. A dimensionless number that relates the densities of a fluid to that of a standard fluid. The value of SG is 1.0 for the following standard conditions: Liquid Standard: Water at 70°F (USCS) Water at 20°C (metric) Gas Standard: Air at 14.696 psia and 60°F (USCS) Air at 760 mm Hg and 0°C (metric)
T	The temperature at the inlet of the valve in absolute temperature units. This value is coincident with the rated flowing pressure value, for example °F + 460.
W	Capacity in Mass Per Time Units.
Z	Compressibility factor for gas or vapor. If unknown, use Z=1.
K_n	Napier Factor. A dimensionless correction factor to the Napier steam flow equation used only for steam and only in the range of P_1 = 1580 to 3208 psia flowing pressure. Calculate K_n from the equation: $K_n = \frac{0.1906P_1 - 1000}{0.2292P_1 - 1061}$ If P is 1423 psig or less, K_n = 1.0. If P is more than 1423 psig, up to and including 3223 psig, K_n is calculated. Note that P_1 is the flowing pressure and is in absolute pressure units.

Set Pressure and Overpressure Relationships for Sizing

Set pressure and overpressure requirements vary with the installation and application of the pressure relief valve(s). The installation may require one or more pressure relief valves per ASME Section VIII and API RP 520. The application will require the pressure relief valve(s) to provide overpressure protection caused by non-fire or fire-related events.

In all cases the overpressure of the pressure relief valve will be the difference between the accumulation of the system and the pressure relief valve's set pressure. In determining the required pressure relief valve orifice area, the flowing pressure value (P_1) will be set equal to the system accumulation value.

Single Valve Installations

Used when only one pressure relief valve is required for system overpressure protection.

1) If the overpressure is not due to a fire exposure event:
   a) The set pressure may be equal to or less than the MAWP of the protected system.
   b) The accumulation of the system must not exceed the larger of 3 psi or 10% above the MAWP (see Table 1.)
2) If the overpressure is due to a fire exposure event on a vessel:
   a) The set pressure may be equal to or less than the MAWP of the protected system.
   b) The accumulation of the system must not exceed 21% above MAWP (see Table 2.)

Multiple Valve Installations

Applies when more than one pressure relief valve is required for system overpressure protection.

1) If the overpressure is not due to a fire exposure event:
   a) The set pressure of at least one valve must be equal to or less than the MAWP of the protected system. The set pressure of any of the remaining valve(s) must not exceed 1.05 times the MAWP.
   b) The accumulation of the system must not exceed the larger of 4 psi or 16% above the MAWP (see Table 3.)
2) If the overpressure is due to a fire exposure event on a vessel:
   a) The set pressure of at least one valve must be equal to or less than the MAWP of the protected system. The set pressure of any of the remaining valve(s) must not exceed 1.10 times the MAWP.
   b) The accumulation of the system must not exceed 21% above MAWP (see Table 2.)

Set Pressure and Overpressure Relationships for Sizing

Table 1 - Flowing Pressure for Single Valve Installations

MAWP of 15 psig to 30 psig	P_1 = MAWP + 3 + 14.7
MAWP of 1.02 barg up to and including 2.06 barg	P_1 = MAWP + 0.206 + 1.01
MAWP of 1.05 kg/cm^{2}g up to and including 2.11 kg/cm^{2}g	P_1 = MAWP + 0.211 + 1.03
MAWP higher than 30 psig	P_1 = 1.1(MAWP) + 14.7
MAWP higher than 2.06 barg	P_1 = 1.1(MAWP) + 1.01
MAWP higher than 2.11 kg/cm^{2}g	P_1 = 1.1(MAWP) + 1.03

Table 2 - Flowing Pressure for FireSizing

MAWP higher than 15 psig	P_1 = 1.21(MAWP) + 14.7
MAWP higher than 1.02 barg	P_1 = 1.21(MAWP) + 1.01
MAWP higher than 1.05 kg/cm^{2}g	P_1 = 1.21(MAWP) + 1.03

NOTE: Fire Sizing Situations do not apply to the 820000 Series valve.

Table 3 - Flowing Pressure for Multiple Valve Installations

MAWP of 15 psig to 25 psig	P_1 = MAWP + 4 + 14.7
MAWP of 1.02 barg up to and including 1.72 barg	P_1 = MAWP + 0.275 + 1.01
MAWP of 1.05 kg/cm^{2}g up to and including 1.75 kg/cm^{2}g	P_1 = MAWP + 0.281 + 1.03
MAWP higher than 25 psig	P_1 = 1.16(MAWP) + 14.7
MAWP higher than 1.72 barg	P_1 = 1.16(MAWP) + 1.01
MAWP higher than 1.75 kg/cm^{2}g	P_1 = 1.16(MAWP) + 1.03

API Sizing Formulas - USCS

API RP 520 Sizing Formulas
USCS Units

Refer to Tables 6 - 8 and select the next larger size above the A_c value calculated.

VAPORS OR GASES
Mass Flow Rate Sizing
(W = lb/hr)

$$A_c = \frac{W \sqrt{T} \sqrt{Z}}{C \; K \; P_1 \sqrt{M} \; K_b}$$

STEAM
Mass Flow Rate Sizing
(W = lb/hr)

$$A_c = \frac{W}{51.5 \; K \; P_1 \; K_b}$$

VAPORS OR GASES
Volumetric Flow Rate Sizing

(Q = Standard ft³/Min Flow Rate at 14.7 psia & 60°F)

$$A_c = \frac{60 \, Q \, p \sqrt{T} \sqrt{Z}}{C \; K \; P_1 \sqrt{M} \; K_b}$$

LIQUIDS
Certified Volumetric Flow Rate Sizing

(If Q = U.S. Gallons per minute, K_U = 38)
(If Q = Cubic feet per hour, K_U = 5.2143)

$$A_c = \frac{Q \sqrt{G}}{K_U \, K \sqrt{P_1 - P_2} \; K_v}$$

AIR
Volumetric Flow Rate Sizing

(Q = Standard ft³/min Flow Rate at 14.7 psia & 60°F)

$$A_c = \frac{60 \, Q \, (0.0763) \sqrt{T} \sqrt{Z}}{356 \; K \; P_1 \, (5.3824) \, K_b}$$

K_d Factors

Valve Series	Steam, Gas or Vapor K_d	Liquid K_d
1900	.975	.744
2900	.975	.744
3900	.975	.826

ASME Sizing Formulas - USCS

ASME Section VIII Sizing Formulas
USCS Units

Refer to Tables 6 - 11 and select the next larger size above the A_c value calculated.

VAPORS OR GASES
Mass Flow Rate Sizing
(W = lb/hr)

$$A_c = \frac{W \sqrt{T} \sqrt{Z}}{C\ K\ P_1 \sqrt{M}\ K_b}$$

STEAM
Mass Flow Rate Sizing
(W = lb/hr)

$$A_c = \frac{W}{51.5\ K\ P_1\ K_b}$$

VAPORS OR GASES
Volumetric Flow Rate Sizing

(Q = Standard ft^3/Min Flow Rate at 14.7 psia & 60°F)

$$A_c = \frac{60\ Q\ p \sqrt{T} \sqrt{Z}}{C\ K\ P_1 \sqrt{M}\ K_b}$$

LIQUIDS
Certified Volumetric Flow Rate Sizing

(If Q = U.S. Gallons per minute, K_U = 38)
(If Q = Cubic feet per hour, K_U = 5.2143)

$$A_c = \frac{Q \sqrt{G}}{K_U\ K \sqrt{P_1 - P_2}\ K_v}$$

AIR
Volumetric Flow Rate Sizing

(Q = Standard ft^3/Min Flow Rate at 14.7 psia & 60°F)

$$A_c = \frac{60\ Q\ (0.0763) \sqrt{T} \sqrt{Z}}{356\ K\ P_1\ (5.3824)\ K_b}$$

K Factors

Valve Series	Steam, Gas or Vapor K	Liquid K
1900	.855	.670
1982	.855	.758
2900	.855	.670
3900	.878	.743
13900 (all except 201 in^2)	.877	N/A
13900 (201 in^2 only)	.850	N/A
19000	.878	.673
820000	N/A	.743

ASME Sizing Formulas - Metric

ASME Section VIII Sizing Formulas
Metric Units

ASME permits metric unit stamping of name plates (ASME Code Case 2116).
Refer to Tables 6 - 11 and select the next larger size above the A_c value calculated.

