SF-19, 19L, 20, 20L Type Safety Valve (Full Bore Type)

for Pressure Vessels, Steam Boiler, etc. (3.0MPa)

SF-19 Type

SF-20 Type

PRESSURE DIVISION

(MPa)

Code No.	Size 15~25mm	Size 40~150mm
1	0.1	Over 2.0~2.5
2	Over 0.1~0.12	Over 2.5~3.0
3	Over 0.12~0.15	
4	Over 0.15~0.18	
5	Over 0.18~0.21	
6	Over 0.21~0.25	
7	Over 0.25~0.3	
8	Over 0.3~0.36	
9	Over 0.36~0.43	
A	Over 0.43~0.5	
B	Over 0.5~0.65	
C	Over 0.65~0.8	
D	Over 0.8~1.0	
E	Over 1.0~1.3	
F	Over 1.3~1.6	
G	Over 1.6~2.0	
H	Over 2.0~2.5	
J	Over 2.5~3.0	

SPECIFICATIONS

Model name	SF-19	SF-19L	SF-20	SF-20L
Code name	SF19-C ☐	SF19L-C ☐	SF20-C ☐	SF20L-C ☐
	※ Code No. of pressure division is required in ☐.			
Cap type	With lever		Without lever	
Applicable fluid	Air	Steam	Air, gases & liquids	Steam
Size	15~150(½″~6″)			
Fluid temperature	−5~235℃			
Set pressure range	Size 15~25mm:0.1~3.0MPa Size 40~150mm:2.0~3.0MPa			
End connection	Inlet:Flanged JIS (10*1), 20, 30KRF(Thickness is based on table of DIMENSIONS)*1. Outlet:Flanged JIS 10KFF*1. *2.			
Materials	Body(Cast steel)*3, Disc & Seat ring(Stainless steel)			
	Disc & Seat ring:Stellited*4.			
Valve body pressure test	2 times of flange rated pressure. (Hydraulic)			

*1. Flange codes JIS B8210 20K or 30K(inlet) × JIS B2220(outlet) are available except size 40mm.
*2. RF flange for outlet side is also available upon your request.
*3. Stainless steel body is available. (Applicable pressure is different for each size)
*4. The valve for steam has split valve disc and only valve seat is stellite welded.

DIMENSIONS

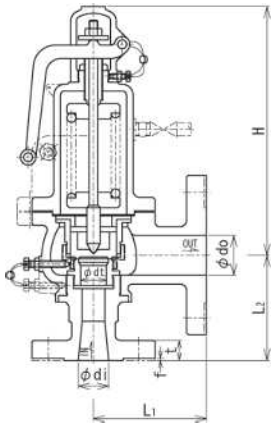
(mm)

Size Inlet×Throat dia.×Outlet	Seat opening dia.	Throat dia.	Throat area	Lift	Face to Face		Height H		Thickness of flange		Mass(kg)	
							SF-19 SF-19L Type	SF-20 SF-20L Type			SF-19 SF-19L Type	SF-20 SF-20L Type
di×dt×do	D	dt	a(mm²)	ℓ	L1	L2			t	f		
15(½″)×11×25(1″)	13	11	94.9	2.8	100	80	203	204	18	1	8.2	8
20(¾″)×15×40(1½″)	18	15	176.6	3.8	105	95	209	210	18	1	9.7	9.5
25(1″)×19×40(1½″)	22	19	283.3	5.0	115	110	257	258	20	1	13	12
40(1½″)×25×65(2½″)	35	25	490.6	6.5	125	125	332	333	28	6	24	24
40(1½″)×30×65(2½″)		30	706.5	7.5								
50(2″)×34×80(3″)	45	34	907.4	8.5	135	135	376	377	30	6	34	33
50(2″)×38×80(3″)		38	1133.5	9.5								
65(2½″)×43×100(4″)	58	43	1451.4	11.0	155	160	472	473	34	8	57	56
65(2½″)×49×100(4″)		49	1884.7	12.5								
80(3″)×55×125(5″)	71	55	2374.6	14.0	175	180	528	529	36	8	77	76
80(3″)×61×125(5″)		61	2920.9	15.5								
100(4″)×69×150(6″)	88	69	3737.3	17.5	205	205	658	659	40	10	131	129
100(4″)×76×150(6″)		76	4534.1	19.0								
125(5″)×86×200(8″)	111	86	5805.8	21.5	225	240	811	813	44	10	270	267
125(5″)×95×200(8″)		95	7084.6	24.0								
150(6″)×105×200(8″)	134	105	8654.6	26.5	255	250	902	904	48	12	316	310
150(6″)×115×200(8″)		115	10381.6	29.0								

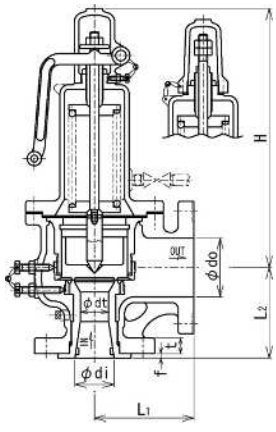
Note: The weight is that of JIS 30K inlet flange.

Flange code inlet JIS (10), 20, 30KRF
Outlet JIS 10K

CONSTRUCTION

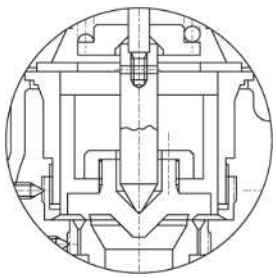


Size 15~25mm



Size 40~150mm

● CONSTRUCTION OF SF-19L, 20L VALVE PART



Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

Extract from JIS B8210-2009 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 gases

For valve for gases, the allowed deviation of start to discharge pressure is set pressure ±5% (minimum pressure: ±0.025MPa). In case of allowed deviation, which is not allowed to exceed set pressure,add the "+" side to "−" side.

Note: For valves for gases, 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 gases

For safety valves for gases, the allowed deviation of discharge-starting pressure is less then1.1 times of star to discharge pressure. However, in the case of setting opening pressure, the deviation should be ±3% set pressure (minimum±0.015MPa).

In case of allowed deviation, which is not allowed to exceed set pressure, add the "+" side to "−" side.

