

SF-1H, 2H Type Safety Valve (Full Bore Type)

for (Pressure Vessels), (Steam Boiler) etc. (2.0MPa)

■ SPECIFICATIONS

Model name	SF-1H	SF-2H
Code name	SF1H-M□	SF2H-M□
	※ Code No. of pressure division is required in □.	
Cap type	With lever	Without lever
Applicable fluid	Steam & air	
Set pressure range	0.1~2.0MPa	
Applicable temperature	-5~230°C	
End connection	inlet JIS R, outlet JIS Rc	
Materials	Body(Ductile cast iron), Disc(Stainless steel), Seat ring(Stainless steel stellited)	
Valve body pressure test	Set pressure 0.1MPa~1.0MPa: Hydraulic 1.5MPa Set pressure 1.0MPa~2.0MPa: Hydraulic 3.0MPa	

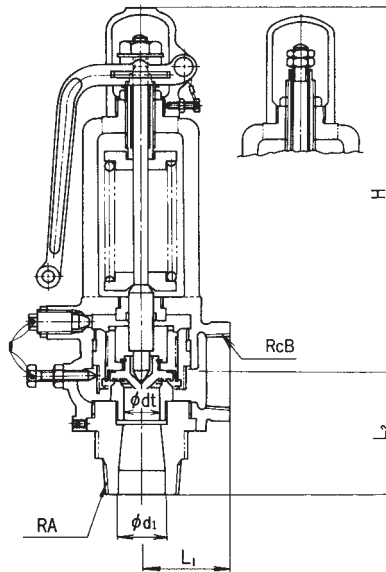
* Size (di) and thread size of End connection are different. Thread size of End connection have to be one size bigger.

■ DIMENSIONS

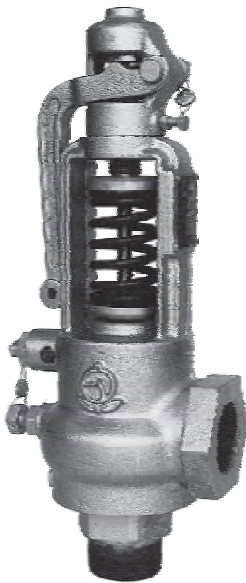
(mm)

Size	End connection		Seat opening dia. D	Throat dia. dt	Throat area a(mm ²)	Lift ℓ	Face to Face		Height H	Mass(kg)	
	A	B					L ₁	L ₂		SF-1H Type	SF-2H Type
20(¾")	1"	1"	18	15	176.6	3.8	50	75	207	3.3	3.2
25(1")	1½"	1½"	22	19	283.3	5.0	60	85	232	5.2	5
40(1½")	2"	2"	35	30	706.5	7.5	70	100	300	9.6	9.2
50(2")	2½"	2½"	45	38	1133.5	9.5	85	115	329	16	16

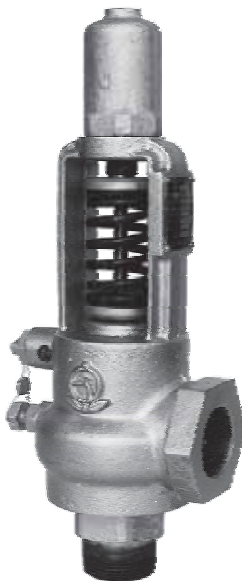
■ CONSTRUCTION



Note:
Different products have different nominal diameter and jointing screw.
The size of jointing screw is one size larger than the size of valve.



SF-1H Type



SF-2H Type

■ PRESSURE DIVISION

(MPa)

Code No.	Pressure division
1	0.1~0.12
2	Over 0.12~0.2
3	Over 0.2~0.3
4	Over 0.3~0.5
5	Over 0.5~0.75
6	Over 0.75~1.0
7	Over 1.0~1.3
8	Over 1.3~1.6
9	Over 1.6~2.0

Applicable Laws/Regulations and Formulas for Calculating Relieving Capacity

Coefficients assigned to equations may be those specified in applicable laws/regulations or in-house data.

※In-house data

1. PRESSURE VESSEL CONSTRUCTION CODE (from JIS B8210-1994)

(1) For steam

$$Q_m = 5.246 C K_d' A (P + 0.1)^{0.9}$$

Q_m: Nominal Relieving capacity (kg/h)

A: Seat opening area (mm²)

Lift type: $A = \pi D \ell$

Full bore type: $A = \frac{\pi d^2}{4}$

D: Seat opening diameter (mm)

ℓ: Lift (mm)

d: Throat diameter (mm)

P: Relieving pressure (MPa)

(Select the larger one of set pressure 1.1 or set pressure +0.02)

C: Coefficient determined according the nature of steam (see Tab. 1 in page 87)

1: Set pressure is less than 0.4MPa, at saturated pressure

0.98: Set pressure is larger than 0.4MPa, at saturated pressure

In the case of super heated steam, see Tab.1, page 87.

K_d': Relieving coefficient

Lift type: 0.96^{*}

Full bore type: 0.864

(2) For gasses

$$Q_m = C' K_d' A P_1 \sqrt{\frac{M}{ZT}} 0.9$$

Q_m: Nominal Relieving capacity (kg/h)

A: Seat opening area (mm²)

Lift type: $A = \pi D \ell$

Full bore type: $A = \frac{\pi d^2}{4}$

D: Seat opening diameter (mm)

ℓ: Lift (mm)

d: Throat diameter (mm)

Z: Compression coefficient: 1^{*} (see Fig.1 in page 89)

T: Absolute temperature (K) of gasses at relieving pressure

C': Coefficient according to κ and P₂/P₁ (See Fig.3, page 89)

κ: Adiabatic exponent (C_p/C_v) (See Tab.2, page 87).

The value is considered 1 if it is not clear.

P₂: Back pressure (MPa·A)

K_d': Relieving coefficient

Lift type: 0.96^{*}

Full bore type: 0.864

M: Molecular weight of gas (see Tab.2, page 87)

P₁: Relieving pressure (MPa·A)

(Select the larger absolute pressure of set pressure 1.1 or absolute pressure of set pressure +0.02)

■ Calculating maximum flow-in gas using the following formula:

$$G = 0.0028 v \rho d^2$$

G: Flow in gas (kg/h)

v: Velocity of gas (m/sec)

(More than 20 for saturated steam, more than 30 for super-heated steam, or more than 10 for common gas)

ρ: Density of gas (kg/m³)

d: Internal diameter of pipe (mm)

(3) For water/hot water (also applicable for hot water with temperature higher than 120°C)

(1) In case of searching from relieving capacity:

$$S = \frac{W}{87.7 \sqrt{(P_1 + 0.1)^{\kappa} \gamma_1}}$$

(2) In case of searching from thermal input of pressure vessel or thermal out put of hot water boiler:

$$S = \frac{Q \varepsilon}{87.7 C \sqrt{(P_1 + 0.1)^{\kappa} \gamma_1}}$$

(If (P₁+0.1)^κ > (P₁-P₂) in equations (1) and (2), replace (P₁-P₂) with (P₁+0.1)^κ)

S: Seat opening area (mm²)

W: Relieving capacity of valve (kg/h)

P₁: Relieving pressure (MPa) (see Note)

Lift type: set pressure 1.1

For SL-37~40, see page 69.

Full bore type: select the larger one of set pressure 1.15 or set pressure +0.034

Relief valve (type E · ED): select the larger one of set pressure 1.25 or set pressure +0.034

P₂: Outlet pressure (MPa)

κ: Correction coefficient (see Fig.2 in page 89)

Δt: Difference between the saturated temperature of relieving pressure P₁ and the temperature of hot water at inlet. (°C)

γ₁: Density hot water at inlet (kg/l) (see Tab.3 in page 88)

Q: Thermal input of pressure vessel or thermal output of hot water boiler (kJ/h)

ε: Coefficient of volumetrical expansion for water (l/°C) (see Tab.4 in page 88)

C: Specific heat of water at constant pressure (kJ/kg°C) (see Tab.4 in page 88)

Note: In the case of full bore type safety valve or relief valve, make sure the pressure does not exceed 1.1 times maximum working pressure of pressure vessel or hot water boiler (or maximum working pressure +0.034).