VAPORS OR GASES
Mass Flow Rate Sizing
(W = kg/hr)

$$A_c = \frac{K_U\ W\ \sqrt{T}\ \sqrt{Z}}{C\ K\ P_1\ \sqrt{M}\ K_b}$$

If P_1 = bara, $K_u = 131.7$
If P_1 = kg/cm²a, $K_u = 134.26$

STEAM
Mass Flow Rate Sizing
(W = kg/hr)

$$A_c = \frac{W}{K_U\ K\ P_1\ K_b}$$

If P_1 = bara, $K_u = 0.5245$
If P_1 = kg/cm²a, $K_u = 0.5144$

VAPORS OR GASES
Volumetric Flow Rate Sizing

(Q = Normal m³/hr Flow Rate at 760 mm Hg at 0°F)

$$A_c = \frac{K_U\ Q\ p\ \sqrt{T}\ \sqrt{Z}}{C\ K\ P_1\ \sqrt{M}}$$

If P_1 = bara, $K_u = 131.7$
If P_1 = kg/cm²a, $K_u = 134.26$

LIQUIDS
Certified Volumetric Flow Rate Sizing

$$A_c = \frac{Q\ \sqrt{G}}{K_U\ K\ \sqrt{P_1 - P_2}\ K_v}$$

If P_1 & P_2 = bara and Q = liters/min, $K_u = 0.849$
If P_1 & P_2 = kg/cm²a and Q = liters/min, $K_u = 0.841$
If P_1 & P_2 = bara and Q = m³/hr, $K_u = 0.0509$
If P_1 & P_2 = kg/cm²a and Q = m³/hr, $K_u = 0.0504$

AIR
Volumetric Flow Rate Sizing

(Q = Normal m³/hr Flow Rate at 760 mm Hg at 0°C)

$$A_c = \frac{K_U\ Q\ (1.2932)\ \sqrt{T}\ \sqrt{Z}}{356\ K\ P_1\ (5.3824)\ K_b}$$

If P_1 = bara, $K_u = 131.71$
If P_1 = kg/cm²a, $K_u = 134.26$

K Factors

Valve Series	Steam, Gas or Vapor K	Liquid K
1900	.855	.670
1982	.855	.758
2900	.855	.670
3900	.878	.743
13900 (all except 201 in²)	.877	Not applicable
13900 (201 in² only)	.850	Not applicable
19000	.878	.673
820000	Not applicable	.743

Correction Factors

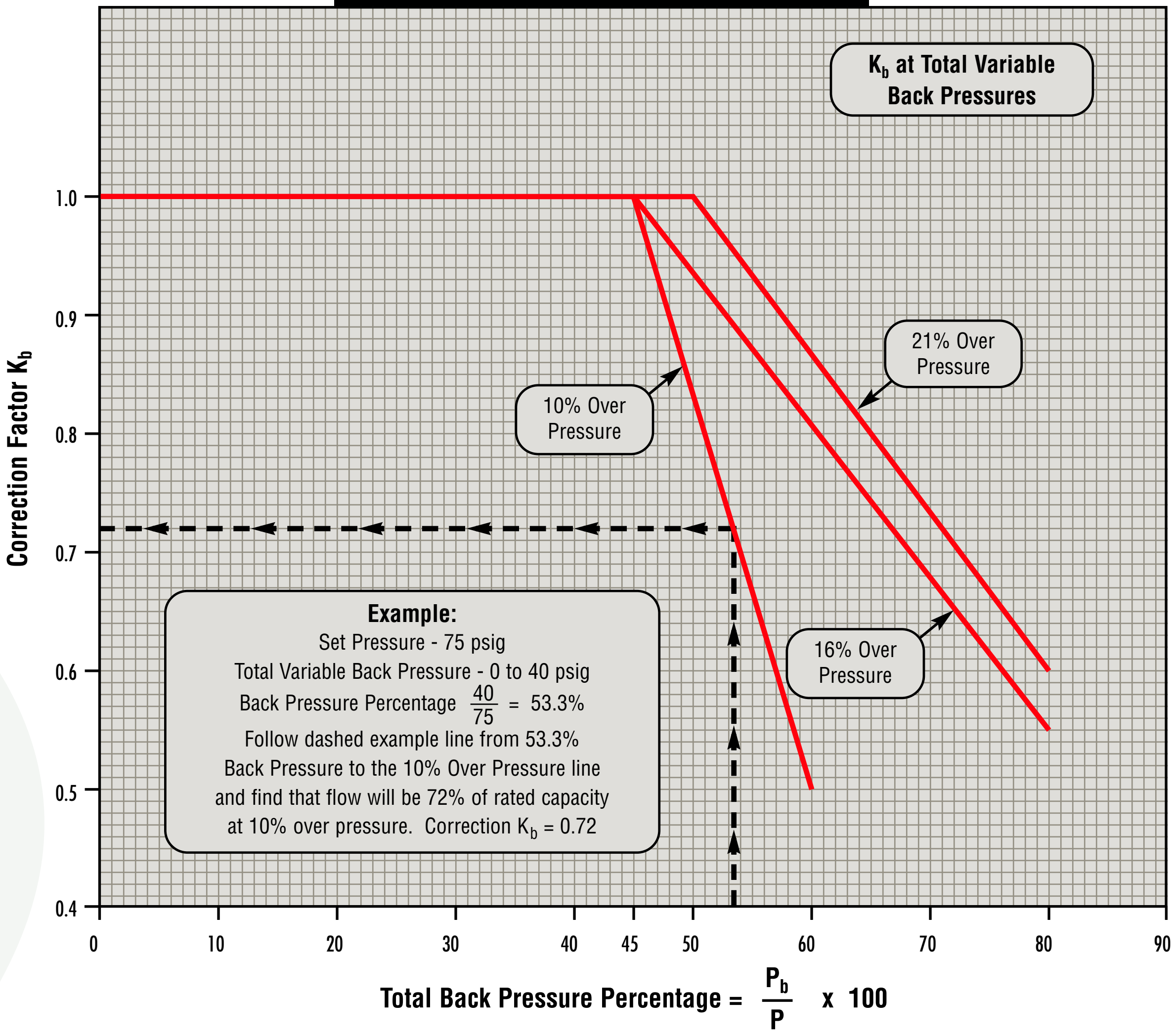


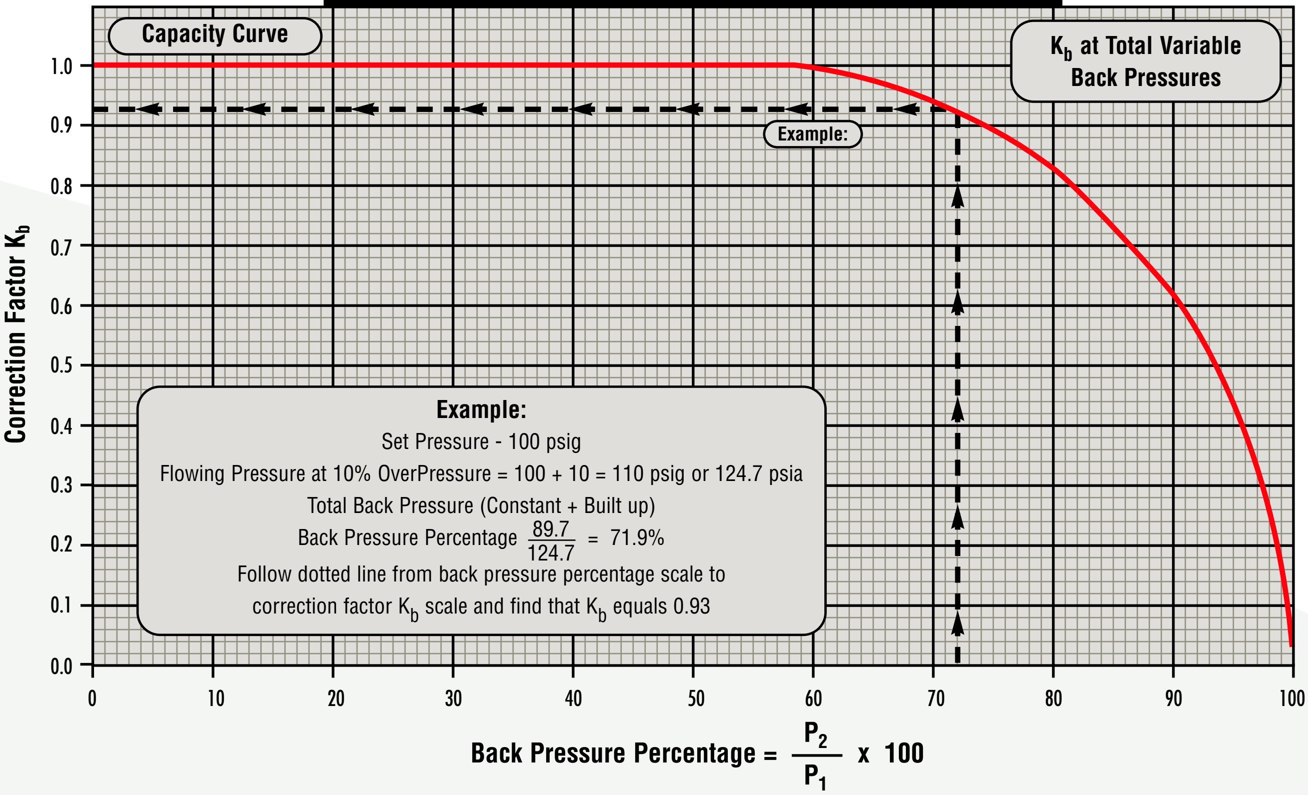
Figure 1 - 1900 Balanced Bellows Valves
Vapors & Gases - Correction Factor K_b

