Total Safety Solution Provider!

JOKWANG

Total Safety Solution Provider! JOKWANG Cat No. FT100 Vol.1

JOKWANG I.L.I. CO.,LTD.

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Cat No.
FT100 **Vol.1**

Think Safety!

JOKWANG

Pressure Relief Valves for UV Stamp

JSV-FT100

J • K SINCE 1968

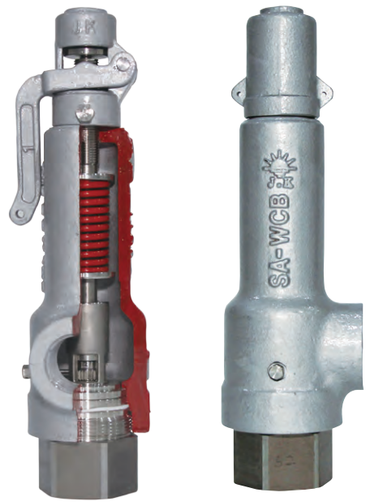
JOKWANG I.L.I CO., LTD.

INTRODUCTION OF COMPANY

Since its establishment in 1968, JOKWANG I.L.I CO., LTD. with its JK trademark has put every effort in pioneering and specializing as one of the leading valve manufacturing companies. Its devotion has concentrated especially in the area of safety & relief valve, pressure reducing valve, stop valve and steam trap.

With almost half a century of experience, we have earned over a good reputation for quality, reliability, reasonable price and excellent performance.

We determined to contribute to serve your need for your heat control and energy saving effort through our precision design, strict testing, and precision processing. Your kind inquiries would be much appreciated, and we will do our best to give you our business suggestions on them, which can be competitive in your market. In closing, we promise for our continuous endeavor, for more research, and for development work to pay back your positive supports and encouragement.



COMPANY HISTORY

Nov. 1968	Founded JOKWANG Industries Company in Busan, Korea
May. 1987	Acquired K.S(Korean Industrial Standard) Mark
Apr. 1989	Acquired Type approval from KR(Korea)
Dec. 1992	Technical Collaboration with VENN in Japan
Dec. 1998	Acquired ISO 9001 Certificate
Dec. 1999	Changed Company name to JOKWANG I.L.I Co., Ltd.
Oct. 2000	Moved to Noksan Industrial Complex in Busan, Korea
Nov. 2003	Acquired Type approval from DNV(Norway)
Mar. 2004	Acquired Type approval from BV(France)
Apr. 2004	Acquired KEPIC Certificate
Jun. 2004	Acquired Type approval from LR(UK)
May. 2006	Acquired Safety Relief Valve ASME "UV" Stamp
Nov. 2006	Patent registered for Pilot-Operated Safety Valve
May. 2010	Acquired Type approval from GL(Germany)
Apr. 2011	Acquired Safety Relief Valve ASME "UV" Stamp(Up to 6,000psig)
Dec. 2011	Awarded Export Tower of 3 Mil. U.S Dollar
Dec. 2011	Acquired Type approval from CCS(China)
Dec. 2011	Acquired ISO14001 Certificate
Mar. 2012	Acquired OHSAS18001 Certificate
Mar. 2013	Acquired Pilot type Safety Relief Valve ASME "UV"Stamp
Jun. 2014	Acquired Safety Relief Valve ASME "V"Stamp
Jun. 2015	Acquired Safety Relief Valve C-Sel(China)
May. 2016	Renewed ASME "UV"Stamp
Jan. 2016	Moved to Sanmak Complex in Yangsan, Korea
Sep. 2016	Renewed ASME "V"Stamp

Certificate

Quality System Certificate

- ' V ' Stamp of ASME Sec.I
- ' UV ' Stamp of ASME Sec.VIII
- Certificate of NBBI Safety Valve Capacity
- ISO 9001 Certificate
- ISO 14001 Certificate
- OHSAS 18001 Certificate
- C-SEL China Special Equipment License