Applicable Laws/Regulations and Formulas for Calculating Relieving Capacity

Coefficients assigned to equations may be those specified in applicable laws/regulations or in-house data.

※In-house data

2. BOILER CONSTRUCTION CODE (from JIS B8210-1994)

(1) For steam

$$Q_m = 5.246 C K_d' A (P+0.1)^{0.9}$$

Q_m : Nominal Relieving capacity (kg/h)

A : Seat opening area (mm²)

Lift type: $A = \pi D \ell$

Full bore type: $A = \frac{\pi d^2}{4}$

D : Seat opening diameter (mm)

ℓ : Lift (mm)

d : Throat diameter (mm)

P : Relieving pressure (MPa)

(Select the larger one of set pressure 1.1 or set pressure +0.02)

C : Coefficient according to the nature of steam (see Tab. 1 in page 87)

1: set pressure is less than 0.4MPa, at saturated pressure

0.98: set pressure is larger than 0.4MPa, at saturated pressure

In the case of overheated steam, see Tab.1, page 87.

K_d' : Relieving coefficient

Lift type: 0.96^{*}

Full bore type: 0.864

(2) For hot water (Applicable when temperature is less than 120°C. If temperature is higher than 120 °C, then use the formula described in (1))

(1) In case of searching from relieving capacity:

$$S = \frac{W}{87.7 \sqrt{(P_1+0.1)^{\kappa} \gamma_1}}$$

(2) In case of searching from thermal input of pressure vessel or thermal output of hot water boiler:

$$S = \frac{Q \epsilon}{87.7 C \sqrt{(P_1+0.1)^{\kappa} \gamma_1}}$$

(If $(P_1+0.1)^{\kappa} > (P_1-P_2)$ in equations (1) and (2), replace (P_1-P_2) with $(P_1+0.1)^{\kappa}$)

S : Seat opening area (mm²)

W : Relieving capacity of valve (kg/h)

P_1 : Relieving pressure (MPa) (see Note)

Lift type: set pressure 1.1

For SL-37~40, see page 69.

Full bore type: select the larger one of set pressure 1.15 or set pressure +0.034

Relief valve (type E · ED): select the larger one of set pressure 1.25 or set pressure +0.034

P_2 : Outlet pressure (MPa)

κ : Correction coefficient (see Fig.2 in page 89)

Δt : Difference between the saturated temperature of relieving pressure P_1 and the temperature of hot water at inlet. (°C)

γ_1 : Density hot water at inlet (kg/l) (see Tab.3 in page 88)

Q : Thermal input of pressure vessel or thermal output of hot water boiler (kJ/h)

ϵ : Coefficient of volumetrical expansion for water (l/°C)

(see Tab.4 in page 88)

C : Specific heat of water at constant pressure (kJ/kg°C) (see Tab.4 in page 88)

■ NOTE

It is necessary installing safety valve when water temperature exceeds 120°C. The formula is as the following:

$$Q_m = 5.246 C K_d' A (P+0.1)^{0.9}$$

In this case, the required relieving capacity (kg/h) of safety valve can be calculated using the following formula:

$$W = \frac{Q}{h_1 - h_2}$$

W : Relieving capacity (kg/h)

Q : Thermal output of hot water boiler (kJ/h)

h_1 : Enthalpy of saturated steam that is equivalent to the maximum working pressure of boiler (kJ/kg).

h_2 : Enthalpy of water supply (kJ/kg)

$$W = \frac{Q \epsilon}{C}$$

ϵ : Coefficient of volumetrical expansion for water (l/°C) (see Tab.4 in page 88)

C : Specific heat of water at constant pressure (kJ/kg°C) (see Tab.4 in page 88)

(3) For Dowtherm boiler

$$Q_m = C' K_d' A P_1 \sqrt{\frac{M}{ZT}} \quad 0.9$$

Q_m : Nominal relieving capacity (kg/h)

A : Seat opening area (mm²)

Lift type: $A = \pi D \ell$

Full bore type: $A = \frac{\pi d^2}{4}$

D : Seat opening diameter (mm)

ℓ : Lift (mm)

d : Throat diameter (mm)

Z : Compression coefficient: 1^{*} (see Fig.1 in page 89)

T : Absolute temperature (K) of gasses at relieving pressure

C' : Coefficient according to κ and P_2/P_1 (See Fig.3, page 89)

κ : Adiabatic exponent (C_p/C_v) (See Tab.2, page 87).

The value is considered 1 if it is not clear.

P_2 : Back pressure (MPa A)

K_d' : Relieving coefficient

Lift type: 0.96^{*}

Full bore type: 0.864

M : Molecular weight of gas (see Tab.2, page 87)

P_1 : Relieving pressure (MPa A)

(Select the larger absolute pressure of set pressure 1.1 or absolute pressure of set pressure +0.02)

DATA/Safety Valves, Relief Valves

Applicable Laws/Regulations and Formulas for Calculating Relieving Capacity

Coefficients assigned to equations may be those specified in applicable laws/regulations or in-house data.

※In-house data

3. IN-HOUSE STANDARDS (for liquids other than water and hot water)

$$W=161 AK \sqrt{PG}$$

W: Relieving capacity (kg/h)
 A: Seat opening area (mm²)
 Lift type: $A = \pi D \ell$
 Full bore type: $A = 0.785d^2$
 D: Seat opening diameter (mm)
 ℓ: Lift (mm)
 d: Throat diameter (mm)

G: Specific gravity
 P: Relieving pressure (MPa)
 K: Flow coefficient
 Lift type: 0.55 for upper guide type
 0.45 for blade type [The value may be different depending on type and accumulation]
 Full bore type: 0.60

TABLE1. COEFFICIENT ACCORDING TO PROPERTY OF STEAM

Absolute pressure Mpa	Temp. °C	Saturated temperature	200	220	240	260	280	300	320	340	360	380	400	420	440	460
0.5	1.005		0.996	0.972	0.951	0.931	0.913	0.896	0.879	0.864	0.894	0.835	0.822			
1.0	0.987		0.981	0.983	0.960	0.938	0.919	0.901	0.884	0.868	0.853	0.838	0.825			
1.5	0.977		0.976	0.970	0.972	0.947	0.925	0.906	0.888	0.872	0.856	0.841	0.828			
2.0	0.972			0.967	0.964	0.955	0.932	0.912	0.893	0.876	0.860	0.845	0.830	0.817	0.804	0.792
2.5	0.969				0.961	0.961	0.937	0.918	0.898	0.880	0.863	0.848	0.833	0.819	0.806	0.793
3.0	0.967				0.962	0.957	0.949	0.924	0.903	0.885	0.867	0.851	0.836	0.822	0.808	0.795
4.0	0.965					0.958	0.954	0.934	0.915	0.894	0.875	0.857	0.841	0.826	0.813	0.799
5.0	0.966						0.955	0.953	0.927	0.904	0.884	0.865	0.848	0.832	0.817	0.803
6.0	0.968						0.962	0.953	0.941	0.911	0.891	0.872	0.854	0.838	0.822	0.808
7.0	0.971							0.958	0.954	0.924	0.901	0.881	0.861	0.844	0.827	0.812
8.0	0.975							0.967	0.956	0.937	0.912	0.888	0.868	0.850	0.833	0.817
9.0	0.980								0.962	0.957	0.926	0.897	0.876	0.856	0.838	0.822
10.0	0.986								0.971	0.961	0.936	0.909	0.883	0.863	0.844	0.827
12.0	0.999									0.975	0.964	0.926	0.903	0.876	0.857	0.838
14.0	1.016										1.002	0.980	0.956	0.920	0.893	0.868
16.0	1.036											1.000	0.988	0.942	0.907	0.883
18.0	1.063												1.038	1.004	0.972	0.929
20.0	1.094													1.028	1.006	0.953