Example:
Set Pressure - 75 psig
Total Variable Back Pressure - 0 to 40 psig
Back Pressure Percentage $\frac{40}{75}$ = 53.3%
Follow dashed example line from 53.3%
Back Pressure to the 10% Over Pressure line
and find that flow will be 72% of rated capacity
at 10% over pressure. Correction K_b = 0.72

Correction Factors

Figure 2 - Non-Bellows Valves

Vapor or Gas Flow Curve at All Back Pressures, Correction Factor K_b



Example:

Set Pressure - 100 psig

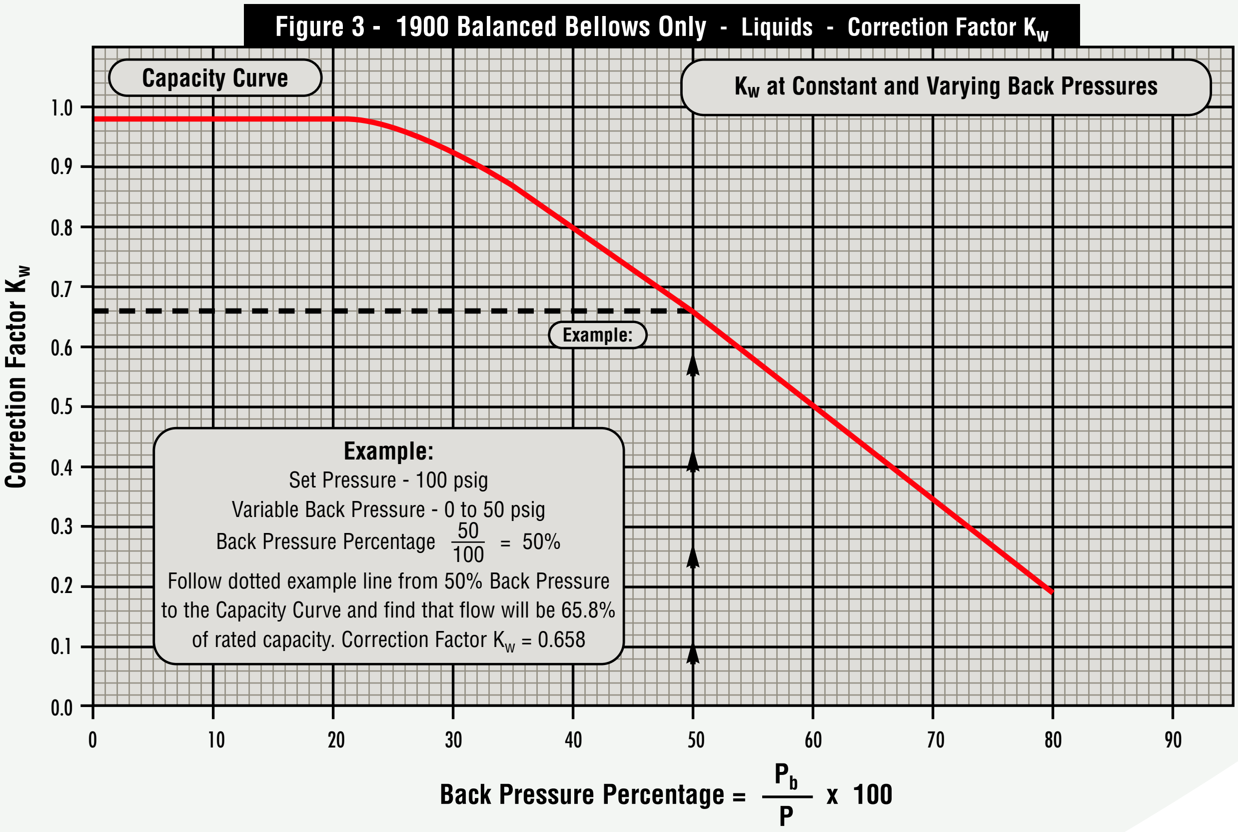
Flowing Pressure at 10% OverPressure = 100 + 10 = 110 psig or 124.7 psia

Total Back Pressure (Constant + Built up)

Back Pressure Percentage $\frac{89.7}{124.7}$ = 71.9%

Follow dotted line from back pressure percentage scale to correction factor K_b scale and find that K_b equals 0.93

Figure 3 - 1900 Balanced Bellows Only - Liquids - Correction Factor K_w



Example:

Set Pressure - 100 psig

Variable Back Pressure - 0 to 50 psig

Back Pressure Percentage $\frac{50}{100}$ = 50%

Follow dotted example line from 50% Back Pressure to the Capacity Curve and find that flow will be 65.8% of rated capacity. Correction Factor K_w = 0.658

Correction Factors

When using the following method, it is suggested that the safety relief valve be sized first with available application data in order to obtain a preliminary required discharge area (A_c). From the standard orifice sizes, the next larger orifice size should be used in determining the Reynolds number (R) from either of the following relationships:

$$R = \frac{Q\,(2{,}800)\,G}{Cp\ \sqrt{A}}$$

OR

$$R = \frac{12{,}700 \times Q}{SSU \times \sqrt{A}}$$

Where:

Q = actual flow rate at the flowing temperature (U.S. gallons per minute)

SG = specific gravity of the liquid at the flowing temperature referred to water = 1.00 at 70°F

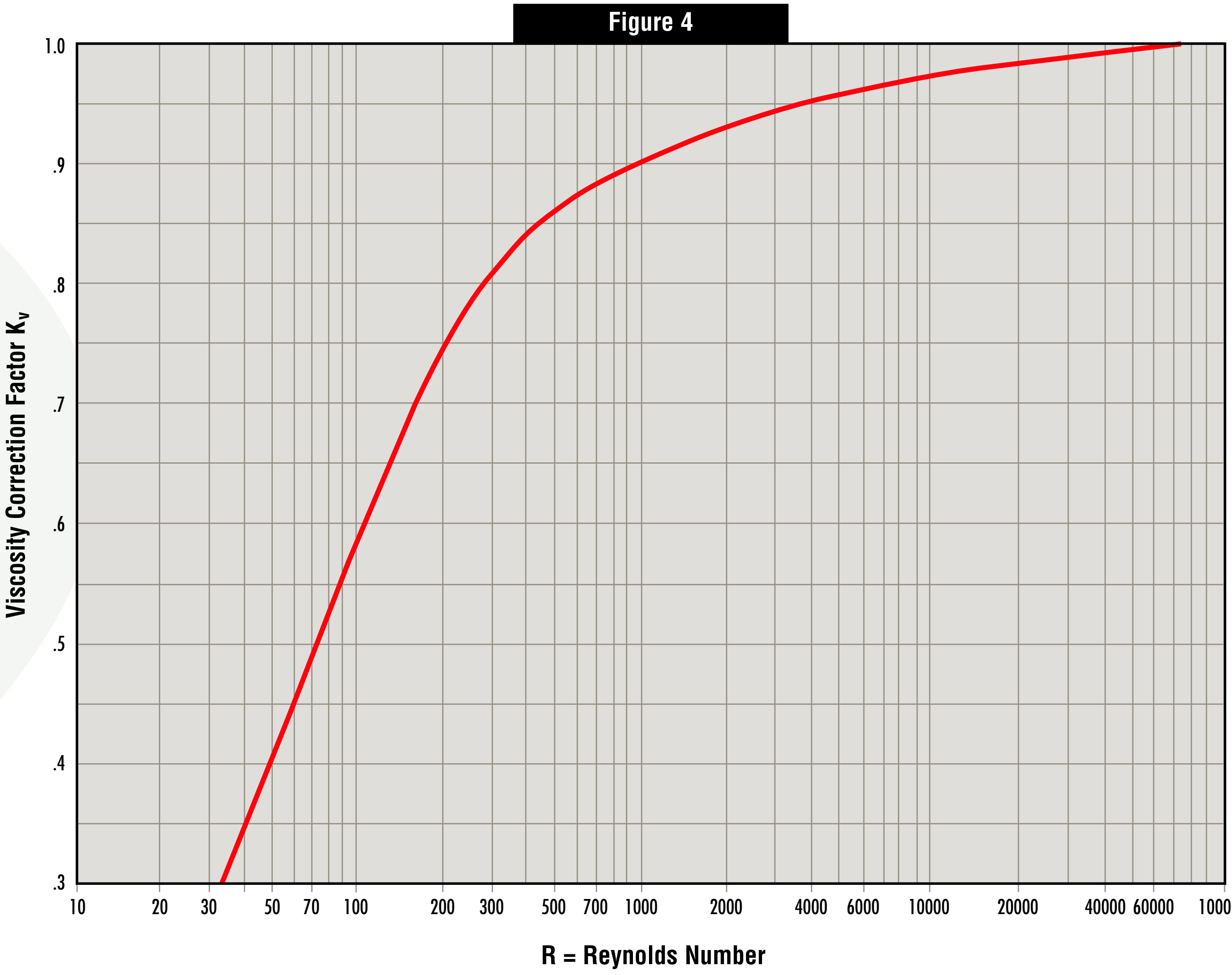
Cp = absolute viscosity at the flowing temperature (in centipoises)

A = valve orifice discharge area (square inches)

SSU = Saybolt Seconds Universal (viscosity at the flowing temperature)

After the value of R is determined, the factor K_v is obtained from Figure 4. Factor K_v is applied to correct the "preliminary required discharge area." If the corrected area exceeds the "chosen standard orifice area", the above calculations should be repeated using the next larger standard orifice size.