■ 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 can be less than 10% of set pressure.

(2) For gases

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

Note: Unless otherwise specified in JIS B8210, Blowdown Standard of VENN shall apply.

■ Restriction of material use (pressure parts of safety valve) (Source: JIS B8210-2009)

(1) For steam

Material of pressure parts	Allowed range
Cast iron	Set pressure: Max.1.6 MPa. Fluid temperature: Max.230°C
Ductile iron casting	Set pressure: Max.2.4 MPa. Fluid temperature: Max.350°C

(2) For gases

Gas type / Material of pressure parts	Toxic,flammable gases	Gases other than toxic,flammable gases	Toxic,flammable gases, other gases
	Allowed range		
Cast iron	Not allowed	Set pressure: Max.0.2 MPa	Not allowed
Ductile cast iron	Set pressure: Max.0.2 MPa	Set pressure: Max.1.6 MPa	Not allowed
Ductile iron casting	A: Application in system for highly toxic gases such as phosgene and hydrogen cyanide,etc is not allowed. B: For gases other than those mentioned in A, the set pressure should be Max.2.4 MPa. C: Fluid temperature should be higher than -5°C and lower than 350°C.		

TABLE1. TOLERANCE OF OPENING PRESSURE OF SAFETY VALVES FOR STEAM

(MPa)

Set pressure	Tolerance
Below 0.5	±0.015
0.5 or more and less than 2.3	±(3% of set pressure)
2.3 or more and less than 7.0	±0.07
7.0 or more	±(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 ±3% of the set pressure (minimum value ±0.015MPa).

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 opening pressure and the reseating pressure.

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

TABLE3. BLOWDOWN PRESSURE OF SAFETY VALVES FOR GASES

(MPa)

Set pressure	Blowdown	
	Metal seat 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 seated and metal seated types shall be in accordance with JIS B0100.

Note. Unless otherwise specified in JIS B8210, Blowdown Standard of VENN shall apply.

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 B8210-2009)

(1) For Steam

$Qm=5.25C'K_{dr}'AP$

Qm: Relieving capacity (kg/h)

A : Seat opening area (mm^2)

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: Absolute relieving pressure (MPa·A)

(Select the larger one of set pressure × 1.1 + 0.101 or set pressure + 0.020 + 0.101).

C': Coefficient determined according to the property of steam (See Tab.1 in Page 87.)

For saturated steam, see the following table:

Absolute relieving pressure (MPa·A)	C': Coefficient determined according the property of steam
Max.0.5	1※
over 0.5~1.0	0.98※
over 1.0~2.0	0.97※
over 2.0	0.96※

For superheated steam, See Tab1. in Page 87.

K_{dr}': Relieving coefficient

Lift type:0.864※

Full bore type:0.777

(2) For Gases

$Qm=C''K_{dr}'P_1AK_b\sqrt{\frac{M}{ZT}}$

Qm: Relieving capacity (kg/h)

A : Seat opening area (mm^2)

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 90)

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

P_1: Relieving pressure (MPa·A)

(Select the larger one of set pressure × 1.1 + 0.101 or set pressure + 0.020 + 0.101.)

P_2: Back pressure (MPa·A)

C'': Coefficient determined according to κ (See Tab.5 in Page 88)

κ : Adiabatic exponent (Isentropic, See Tab.4 in Page 88).

The value will be 1.001 if it is not specified, in which case C''=23.95

K_{dr}': Relieving coefficient

Lift type:0.864※

Full bore type:0.777

K_b: Back pressure compensation coefficient (Depending on P_2/P_1 and κ . See Tab.6 in Page 89)

M: Molecular weight of gas (See Tab.4 in Page 88)

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

$G=0.0028\,\upsilon\rho d^2$

G: Flow in gas (kg/h)

υ : Velocity of gas (m/sec)

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

ρ : Density of gas (kg/m^3)

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 output of hot water boiler:

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

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

S : Seat opening area (mm^2)

W: Relieving capacity of valve (kg/h)

P_1: Relieving pressure (MPa) (See Note)

Lift type: set pressure ×1.1

For SL-37~40, 43,44 type,see Page 65.

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 : Coefficient correction (See Fig.2 in Page 90)

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

γ_1: Density of the hot water at inlet (kg/L) (See Tab.2 in Page 87)

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

ε : Coefficient of volumetrical expansion for water(1/°C) (See Tab.3 in Page 87)

C: Specific heat of water at constant pressure (kJ/kg°C) (See Tab.3 in Page 87)

Note: In the case of full-bore valve and relief valve, make sure the relieving pressure (P_1) does not exceed "maximum working pressure of pressure vessel or hot water boiler X 1.1" 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 B8210-2009)

(1) For Steam

$Qm=5.25C'K_{dr}'AP$

Qm: Relieving capacity (kg/h)

A : Seat opening area (mm^2)

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: Absolute relieving pressure (MPa·A)

(Select the larger one of set pressure × 1.03 + 0.101 or set pressure + 0.015 + 0.101)

C': Coefficient determined according the property of steam (See Tab.1 in Page 87)

For saturated steam, see the following table:

Absolute relieving pressure (MPa·A)	C': Coefficient determined according the property of steam
Max.0.5	1※
over 0.5~1.0	0.98※
over 1.0~2.0	0.97※
over 2.0	0.96※

For superheated steam, see Tab.1 in Page 87.

K_{dr}': Relieving coefficient

Lift type:0.864※

Full bore type:0.777

(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 thermal output of hot water boiler:

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

In formula (i) and (ii), if $(P_1+0.1)\,\kappa > (P_1-P_2)$, then $(P_1+0.1)\kappa$ should be replaced by (P_1-P_2).

S: Seat opening area (mm^2)

W: Required relieving capacity of valve (kg/h)

Note: In the case of full-bore valve and relief valve, make sure the relieving pressure (P_1) does not exceed "maximum working pressure of pressure vessel or hot water boiler X 1.1" or "maximum working pressure + 0.034".

P_1: Relieving pressure (MPa) (see Note)

Lift type: set pressure ×1.1

For SL-37~40,43,44 type see Page 65.