* Intermediate values of pressure and temperature in this table are calculated by proportional method. However, in case of Absolute pressure less than 0.5MPa refer at absolute pressure 0.5MPa.
 Example. In case of Absolute pressure:1.2MPa, Temperature:230°C, C=0.960

TABLE2. GAS PROPERTY

Name	Chemical symbol	Molecular weight	Adiabatic index Cp/Cv κ	Critical temp. Tc K	Critical pressure Pc MPa
Acetylene	C ₂ H ₂	26.04	1.28	308.5	6.25
Air		28.96	1.40	—	—
Ammonia	NH ₃	17.03	1.31	405.6	11.46
Argon	Ar	39.94	1.67	150.8	4.94
Benzene	C ₆ H ₆	78.11	1.12	562.8	4.96
Isobutane	iso-C ₄ H ₁₀	58.12	1.10	408.2	3.70
Normal butane	n-C ₄ H ₁₀	58.12	1.09	425.5	3.75
Carbon disulfide	CS ₂	76.14	1.21	549.2	7.65
Carbon dioxide	CO ₂	44.01	1.29	304.2	7.63
Carbon monoxide	CO	28.01	1.40	133.0	3.62
Chlorine	Cl ₂	70.90	1.36	417.2	7.83
Cyclohexane	C ₆ H ₁₂	84.16	1.09	481.6	4.06
Normal decane	n-C ₁₀ H ₂₂	142.29	1.03	618.4	2.13
Ethane	C ₂ H ₆	30.07	1.19	305.4	4.89
Ethyl alcohol	C ₂ H ₅ OH	46.07	—	516.2	6.38
Ethylene	C ₂ H ₄	28.05	1.24	282.7	5.09
Helium	He	4.00	1.66	5.3	0.24
Normal heptane	n-CH ₂ (CH ₂) ₅ CH ₃	100.21	1.05	540.2	2.73
Normal hexane	n-C ₆ H ₁₄	86.18	1.06	507.7	3.03
Hydrogen chloride	HCl	36.46	1.41	324.7	8.43
Hydrogen	H ₂	2.16	1.41	33.2	1.32
Hydrogen sulfide	H ₂ S	34.08	1.32	373.6	9.16
Methane	CH ₄	16.04	1.31	190.9	4.71
Methyl alcohol	CH ₃ OH	32.04	1.20	512.6	8.02
Methyl chloride	CH ₂ Cl	50.49	1.20	416.3	6.75
Nitrogen	N ₂	28.01	1.40	126.3	3.44
Nitrogen suboxide	N ₂ O	44.01	1.30	309.3	7.39
Normal nonane	n-CH ₂ (CH ₂) ₇ CH ₃	128.26	1.04	594.7	2.30
Oxygen	O ₂	32.00	1.40	154.7	5.12
Normal pentane	n-CH ₂ (CH ₂) ₃ CH ₃	72.15	1.07	470.1	3.35
Normal propane	n-CH ₂ CH ₂ CH ₃	44.11	1.13	370.0	4.27
Steam	H ₂ O	18.02	1.33	647.1	22.12
Sulfur dioxide	SO ₂	64.06	1.29	593.6	4.23
Toluene	C ₆ H ₅ CH ₃	92.14	1.09	593.6	4.23
Propylene	CH ₃ CHCH ₂	42.08	1.15	365.1	4.60
Octane	C ₈ H ₁₈	114.23	1.05	—	—

*1. For air, Tc=132.45(K) and Pc=3.769(MPa·A)
 *2. When obtaining the compression factor Z of hydrogen and helium, add 8 to both Tc and add 0.8 to both Pc.



DATA/Safety Valves, Relief Valves

Applicable Laws/Regulations and Formulas for Calculating Relieving Capacity

TABLE3. HOT WATER SPECIFIC GRAVITY γ_1 (kg/ t)

Pressure MPa A \ Temp.°C	0.1	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.5
40	0.992	0.992	0.992	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993
50	0.998	0.988	0.988	0.988	0.988	0.988	0.989	0.989	0.989	0.989	0.989	0.989	0.989
60	0.983	0.983	0.983	0.983	0.983	0.984	0.984	0.984	0.984	0.984	0.984	0.984	0.984
70	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.979	0.979	0.979	0.979
80	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.973	0.973	0.973	0.973
90	0.965	0.965	0.965	0.965	0.965	0.966	0.966	0.966	0.966	0.966	0.966	0.966	0.966
100		0.958	0.958	0.958	0.958	0.959	0.959	0.959	0.959	0.959	0.959	0.959	0.959
110		0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.952	0.952	0.952	0.952
120		0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.944	0.944	0.944	0.944	0.944
130			0.935	0.935	0.935	0.935	0.935	0.935	0.935	0.935	0.936	0.936	0.936
140			0.926	0.926	0.926	0.926	0.926	0.926	0.927	0.927	0.927	0.927	0.927
150				0.917	0.917	0.917	0.917	0.917	0.918	0.918	0.918	0.918	0.918
160					0.907	0.908	0.908	0.908	0.908	0.908	0.908	0.908	0.908
170					0.897	0.897	0.898	0.898	0.898	0.898	0.898	0.898	0.898
180							0.887	0.887	0.887	0.887	0.888	0.888	0.888
190								0.876	0.876	0.876	0.877	0.877	0.877
200									0.865	0.865	0.865	0.865	0.865
210										0.853	0.853	0.853	0.853
220													0.841

Remarks: Intermediate values in this table are calculated by proportional method.
* In case of below 40°C:1

TABLE4. COEFFICIENT OF VOLUMETRICAL EXPANSION FOR WATER

Temp.°C	Specific heat C kJ/kg°C	Expansion coefficient ϵ t/°C
Below 40°C	4.150	0.00039
40	4.179	0.00039
50	4.181	0.00046
60	4.185	0.00053
70	4.190	0.00060
80	4.197	0.00066
90	4.205	0.00072
100	4.216	0.00079
110	4.229	0.00085
120	4.245	0.00090
130	4.263	0.00097
140	4.285	0.00103
150	4.310	0.00110
160	4.339	0.00118
170	4.317	0.00126
180	4.408	0.00134
190	4.449	0.00145
200	4.497	0.00155
210	4.551	0.00165
220	4.613	0.00179

Remarks: Intermediate values in this table are calculated by proportional method.

TABLE5. Value C against κ

κ	C	P ₂ /P ₁	κ	C	P ₂ /P ₁	κ	C	P ₂ /P ₁	κ	C	P ₂ /P ₁
1.00	2380	0.606	1.20	2550	0.563	1.40	2700	0.528	1.60	2820	0.496
1.02	2410	0.602	1.22	2570	0.559	1.42	2710	0.525	1.62	2830	0.493
1.04	2420	0.597	1.24	2590	0.556	1.44	2720	0.522	1.64	2850	0.490
1.06	2440	0.593	1.26	2600	0.552	1.46	2730	0.518	1.66	2860	0.488
1.08	2460	0.588	1.28	2620	0.549	1.48	2750	0.515	1.68	2870	0.485
1.10	2480	0.584	1.30	2630	0.545	1.50	2760	0.512	1.70	2880	0.482
1.12	2490	0.580	1.32	2650	0.542	1.52	2770	0.509	1.80	2940	0.468
1.14	2500	0.576	1.34	2660	0.538	1.54	2790	0.505	1.90	2980	0.456
1.16	2520	0.571	1.36	2680	0.535	1.56	2800	0.502	2.00	3030	0.444
1.18	2540	0.567	1.38	2690	0.531	1.58	2810	0.499	2.20	3130	0.422

* In case κ takes middle value. Obtain P₂/P₁ with interpolation and disregard below 4 places to decimals, and disregard below decimal point for C.