Figure 4



Fluid Properties

Table 4 - Gas Constant C

k	C	k	C	k	C
0.50	238	1.02	318	1.52	366
0.52	242	1.04	320	1.54	368
0.54	246	1.06	322	1.56	369
0.56	250	1.08	325	1.58	371
0.58	254	1.10	327	1.60	373
0.60	257	1.12	329	1.62	374
0.62	261	1.14	331	1.64	376
0.64	264	1.16	333	1.66	377
0.66	268	1.18	335	1.68	379
0.68	271	1.20	337	1.70	380
0.70	274	1.22	339	1.72	382
0.72	277	1.24	341	1.74	383
0.74	280	1.26	343	1.76	384
0.76	283	1.28	345	1.78	386
0.78	286	1.30	347	1.80	387
0.80	289	1.32	349	1.82	389
0.82	292	1.34	351	1.84	390
0.84	295	1.36	353	1.86	391
0.86	297	1.38	354	1.88	393
0.88	300	1.40	356	1.90	394
0.90	303	1.42	358	1.92	395
0.92	305	1.44	360	1.94	397
0.94	308	1.46	361	1.96	398
0.96	310	1.48	363	1.98	399
0.98	313	1.50	365	2.00	400
1.01	317				

The relationship of “k” and “C” are expressed by the equation:

$$C = 520 \sqrt{k \left(\frac{2}{k+1}\right) \frac{k+1}{k-1}}$$

Fluid Properties

Table 5 - Constant and Capacity Conversion Factors for Common Fluids

	GAS & VAPOR PHASE			LIQUID PHASE			
FLUID	k*	MW	G* AIR = 1	G WATER = 1	G TEMP °F	BOILING POINT* °F	CRITICAL TEMP °F
Acetaldehyde	1.14	44.05	1.521	0.783	64	68	370
Acetic Acid	1.15	60.05	2.073	1.049	68	245	611
Acetone	-	-	-	0.791	68	133	455
Acetylene	1.26	26.04	0.899	-	-	-119	97
Air	1.40	28.97	1.00	-	-	-	-222
Ammonia	1.33	17.03	0.588	0.817	-110	-27	270
Argon	1.67	39.94	1.388	1.65	-387	-301	-188
Benzene	1.12	78.11	2.696	0.879	68	176	551
Butadiene 1,3	1.12	54.09	1.867	0.621	68	24	306
Butane N-	1.094	58.12	2.006	0.579	68	31	307
Butane ISO-	1.094	58.12	2.006	0.557	68	11	273
Carbon Dioxide	1.30	44.01	1.519	1.101	-35	SUBL.	88
Carbon Disulfide	1.21	76.13	2.628	1.263	68	116	523
Carbon Monoxide	1.40	28.00	0.966	0.814	-318	-314	-218
Chlorine	1.36	70.90	2.45	1.58	-29	-30	291
Cyclohexane	1.09	84.16	2.905	0.779	69	177	538
Ethane	1.22	30.07	1.04	0.546	-126	-127	90
Ethyl Alcohol	1.13	46.07	1.59	0.789	68	173	469
Ethyl Chloride	1.19	64.52	2.227	0.903	50	54	369
Ethylene (Ethene)	1.26	28.05	0.968	0.566	-152	-155	49
Helium	1.66	4.00	0.138	-	-	-452	-450
N-Hexane	1.06	86.17	2.974	0.659	68	156	454
Hydrogen Chloride	1.41	36.50	1.26	-	-	-118	124
Hydrogen	1.41	2.016	0.069	0.0709	-423	-423	-400
Hydrogen Sulfide	1.32	34.07	1.176	-	-	-76	213
Kerosene	-	-	-	0.815	60	-	-
Methane	1.31	16.04	0.554	0.415	-263	-258	-116
Methyl Alcohol	1.20	32.04	1.11	0.792	68	149	464
Methyl Butane	1.08	72.15	2.49	0.625	60	82	370
Methyl Chloride	1.20	50.49	1.743	0.952	32	-11	290
Natural Gas (typical)	1.27	19.00	0.656	-	-	-	-
Nitric Acid (HNO_3)	-	-	-	1.502	60	187	-
Nitric Oxide	1.40	30.00	1.0036	1.269	-239	-240	-137
Nitrogen	1.40	28.00	0.967	1.026	-422	-321	-233
Nitrous Oxide	1.30	44.00	1.519	1.226	-128	-131	98
Oxygen	1.40	32.00	1.104	1.426	-422	-297	-182
N-Pentane	1.07	72.15	2.49	0.631	60	97	386
Propane	1.13	44.09	1.522	0.585	-49	-44	206
Propylene	1.15	42.08	1.453	0.609	-53	-54	197
Styrene	1.07	104.14	3.60	0.906	68	293	706
Sulfur Dioxide	1.29	64.06	2.21	1.434	32	14	315

* Value at 14.7 pounds per square inch, absolute.

API Standard Orifice Areas - 1900

Table 6 - 1900 Series (USCS)

(A_c) API Effective Orifice Area (In^2)	Orifice Letter Size **	(A_c) ASME and Actual Orifice Area (In^2)	API Set Pressure Range (psig)	Available Set Pressure Range (psig)
0.110	D	0.1279	5 - 6000	5 - 6250
0.196	E	0.2279	5 - 6000	5 - 6250
0.307	F	0.3568	5 - 5000	5 - 6250
0.503	G	0.5849	4 - 3705	4 - 5000
0.785	H	0.9127	4 - 2750	4 - 3418
1.287	J	1.4960	5 - 2700	5 - 2700
1.838	K	2.1380	5 - 2200	5 - 2540
2.853	L	3.3170	5 - 1500	5 - 2200
3.600	M	4.1860	5 - 1100	5 - 1600
4.340	N	5.0470	6 - 1100	6 - 1600
6.380	P	7.4170	7 - 1000	7 - 1600
11.050	Q	12.8500	7 - 600	7 - 900
16.000	R	18.6000	7 - 300	7 - 650
26.000	T	30.2100*	9 - 300	9 - 300
N/A	V	50.26	N/A	15 - 300
N/A	W	78.996	N/A	15 - 300

* Prior to 1999 this area was 28.62 in^2. Consult factory for clarification.

** V and W orifices should be sized using ASME formula and orifice area.

API Standard Orifice Areas - 2900

Table 7 - 2900 Series (USCS)

(A_c) API Effective Orifice Area (in²)	Orifice Letter Size *	(A_c) ASME and Actual Orifice Area (in²)	API Set Pressure Range (psig)	Available Set Pressure Range (psig)
0.110	D	0.1279	5 - 6000	5 - 3750
0.196	E	0.2279	5 - 6000	5 - 3750
0.307	F	0.3568	5 - 5000	5 - 3750
0.503	G	0.5849	4 - 3705	4 - 3750
0.785	H	0.9127	4 - 2750	4 - 3750
1.287	J	1.4960	5 - 2700	5 - 3750
1.838	K	2.1380	5 - 2200	5 - 3750
2.853	L	3.3170	5 - 1500	5 - 3750
3.600	M	4.1860	5 - 1100	5 - 2250
4.340	N	5.0470	6 - 1100	6 - 2250
6.380	P	7.4170	7 - 1000	7 - 2250
11.050	Q	12.8500	7 - 600	7 - 1500
16.000	R	18.6000	7 - 300	7 - 1500
26.000	T	30.2100	9 - 300	9 - 1500
N/A	V	50.26	N/A	15 - 675
N/A	W	78.996	N/A	15 - 385

* V and W orifices should be sized using ASME formula and orifice area.

API Standard Orifice Areas - 3900

Table 8 - 3900 Series (USCS)

(A_c) API Effective Orifice Area (in^2)	Orifice Letter Size	(A_c) ASME and Actual Orifice Area (in^2)	API Set Pressure Range (psig)	Available Set Pressure Range (psig)
0.110	D	0.1279	5 - 3705	5 - 3750
0.196	E	0.2279	5 - 3705	5 - 3750
0.307	F	0.3568	5 - 3705	5 - 3750
0.503	G	0.5849	4 - 3705	4 - 3750
0.785	H	0.9127	4 - 2750	4 - 3418
1.287	J	1.4960	5 - 2700	5 - 2700
1.838	K	2.1380	5 - 2200	5 - 2540
2.853	L	3.3170	5 - 1500	5 - 2200
3.600	M	4.1860	5 - 1100	5 - 1600
4.340	N	5.0470	6 - 1100	6 - 1600
6.380	P	7.4170	7 - 1000	7 - 1600
11.050	Q	12.8500	7 - 600	7 - 900
16.000	R	18.6000	7 - 300	7 - 650
26.000	T	30.2100*	9 - 300	9 - 300

* Prior to 1999 this area was 28.62 in^2. Consult factory for clarification.