Type Approval

- LR - Lloyd's Register
- BV - Bureau Veritas
- KR - Korean Register
- CCS - China Classification Society
- DNV·GL - Det norske Veritas·Germanischer Veritas

General information

01 About SRV(Safety Relief Valve)

01 General Definition of Safety Relief Valve(SRV)

A pressure relief device is any device that can purge a system from an overpressure condition. More particularly, an SRV is a pressure relief device that is self-actuated, and whose primary purpose is the protection of life and equipment. Through a controlled discharge of a required(rated) amount of fluid at a predetermined pressure, an SRV must prevent overpressure in pressurized vessels and systems, and it operates within limits which are determined by international codes. An SRV is often the final control device in the prevention of accidents or explosions caused by overpressure.

The SRV must close at a predetermined pressure when the system pressure has returned to a safe lever at values determined by the codes.

SRVs must be designed with materials compatible with many process fluids, from simple air and water to the most corrosive and toxic media. They must also be designed to operate in a consistently smooth manner on a variety of fluids and fluid phases. These design parameters lead to a wide array of SRV products available in the market today, with the on constant being that they all must comply with the internationally recognized codes.

02 Where do SRVs fit in the process?

Every industrial process system is designed to work against a certain maximum pressure and temperature called its rating or design pressure. It is in the economic interest of the users to work as close as possible towards the maximum limits of this design pressure in order to optimize the process output, hence increase the profitability of the system.

Nowadays, pressures and flow in the process industry are controlled by electronic process systems and highly sophisticated instrumentation devices. Almost all control systems are powered by an outside power source(electric, pneumatic, hydraulic). The law requires that when everything fails regardless of the built-in redundancies, there is still an independent working device powered only by the medium it protects. This is the function of the SRV, which, when everything else works correctly in the system, should never have to work. However, practice proves the contrary, and there are a variety of incidents which will allow the system pressure to exceed the design pressure.

Although many pressure relief devices are called SRVs, not every SRV has the same characteristics of or operational precision. Only the choice of the correct pressure safety device for the right application will assure the safety of the system and allow the user to maximize process output and minimize down-time for maintenance purposes. Making the correct choice also means avoiding interference between the process instrumentation set points in the control loop and the pressure relief device limits selected. There SRV operation al limits can vary greatly even when all are complying with the codes.

03 Pressure Relief Devices

Pressure relief device

Actuated by inlet static pressure and designed to open during emergency or abnormal conditions to prevent a rise of internal fluid pressure in excess of a specified design value. The device also may be designed to prevent excessive internal vacuum. The device may be designed to prevent excessive internal vacuum. The device may be a pressure relief valve, a non-reclosing pressure relief device, or a vacuum relief valve.

Pressure relief valve

A pressure relief device designed to open and relieve excess pressure and to reclose and prevent the further flow of fluid after normal conditions have been restored.

a A relief valve

It is a spring loaded pressure relief valve actuated by the static pressure upstream of the valve. The valve opens normally in proportion to the pressure increase over the opening pressure. A relief valve is used primarily with incompressible fluids.

b A safety valve

It is a spring loaded pressure relief valve actuated by the static pressure upstream of the valve and characterized by rapid opening or pop action. A safety valve is normally used with compressible fluids.

c A safety relief valve

It is a spring loaded pressure relief valve that may be used as either a safety or reliefvalve depending on the application.

d A conventional pressure relief valve

It is a spring loaded pressure relief valve whose operational characteristics are directly affected by changes in the back pressure.

e A balanced pressure relief valve

A It is spring loaded pressure relief valve that incorporates a bellows or other means for minimizing the effect of back pressure on the operational characteristics of the valve.

f A pilot operated pressure relief valve

It is a pressure relief valve in which the major relieving device or main valve is combined with and controlled by a self actuated auxiliary pressure relief valve(pilot).

Non-reclosing pressure relief device

A pressure relief device which remains open after operation. A manual resetting means may be provided.