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 : Coefficient correction (See Fig.2 in Page 90)

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

γ_1: Density of the hot water at inlet (kg/L) (See Tab.2 in Page 87)

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

ε : Coefficient of volumetrical expansion for water(1/°C) (See Tab.3 in Page 87)

C: Specific heat of water at constant pressure (kJ/kg°C) (See Tab.3 in Page 87)

■ NOTE

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

$Qm=5.25C'K_{dr}'AP$

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

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

W: Required relieving capacity of safety valve (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)

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

ε : Coefficient of volumetrical expansion of water (1/°C) (See Tab.3 in Page 87)

C: Specific heat of water at constant pressure (kJ/kg°C) (See Tab.3 in Page 87)

(3) For dowtherm boiler

$$Qm=C''K_{dr}'P_1AK_b\sqrt{\frac{M}{ZT}}$$

Qm: Relieving capacity (kg/h)

A : Seat opening area (mm^2)

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 90)

T: Absolute temperature (K) of gases at absolute relieving pressure

P_1: Absolute relieving pressure (MPa·A)

(Select the larger one of set pressure × 1.1 + 0.101 or set pressure + 0.020 + 0.101)

P_2: Absolute back pressure (MPa·A)

C': Coefficient determined according to κ (See Tab.5, Page 88)

κ : Adiabatic exponent (Isentropic, See Tab.4 in Page 88)

The value will be 1.001 if it is not specified, in which case C"=23.95

K_{dr}': Relieving coefficient

Lift type:0.864※

Full bore type:0.777

K_b: Back pressure compensation coefficient (Depending on P_2/P_1 and κ . See Tab.6 in Page 89)

M: Molecular weight of air (See Tab.4 in Page 88)

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. JIS B8210-2009: SPRING SAFETY VALVE FOR STEAM AND GAS

(1) For Steam

$Qm=5.25C'K_{dr}'AP$

Qm: Relieving capacity (kg/h)

A : Seat opening area (mm^2)

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: Absolute relieving pressure (MPa·A)

Products for boiler: (Select the larger one of set pressure × 1.03 + 0.101 or set pressure + 0.015 + 0.101)

Products for pressure vessels: (Select the larger one of set pressure × 1.1 + 0.101 or set pressure + 0.020 + 0.101)

C': Coefficient determined according to the property of steam (See Tab.1 in Page 87.)

For saturated steam, see the following table:

Absolute flow rating pressure (MPa·A)	C': Coefficient depending on the nature of steam
Max.0.5	1※
Over 0.5~1.0	0.98※
Over 1.0~2.0	0.97※
Over 2.0	0.96※

For superheated steam, See the table in Page 87.

K_{dr}': Relieving coefficient

Lift type:0.864※

Full bore type:0.777

(2) For Gases

$Qm=C''K_{dr}'P_1AK_b\sqrt{\frac{M}{ZT}}$

Qm: Relieving capacity (kg/h)

A : Seat opening area (mm^2)

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 90)

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

P_1: Absolute relieving pressure (MPa·A)
(Select the larger one of set pressure × 1.1 + 0.101 or set pressure + 0.020 + 0.101)

P_2: Absolute back pressure (MPa·A)

C'': Coefficient determined according to κ (See Tab.5 in Page 88)

κ : adiabatic exponent (See Tab.4, Page 88)
The value will be 1.001 if it is not specified, in which case C"=23.95

K_{dr}': Relieving coefficient

Lift type:0.864※

Full bore type:0.777

K_b: Back pressure compensation coefficient (Depending on P_2/P_1 and κ . See Tab.6 in Page 89)

M: Molecular weight of air (See Tab.4 in Page 88)

4. ELECTRICITY BUSINESS ACT (Technical Standard for Thermal Equipments for Power Generation) (Formula source: JIS B8210-1994)

■ **Applicable for boilers and supporting equipments**

(1) For Steam

$Qm=5.246CK_d'A(P+0.1)\times 0.9$

Qm: Relieving capacity (kg/h)

A : Seat opening area (mm^2)

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)

Set pressure≦0.1 MPa: Set pressure + 0.02

Set pressure >0.1 MPa: Set pressure × 1.03

C: Coefficient determined according to the property of steam (See Tab.1 in Page 87)

Set pressure is<0.5MPa·A, at saturated pressure:1

Set pressure is≧0.5MPa·A, at saturated pressure:0.98

Superheated steam: Please contact our agent in your area.

K_d': Rated discharge coefficient

Lift type:0.96※

Full bore type:0.864

(2) For Gases

$Qm=C'Kd'AP_1\sqrt{\frac{M}{ZT}}\times 0.9$

Qm: Relieving capacity (kg/h)

A : Seat opening area (mm^2)

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 90)

T: Absolute temperature (K) of gases at absolute relieving pressure

C': Coefficient determined according to κ and P_2/P_1 (See Fig.3 in Page 90)

κ : Adiabatic exponent (C_ρ/C_υ) (See Tab.4 in Page 88)
The value is considered as 1 if it is not clear.

P_2: Absolute back pressure (MPa·A)

K_d': Relieving coefficient

Lift type:0.96※

Full bore type:0.864

P_1: Absolute relieving pressure (MPa·A)
(Absolute value of "set pressure×1.1")

M: Molecular weight of gas (See Tab.4 in Page 88)

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

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

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

W: Relieving capacity (kg/h)
A: Seat opening area (mm^2)
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 upon the inlet side temperature
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 C'

(JIS B8210-2009)

