

13900

Safety Relief Valve



Consolidated®

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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 straightforward. 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 facilitate 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 deaerators.

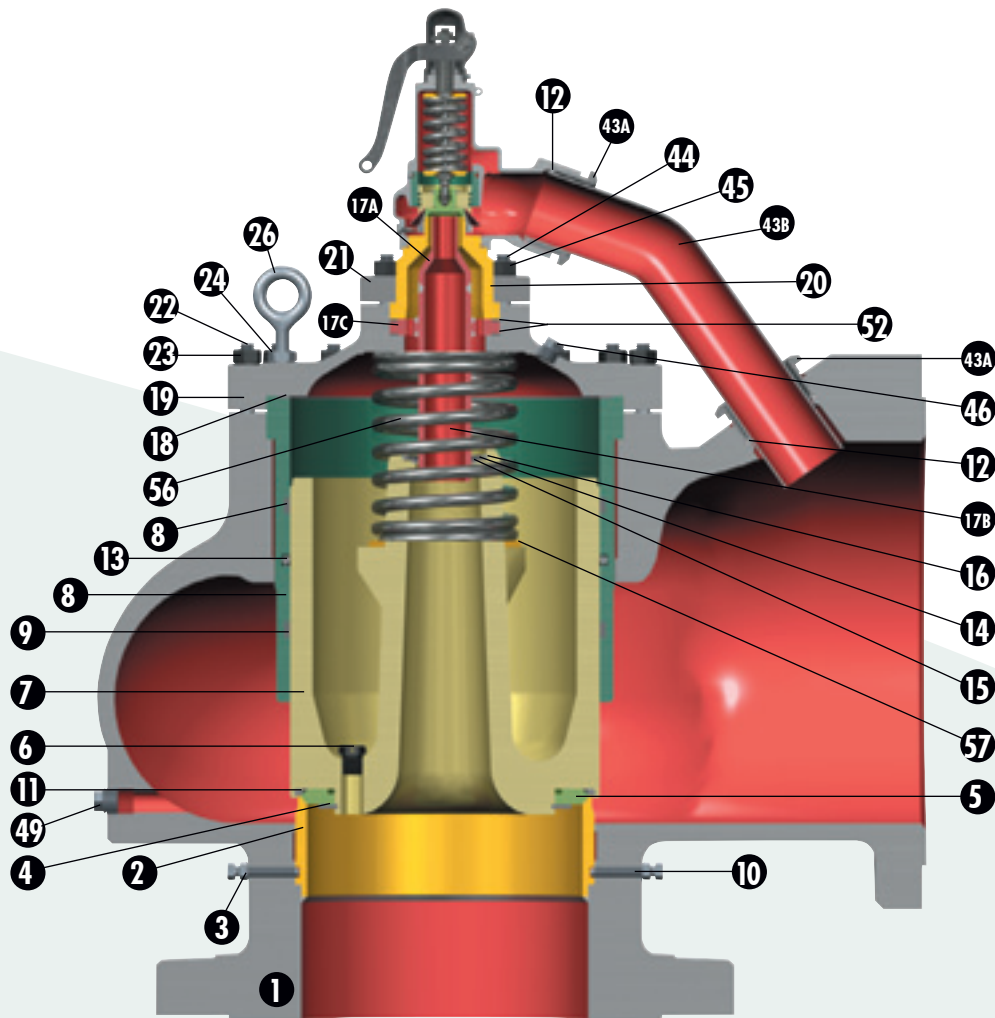
CAUTION: These valves are not to be used on power boilers.

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

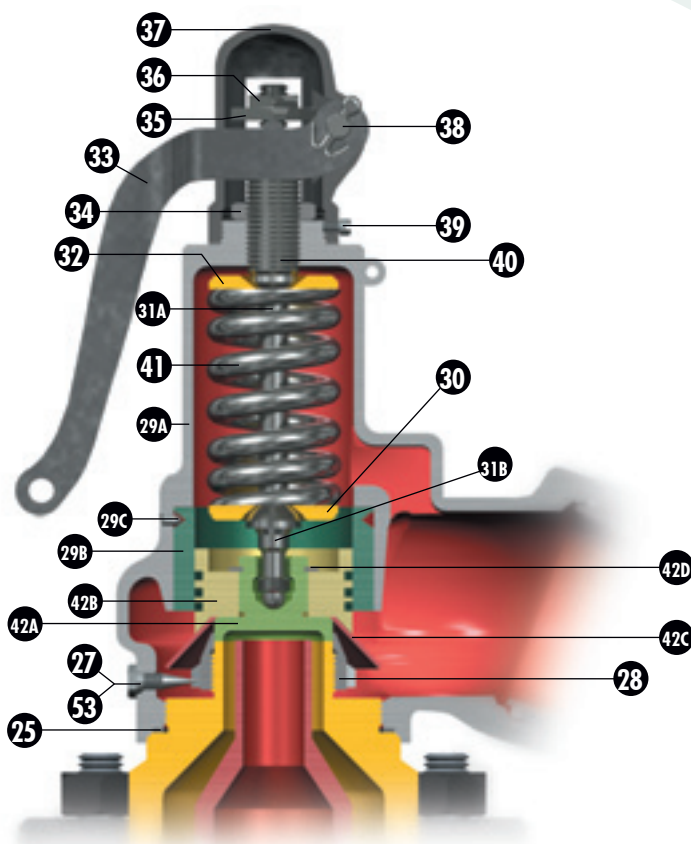
NOTES: 1 22" 150# flange is not covered by ANSI B16.5. Drilling is (20) 1-3/8 dia. holes on a 27-1/4 dia. bolt circle.