Rupture disk device

A non-reclosing pressure relief device actuated by static differential pressure between the inlet and outlet of the device and designed to function by the bursting of a rupture disk. A rupture disk device includes a rupture disk and a rupture disk holder.

About SRV(Safety Relief Valve)

a A rupture disk

It is a pressure containing, pressure and temperature sensitive element of a rupture disk device.

b A rupture disk holder

It is the structure which encloses and clamps the rupture disk in position.(Some disks are designed to be installed between standard flanges without holders.)

c A non fragmenting rupture disk

It is a rupture disk designed and manufactured to be installed upstream of other piping components, such as pressure relief valves, and will not impair the function of those components when the disk ruptures.

Pin-actuated device

A non-reclosing pressure relief device actuated by static pressure and designed to function by buckling or breaking a pin which holds a piston or a plug in place. Upon buckling or breaking of the pin, the piston or plug instantly moves to the full open position.

* Reference
- The Safety Relief Valve Handbook - API STD 520 Part 2.

02 Sizing Program Basis

Instruction of Sizing Program

After receiving the inquiry or P/O(purchase order) from our precious customers, we input the data for specification of PSV in the COMPUTER SIZING PROGRAM(see fig. 1).

This helps calculate the valve capacity and select the exact size compared than required capacity.

When we calculate the capacity, must-have information such as fluid name & states, temperature, pressure, required capacity and allowable overpressure condition(10%, 16%, 21%) are considered and reflected in the system according to the calculation standard as ASME Sec.VIII and API STD 520 and so on.

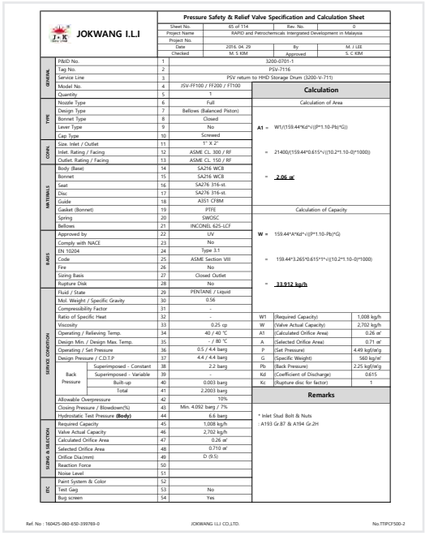
Also the variety of pressure unit including Kg/cm²g, Barg, MPag, kPag, pisg and so on could be used in the system.

The whole information for the each PSV is saved in our system and the data sheet with calculation sheet(see fig. 2) based on it could be printed out automatically.

It is possible to trace the saved information of each PSV with customer's name and serial number on the customer's request.

20	010200	Tag No(O)	PSV-001
30	010300	Service Line	
40	010800	Design Type	C Conventional
100	010700	Bonnet-Type(*)	C Close
101	041900	Lever-Type(*)	L Plain Lever
102	020901	Inlet Connect Code(*)	ANSI ANSI
103	020902	Inlet-Rating(*)	150 150LB
104	020903	Inlet-Facing(*)	R RF
105	021001	Outlet Connect Code(*)	ANSI ANSI
106	021002	Outlet-Rating(*)	150 150LB
107	021003	Outlet-Facing(*)	R RF
110	020803	Size(nozzle)(*)	0.250SO 1¼"
112	074400	Orifice Designation(*)	E E(12.7)
200	031101	Body(*)	S-WCB SA216 WCB
201	031200	Seat(*)	S-CF8M-S SA351 CF8M(STELLITED)
202	031301	Disc(*)	SA316-S SA 276 316(STELLITED)
203	031701	Bellows-M	NA none
300	010100	Model No	JSV-FF100
400	052200	Code(*)	A8 ASME sec. VIII
401	082502	Fluid State(*)	A AIR
402	082501	Fluid Name(*)	Air
403	062700	Mol.weight or specificGravity*	28.96
404	063900	Compressibility Factor(*)	1
405	064000	Specific Heat(*)	1.4
407	069902	Pressure Unit(*)	K0 Kg/barg
409	069903	Temp. Unit	°C °C
410	063100	Operating Temp.	
411	063200	Blowout Temp.(* Gas/Air)	20
413	062900	Operating pressure	
414	063000	Setting pressure(*)	5
430	063600	Closing Pressure(*)	4.85
432	063700	Hydrostatic Test(*)	7.5
440	083300	Constant Back Pressure	
441	083400	Variable Back Pressure	
450	063800	Allowable Overpressure(%)	10 10
490	069901	Capacity Unit	K0 kg/h
491	069904	Area Unit	MM mm²
492	082600	Required Capacity	120
494	074200	Calculated Area	26.593
496	074300	Selected Area	126.677
498	074500	Valve Capacity(*)	572
550	042100	Paint Color(*)	S Silver
551	042000	GAG	Y Yes
574	999997	Remark	
580	052400	Other	NA
581	052300	Fire	N No
582	082800	Viscosity(Cp)	