API Standard Orifice Areas - 19000

Table 9 - 19000 Series (USCS)

Inlet Size (in)	Model Number	(A_c) Actual (ASME) Orifice Area (in^2)	Set Pressure Range (psig)
1/2, 3/4, 1	19096L	.096	5 - 290
1/2, 3/4, 1	19110L	.110	5 - 290
3/4, 1	19126L	.126	5 - 290
1	19226L	.226	5 - 290
1-1/2	19357L	.357	5 - 290
2	19567L	.567	5 - 290
1/2, 3/4, 1	19096M	.096	291 - 2000
3/4, 1	19126M	.126	291 - 2000
1	19226M	.226	291 - 2000
1-1/2	19357M	.357	291 - 1500
2	19567M	.567	291 - 1500
3/4	19096H	.096	2001 - 5000
3/4	19126H	.126	2001 - 8000
1	19226H	.226	2001 - 6400

API Standard Orifice Areas
1982, 820000, and 13900

Table 10 - 1982 & 820000 Series (USCS)

Inlet Size (in)	(A_c) Actual (ASME) Orifice Area (in^2)	Set Pressure Range (psig)
1/2	0.121	10 - 500
3/4	0.216	10 - 500
1	0.332	10 - 500
1-1/2	0.857	10 - 500

Table 11 - 13900 Series (USCS)

Inlet Size (in)	(A_c) Actual (ASME) Orifice Area (in^2)	Set Pressure Range (psig)
16	114.0	15 - 300
18	143.1	15 - 300
20	176.7	15 - 300
22	201.0	15 - 300

Superheat Correction Factors

Table 12 - Superheat Correction Factor K_{sh}

Flowing Press. (psia)	Superheat Correction Factor K_{sh}, Total Temperature in °F of Superheated Steam																
	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200
50	0.987	0.957	0.930	0.905	0.882	0.861	0.841	0.823	0.805	0.789	0.774	0.759	0.745	0.732	0.719	0.708	0.696
100	0.998	0.963	0.935	0.909	0.885	0.864	0.843	0.825	0.807	0.790	0.775	0.760	0.746	0.733	0.720	0.708	0.697
150	0.984	0.970	0.940	0.913	0.888	0.866	0.846	0.826	0.808	0.792	0.776	0.761	0.747	0.733	0.721	0.709	0.697
200	0.979	0.977	0.945	0.917	0.892	0.869	0.848	0.828	0.810	0.793	0.777	0.762	0.748	0.734	0.721	0.709	0.698
250	-	0.972	0.951	0.921	0.895	0.871	0.850	0.830	0.812	0.794	0.778	0.763	0.749	0.735	0.722	0.710	0.698
300	-	0.968	0.957	0.926	0.898	0.874	0.852	0.832	0.813	0.796	0.780	0.764	0.750	0.736	0.723	0.710	0.699
350	-	0.968	0.963	0.930	0.902	0.877	0.854	0.834	0.815	0.797	0.781	0.765	0.750	0.736	0.723	0.711	0.699
400	-	-	0.963	0.935	0.906	0.880	0.857	0.836	0.816	0.798	0.782	0.766	0.751	0.737	0.724	0.712	0.700
450	-	-	0.961	0.940	0.909	0.883	0.859	0.838	0.818	0.800	0.783	0.767	0.752	0.738	0.725	0.712	0.700
500	-	-	0.961	0.946	0.914	0.886	0.862	0.840	0.820	0.801	0.784	0.768	0.753	0.739	0.725	0.713	0.701
550	-	-	0.962	0.952	0.918	0.889	0.864	0.842	0.822	0.803	0.785	0.769	0.754	0.740	0.726	0.713	0.701
600	-	-	0.964	0.958	0.922	0.892	0.867	0.844	0.823	0.804	0.787	0.770	0.755	0.740	0.727	0.714	0.702
650	-	-	0.968	0.958	0.927	0.896	0.869	0.846	0.825	0.806	0.788	0.771	0.756	0.741	0.728	0.715	0.702
700	-	-	-	0.958	0.931	0.899	0.872	0.848	0.827	0.807	0.789	0.772	0.757	0.742	0.728	0.715	0.703
750	-	-	-	0.958	0.936	0.903	0.875	0.850	0.828	0.809	0.790	0.774	0.758	0.743	0.729	0.716	0.703
800	-	-	-	0.960	0.942	0.906	0.878	0.852	0.830	0.810	0.792	0.774	0.759	0.744	0.730	0.716	0.704
850	-	-	-	0.962	0.947	0.910	0.880	0.855	0.832	0.812	0.793	0.776	0.760	0.744	0.730	0.717	0.704
900	-	-	-	0.965	0.953	0.914	0.883	0.857	0.834	0.813	0.794	0.777	0.760	0.745	0.731	0.718	0.705
950	-	-	-	0.969	0.958	0.918	0.886	0.860	0.836	0.815	0.796	0.778	0.761	0.746	0.732	0.718	0.705
1000	-	-	-	0.974	0.959	0.923	0.890	0.862	0.838	0.816	0.797	0.779	0.762	0.747	0.732	0.719	0.706
1050	-	-	-	-	0.960	0.927	0.893	0.864	0.840	0.818	0.798	0.780	0.763	0.748	0.733	0.719	0.707
1100	-	-	-	-	0.962	0.931	0.896	0.867	0.842	0.820	0.800	0.781	0.764	0.749	0.734	0.720	0.707
1150	-	-	-	-	0.964	0.936	0.899	0.870	0.844	0.821	0.801	0.782	0.765	0.749	0.735	0.721	0.708
1200	-	-	-	-	0.966	0.941	0.903	0.872	0.846	0.823	0.802	0.784	0.766	0.750	0.735	0.721	0.708
1250	-	-	-	-	0.969	0.946	0.906	0.875	0.848	0.825	0.804	0.785	0.767	0.751	0.736	0.722	0.709
1300	-	-	-	-	0.973	0.952	0.910	0.878	0.850	0.826	0.805	0.786	0.768	0.752	0.737	0.723	0.709
1350	-	-	-	-	0.977	0.958	0.914	0.880	0.852	0.828	0.807	0.787	0.769	0.753	0.737	0.723	0.710
1400	-	-	-	-	0.982	0.963	0.918	0.883	0.854	0.830	0.808	0.788	0.770	0.754	0.738	0.724	0.710
1450	-	-	-	-	0.987	0.968	0.922	0.886	0.857	0.832	0.809	0.790	0.771	0.754	0.739	0.724	0.711
1500	-	-	-	-	0.993	0.970	0.926	0.889	0.859	0.833	0.811	0.791	0.772	0.755	0.740	0.725	0.711
1550	-	-	-	-	-	0.972	0.930	0.892	0.861	0.835	0.812	0.792	0.773	0.756	0.740	0.726	0.712
1600	-	-	-	-	-	0.973	0.934	0.894	0.863	0.836	0.813	0.792	0.774	0.756	0.740	0.726	0.712
1650	-	-	-	-	-	0.973	0.936	0.895	0.863	0.836	0.812	0.791	0.772	0.755	0.739	0.724	0.710
1700	-	-	-	-	-	0.973	0.938	0.895	0.863	0.835	0.811	0.790	0.771	0.754	0.738	0.723	0.709
1750	-	-	-	-	-	0.974	0.940	0.896	0.862	0.835	0.810	0.789	0.770	0.752	0.736	0.721	0.707