Fig.1 Coefficient of compressibility Z

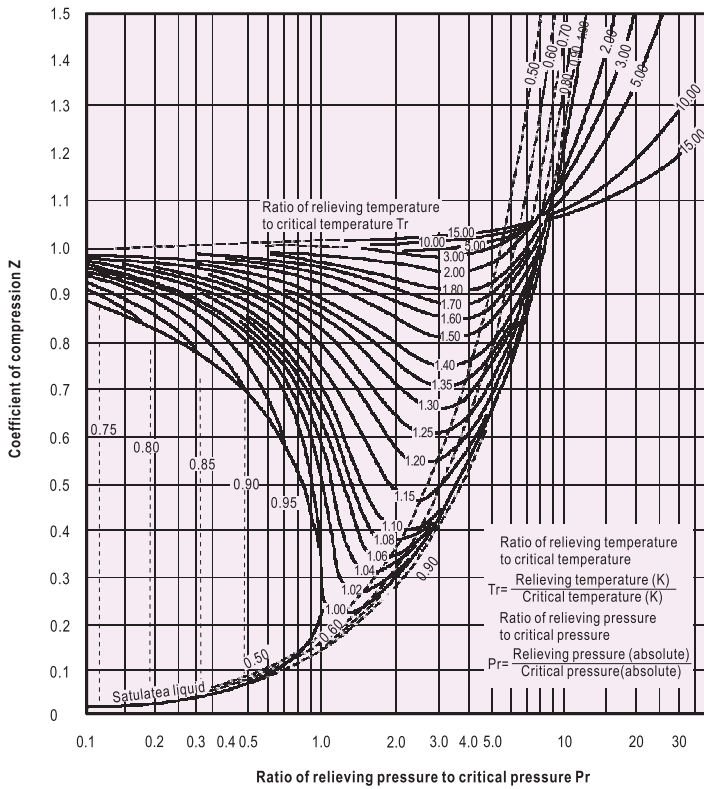


Fig.2 $\Delta t^\circ C$ correction coefficient κ

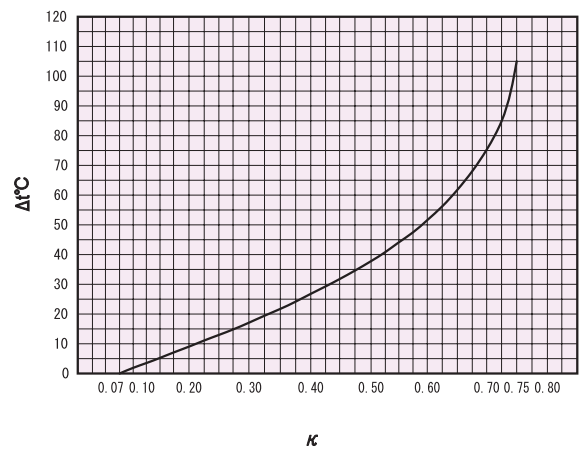
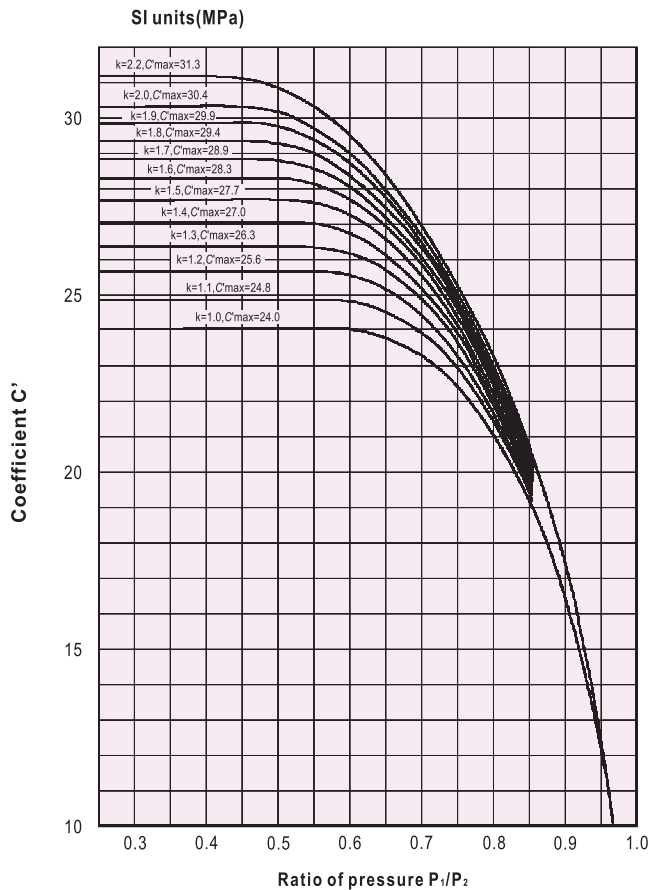


Fig.3 Coefficient (C') based on κ and P_2/P_1



RELIEVING CAPACITY (PRESSURE VESSEL CONSTRUCTION CODE)

<Steam>

■ FULL BORE TYPE

$Q_m = 5.246CK^2A(P+0.1) \cdot 0.9 \dots \dots \dots$ { C=0.98(C=1 if set pressure<0.4MPa), K_i=0.864 }
 { P is the larger one of (set pressure +0.02) or (set pressure 1.1) }

Model name	Size mm	Set pressure MPa	A	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0				
SF-1H, 2H	20	15	176.6	158	230	309	381	458	536	614	691	769	847	924	1000	1080	1150	1230	1310	1390	1460	1540	1620														
	25	19	283.3	254	369	496	611	736	860	985	1100	1230	1350	1480	1600	1730	1850	1980	2100	2230	2350	2480	2600														
	40	30	706.5	634	922	1230	1520	1830	2140	2450	2760	3070	3380	3690	4010	4320	4630	4940	5250	5560	5870	6180	6490														
	50	38	1133.5	1010	1470	1980	2440	2940	3440	3940	4440	4930	5430	5930	6430	6930	7430	7920	8420	8920	9420	9920	10400														
	15	11	94.9	85.1	123	166	204	246	288	330	371	413	455	496	538	580	622	663	705	747	789	830	872	914	956	997	1030	1080	1120	1160	1200	1240	1280	1320	1360		
SF-19L, 20L	20	15	176.6	158	230	309	381	458	536	614	691	769	847	924	1000	1080	1150	1230	1310	1390	1460	1540	1620														
	25	19	283.3	254	369	496	611	736	860	985	1100	1230	1350	1480	1600	1730	1850	1980	2100	2230	2350	2480	2600														
SF-13L, 14L	25	19	283.3	254	369	496	611	736	860	985	1100	1230	1350	1480	1600	1730	1850	1980	2100	2230	2350	2480	2600														
	40	25	490.6	440	640	860	1050	1270	1490	1700	1920	2130	2350	2560	2780	3000	3210	3430	3640	3860	4070	4290	4510	4720	4940	5150	5370	5580	5800	6020	6230	6450	6660	6880	7090	7300	
SF-16L (0.1~1MPa)	30	34	706.5	634	922	1230	1520	1830	2140	2450	2760	3070	3380	3690	4010	4320	4630	4940	5250	5560	5870	6180	6490	6800	7110	7420	7730	8040	8360	8670	8980	9290	9600	9910	10220	10530	
	40	38	907.4	814	1180	1590	1950	2350	2750	3150	3550	3950	4350	4750	5150	5550	5950	6340	6740	7140	7540	7940	8340	8740	9140	9540	9930	10300	10700	11100	11500	11900	12300	12700	13100	13500	
SF-17L SF-18L (1~2MPa)	43	49	1451.4	1300	1890	2540	3130	3770	4400	5040	5680	6320	6960	7600	8230	8870	9510	10100	10700	11400	12000	12700	13300	13900	14600	15200	15800	16500	17100	17800	18400	19000	19700	20300	21000	21700	
	55	61	2374.6	2130	3090	4160	5120	6170	7210	8250	9300	10300	11300	12400	13400	14500	15500	16600	17600	18700	19700	20700	21800	22800	23900	24900	26000	27000	28000	29100	30100	31100	32100	33200	34200	35300	
SF-19L SF-20L (2~3MPa)	69	76	4534.1	4080	5910	7950	9780	11700	13700	15700	17700	19700	21700	23700	25700	27700	29700	31700	33700	35700	37700	39600	41600	43600	45600	47600	49600	51600	53600	55600	57600	59600	61600	63600	65600		
	125	95	7084.6	6350	9240	12400	15200	18400	21500	24600	27700	30800	33900	37100	40200	43300	46400	49500	52600	55700	58800	61900	65000	68100	71200	74300	77400	80500	83600	86700	89800	92900	96000	99100	102200	105300	
LIFT TYPE	105	105	8654.6	7760	11200	15100	18600	22400	26200	30100	33900	37700	41500	45300	49100	52900	56700	60500	64300	68100	71900	75700	79500	83300	87100	90900	94700	98500	102300	106100	110000	113800	117600	121400	125200		
	150	115	10381.6	9310	13500	18200	22400	26900	31500	36100	40600	45200	49800	54300	58900	63400	68000	72600	77100	81700	86300	90800	95400	100000	104000	109000	113000	118000	122000	127000	131000	136000	141000	146000	151000		

dt: Throat dia. (mm), A: Seat opening area (mm²)