Fig. 1 - Sizing Program – ERP System



JOKWANG I.L.I

Pressure Safety & Relief Valve Specification and Calculation Sheet

Sheet No. 65 of 114 Rev. No. 0
Project Name KAPEC and Petrochemicals Interagrated Development in Malaysia
Project No.
Date 2016. 04. 29 By M. I. LEE
Checked M. S. KIM Approved S. C. KIM

GENERAL	P&ID No.	1	SJDD-0705-1
	Tag No.	2	PSV-7116
	Service Line	3	PSV return to HHD Storage Drum (3200-U-717)
	Model No.	4	JSV-FF100 / FF200 / FT100
	Quantity	5	1
BODY	Nozzle Type	6	Full
	Design Type	7	Bellows (Balanced Piston)
	Bonnet Type	8	Closed
	Lever Type	9	No
	Cap Type	10	Screwed
CONN'T	Size. Inlet / Outlet	11	1" X 2"
	Inlet. Rating / Facing	12	ASME CL. 300 / RF
	Outlet. Rating / Facing	13	ASME CL. 150 / RF
MATERIALS	Body (Base)	14	SA216 WCB
	Bonnet	15	SA216 WCB
	Seat	16	SA276 316 nit.
	Disc	17	SA276 316 nit.
	Guide	18	A351 CF8M
	Gasket (Bonnet)	19	PTFE
	Spring	20	SWOSC
	Bellows	21	INCONEL 625 LCF
RATE	Approved by	22	LIV
	Comply with NACE	23	No
	EN 10204	24	Type 3.1
	Code	25	ASME Section VIII
	Fire	26	No
	Sizing Basis	27	Closed Outlet
	Rupture Disk	28	No
SERVICE CONDITION	Fluid / State	29	PENTANE / Liquid
	Mol. Weight / Specific Gravity	30	0.56
	Compressibility Factor	31	-
	Ratio of Specific Heat	32	-
	Viscosity	33	0.25 cp
	Operating / Relieving Temp.	34	40 / 40 °C
	Design Min. / Design Max. Temp.	35	- / 80 °C
	Operating / Set Pressure	36	0.5 / 4.4 barg
	Design Pressure / C.D.T.P	37	4.4 / 4.4 barg
Back Pressure	Superimposed - Constant	38	2.2 barg
	Superimposed - Variable	39	-
	Built-up	40	0.003 barg
	Total	41	2.2003 barg
	Allowable Overpressure	42	10%
	Closing Pressure / Blowdown(%)	43	Min. 4.092 barg / 7%
	Hydrostatic Test Pressure (Body)	44	6.6 barg
	Required Capacity	45	1,008 kg/h
	Valve Actual Capacity	46	2,702 kg/h
	Calculated Orifice Area	47	0.26 in²
	Selected Orifice Area	48	0.710 in²
	Orifice Dia.(mm)	49	D (9.5)
	Reaction Force	50	
	Noise Level	51	
PAINT & ACCESSORY	Paint System & Color	52	
	Test Gag	53	No
	Bug screen	54	Yes