Superheat Correction Factors

Table 12 - Superheat Correction Factor K_{sh}

Flowing Press. (psia)	Superheat Correction Factor K_{sh}, Total Temperature in °F of Superheated Steam																
	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200
1800	-	-	-	-	-	0.975	0.942	0.897	0.862	0.834	0.810	0.788	0.768	0.751	0.735	0.720	0.705
1850	-	-	-	-	-	0.976	0.944	0.897	0.862	0.833	0.809	0.787	0.767	0.749	0.733	0.718	0.704
1900	-	-	-	-	-	0.977	0.946	0.898	0.862	0.832	0.807	0.785	0.766	0.748	0.731	0.716	0.702
1950	-	-	-	-	-	0.979	0.949	0.898	0.861	0.832	0.806	0.784	0.764	0.746	0.729	0.714	0.700
2000	-	-	-	-	-	0.982	0.952	0.899	0.861	0.831	0.805	0.782	0.762	0.744	0.728	0.712	0.698
2050	-	-	-	-	-	0.985	0.954	0.899	0.860	0.830	0.804	0.781	0.761	0.742	0.726	0.710	0.696
2100	-	-	-	-	-	0.988	0.956	0.900	0.860	0.828	0.802	0.779	0.759	0.740	0.724	0.708	0.694
2150	-	-	-	-	-	-	0.956	0.900	0.859	0.827	0.801	0.778	0.757	0.738	0.722	0.706	0.692
2200	-	-	-	-	-	-	0.955	0.901	0.859	0.826	0.799	0.776	0.755	0.736	0.720	0.704	0.690
2250	-	-	-	-	-	-	0.954	0.901	0.858	0.825	0.797	0.774	0.753	0.734	0.717	0.702	0.687
2300	-	-	-	-	-	-	0.953	0.901	0.857	0.823	0.795	0.772	0.751	0.732	0.715	0.699	0.685
2350	-	-	-	-	-	-	0.952	0.902	0.856	0.822	0.794	0.769	0.748	0.729	0.712	0.697	0.682
2400	-	-	-	-	-	-	0.952	0.902	0.855	0.820	0.791	0.767	0.746	0.727	0.710	0.694	0.679
2450	-	-	-	-	-	-	0.951	0.902	0.854	0.818	0.789	0.765	0.743	0.724	0.707	0.691	0.677
2500	-	-	-	-	-	-	0.951	0.902	0.852	0.816	0.787	0.762	0.740	0.721	0.704	0.688	0.674
2550	-	-	-	-	-	-	0.951	0.902	0.851	0.814	0.784	0.759	0.738	0.718	0.701	0.685	0.671
2600	-	-	-	-	-	-	0.951	0.903	0.849	0.812	0.782	0.756	0.735	0.715	0.698	0.682	0.664
2650	-	-	-	-	-	-	0.952	0.903	0.848	0.809	0.779	0.754	0.731	0.712	0.695	0.679	0.664
2700	-	-	-	-	-	-	0.952	0.903	0.846	0.807	0.776	0.750	0.728	0.708	0.691	0.675	0.661
2750	-	-	-	-	-	-	0.953	0.903	0.844	0.804	0.773	0.747	0.724	0.705	0.687	0.671	0.657
2800	-	-	-	-	-	-	0.956	0.903	0.842	0.801	0.769	0.743	0.721	0.701	0.684	0.668	0.653
2850	-	-	-	-	-	-	0.959	0.902	0.839	0.798	0.766	0.739	0.717	0.697	0.679	0.663	0.649
2900	-	-	-	-	-	-	0.963	0.902	0.836	0.794	0.762	0.735	0.713	0.693	0.675	0.659	0.645
2950	-	-	-	-	-	-	-	0.902	0.834	0.790	0.758	0.731	0.708	0.688	0.671	0.655	0.640
3000	-	-	-	-	-	-	-	0.901	0.831	0.786	0.753	0.726	0.704	0.684	0.666	0.650	0.635
3050	-	-	-	-	-	-	-	0.899	0.827	0.782	0.749	0.722	0.699	0.679	0.661	0.645	0.630
3100	-	-	-	-	-	-	-	0.896	0.823	0.777	0.744	0.716	0.693	0.673	0.656	0.640	0.625
3150	-	-	-	-	-	-	-	0.894	0.819	0.772	0.738	0.711	0.688	0.668	0.650	0.634	0.620
3200	-	-	-	-	-	-	-	0.889	0.815	0.767	0.733	0.705	0.682	0.662	0.644	0.628	0.614

ASME Saturated Water Valve Sizing / Rupture Disk Combinations

Below is a copy of Appendix 11, Para. 11-2 and Flow Capacity Curve Fig. 11-2 from the ASME Code, Section VIII, which is used in determining valve relieving orifice areas required for saturated water service.

(a) Since it is realized that the saturated water capacity is configuration sensitive, the following applies only to those safety valves that have a nozzle type construction (throat to inlet area ration of 0.25 to 0.80 with a continuously contoured change) and have exhibited a coefficient K_d in excess of 0.90. No saturated water rating shall apply to other types of construction.

NOTE: The manufacturer, user and Inspector are all cautioned that for the following rating to apply, the valve shall be continuously subjected to saturated water. If, after initial relief the flow media changes to quality steam, the valve shall be rated as per dry saturated steam. Valves installed on vessels or lines containing steam-water mixture shall be rated on dry saturated steam.

(b) To determine the saturated water capacity of a valve currently rated under UG-131 and meeting the requirement of (a) above, refer to Fig. 5. Enter the graph at the set pressure of the valve, move vertically upward to the saturated water line and read horizontally the relieving capacity. This capacity is the theoretical, isentropic value arrived at by assuming equilibrium flow and calculated values for the critical pressure ratio.

Example of the method for sizing safety relief valves using this curve:

Fluid	Saturated Water
Required Capacity	183,795 lb/Hr
Allowable Overpressure	10%
Set Pressure	600 psig
Relieving Temperature	470°F

Calculations:

1. Consult Saturated Water Capacity Curve (Fig. 5) for capacity of one square inch of orifice area at given set pressure.

Capacity of one square inch = 84,000 lb/hr (at 600 psig set pressure)

2. Divide required capacity by the capacity of one square inch to get the required orifice area:

$$\frac{183,795}{84,000} = 2.188 \text{ sq. in.}$$

3. Therefore, in this case, an “L” orifice valve is required that has a relieving orifice (ASME) area of 3.317 square inches.

Two possibilities exist for sizing safety relief valves in conjunction with rupture disks at their inlet. First, the rupture disk has not been ASME certified in combination with the safety relief valve; second, the rupture disk has been ASME certified in combination with the safety relief valve.

ASME Rupture Disk Combinations K_c

A) Rupture Disk not Certified with the Safety Relief Valve

For those situations, the safety relief valve is sized in accordance with previously identified methods. However, this combination of rupture disk and pressure relief valve can only be credited with 90% of its ASME certified relieving capacity.

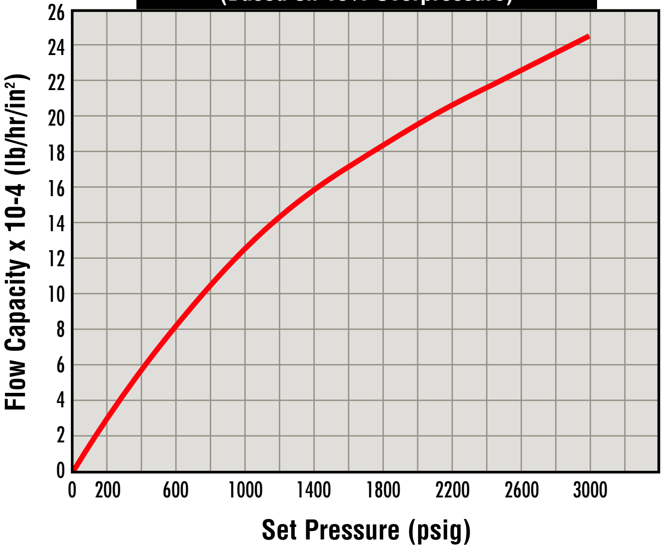
B) Rupture Disk is certified with the Safety Relief Valve K_c

In this case, the particular type of safety relief valve has been actually flow tested in combination with a unique rupture disk supplier’s design type and a combination capacity factor established. The combination capacity factor is published by the National Board of Boiler & Pressure Vessels.

The safety relief valve ASME certified relieving capacity must be multiplied by the combination capacity factor to obtain the allowable ASME relieving capacity for the combination of the safety relief valve and rupture disk.

C) In all cases ASME installation requirements must be followed. Refer to ASME Code Section VIII, paragraph UG-127.

Figure 5
Flow Capacity Curve for Rating Nozzle Type Safety Valves on Saturated Water (Based on 10% Overpressure)



Thermal Expansion / API Fire Sizing

Sizing Formula for Thermal Expansion of Trapped Liquids*

Flow rates for relieving devices protecting heat exchangers, condensers and coolers against thermal expansion of trapped liquids can be approximated by use of the following:

$$GPM = \frac{BH}{500\ GC}$$

Where:

GPM = Flow rate in U.S. gallons per minute at the flowing temperature.

B = Cubical expansion coefficient per degree Fahrenheit for the liquid at the expected temperature differential. It is best to obtain this information from the process design data: however, shown here are typical values for hydrocarbon liquids and for water:

	B
3° to 35° API gravity	0.0004
35° to 51° API gravity	0.0005
51° to 64° API gravity	0.0006
64° to 79° API gravity	0.0007
79° to 89° API gravity	0.0008
89° to 94° API gravity	0.00085
94° to 100° API gravity& lighter	0.0009
Water	0.0001

H = Total heat transfer rate, in BTU/hr. This should be taken as the maximum exchanger duty during operation.

G = Specific gravity referred to water = 1.00 at 60˚. Compressibility of liquid is usually ignored.

C = Specific heat in BTU/lb/˚F of the trapped fluid.