■ LIFT TYPE

$Q_m = 5.246CK^2A(P+0.1) \cdot 0.9 \dots \dots \dots$ { C=0.98(C=1 if set pressure<0.4MPa), K_i=0.96 }
 { P is the larger one of (set pressure +0.02) or (set pressure 1.1) }

Model name	Size mm	Set pressure MPa	A	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0			
SF-1H, 2H	20	15	18.8	14.4	27.2	36.6	45	54.2	63.4	72.6	81.8	91	100	109	118	127	136	146	155	164	173	182	192	201	210	219	228	237	247	256	265	274	283	293	303		
	25	19	31.4	24.1	45.5	61.1	75.3	90.6	106	121	136	152	167	182	198	213	228	244	259	274	290	305	320	336	351	366	382	397	412	428	443	458	474	489	504	519	
	40	30	78.3	61.8	116	156	192	231	271	310	349	388	428	467	506	545	584	624	663	702	741	781	820	859	898	938	977	1010	1050	1090	1130	1170	1210	1250	1290	1330	
	50	38	125.6	96.7	125	182	244	301	362	424	485	546	608	669	730	792	853	914	976	1030	1090	1160	1220	1280	1340	1400	1460	1520	1590	1650	1710	1770	1830	1890	1950	2010	
	65	49	204.1	157	203	296	397	489	589	689	788	888	988	1080	1180	1280	1380	1480	1580	1680	1780	1880	1980	2080	2180	2280	2380	2480	2580	2680	2780	2880	2980	3080	3180	3280	
SF-19L, 20L	20	15	18.8	14.4	27.2	36.6	45	54.2	63.4	72.6	81.8	91	100	109	118	127	136	146	155	164	173	182	192	201	210	219	228	237	247	256	265	274	283	293	303		
	25	19	31.4	24.1	45.5	61.1	75.3	90.6	106	121	136	152	167	182	198	213	228	244	259	274	290	305	320	336	351	366	382	397	412	428	443	458	474	489	504	519	
SF-13L, 14L	25	19	283.3	254	369	496	611	736	860	985	1100	1230	1350	1480	1600	1730	1850	1980	2100	2230	2350	2480	2600														
	40	25	490.6	440	640	860	1050	1270	1490	1700	1920	2130	2350	2560	2780	3000	3210	3430	3640	3860	4070	4290	4510	4720	4940	5150	5370	5580	5800	6020	6230	6450	6660	6880	7090	7300	
SF-16L (0.1~1MPa)	30	34	706.5	634	922	1230	1520	1830	2140	2450	2760	3070	3380	3690	4010	4320	4630	4940	5250	5560	5870	6180	6490	6800	7110	7420	7730	8040	8360	8670	8980	9290	9600	9910	10220	10530	
	40	38	907.4	814	1180	1590	1950	2350	2750	3150	3550	3950	4350	4750	5150	5550	5950	6340	6740	7140	7540	7940	8340	8740	9140	9540	9930	10300	10700	11100	11500	11900	12300	12700	13100	13500	
SF-17L SF-18L (1~2MPa)	43	49	1451.4	1300	1890	2540	3130	3770	4400	5040	5680	6320	6960	7600	8230	8870	9510	10100	10700	11400	12000	12700	13300	13900	14600	15200	15800	16500	17100	17800	18400	19000	19700	20300	21000	21700	
	55	61	2374.6	2130	3090	4160	5120	6170	7210	8250	9300	10300	11300	12400	13400	14500	15500	16600	17600	18700	19700	20700	21800	22800	23900	24900	26000	27000	28000	29100	30100	31100	32100	33200	34200	35300	
SF-19L SF-20L (2~3MPa)	69	76	4534.1	4080	5910	7950	9780	11700	13700	15700	17700	19700	21700	23700	25700	27700	29700	31700	33700	35700	37700	39600	41600	43600	45600	47600	49600	51600	53600	55600	57600	59600	61600	63600	65600		
	125	95	7084.6	6350	9240	12400	15200																														

RELIEVING CAPACITY (BOILER CONSTRUCTION CODE)

<Steam>

$Q_m = 5.246K_d A (P+0.1) \cdot 0.9 \dots\dots\dots$ { C=0.98 (C=1 if set pressure < 0.4MPa), $K_d=0.864$
 P=set pressure 1.03 (in case of set pressure < 0.1MPa), P=set pressure + 0.02MPa }

Model name	Size mm	dt	Set pressure MPa A	Relieving Capacity (kg/h)																														
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	
SF-1H, 2H	20	15	176.6	158	220	294	361	434	506	579	652	725	797	870	943	1010	1080	1160	1230	1300	1370	1450	1520											
	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270	1390	1510	1620	1740	1860	1970	2090	2210	2320	2440											
	40	30	706.5	634	881	1170	1440	1730	2020	2310	2600	2900	3190	3480	3770	4060	4350	4640	4930	5220	5510	5800	6100											
	50	38	1133.5	1010	1410	1890	2320	2780	3250	3720	4180	4650	5120	5580	6050	6520	6980	7450	7920	8380	8850	9320	9780											
	15	11	94.9	85.1	118	158	194	233	272	311	350	389	428	467	506	545	585	624	663	702	741	780	819	858	897	936	975	1010	1050	1090	1130	1170	1210	
SF-19L, 20L	20	15	176.6	158	220	294	361	434	506	579	652	725	797	870	943	1010	1080	1160	1230	1300	1370	1450	1520	1590	1670	1740	1810	1880	1960	2030	2100	2170	2250	
	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270	1390	1510	1620	1740	1860	1970	2090	2210	2320	2440	2560	2670	2790	2910	3020	3140	3260	3370	3490	3610	
SF-13L	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270	1390	1510	1620	1740	1860	1970	2090	2210	2320	2440	2560	2670	2790	2910	3020	3140	3260	3370	3490	3610	
	40	30	706.5	634	881	1170	1440	1730	2020	2310	2600	2900	3190	3480	3770	4060	4350	4640	4930	5220	5510	5800	6100	6390	6680	6970	7260	7550	7840	8130	8420	8710	9000	
SF-16L (0.1~1MPa)	50	38	1133.5	1010	1410	1890	2320	2780	3250	3720	4180	4650	5120	5580	6050	6520	6980	7450	7920	8380	8850	9320	9780											
	65	49	1884.7	1690	2350	3140	3850	4630	5400	6180	6960	7730	8510	9290	10000	10800	11600	12300	13100	13900	14700	15400	16200	17000	17800	18600	19300	20100	20900	21700	22400	23200	24000	
SF-17L	80	61	2920.9	2620	3640	4870	5970	7180	8380	9580	10770	11900	13100	14300	15600	16800	18000	19200	20400	21600	22800	24000	25200	26400	27600	28800	30000	31200	32400	33600	34800	36000	37200	
	100	76	4534.1	4060	5650	7560	9280	11100	13000	14800	16700	18600	20400	22300	24200	26000	27900	29800	31600	33500	35400	37200	39100	41000	42800	44700	46600	48400	50200	52000	53800	55600	57400	
SF-19L SF-20L (2~3MPa)	125	95	8054.6	7240	9680	11800	14200	16600	19000	21400	23800	26200	28600	31000	33300	35700	38100	40500	42900	45300	47700	50100	52500	54900	57300	59600	62000	64400	66800	69200	71600	74000		
	105	95	8654.6	7760	10300	12700	15100	17500	19900	22300	24700	27100	29500	31900	34300	36700	39100	41500	43900	46300	48700	51100	53500	55900	58300	60700	63100	65500	67900	70300	72700	75100		
150	115	10381.6	9310	12900	17300	21200	25500	29700	34000	38300	42600	46900	51100	55400	59700	63900	68200	72500	76800	81000	85300	89600	93900	98100	102000	106000	110000	114000	118000	122000	126000	130000		

 dt: Throat dia. (mm), A: Seat opening area (mm²)