Calculation

Calculation of Area

A1 = W1/(159.44*Kd*√(P1*10-Pb*G))

= 21400/(159.44*0.615*√(10.2*1.10-0)*1000)

= **2.06 in²**

Calculation of Capacity

W = 159.44*A*Kd*√(P1*1.10-Pb*G)

= 159.44*1.265*0.615*1*√(10.2*1.10-0)*1000)

= **33,912 kg/h**

W1	(Required Capacity)	1,008 kg/h
W	(Valve Actual Capacity)	2,702 kg/h
A1	(Calculated Orifice Area)	0.26 in²
A	(Selected Orifice Area)	0.71 in²
P	(Set Pressure)	4.49 kgf/cm²g
G	(Specific Weight)	560 kg/m³
Pb	(Back Pressure)	2.25 kgf/cm²g
Kd	(Coefficient of Discharge)	0.615
Kc	(Rupture disc for factor)	1

Remarks

* Inlet Stud Bolt & Nuts
A193 Gr.B7 (& A194 Gr.2H)

Ref. No. : 160425-060-650-399769-0 JOKWANG I.L.I CO.,LTD No.TTRPCF500-2

Fig. 2 - Data & Calculation Sheet

03 Numbering System

T1	C	-	1	D	1	A	2	1	-	2	1	1	-	C	N	1

Model
T1 : FT100

Construction
C : Conventional
B : Balanced

Inlet Size
1 : 1/2"
2 : 3/4"
3 : 1"

Orifice
D

Outlet Size
1 : 1"

Connection Code
A : ASME

Inlet End Connection
1 : Male NPT
2 : Female NPT
3 : Socket Welding

Outlet End Connection
1 : Female NPT
2 : Socket Welding

Base Material
1 : 304 Stainless Steel
2 : 316 Stainless Steel
3 : 304L Stainless Steel
4 : 316L Stainless Steel
5 : etc.

Trim Material
1 : Stainless Steel
2 : etc.

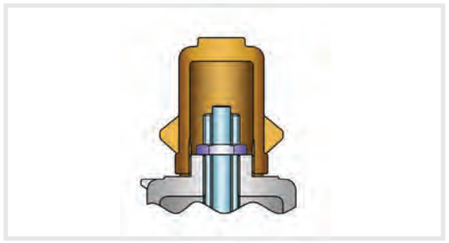
Spring Material
1 : Carbon Steel
2 : Stainless Steel
3 : Inconel X-750
4 : etc.

Bonnet & Lever Type
CN : Close Non Lever
CL : Close Plan Lever
PL : Close Packed Lever

Test Gag
1 : Yes
2 : No

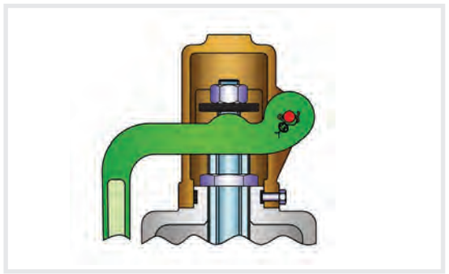
JSV-FT100

01 Cap with Accessory



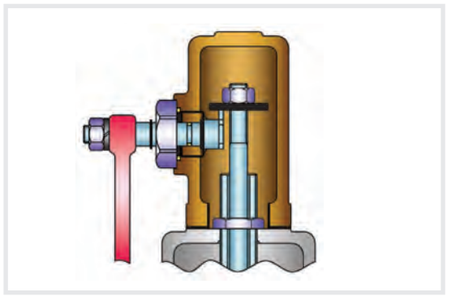
None Lever

A component used to restrict access and/or protect the adjustment screw in a reclosing pressure relief device. It may or may not be a pressure containing part.