Absolute pressure (MPa) \ Temp. (℃)	Saturated temperature	200	220	240	260	280	300	320	340	360	380	400	420	440	460
0.5	1.004	0.994	0.971	0.950	0.931	0.912	0.895	0.879	0.863	0.848	0.834	0.821	0.808	0.796	0.784
1.0	0.986	0.980	0.982	0.960	0.938	0.919	0.900	0.883	0.867	0.852	0.837	0.824	0.810	0.798	0.786
1.5	0.976	0.975	0.969	0.969	0.946	0.925	0.906	0.888	0.871	0.855	0.843	0.826	0.813	0.800	0.788
2.0	0.971		0.966	0.963	0.955	0.932	0.912	0.893	0.875	0.859	0.844	0.829	0.815	0.802	0.790
2.5	0.968			0.960	0.965	0.940	0.918	0.898	0.880	0.863	0.847	0.832	0.818	0.805	0.792
3.0	0.966			0.961	0.956	0.948	0.925	0.904	0.884	0.867	0.850	0.835	0.821	0.807	0.794
4.0	0.964				0.957	0.953	0.939	0.915	0.895	0.875	0.857	0.841	0.826	0.811	0.798
5.0	0.965					0.955	0.952	0.929	0.905	0.884	0.865	0.847	0.831	0.816	0.802
6.0	0.968					0.962	0.953	0.943	0.917	0.893	0.873	0.854	0.837	0.821	0.807
7.0	0.971						0.959	0.954	0.930	0.904	0.881	0.861	0.843	0.826	0.811
8.0	0.975						0.968	0.956	0.944	0.915	0.890	0.869	0.849	0.832	0.816
9.0	0.980							0.963	0.960	0.927	0.900	0.877	0.856	0.837	0.820
10.0	0.987							0.972	0.962	0.941	0.911	0.885	0.863	0.843	0.825
12.0	1.000								0.977	0.973	0.935	0.904	0.878	0.856	0.836
14.0	1.019								1.005	0.982	0.964	0.926	0.896	0.870	0.848
16.0	1.039									1.005	1.001	0.952	0.916	0.886	0.861
18.0	1.068									1.044	1.007	0.977	0.933	0.903	0.875
20.0	1.100										1.036	1.011	0.958	0.917	0.890

* When pressure/temperature is an intermediate value, it is necessary to take the minimum value of absolute pressure/temperature division and do not apply the proportional method. When absolute pressure is below 0.5 MPa·A, then 0.5 MPa·A should be used as absolute pressure. For example, when relieving pressure (absolute pressure) is 1.6 MPa·A and temperature is 245°C, C' = 0.946.

TABLE2. HOT WATER SPECIFIC GRAVITY γ_t(kg/L)

(Source: Interpretation of Boiler Structure Standard)

Temp.℃ \ Pressure MPa・A	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	0.978	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	0.972	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	0.951	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	0.935	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	0.917	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
220													0.841

Note: Intermediate value should be calculated using the proportional method.
* Water density should be "1" when temperature is lower than 40°C.

TABLE3. SPECIFIC HEAT AND EXPANSION COEFFICIENT OF HOT WATER

(Source: Interpretation of Boiler Structure Standard)

Temp.℃	Specific heat of water at constant pressure C kJ/kg℃	Expansion coefficient ε 1/℃
Below 40℃	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	4.371	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

Note: Intermediate value should be calculated using the proportional method.

Applicable Laws & Regulations and Formulas for Calculating Relieving Capacity

TABLE4. GAS PROPERTY

(JIS B8210-2009)

Gas names	Chemical symbol	Molecular weight *M* (kg/kmol)	Adiabatic (isentropic) index κ (1.013bar a,15℃)	Critical pressure *Pc* (bar a.)	Critical temp. *Tc* (K)	Critical pressure ratio
Acetylene	C_2H_2	26.02	1.26	62.82	309.15	0.553
Air	—	28.96	1.40	37.69	132.45	0.528
Ammonia	NH_3	17.03	1.31	112.98	405.55	0.544
Argon	Ar	39.91	1.66	48.64	151.15	0.488
Normal butane	C_4H_{10}	58.08	1.11	36.48	426.15	0.583
Carbon dioxide	CO_2	44.00	1.30	73.97	304.25	0.546
Carbon monoxide	CO	28.00	1.40	35.46	134.15	0.528
Chlorine	Cl_2	70.91	1.35	77.11	417.15	0.537
Chlorofluoromethane	$CHClF_2$	86.47	1.18	49.14	370.15	0.568
Ethane	C_2H_6	30.05	1.22	49.45	305.25	0.561
Ethylene	C_2H_4	28.03	1.25	51.57	282.85	0.555
Hydrogen	H_2	2.015	1.41	12.97	33.25	0.527
Hydrogen chloride	HCl	36.46	1.41	82.68	324.55	0.527
Hydrogen sulfide	H_2S	34.08	1.32	90.08	373.55	0.542
Isobutane	$CH(CH_3)_3$	58.08	1.11	37.49	407.15	0.583
Methane	CH_4	16.03	1.31	46.41	190.65	0.544
Methyl chloride	CH_3Cl	50.48	1.28	66.47	416.25	0.549
Nitrogen	N_2	28.02	1.40	33.94	126.05	0.528
Nitrogen suboxide	N_2O	44.02	1.30	72.65	309.65	0.546
Oxygen	O_2	32.00	1.40	50.36	154.35	0.528
Propane	C_3H_3	44.06	1.13	43.57	368.75	0.579
Propylene	C_3H_6	42.05	1.15	46.60	365.45	0.574
Sulfur dioxide	SO_2	64.07	1.29	78.73	430.35	0.548

TABLE5. COEFFICIENT DEPENDING ON ADIABATIC (ISENTROPIC) EXPONENT (κ) (C") (JIS B8210-2009)