$Q_m = 5.246K_d A (P+0.1) \cdot 0.9 \dots\dots\dots$ { C=0.98 (C=1 if set pressure < 0.4MPa), $K_d=0.96$
 P=set pressure 1.03 (in case of set pressure < 0.1MPa), P=set pressure + 0.02MPa }

Model name	Size mm	dt	Set pressure MPa A	Relieving Capacity (kg/h)																														
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	
LIFT TYPE	20	15	176.6	158	220	294	361	434	506	579	652	725	797	870	943	1010	1080	1160	1230	1300	1370	1450	1520											
	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270	1390	1510	1620	1740	1860	1970	2090	2210	2320	2440											
	40	30	706.5	634	881	1170	1440	1730	2020	2310	2600	2900	3190	3480	3770	4060	4350	4640	4930	5220	5510	5800	6100											
	50	38	1133.5	1010	1410	1890	2320	2780	3250	3720	4180	4650	5120	5580	6050	6520	6980	7450	7920	8380	8850	9320	9780											
	15	11	94.9	85.1	118	158	194	233	272	311	350	389	428	467	506	545	585	624	663	702	741	780	819	858	897	936	975	1010	1050	1090	1130	1170	1210	
LIFT TYPE	20	15	176.6	158	220	294	361	434	506	579	652	725	797	870	943	1010	1080	1160	1230	1300	1370	1450	1520	1590	1670	1740	1810	1880	1960	2030	2100	2170	2250	
	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270	1390	1510	1620	1740	1860	1970	2090	2210	2320	2440	2560	2670	2790	2910	3020	3140	3260	3370	3490	3610	
LIFT TYPE	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270	1390	1510	1620	1740	1860	1970	2090	2210	2320	2440	2560	2670	2790	2910	3020	3140	3260	3370	3490	3610	
	40	30	706.5	634	881	1170	1440	1730	2020	2310	2600	2900	3190	3480	3770	4060	4350	4640	4930	5220	5510	5800	6100	6390	6680	6970	7260	7550	7840	8130	8420	8710	9000	
LIFT TYPE	50	38	1133.5	1010	1410	1890	2320	2780	3250	3720	4180	4650	5120	5580	6050	6520	6980	7450	7920	8380	8850	9320	9780											
	65	49	1884.7	1690	2350	3140	3850	4630	5400	6180	6960	7730	8510	9290	10000	10800	11600	12300	13100	13900	14700	15400	16200	17000	17800	18600	19300	20100	20900	21700	22400	23200	24000	
LIFT TYPE	80	61	2920.9	2620	3640	4870	5970	7180	8380	9580	10770	11900	13100	14300	15600	16800	18000	19200	20400	21600	22800	24000	25200	26400	27600	28800	30000	31200	32400	33600	34800	36000	37200	
	100	76	4534.1	4060	5650	7560	9280	11100	13000	14800	16700	18600	20400	22300	24200	26000	27900	29800	31600	33500	35400	37200	39100	41000	42800	44700	46600	48400	50200	52000	53800	55600	57400	
LIFT TYPE	125	95	8054.6	7240	9680	11800	14200	16600	19000	21400	23800	26200	28600	31000	33300	35700	38100	40500	42900	45300	47700	50100	52500	54900	57300	59600	62000	64400	66800	69200	71600	74000		
	105	95	8654.6	7760	10300	12700	15100	17500	19900	22300	24700	27100	29500	31900	34300	36700	39100	41500	43900	46300	48700	51100	53500	55900	58300	60700	63100	65500	67900	70300	72700	75100		
150	115	10381.6	9310	12900	17300	21200	25500	29700	34000	38300	42600	46900	51100	55400	59700	63900	68200	72500	76800	81000	85300	89600	93900	98100	102000	106000	110000	114000	118000	122000	126000	130000		

 D: Seat opening dia. (mm), A: Seat opening area (mm²)

RELIEVING CAPACITY (VENN STANDARD)

<Liquids>
(Except Hot water and water)



■ FULL BORE TYPE $W=161 AK\sqrt{PG}$ (K=0.6, G=1, Accumulation 15%, A=0.785dt²) (10³kg/h)

Set pressure MPa	Size mm																													
	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100												
11	3.10	4.39	5.38	6.21	6.95	7.61	8.22	8.79	9.32	9.83	10.3	10.7	11.2	11.6	12.0	12.4	12.8	13.1	13.5	13.9	14.2	14.5	14.9	15.2	15.5	15.8	16.1	16.4	16.7	17.0
15	5.78	8.18	10.0	11.5	12.9	14.1	15.3	16.3	17.3	18.2	19.1	20.0	20.8	21.6	22.4	23.1	23.8	24.5	25.2	25.8	26.5	27.1	27.7	28.3	28.9	29.4	30.3	30.6	31.1	31.6
19	9.28	13.1	16.0	18.5	20.7	22.7	24.5	26.2	27.8	29.3	30.7	32.1	33.4	34.7	35.9	37.1	38.2	39.3	40.4	41.5	42.5	43.5	44.5	45.4	46.4	47.3	48.2	49.1	49.9	50.8
25	16.0	22.7	27.8	32.1	35.9	39.3	42.5	45.4	48.2	50.8	53.3	55.6	57.9	60.1	62.2	64.2	66.2	68.1	70.0	71.8	73.6	75.3	77.0	78.7	80.3	81.9	83.5	85.0	86.5	88.0
30	23.1	32.7	40.0	46.2	51.7	56.6	61.2	65.4	69.4	73.1	76.7	80.1	83.4	86.5	89.6	92.5	95.4	98.1	100	103	106	108	110	113	115	118	120	122	124	126
35	29.7	42.0	51.4	59.4	66.4	72.8	78.6	84.0	89.1	93.9	98.5	102	107	111	115	118	122	126	129	132	136	139	142	145	148	151	154	157	160	162
40	37.1	52.5	64.3	74.2	83.0	90.9	98.2	105	111	117	123	128	133	138	143	148	153	157	161	166	170	174	178	181	185	189	192	196	199	203
45	47.5	67.2	82.3	95.0	106	116	125	134	142	150	157	164	171	177	184	190	196	201	207	212	217	223	228	232	237	242	247	251	256	260
50	61.7	87.3	107	123	138	151	163	174	185	195	204	213	222	231	239	246	254	261	269	276	282	289	296	302	308	314	320	326	332	338
55	77.7	110	135	156	174	190	205	220	233	245	257	269	281	291	301	311	320	330	33.9	347	356	364	373	381	388	396	404	411	418	426
60	95.6	135	166	191	214	234	253	270	287	303	317	331	344	358	370	382	394	405	417	427	438	448	458	468	478	487	497	506	515	524
65	122	173	212	245	274	299	323	346	367	387	406	424	441	458	474	489	504	519	533	547	561	574	587	599	612	624	636	647	659	670
70	149	210	257	297	332	363	392	420	445	469	490	514	535	555	575	594	612	630	647	664	680	696	712	727	742	757	771	785	799	813
75	190	269	329	380	425	465	503	537	570	601	630	658	685	711	736	760	784	806	829	850	871	892	912	931	950	969	988	1000	1020	1040
80	232	328	402	464	519	568	614	656	696	733	769	803	836	868	898	928	956	984	1010	1030	1060	1080	1110	1130	1160	1180	1200	1220	1240	1270
85	284	401	491	567	634	694	750	801	850	896	940	982	1020	1060	1090	1130	1160	1200	1230	1260	1290	1320	1350	1380	1410	1440	1470	1500	1520	1550
90	340	481	589	680	760	833	899	961	1020	1070	1120	1170	1220	1270	1310	1360	1400	1440	1480	1520	1550	1590	1630	1660	1700	1730	1760	1790	1830	1860

P: Relieving pressure (MPa), dt: Throat dia. (mm)

*1. Coefficient K and Accumulation are different according to types.