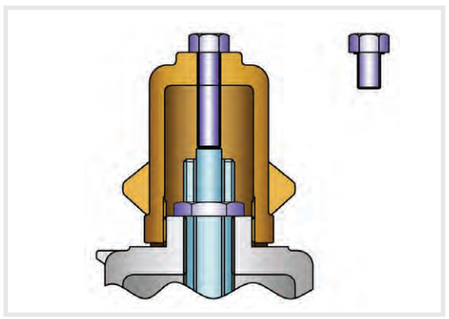
Plain Lever

A device to apply an external force to the stem of a pressure relief valve to manually operate the valve at some pressure below the set pressure.



Packed Lever

As indicated by the name, this 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 lever should be used when positive protection against leakage is required.



Cap with Gag

A device used on re-closing pressure relief devices to prevent the device from opening. The reason why gag is used is to hold the valve closed while a valve is being subjected to hydrostatic test.

* Ref.: ASME Sec. VIII

02 Specification

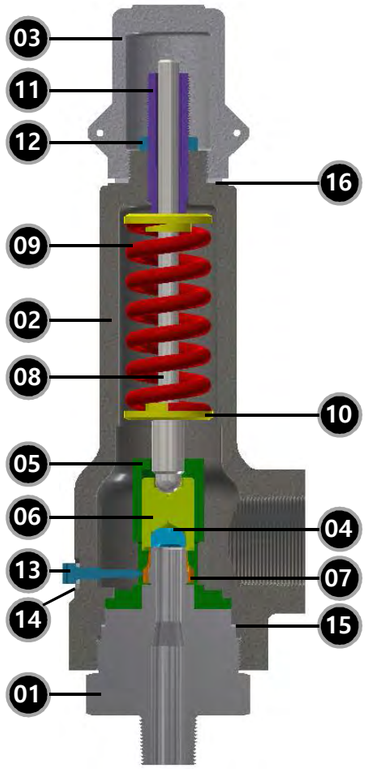
Type	Conventional & Balanced
Applicable Code	ASME Sec. VIII
Size	1" / 2" ~ 1" × 1"
Orifice	D(0.11in^2)
Set Pressure Range	STEAM : 15 ~ 2500 psig(1.03 ~ 172,.0bar)
	AIR : 15 ~ 4500 psig(1.03 ~ 310.0bar)
	WATER : 15 ~ 4500 psig(1.03 ~ 310.0bar)
Allowable Leakage	API STD 527

Orifice	Pressure Range	Standard Connections*
0.110 Sq. in.	15 to 780 psig	1 / 2" MNPT × 1" FNPT
		3 / 4" MNPT × 1" FNPT
		3 / 4" FNPT × 1" FNPT
		1" FNPT × 1" FNPT
	780 to 4500 psig	3 / 4" FNPT × 1" FNPT
		1" MNPT x 1" FNPT

* PT thread also available

03 Part Name & Material

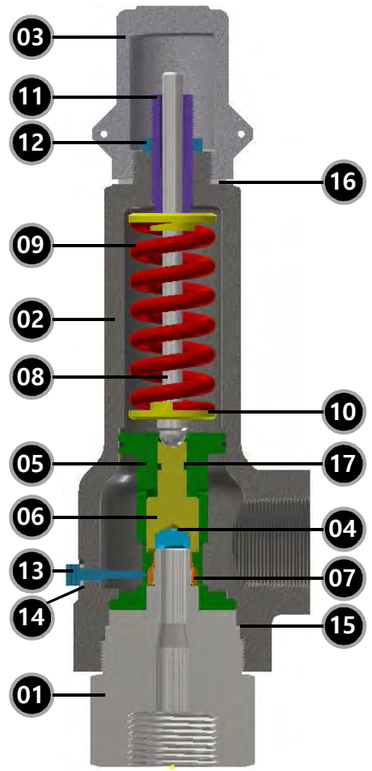
Conventional Type



No.	Part Name	Material
1	Base	SA276 304
2	Bonnet	SA216 WCB
3	Cap	Carbon Steel
4	Disc	316 Stainless Steel
5	Disc Guide	316 Stainless Steel
6	Disc Holder	316 Stainless Steel
7	Adjust Ring	Stainless Steel
8	Valve Stem	Stainless Steel
9	Spring	Carbon Steel
10	Spring Seat	Stainless Steel
11	Adjust Screw	Stainless Steel
12	Lock Nut	Stainless Steel
13	Set Screw	Stainless Steel
14	Set Screw Gasket	PTFE
15	Bonnet Screw Gasket	PTFE
16	Cap Gasket	PTFE

The material could be changeable upon request.