κ	C"	κ	C"	κ	C"	κ	C"	κ	C"	κ	C"
0.41	16.65	0.71	20.96	1.01	24.04	1.31	26.41	1.61	28.34	1.91	29.96
0.42	16.82	0,72	21.08	1.02	24.12	1.32	26.49	1.62	28.40	1.92	30.01
0.43	17.00	0.73	21.20	1.03	24.21	1.33	26.56	1.63	28.46	1.93	30.06
0.44	17.17	0.74	21.31	1.04	24.30	1.34	26.63	1.64	28.52	1.94	30.10
0.45	17.33	0.75	21.43	1.05	24.39	1.35	26.69	1.65	28.58	1.95	30.15
0.46	17.50	0.76	21.54	1.06	24.47	1.36	26.76	1.66	28.63	1.96	30.20
0.47	17.66	0.77	21.65	1.07	24.56	1.37	26.83	1.67	28.69	1.97	30.25
0.48	17.82	0.78	21.76	1.08	24.64	1.38	26.90	1.68	28.74	1.98	30.30
0.49	17.98	0.79	21.87	1.09	24.72	1.39	26.97	1.69	28.80	1.99	30.34
0.50	18.13	0.80	21.98	1.10	24.81	1.40	27.03	1.70	28.86	2.00	30.39
0.51	18.29	0.81	22.09	1.11	24.89	1.41	27.10	1.71	28.91	2.01	30.44
0.52	18.44	0.82	22.19	1.12	24.97	1.42	27.17	1.72	28.97	2.02	30.49
0.53	18.58	0.83	22.30	1.13	25.05	1.43	27.23	1.73	29.02	2.03	30.53
0.54	18.73	0.84	22.40	1,14	25.13	1.44	27.30	1.74	29.08	2.04	30.58
0.55	18.88	0.85	22.51	1.15	25.21	1.45	27.36	1.75	29.13	2.05	30.63
0.56	19.02	0.86	22.61	1.16	25.29	1.46	27.43	1.76	29.18	2.06	30.67
0.57	19.16	0.87	22.71	1.17	25.37	1.47	27.49	1.77	29.24	2.07	30,72
0.58	19.30	0.88	22.81	1.18	25.45	1.48	27.55	1.78	29.29	2.08	30.76
0.59	19.44	0.89	22.91	1.19	25.53	1.49	27.62	1.79	29.34	2.09	30.81
0.60	19.57	0.90	23.01	1.20	25.60	1.50	27.68	1.80	29.40	2.10	30.85
0.61	19.71	0.91	23.11	1.21	25.68	1.51	27.74	1.81	29.45	2.11	30.90
0.62	19.84	0.92	23.20	1.22	25.76	1.52	27.80	1.82	29.50	2.12	30.94
0.63	19.97	0.93	23.30	1.23	25.83	1.53	27.86	1.83	29.55	2.13	30.99
0.64	20.10	0.94	23.39	1.24	25.91	1.54	27.93	1.84	29.60	2.14	31.03
0.65	20.23	0.95	23.49	1.25	25.98	1.55	27.99	1.85	29.65	2.15	31.07
0.66	20.35	0.96	23.58	1.26	26.05	1.56	28.05	1.86	29.71	2.16	31.12
0.67	20.48	0.97	23.67	1.27	26.13	1.57	28.11	1.87	29.76	2.17	31.16
0.68	20.60	0,98	23.76	1.28	26.20	1.58	28.17	1.88	29.81	2.18	31.21
0,69	20.72	0.99	23.86	1.29	26.27	1.59	28.23	1.89	29.86	2.19	31.25
0.70	20.84	1.001	23.95	1.30	26.34	1.60	28.29	1.90	29.91	2.20	31.29

Note: Intermediate value should be calculated using the interpolational method.

Calculation formula

$$C=39.48\sqrt{\kappa\left(\frac{2}{\kappa+1}\right)^{\frac{\kappa+1}{\kappa-1}}}$$

Fig.1 Coefficient of compressibility Z (JIS B8210-2009)

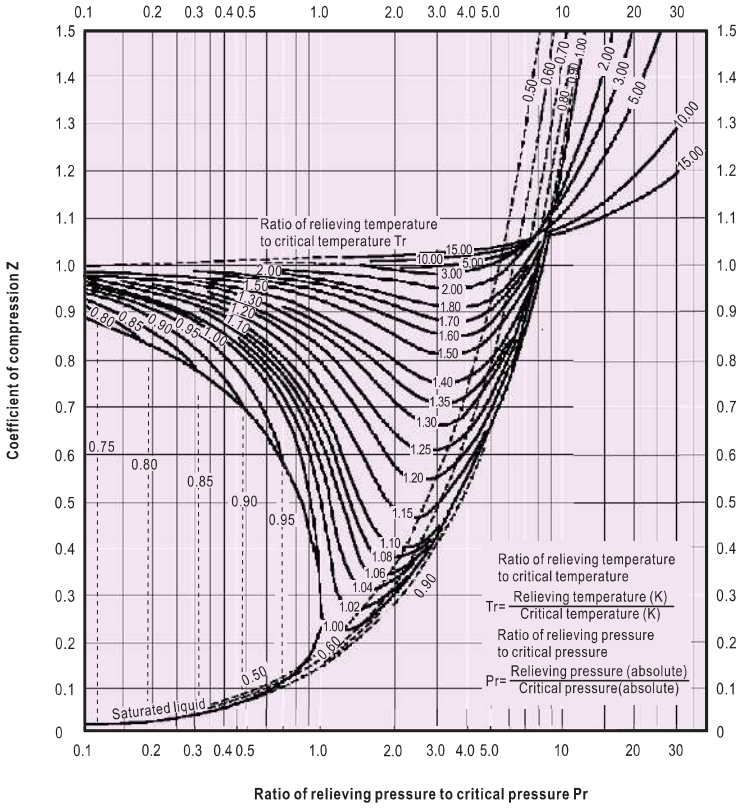


Fig.2 Δt°C correction coefficient κ

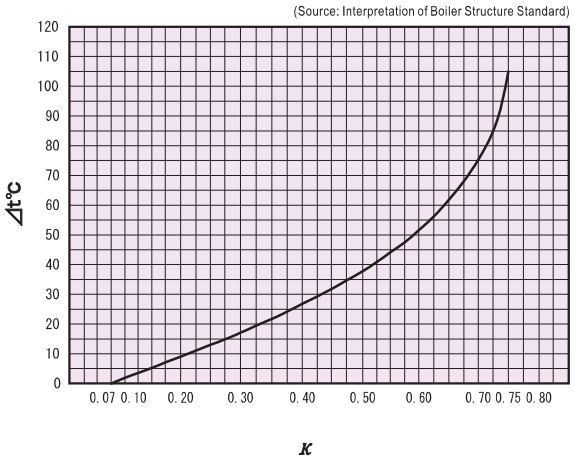
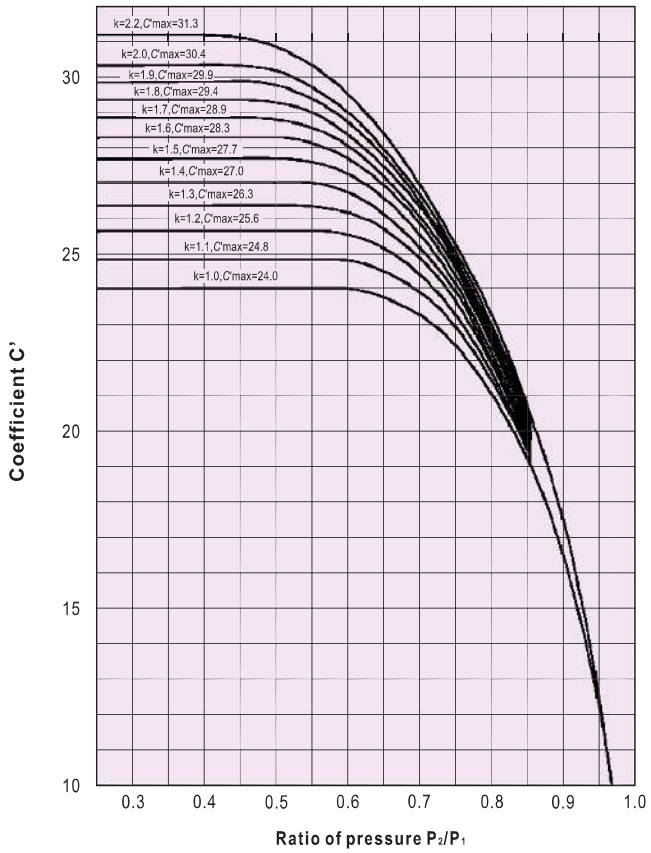