*2. P (MPa), which is for actual calculation to decide discharge amount, is (P)+(Accumulation) – (Back pressure)

(10³kg/h)

■ LIFT TYPE $W=161 AK\sqrt{PG}$ (K=0.55, G=1, Accumulation 10%, A= π D²/4)

Set pressure MPa	Size mm																													
	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100												
11	0.552	0.780	0.956	1.10	1.23	1.35	1.46	1.56	1.65	1.74	1.83	1.91	1.99	2.06	2.13	2.20	2.27	2.34	2.40	2.46	2.53	2.58	2.64	2.70	2.76	2.81	2.86	2.92	2.97	3.02
15	0.922	1.30	1.59	1.84	2.06	2.25	2.43	2.60	2.76	2.91	3.05	3.19	3.32	3.45	3.57	3.68	3.80	3.91	4.01	4.12	4.22	4.32	4.42	4.51	4.61	4.70	4.79	4.87	4.96	5.05
19	1.61	2.28	2.79	3.22	3.60	3.94	4.26	4.56	4.83	5.09	5.34	5.58	5.81	6.03	6.24	6.44	6.64	6.84	7.02	7.21	7.38	7.56	7.73	7.89	8.06	8.22	8.37	8.53	8.68	8.83
25	2.35	3.33	4.08	4.71	5.27	5.77	6.23	6.67	7.07	7.45	7.82	8.16	8.50	8.82	9.13	9.43	9.72	10.0	10.2	10.5	10.8	11.0	11.3	11.5	11.7	12.0	12.2	12.4	12.6	12.9
30	3.68	5.21	6.38	7.37	8.24	9.03	9.75	10.4	11.0	11.6	12.5	13.2	13.8	14.2	14.7	15.2	15.6	16.0	16.4	16.9	17.3	17.6	18.0	18.4	18.8	19.1	19.5	19.8	20.2	20.6
35	5.99	8.47	10.3	11.9	13.4	14.6	15.8	16.9	17.9	18.9	19.8	20.7	21.6	22.4	23.2	23.9	24.7	25.4	26.1	26.8	27.4	28.1	28.7	29.3	29.9	30.5	31.1	31.7	32.2	32.8
40	10.1	14.4	17.6	20.3	22.7	24.9	26.9	28.8	30.5	32.2	33.7	35.2	36.7	38.1	39.4	40.7	42.0	43.2	44.4	45.5	46.6	47.7	48.8	49.9	50.9	51.9	52.9	53.9	54.8	55.8
45	13.1	18.5	22.7	26.2	29.3	32.1	34.7	37.1	39.4	41.5	43.5	45.5	47.4	49.1	50.8	52.5	54.1	55.7	57.2	58.7	60.2	61.6	63.0	64.3	65.6	66.9	68.2	69.5	70.7	71.9
50	14.4	20.4	25.0	28.9	32.3	35.4	38.2	40.8	43.3	45.7	47.9	50.0	52.1	54.0	55.9	57.8	59.6	61.3	63.0	64.6	66.2	67.8	69.3	70.8	72.2	73.7	75.1	76.5	77.8	79.1
55	22.9	32.4	39.6	45.8	51.2	56.1	60.6	64.8	68.7	72.4	75.9	79.3	82.6	85.7	88.7	91.6	94.4	97.2	99.8	102	105	107	109	112	114	116	119	121	123	125
60	33.0	46.3	56.6	66.1	74.8	82.8	90.2	97.1	103.6	110	116.8	123	129.8	136.2	142.4	148.4	154.2	160	165.8	171.6	177.2	182.7	188.1	193.4	198.6	203.8	209	213	216	219
65	36.8	52.1	63.8	73.7	82.4	90.3	97.5	104	110	116	122	127	132	138	142	147	152	156	160	164	169	173	176	180	184	188	191	195	198	202
70	39.5	55.9	68.5	79.1	88.4	96.9	104	111	118	125	131	137	142	148	153	158	163	167	172	176	181	185	189	193	197	201	205	209	213	216
75	52.5	74.3	91.0	105	117	128	139	148	157	166	174	182	189	196	203	210	216	223	229	235	240	246	252	257	262	268	273	278	283	287
80	59.0	83.4	102	118	131	144	156	166	177	186	195	204	212	220	228	236	243	250	257	263	270	276	283	289	295	300	306	312	317	323

P: Relieving pressure (MPa), D: Seat opening dia. (mm), R: Lift (A)

*1. Coefficient K, Accumulation and Lift are different according to types.

*2. Refer to page 69 for safety relief valves (SL-37~40F Type).

*3. P (MPa), which is for actual calculation to decide discharge amount, is (P)+(Accumulation) – (Back pressure)

Extract from JIS B8210-1994 Spring Safety Valve for Steam and Gases

■ Allowed deviation of discharge-starting pressure

(1) For steam

There is no provision on the relief pressure of safety valve for steam.

(2) For gasses

For valve for gasses, the allowed deviation of start to discharge pressure is set pressure $\pm 5\%$ (minimum pressure: $\pm 0.025\text{MPa}$). In case of allowed deviation, which is not allowed to exceed set pressure, add the "+" side to "-" side.

Note: For valves for gasses, the set pressure is generally the start to discharge pressure.

■ Allowed deviation of opening pressure (popping pressure)

(1) For steam

See Table 1 for the deviation of opening pressure. In case of allowed deviation, which is not allowed to exceed set pressure, add the "+" side to "-" side.

(2) For gasses

For safety valves for gasses, the allowed deviation of discharge-starting pressure is less than 1.1 times of start to discharge pressure. However, in the case of setting opening pressure, the deviation should be $\pm 3\%$ set pressure (minimum $\pm 0.014\text{MPa}$).

■ BLOWDOWN

(1) For steam

See Table 2 for the blowdown pressure of safety valves for steam. For valves for steam used with through flow boilers, re-heater, and piping, which opening pressure exceeds 0.3MPa , the blowdown pressure should be less than 10% of set pressure.

(2) For gasses

See Table 3 for blowdown pressure of safety valves for gasses.

TABLE1. TOLERANCE OF OPENING PRESSURE OF SAFETY VALVES FOR STEAM

(MPa)

Set pressure	Tolerance
Below 0.5	± 0.014 or less
0.5 or more and below 2.3	$\pm(3\%$ of set pressure)
2.3 or more and below 7.0	± 0.07
7.0 or more	$\pm(1\%$ of set pressure)

*1. For steam, generally the set pressure is assumed to be the opening pressure.

*2. The tolerance of the opening pressure of the safety valves for steam used other than in boilers can be $\pm 3\%$ of the set pressure (minimum value $\pm 0.014\text{MPa}$).

TABLE2. BLOWDOWN PRESSURE OF SAFETY VALVES FOR STEAM

(MPa)

Set pressure	Blowdown
0.4 or less	0.03
Over 0.4	7%(4%) or less of set pressure

*1. Generally, the blowdown pressure for steam shall be the difference between the popping pressure and the reseating pressure.

*2. The figures in () can be determined in accordance with the agreement between the parties concerned.

TABLE3. BLOWDOWN PRESSURE OF SAFETY VALVES FOR GAS

(MPa)

Set pressure	Blowdown	
	Metal seated type	Soft seat type
0.2 or less	0.03 or less	0.05 or less
Over 0.2	15% or less of set pressure	25% or less of set pressure

*1. Generally, the blowdown pressure for gases shall be the difference between the start to discharge pressure and the reseating pressure. However, when set by the opening pressure, it shall be the difference between the opening pressure and the reseating pressure.