Balanced Type



No.	Part Name	Material
1	Base	SA276 304
2	Bonnet	SA216 WCB
3	Cap	Carbon Steel
4	Disc	316 Stainless Steel
5	Disc Guide	316 Stainless Steel
6	Disc Holder	316 Stainless Steel
7	Adjust Ring	Stainless Steel
8	Valve Stem	Stainless Steel
9	Spring	Carbon Steel
10	Spring Seat	Stainless Steel
11	Adjust Screw	Stainless Steel
12	Lock Nut	Stainless Steel
13	Set Screw	Stainless Steel
14	Set Screw Gasket	PTFE
15	Bonnet Screw Gasket	PTFE
16	Cap Gasket	PTFE
17	O-Ring	VITON

The material could be changeable upon request.

04 Dimension

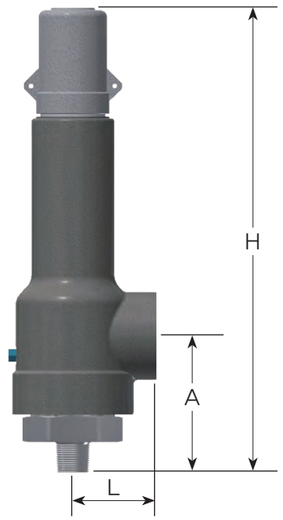
USC Units

Orifice Diamater, mm (Area, inch²)	Pressure Range (psig)	Standard Connection		Dimension(inch)		
		Inlet	Outlet	L	A	H
9.5 (70.9)	15 to 780	1/2" MNPT	1" FNPT	2	3 5/16	11 3/16
		3/4" MNPT	1" FNPT	2	3 5/16	11 3/16
		3/4" FNPT	1" FNPT	2	3 5/16	11 3/16
		1" FNPT	1" FNPT	2	3 5/16	11 3/16
	780 to 4500	3/4" FNPT	1" FNPT	2 7/16	3 5/16	13 2/16
		1" MNPT	1" FNPT	2 7/16	3 5/16	13 2/16

Metric Units

Orifice Diamater, mm (Area, inch²)	Pressure Range (bar)	Standard Connection		Dimension(mm)		
		Inlet	Outlet	L	A	H
9.5 (70.9)	1.03 to 53.8	1/2" MNPT	1" FNPT	51	84	284
		3/4" MNPT	1" FNPT	51	84	284
		3/4" FNPT	1" FNPT	51	84	284
		1" FNPT	1" FNPT	51	84	284
	53.8 to 310.2	3/4" FNPT	1" FNPT	62	84	334
		1" MNPT	1" FNPT	62	84	334

* PT thread also available



05 Capacity Tables (USC Units)

USC Units

Set Pressure (psig)	Air (SCFM)	Steam (Lbm/hr)	Water (GPM)
15	56.9	160.6	12.7
20	65.6	185.1	14.3
30	83.0	234.2	17.2
40	102.1	288.2	19.8
50	121.3	342.2	22.2
60	140.4	396.2	24.3
70	159.6	450.2	26.2
80	178.7	504.3	28.0
90	197.8	558.3	29.8
100	217.0	612.3	31.4
150	312.7	882.3	38.4
200	408.4	1152.4	44.3
250	504.1	1422.4	49.6
300	599.8	1692.5	54.3
350	695.5	1962.5	58.7
400	791.2	2232.6	62.7
450	886.9	2502.6	66.5
500	982.6	2772.7	70.1
600	1174.0	3312.8	76.8
700	1365.4	3852.9	83.0
800	1556.8	4393.0	88.7
900	1748.2	4933.1	94.1
1000	1939.6	5473.2	99.2
1100	2131.0	6013.3	104.0
1200	2322.4	6553.4	108.6
1300	2513.8	7093.5	113.1
1400	2705.2	7633.6	117.3
1500	2896.6	8173.7	121.5
1600	3088.0	8713.8	125.4