Fig.3 Coefficient (C') based on κ and P_2/P_1 (JIS B8210-2009)



Key Points for Installation of Safety Valves and Relief Valves

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.

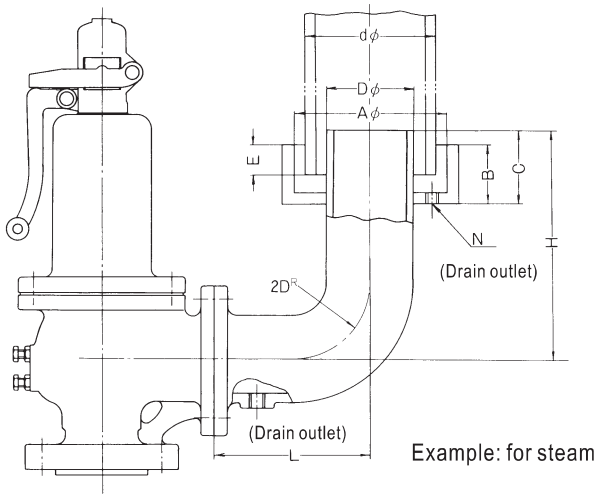
- To avoid installation place where is influenced by explosive sound and blast.
- Avoid damage to electrical equipments, machines, tools etc. in the case the fluid is steam or water.
- Avoid corrosion, poisoning, anoxia etc. in the case the fluid is harmful gas.
- In the case of screwed type safety valve or relief valve, install union joint at the discharge pipe of the outlet side to allow easy dismounting (see Fig.1 in next page).

❺ 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.

❻ In the case of full bore type safety valve for liquids or harmful gases 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).



Example: for steam

■ 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	Rc⅜″
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 Valves and Relief Valves

■ PIPING EXAMPLE

Fig.1 Example: Pressure tank installation

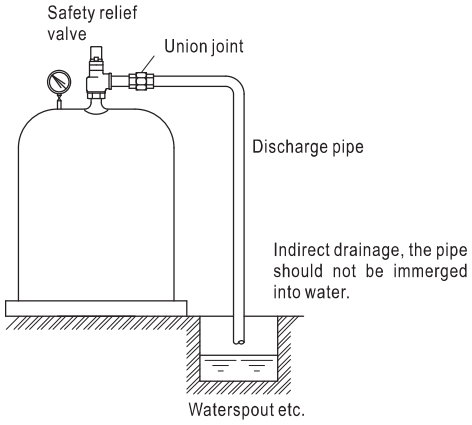


Fig.2 Example: Installation of the secondary side of pressure reducing valve

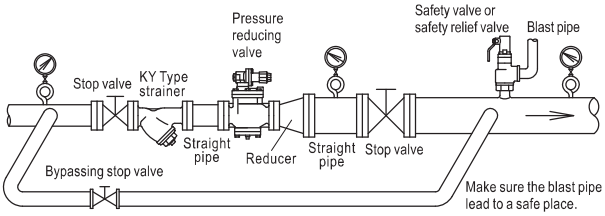


Fig.3 Example connection of back pressure adjusting cock

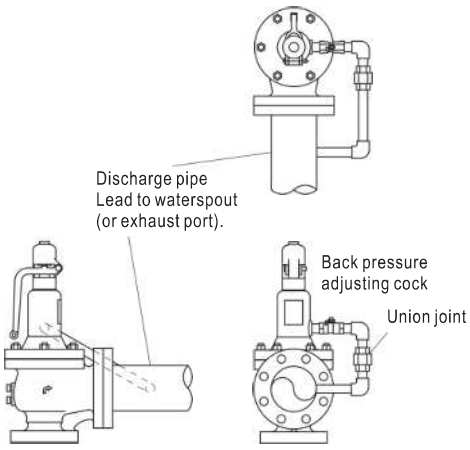


Fig.4 Installation of test gag

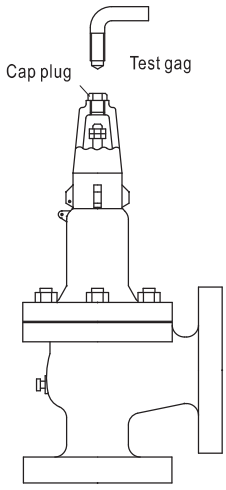
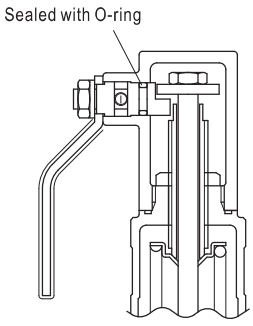
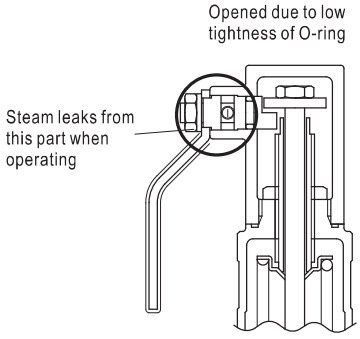