*2. The definition of the soft seat and metal seated types shall be in accordance with JIS B 0100.

Note. The blowdown pressure defined by Venn shall be in accordance with the Venn standard unless otherwise specified by JIS B8210.

Key Points for Installation of Safety Valve and Relief Valve

1. Installation

- ❶ Safety valve should be vertical to pipe. Before installation, remove scale and dust and clean the surfaces that contact with gasket.
- ❷ The diameter of the installation pipe should be larger than the diameter of valve. To reduce pressure loss to minimum degree, the stand pipe should be as short as possible.
- ❸ The stand pipe should be rigid and hard enough to bear the compression force, shearing force, bending stress or other counterforce caused by relieving of safety valve.
- ❹ Compared with the diameter of the outlet of safety valve, the diameter of the discharge pipe should be as large as possible. The discharge pipe should be as short as possible, without any bending, lead to outside of the door or other safe place, and be properly supported to avoid the occurrence of undesired stress (including thermal stress).

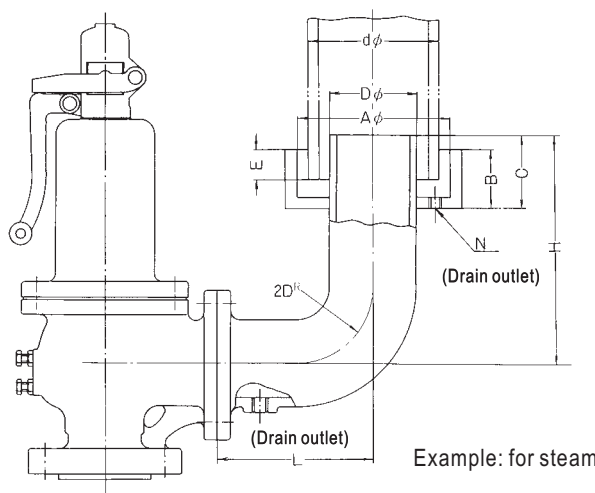
When deciding the place that the outlet of the discharge pipe faces, pay attention to the following issues.

- To avoid installation place where is influenced by explosive sound and blast.
- Avoid damage to electrical equipments, machines, tools etc. in the case the fluid is steam or water.
- Avoid corrosion, poisoning, anoxia etc. in the case the fluid is harmful gas.

- ❺ In the case of screwed type safety valve or relief valve, install union joint at the discharge pipe of the outlet side to allow easy dismounting (see Fig.1 in next page).
- ❻ At parts of the discharge pipe where drain or rain may accumulate, install the drain outlet, which is possible to discharge drain completely, and connect to dike.
- ❼ In the case of full bore type safety valve for liquids or harmful gasses and have faucet for adjusting back pressure, install the valve on the outlet discharge pipe (see Fig.3 in next page).

- ❼ To avoid adverse impact on safety valve that is caused by thermal expansion of devices or discharge pipe, install proper expansion joint at the outlet of valve and install a discharge pipe at the end (see the figure below). To limit counterforce, the distance between the axes of the valve and the center of discharge pipe should be as short as possible, and the radius of the elbow pipe should be at least 2D (D: the internal diameter of the elbow). below figure also shows the standard dimensions of the discharge pipe of safety valve.

- ❽ Cares should be paid on installation of valves with lever (open type). It may effuse fluid from upper cap when such valves are operating (see Fig.5 in the next page).



REFERENCE DIMENSION FOR EXHAUST PIPE

(mm)

Outlet size	D	d	(A)	B	C	E	L	H	N
40(1½")	40	65	130	60	80	30	130	220	Rc¾"
50(2")	50	80	150	60	90	40	150	230	Rc½"
65(2½")	65	100	200	60	100	40	180	270	Rc½"
80(3")	80	125	200	70	120	50	200	310	Rc½"
100(4")	100	150	250	70	140	60	250	370	Rc¾"
125(5")	125	200	300	80	160	70	300	430	Rc1"
150(6")	150	200	300	80	180	70	350	500	Rc1"
200(8")	200	250	380	100	220	80	450	610	Rc1"

2. Maintenance and operating instructions

- ❶ At the installation of safety valves avoid the place where there is possibility to obstruct their functions by vibration or corrosion and do not give impact from outside.
- ❷ After installation, make sure the pressure of the device has reached at least 75% discharge pressure of the valve before using the test lever to start the valve.
- ❸ Normal working pressure of the equipment shall not exceed 90% of the blowdown pressure of the valve and 80 to 85% when pulsation is expected.

- ❹ If possible, remove safety valve before making water pressure test. To make water pressure test without removing safety valve, pay attention to the following below (see Fig.4 in the next page).
 - ⓐ To prevent valve from being damaged due to improper load, when the pressure of the device reaches 80~90% of discharge pressure, install test gag* and press lightly on the end of valve shaft. The test gag must be rotated using hand. If you rotate it using

spanner or other tools, there may have excessively large pressing force, the seat may be damaged, the shaft may be bended, and the valve may not function normally.

- ⓑ After water pressure test and the pressure reduces to 80~90% relieving pressure, remove test gag immediately.

※ The test gag is optional item.

Key Points for Installation of Safety Valve and Relief Valve

PIPING EXAMPLE

Fig.1 Example: Pressure tank installation

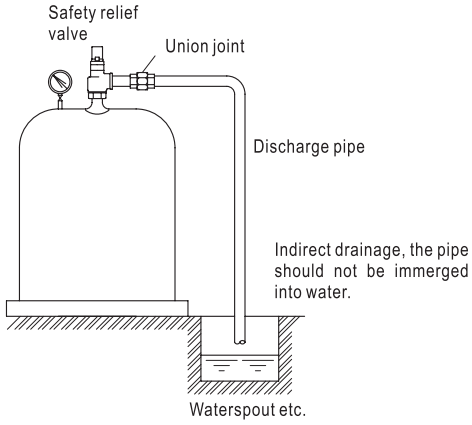


Fig.2 Example: Installation of the secondary side of pressure reducing valve

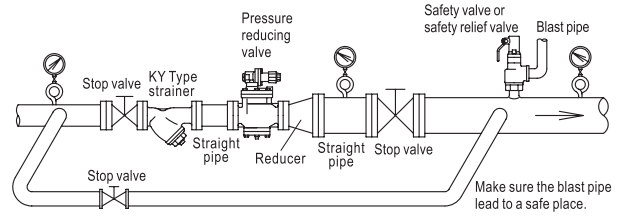


Fig.3 Example connection of (back pressure adjusting cock)

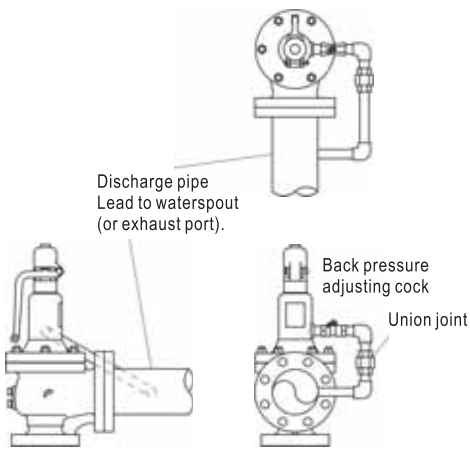


Fig.4 Installation of test gag

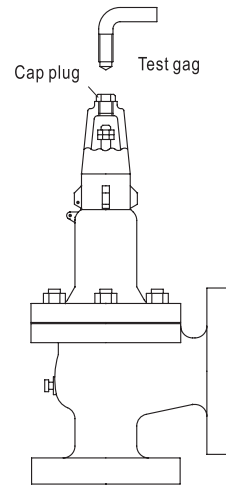


Fig.5 Lever structure

Lever structure of SL-37, 39, 39F Type
For air, gas, or liquid