Set Pressure (psig)	Air (SCFM)	Steam (Lbm/hr)	Water (GPM)
1700	3279.4	9253.9	129.3
1800	3470.8	9794.0	133.0
1900	3662.2	10334.1	136.7
2000	3853.6	10874.2	140.2
2100	4045.0	11414.3	143.7
2200	4236.4	11954.4	147.1
2300	4427.8	12494.5	150.4
2400	4619.2	13034.6	153.6
2500	4810.6	13574.7	156.8
2600	5002.0		159.9
2700	5193.4		162.9
2800	5384.8		165.9
2900	5576.2		168.9
3000	5767.6		171.8
3100	5959.0		174.6
3200	6150.4		177.4
3300	6341.8		180.1
3400	6533.2		182.9
3500	6724.6		185.5
3600	6916.0		188.2
3700	7107.4		190.8
3800	7298.8		193.3
3900	7490.2		195.8
4000	7681.6		198.3
4100	7873.0		200.8
4200	8064.4		203.2
4300	8255.8		205.6
4400	8447.2		208.0
4500	8638.6		210.4

06 Capacity Tables (Metric Units)

Metric Units

Set Pressure (bar)	Air (SCFM)	Steam (Lbm/hr)	Water (GPM)
1.03	56.9	160.6	12.7
1.38	65.6	185.1	14.3
2.07	83.0	234.2	17.2
2.76	102.1	288.2	19.8
3.45	121.3	342.2	22.2
4.14	140.4	396.2	24.3
4.83	159.6	450.2	26.2
5.52	178.7	504.3	28.0
6.21	197.8	558.3	29.8
6.89	217.0	612.3	31.4
10.34	312.7	882.3	38.4
13.79	408.4	1152.4	44.3
17.24	504.1	1422.4	49.6
20.68	599.8	1692.5	54.3
24.13	695.5	1962.5	58.7
27.58	791.2	2232.6	62.7
31.03	886.9	2502.6	66.5
34.47	982.6	2772.7	70.1
41.37	1174.0	3312.8	76.8
48.26	1365.4	3852.9	83.0
55.16	1556.8	4393.0	88.7
62.05	1748.2	4933.1	94.1
68.95	1939.6	5473.2	99.2
75.84	2131.0	6013.3	104.0
82.74	2322.4	6553.4	108.6
89.63	2513.8	7093.5	113.1
96.53	2705.2	7633.6	117.3
103.42	2896.6	8173.7	121.5
110.32	3088.0	8713.8	125.4

Set Pressure (bar)	Air (SCFM)	Steam (Lbm/hr)	Water (GPM)
117.21	3279.4	9253.9	129.3
124.10	3470.8	9794.0	133.0
131.00	3662.2	10334.1	136.7
137.89	3853.6	10874.2	140.2
144.79	4045.0	11414.3	143.7
151.68	4236.4	11954.4	147.1
158.58	4427.8	12494.5	150.4
165.47	4619.2	13034.6	153.6
172.37	4810.6	13574.7	156.8
179.26	5002.0		159.9
186.16	5193.4		162.9
193.05	5384.8		165.9
199.95	5576.2		168.9
206.84	5767.6		171.8
213.74	5959.0		174.6
220.63	6150.4		177.4
227.53	6341.8		180.1
234.42	6533.2		182.9
241.31	6724.6		185.5
248.21	6916.0		188.2
255.10	7107.4		190.8
262.00	7298.8		193.3
268.89	7490.2		195.8
275.79	7681.6		198.3
282.68	7873.0		200.8
289.58	8064.4		203.2
296.47	8255.8		205.6
303.37	8447.2		208.0
310.20	8638.6		210.4

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