Fig.5 Lever structure

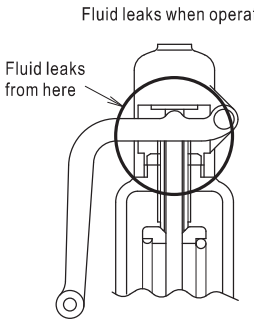
Lever structure of SL-37, 39, 39F,43 Type
For air, gas, or liquid



For steam



Open type lever structure



■ FULL BORE TYPE

$$Qm = C'' K_{dr}' P_1 A K_b \sqrt{\frac{M}{ZT}} \quad \cdots\cdots$$

C''=27.03, K_{dr}'=0.777, M=28.96, Z=1, T=293
P_1 = the larger one of (set pressure ×1.1+0.101) or (set pressure +0.02+0.101)

(kg/h)

Model name	Size (mm)	dt	A	Set pressure MPa 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	257	374	502	630	759	887	1010	1140	1270	1400	1520	1650	1780	1910	2040	2170	2290	2420	2550	2680										
	25	19	283.3	413	600	806	1010	1210	1420	1620	1830	2040	2240	2450	2650	2860	3060	3270	3480	3680	3890	4090	4300										
	40	30	706.5	1030	1490	2010	2520	3030	3550	4060	4570	5080	5600	6110	6620	7140	7650	8160	8680	9190	9700	10200	10700										
	50	38	1133.5	1650	2400	3220	4040	4870	5690	6510	7340	8160	8980	9810	10600	11400	12200	13100	13900	14700	15500	16300	17200										
SF-19L, 20L	15	11	94.9	138	201	270	338	407	476	545	614	683	752	821	890	959	1020	1090	1160	1230	1300	1370	1440	1510	1570	1640	1710	1780	1850	1920	1990	2060	2130
	20	15	176.6	257	374	502	630	759	887	1010	1140	1270	1400	1520	1650	1780	1910	2040	2170	2290	2420	2550	2680	2810	2930	3060	3190	3320	3450	3580	3700	3830	3960
	25	19	283.3	413	600	806	1010	1210	1420	1620	1830	2040	2240	2450	2650	2860	3060	3270	3480	3680	3890	4090	4300	4500	4710	4920	5120	5330	5530	5740	5950	6150	6360
SF-13L, 14L	25	19	283.3	413	600	806	1010	1210	1420	1620	1830	2040	2240																				
SF-13L SF-16L (0.1~1MPa) SF-17L SF-18L (1~2MPa) SF-19L SF-20L (2~3MPa)	40	25	490.6	715	1030	1390	1750	2100	2460	2820	3170	3530	3890	4240	4600	4950	5310	5670	6020	6380	6740	7090	7450	7810	8160	8520	8870	9230	9590	9940	10300	10600	11000
		30	706.5	1030	1490	2010	2520	3030	3550	4060	4570	5080	5600	6110	6620	7140	7650	8160	8680	9190	9700	10200	10700	11200	11700	12200	12700	13200	13800	14300	14800	15300	15800
	50	34	907.4	1320	1920	2580	3240	3900	4550	5210	5870	6530	7190	7850	8510	9170	9830	10400	11100	11800	12400	13100	13700	14400	15100	15700	16400	17000	17700	18300	19000	19700	20300
		38	1133.5	1650	2400	3220	4040	4870	5690	6510	7340	8160	8980	9810	10600	11400	12200	13100	13900	14700	15500	16300	17200	18000	18800	19600	20500	21300	22100	22900	23800	24600	25400
	65	43	1451.4	2110	3070	4130	5180	6230	7290	8340	9400	10400	11500	12500	13600	14600	15700	16700	17800	18800	19900	20900	22000	23100	24100	25200	26200	27300	28300	29400	30400	31500	32500
		49	1884.7	2750	3990	5360	6730	8100	9470	10800	12200	13500	14900	16300	17600	19000	20400	21700	23100	24500	25800	27200	28600	30000	31300	32700	34100	35400	36800	38200	39500	40900	42300
	80	55	2374.6	3460	5030	6750	8480	10200	11900	13600	15300	17100	18800	20500	22200	24000	25700	27400	29100	30900	32600	34300	36000	37800	39500	41200	42900	44700	46400	48100	49800	51600	53300
		61	2920.9	4260	6190	8310	10400	12500	14600	16700	18900	21000	23100	25200	27400	29500	31600	33700	35800	38000	40100	42200	44300	46400	48600	50700	52800	54900	57100	59200	61300	63400	65500
	100	69	3737.3	5450	7920	10600	13300	16000	18700	21400	24200	26900	29600	32300	35000	37700	40400	43200	45900	48600	51300	54000	56700	59400	62200	64900	67600	70300	73000	75700	78400	81200	83900
		76	4534.1	6610	9610	12900	16100	19400	22700	26000	29300	32600	35900	39200	42500	45800	49100	52400	55700	59000	62300	65500	68800	72100	75400	78700	82000	85300	88600	91900	95200	98500	101000
	125	86	5805.8	8470	12300	16500	20700	24900	29100	33300	37600	41800	46000	50200	54400	58600	62900	67100	71300	75500	79700	83900	88200	92400	96600	100000	105000	109000	113000	117000	121000	126000	130000
		95	7084.6	10300	15000	20100	25300	30400	35500	40700	45800	51000	56100	61300	66400	71600	76700	81900	87000	92200	97300	102000	107000	112000	117000	123000	128000	133000	138000	143000	148000	153000	159000
	150	105	8654.6	12600	18300	24600	30900	37200	43400	49700	56000	62300	68600	74900	81200	87400	93700	100000	106000	112000	118000	125000	131000	137000	144000	150000	156000	162000	169000	175000	181000	188000	194000
		115	10381.6	15100	22000	29500	37000	44600	52100	59700	67200	74700	82300	89800	97400	104000	112000	120000	127000	135000	142000	150000	157000	165000	172000	180000	187000	195000	202000	210000	218000	225000	233000

dt:Throat dia.(mm), A:Seat opening area(mm^2)