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 Spring: 401°F - 550°F Chrome Alloy 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
43A	Discharge Tube Assembly 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 X750 Nickel Steel
57	Disc Spring Ring 410 Cond. A Stainless Steel

Standard Options

The CONSOLIDATED 13900 Series Valves are available with the following options:

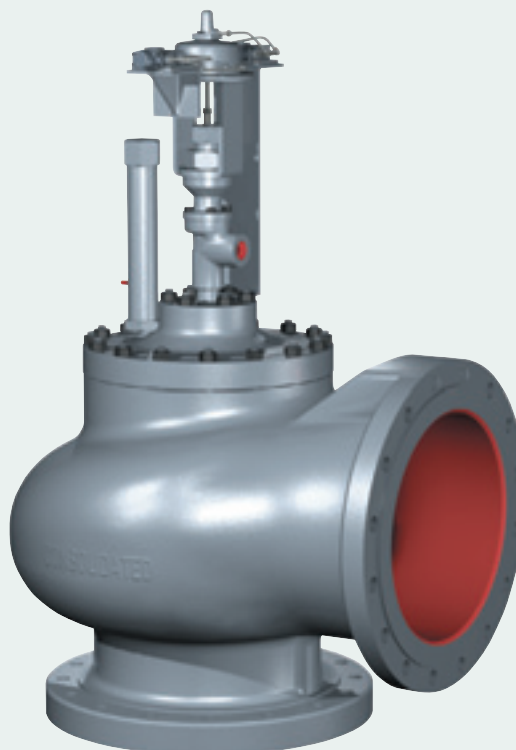
Omit Pilot Discharge Piping

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.

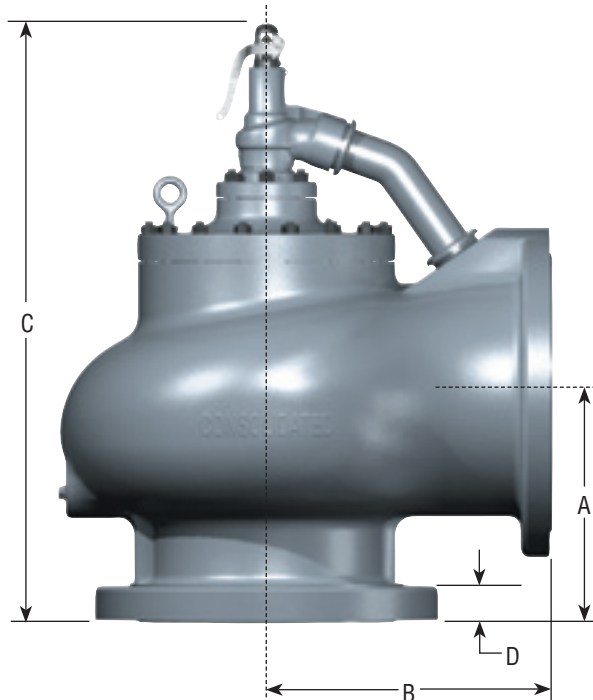


13900 Series - Dimensions & Weights - (USCS Units)
Dimensions (Inches) and Weights (pounds)

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	948148	1170775	1290780
140	868613	1090338	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	160553	197578	218572
60	148090	185892	228760	253067
70	168276	211230	259942	287562
80	188461	236569	291123	322057
90	208647	261907	322305	356552
100	228833	287246	353487	391047
120	269204	337923	415850	460037
140	309576	388600	478214	529027
160	349948	439276	540577	598017
180	390319	489953	602941	667007
200	430691	540630	665304	735997
220	471062	591307	727668	804987
240	511434	641984	790031	873977
260	551805	692661	852394	942967
280	592177	743338	914758	1011957
300	632549	794015	977121	1080947