*Extracted from API RP 520 Part 1 - Design

API Fire Sizing

The hazard of fire in operating plants that handle or process flammable liquids or gases must be a consideration in the sizing of safety relief valves. Any pressure vessel, or other pressure containing equipment protected by pressure relief valves under normal operating conditions, should be fire sized in the event that the equipment may be exposed to fire (although contents of the vessel are not flammable.)

A fire may occur due to leakage of flammable material from equipment and pipe lines, or may be caused by operational mishaps. If accidentally ignited, this burning material will immediately endanger adjacent vessels and equipment. Burning material can become an open, free burning fire quickly and carried some distance from the source of the leak by the slope of the ground in the case of liquids and by air currents with gas or vapor.

In the event that an open fire occurs around equipment or vessels, heat will naturally be absorbed by anything coming in contact with the flames and/or hot gases of the fire. If this heat absorption in a vessel continues for a long enough time, the vessel contents will be heated and the pressure will rise until the safety relief valve opens.

Therefore it is necessary, when determining the safety relief valve size, to consider the probability of fire exposure.

A. FireSizing For Liquid Hydrocarbons

1) **The following information is necessary prior to fire sizing a vessel containing a liquid.**

- Tank Size (dimensions describing shape)
- Mounting (horizontal or vertical; height above ground)
- Fluid (composition by names)
- Normal liquid level (NLL): % full, depth of fluid or liquid-full
- F factor - See Table A1; if not known, use a factor of 1
- Operating pressure
- Set pressure
- Operating temperature
- Saturation temperature at P_1
- K (ratio of specific heats)
- M (molecular weight)
- Z (compressibility factor); if not known, assume Z = 1

Table A1 - **Type of Equipment - Factor F**[a]

Bare vessel	1.0
Insulated vessel[b] (These arbitrary insulation conductance values are shown as examples and are in British Thermal Units per hour per square foot per degree Fahrenheit):	
4	**0.3**
2	**0.15**
1	**0.075**
0.67	**0.05**
0.5	**0.0376**
0.4	**0.03**
0.33	**0.026**
Water application facilities, on bare vessel[c]	1.0
Depressurizing and emptying facilities[d]	1.0

---

[a] These are suggested values for the conditions assumed in A.2. When these conditions do not exist, engineering judgment should be exercised either in selecting a higher factor or in providing means of protecting vessels from fire exposure as suggested in API RP 520, Part 1 - Sizing and Selection, D.8.

[b] Insulation shall resist dislodgement by fire-hose streams. For the examples, a temperature difference of 1600°F was used. These conductance values are based on insulation having thermal conductivity of 4 BTU/hr-ft²-°F per inch at 1600°F and correspond to various thicknesses of insulation between 1 and 12 inches.

[c] No reduction is given due to the inherent variables present, e.g. freezing weather, high winds clogged systems, etc.

[d] No reduction is given due to the inherent variables present, e.g. inaccessibility of manual controls, timing of depressurization, direction of automated controls, etc.

API Fire Sizing

2) Determine Heat Absorption

$$Q = 21{,}000\ FA^{0.82}$$

Where:

Q = Total heat absorption (input) into the wetted surface in BTU(British Thermal Units) per hour
F = Environment Factor (see Table A1)
A = Total wetted surface area in square feet

When adequate draining and fire fighting equipment do not exist,

$$Q = 34{,}500\ FA^{0.82}$$

The determination of the total wetted surface area can become lengthy for certain vessel configurations, such as a horizontal cylindrical vessel with elliptical ends. Total surface area formulas for several different vessel shapes are listed in Table A2.

Total wetted surface area (A) = F_{wp} x Total vessel surface area (F_{wp} = Wetted Perimeter factor)

For horizontal vessels, use Table A2 and Figure 6. For vertical vessels, use Table A2 and Figure 7.

3) Determination of vapor discharge capacity in lb/hr

$$W = \frac{Q}{\text{Latent Heat of Vaporization}}$$

Determine Q from step (2).
Determine latent heat of vaporization from the fluid properties.

Table A2 - Total Surface Area Formulas*

SPHERE	$A = \pi D^2$
Vertical cylinder with flat ends	$A = \pi(DL + D^2/2)$
Vertical cylinder with elliptical ends	$A = \pi(DL + 2.61)D^2$
Vertical cylinder with hemispherical ends	$A = \pi(DL + D^2)$
Horizontal cylinder with flat ends	$A = \pi(DL + D^2/2)$
Horizontal cylinder with elliptical ends	$A = \pi(DL + 2.61)D^2$
Horizontal cylinder with hemispherical ends	$A = \pi(DL+D^2)$

$\pi = 3.1416$

---

* It is recommended that the total wetted surface ("A" in the above formulas) is at least that wetted surface included within a height of 25 feet above grade, or in the case of spheres and spheroids, at least the elevation of the maximum horizontal diameter or a height of 25 feet, whichever is greater. The term "grade" usually refers to ground grade, but may be at any level at which a sizable fire could be sustained.

4) Determination of orifice area requirements

Valves are to be sized in accordance with previously defined methods given in "Sizing Formulas" (see pages VS.5 - VS.7.)

API Fire Sizing Example (for vessels containing liquid hydrocarbons)

a) Sample Vessel Information

- Tank size: 6' dia. x 12' long, seam to seam, elliptical ends
- Mounting: Horizontal and 3' above ground
- Fluid: Propane
- Normal liquid level: 80% filled
- F factor: 1 (no insulation) (from Table A1)
- Operating Pressure: 100 psig
- Set Pressure: 250 psig
- Operating Pressure: 80°F
- Saturation Temperature: 142°F
- K: 1.13
- M (molecular weight): 44.09
- Z (compressibility factor): 1
- Latent Heat of vaporization: 110 BTU/lb

b) Solution

Wetted surface area:

Enter 80% filled on Figure 6 to determine that $F_{wp} = .67$

Select total surface area formula from Table A2 for a horizontal cylinder with elliptical ends.

$A = F_{wp} \times [\ \pi\ (DL + 2.61\ D^2)]$

$A = .67 \times (\pi\ \ x\ 6 \times 12 + 2.61 \times 6 \times 6) = 214.5$ sq. ft.

Heat absorbed:

$Q = 21000\ FA^{0.82}$

$Q = 21000\ (1)\ 214.5^{0.82} = 1{,}713{,}940$ BTU/hr

Vapor generated:

$$W = \frac{Q}{\text{Latent Heat of Vaporization}}$$

$$W = \frac{1{,}713{,}940}{110} = 15{,}581\ \text{lb/hr}$$

API Fire Sizing

B. Fire Sizing For Vessels Containing Gases

1) The following information is necessary prior to fire sizing a vessel containing a vapor or gas.

- Tank Size: Dimensions describing shape
- Mounting: Horizontal or vertical; height above ground
- Fluid: Composition by names of specific heats
- Operating pressure: P° (psia)
- Set pressure, P (psig)
- Operating temperature: T° (°F + 460)
- Relieving temperature: If not known calculate as shown below:

P = Set pressure, psig
P_1 = Flowing pressure, psia = (P x 1.21) + 14.7
P° = Normal Operating pressure, psia
T° = Normal operating temperature absolute (°R)
T_1 = Relieving temperature = T_1 - 460

NOTE: Use caution when T_1 exceeds 1100°F for carbon steel.

$$T_1 = \frac{P_1 \text{ x } T_o}{P_o}$$

2) Determine orifice area requirement.

The required orifice area for a safety relief valve on a gas-containing vessel exposed to an open fire can be determined by the following formula.

$$A = \frac{F^1 \text{ x } A^1}{P_1}$$

F' can be determined from the following relationship. The recommended minimum value of F' is 0.01; when the minimum value is unknown, F' = 0.045 should be used.

$$F' = \frac{0.1406}{CK_D} \text{ x } \frac{(T_\omega - T_1)^{1.25}}{(T_1)^{0.6506}}$$

Where:

A = effective discharge area of the valve, in square inches.

A^1 = exposed surface area of the vessel, in square feet.

P_1 = upstream relieving pressure, in pounds per square inch absolute. This is the set pressure plus the allowable overpressure plus the atmospheric pressure.

C = coefficient determined by the ratio of the specific heat of the gas at standard conditions. This can be obtained from Tables 4 and 5.

T_ω = vessel wall temperature, in degrees Rankine.

T_1 = gas temperature, absolute, in degrees Rankine, at the upstream pressure, determined from the following relationship:

$$T_1 = \frac{P_1 \text{ x } T_o}{P_o}$$

Where:

P_η = normal operating gas pressure, in pounds per square inch absolute.

T_η = normal operating gas temperature, in degrees Rankine.

The recommended maximum vessel wall temperature for the usual carbon steel plate materials is 1100°F. Where vessels are fabricated form alloy materials, the value for T_ω should be changed to a more appropriate recommended maximum.