■ LIFT TYPE

$$Qm = C'' K_{dr}' P_1 A K_b \sqrt{\frac{M}{ZT}} \quad \cdots\cdots$$

C''=27.03, K_{dr}'=0.864, M=28.96, Z=1, T=293
P_1 = the larger one of (set pressure ×1.1+0.101) or (set pressure +0.02+0.101)

(kg/h)

Size (mm)	D	A	Set pressure MPa 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
15	15	18.8	23.3	30.5	44.3	59.4	74.6	89.8	105	120	135	150	165	180	196	211	226	241	256	272	287	302	317	332	347	363	378	393	408	423	439	454	469
20	20	31.4	39	50.9	74	99.3	124	150	175	200	226	251	276	302	327	352	378	403	429	454	479	505	530	555	581	606	631	657	682	708	733	758	784
25	25	54.9	68.2	89	129	173	218	262	306	351	395	439	484	528	572	617	661	705	750	794	838	883	927	971	1010	1060	1100	1140	1190	1230	1280	1320	1370
32	32	80.3	99.8	130	189	254	318	383	448	513	578	643	708	772	837	902	967	1030	1090	1160	1220	1290	1350	1420	1480	1550	1610	1680	1740	1810	1870	1940	2000
40	40	125.6	156	203	296	397	498	600	701	803	904	1000	1100	1200	1310	1410	1510	1610	1710	1810	1910	2020	2120	2220	2320	2420	2520	2620	2730	2830	2930	3030	3130
50	50	204.1	253	331	481	645	810	975	1140	1300	1470	1630	1790	1960	2120	2290	2450	2620	2780	2950	3110	3280	3440	3610	3770	3940	4100	4270	4430	4600	4760	4930	5090
65	65	346.9	431	562	817	1090	1370	1650	1930	2210	2490	2770	3050	3330	3610	3890	4170	4450	4730	5020	5300	5580	5860	6140	6420	6700	6980	7260	7540	7820	8100	8380	8660
75	75	447.4	556	725	1050	1410	1770	2130	2490	2860	3220	3580	3940	4300	4660	5020	5390	5750	6110	6470	6830	7190	7550	7910	8280	8640	9000	9360	9720	10000	10400	10800	11100
80	78.4	492.3	611	798	1160	1550	1950	2350	2750	3140	3540	3940	4340																				
100	100	785.0	975	1270	1850	2480	3110	3750	4380	5020	5650	6280	6920	7550	8190	8820	9450	10000	10700	11300	11900	12600	13200	13800	14500	15100	15700	16400	17000	17700	18300	18900	19600
	99.4	780.2	969	1260	1830	2460	3090	3720	4350	4980	5610	6240	6870																				
125	125	1256.0	1560	2030	2960	3970	4980	6000	7010	8030	9040	10000	11000	12000	13100	14100	15100	16100	17100	18100	19100	20200	21200	22200	23200	24200	25200	26200	27300	28300	29300	30300	31300
	130	1347.0	1670	2180	3170	4260	5350	6430	7520	8610	9700	10700	11800																				
150	150	1789.8	2220	2900	4210	5660	7100	8550	10000	11400	12800	14300	15700	17200	18600	20100	21500	23000	24400	25900	27300	28700	30200	31600	33100	34500	36000	37400	38900	40300	41800	43200	44600
	160	2009.6	2490	3260	4730	6350	7980	9600	11200	12800	14400	16000	17700																				

D:Seat opening dia.(mm), A:Seat opening area(mm^2) * Refer to Page 65 for safety relief valves (SL-37~40, 39F, 40F, 43, 44 Type).

E141242A

RELIEVING CAPACITY (VENN STANDARD)

■ FULL BORE TYPE

$W=161\times AK\sqrt{PG}$ (K=0.6, G=1, Accumulation 15% $A=0.785dt^2$)

(10^3kg/h)

	Size mm	Set pressure MPa	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-20	15	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
	20	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
	25	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
SF-14	25	19	9.28	13.1	16.0	18.5	20.7	22.7	24.5	26.2	27.8	29.3																				
SF-14 SF-16 (0.1~1MPa) SF-18 (1~2MPa) SF-20 (2~3MPa)	40	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
	50	34	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
		38	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
	65	43	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
		49	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
	80	55	77.7	110	135	156	174	190	205	220	233	245	257	269	280	291	301	311	320	330	339	347	356	364	373	381	388	396	404	411	418	426
		61	95.6	135	166	191	214	234	253	270	287	302	317	331	344	358	370	382	394	405	417	427	438	448	458	468	478	487	497	506	515	524
	100	69	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
		76	149	210	257	297	332	363	392	420	445	469	492	514	535	555	575	594	612	630	647	664	680	696	712	727	742	757	771	785	799	813
	125	86	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
		95	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
	150	105	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
		115	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)

■ LIFT TYPE

$W=161\times AK\sqrt{PG}$ (K=0.55, G=1, Accumulation 10% $A=\pi D\ell$)

(10^3kg/h)

Size mm	D	Set pressure MPa	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
15	15		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
20	20		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
25	25		1.61	2.28	2.79	3.22	3.60	3.94	4.26	4.56	4.83	5.09	5.34	5.58	5.18	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
32	32		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
40	40		3.68	5.21	6.38	7.37	8.24	9.03	9.75	10.4	11.0	11.6	12.5	12.7	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
50	50		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
65	65		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
75	75		13.1	18.5	22.7	26.2	29.3	32.1	34.7	37.1	39.4	41.5	43.5	45.5	47.3	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
80	78.4		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
100	100		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
	99.4		23.0	32.6	39.9	46.1	51.5	56.4	60.9	65.2	69.1	72.9	76.4	79.8	83.1	86.2	89.2	92.2	95.0	97.8	100	103	105	108	110	112	115	117	119	121	124	126
125	125		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
	130		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
150	150		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
	160		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 65 for safety relief valves (SL-37~40,39F ,40F, 43, 44 Type).
∗3. P (MPA), which is for actual calculation to decide discharge amount, is (P)+(Accumulation)−(Back pressure)
∗4. The relieving capacity of safety relief vales (SL-37~40, 39F, 40F Type (Page 62~64) and SL-43, 44 Type (Page 66)) are different from the values in this table.

<Liquids>
(Except hot water and water)