API Fire Sizing Example
(for vessels containing gases)

a) Information required

- Tank size: 5' dia. x 12' long seam-to-seam, flat ends.
- Mounting: Horizontal and 2" above grade
- Fluid: ISOBUTANE VAPOR
- k: for isobutane = 1.094
- C: 327
- Operating pressure: 110 psig
- Set pressure: 150 psig
- Operating temperature: 160°F
- Relieving temperature: Not known
- T: 1025°F

b) Solution

Calculate flowing pressure:

P_1 = 150 x 1.21 + 14.7 = 196.2 psia
P° = 110 + 14.7 = 124.7 psia
T°= 160 + 460 = 620° R absolute

Calculate flowing temperature:

$$T_1 = \frac{196.2 \text{ x } 620}{124.7} = 975° \text{ R absolute}$$

Fahrenheit flowing temperature or gas temperature at P_1:

$$T_1 = 975 - 460 = 515°F$$

API Fire Sizing

Determination of Relief Valve Factor F^1:

$$F' = \frac{0.1406 (T_\omega - T_1)^{1.25}}{CK_D \times (T_1)^{0.6506}}$$

$$F' = \frac{0.1406 (1485 - 975)^{1.25}}{(327) (.95) (975)^{0.6506}}$$

$$F' = 0.012$$

Determination of exposed vessel surface area:

Select wetted surface area formula from Table A2 for "horizontal cylinder with flat ends":

$$A_S = \pi \left(DL + \frac{D^2}{2}\right)$$

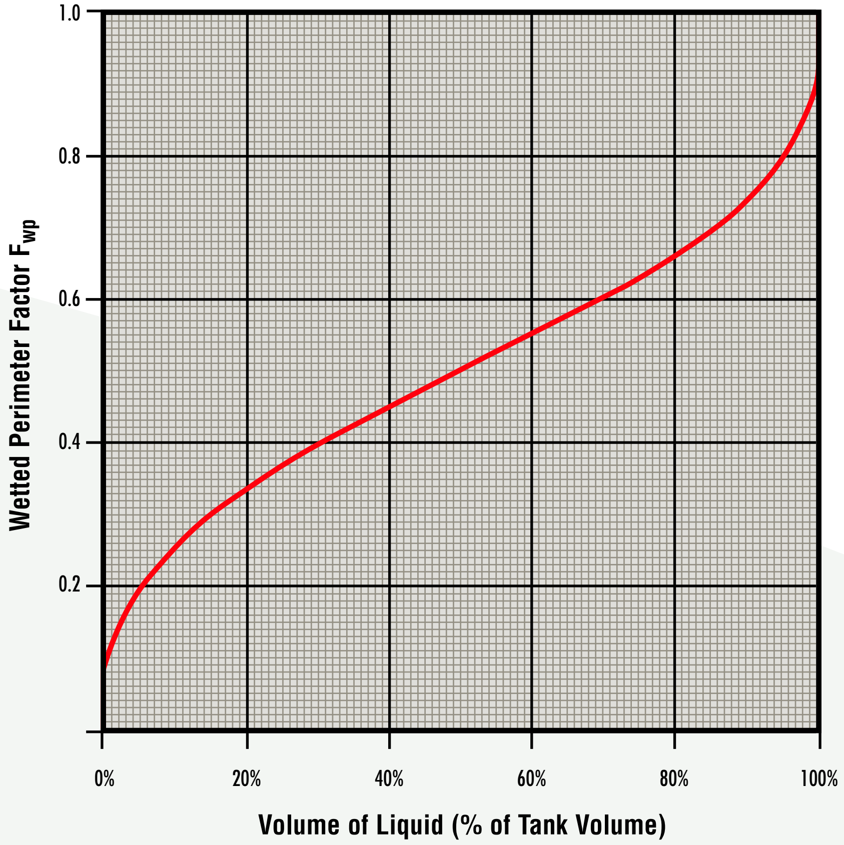
$$A_S = \pi \left(5 \times 12 + \frac{25}{2}\right) = 227.8 \text{ sq. ft.}$$

Now put values in the formula as follows:

$$A_C = \frac{F' \times A_S}{\sqrt{P_1}}$$

$$A_C = \frac{.012 \times 227.8}{\sqrt{196.2}} = .1952 \text{ sq. in.}$$

API Fire Sizing



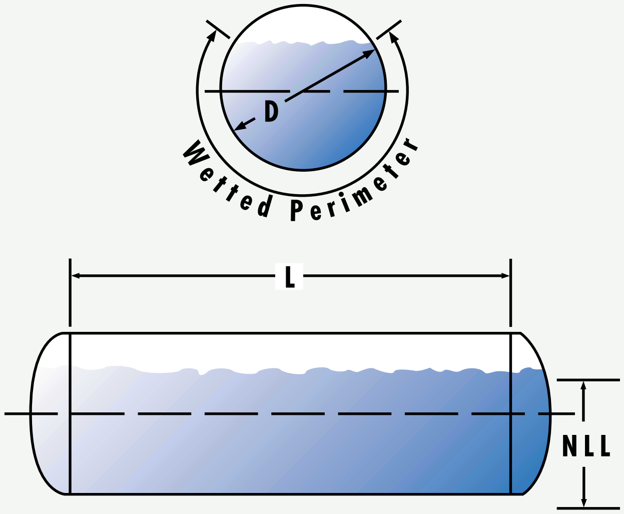


Figure 6 - Horizontal Tank

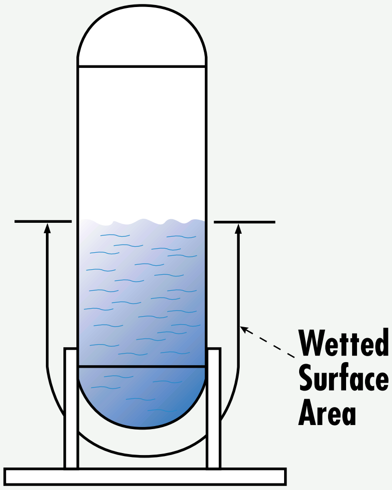


Figure 7 - Vertical Tank

Sizing for Multiple Fluids (Gas / Liquid) Per API (not a Diers Methodology)

To properly size for a mixed flow application per API guidelines, the following steps are required:

1. Determine the quantity of gas flow required.
2. Determine the quantity of liquid flow required.

NOTE: Refer to Page VS.3 for definition of formula symbols.

3. Use the applicable flow equations for each media to determine the orifice area required to flow each media.
4. The orifice area of valve selected must equal or exceed the sum of the flow area required for the gas and the flow area required for the liquid.
5. The proper selection would be an H orifice, which has an orifice area of 0.785 sq. in.
6. Due to the calculated orifice area required in the example, additional calculations should be considered utilizing the 820000 or 19000 Series formulas. This may allow a less expensive valve selection.

Example:

Given:

Set Pressure: 100 psig
Overpressure: 10%
Specific Gravity: 1 for Water
Rel. Temp: 68°F
Required Capacity: Air - 800 SCFM
Water - 35 GPM
Back Pressure: 0 psig

A. Solve for orifice area required for air capacity

$Q = 800$ SCFM
$P_1 = 100\ (1.1) + 14.7 = 124.7$
$T_a = 68 + 460 = 528$
$Z = 1$
$K_b = 1$
$K_d = .95$

$$A_c = \frac{60\ Q\ (0.0763)\ \sqrt{T}\ \sqrt{Z}}{356\ K_d\ P_1\ (5.3824)\ K_b}$$

$$A_c = \frac{60\ (800)\ 0.0763)\ (22.978)\ (1)}{356\ (.95)\ (124.7)\ (5.3824)\ (1)}$$

$$A_c = 0.37$$

B. Solve for orifice area required for water capacity.

$Q = 35$ gpm
$G = 1$
$P = 100$
$P_b = 0$
$K_d = .62$
$K_v = 1$
$K_w = 1$

NOTE: Formula used in ASME - Liquid Trim

$$A_c = \frac{Q\ \sqrt{G}}{38\ K_d\ \sqrt{1.25\ P - P_b\ K_v\ K_w}}$$

$$A_c = \frac{35\ (1)}{38\ (.62)\ \sqrt{1.25\ (100) - 0\ (1)\ (1)}}$$

$$A_c = 0.132$$

C. Total orifice required = .37 sq. in. (air) + 0.132 sq. in. (water) or .502 sq. in.

Organic Fluid Systems

The use of Organic Fluid Systems falls under special rules for sizing and valve selection. Organic fluids are known under a variety of trade names as noted below:

TRADE NAME	COMPANY
Thermia	Shell Oil Co.
Dowtherm	Dow Chemical Co.
Therminol	Monsanto Chemical Co.
Caloria	Exxon Corp.
Mobiltherm	Mobil Corp.
Ucon	Union Carbide Corp.

Depending on the type of system in which the fluid is used, valve selection may be affected. The following criteria should be used in valve selections:

Vapors

Organic vapor pressure relief valve requirements are specified in ASME Section I PVG. See the 1900P section in this catalog.

Liquids

In cases where the fluid is not vaporized, as would be the case when heat transfer is involved, the valve must be sized on the basis of liquid. The LA liquid trim valves must be supplied and applicable sizing equations used.

The pressure relief valve requirements for these applications are contained in ASME Section VIII.