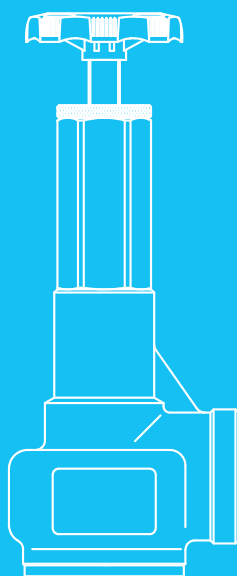


# Safety Relief Valve

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# 3



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## Step 0 Type/Structure/Features

Please refer to this for type, structure and features of safety relief valve and safety valve.

## Step 1 Selection

Please look at the ID chart to select the right products depending on the intended uses. Details are on the product page.

## Step 2 Sizing

Please refer to nominal size selection value table or calculation formula of nominal size selection P.3-12 for selecting the suitable model and size.

## Step 3 Attentions for usage

Be sure to check guidelines for optimal usage of safety relief valve and safety valve such as installation.

## Type of Safety Valve and Its Main Purpose

3

## What is safety valve?

Safety valve ensures safety of equipment and system by automatically operating to open its valve when inlet pressure rises and reaches set pressure, and to close valve when inlet pressure falls to set pressure.

## Full bore type safety valve

The flow passage area at valve seat is bigger enough than the nozzle throat area at the inlet side.

## • Main purpose

Lift type safety valve can be used when discharge amount is insufficient. Steam boiler needs this type.

## Lift type safety valve

The lift of the valve is 1/40 or more and less than 1/4 of the inside diameter of valve seat, and the flow passage area of valve port becomes the smallest in the flow passage area when the valve disc is opened.

## • Main purpose

It can be used as safety device for outlet side of pressure reducing valve, steam/air piping, pressure vessel.

## Relief valve

The valve is mainly applied to liquid, and automatically operates to open its valve disc when inlet pressure rises and reaches set pressure, and to close the valve disc when inlet pressure falls to set pressure.

## • Main purpose

It can be used for consecutive blow of cold and hot water piping, as safety device, or relief valve at outlet side of pump.

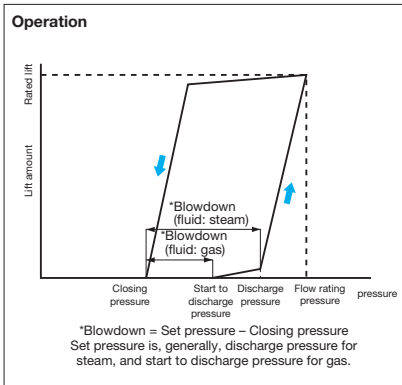
## Safety Relief Valve

The valve is mainly applied to steam, gas and liquid, and has both functions of safety valve and relief valve.

## • Main purpose

It can be used as safety device for piping and pressure vessel at line of steam/air/cold and hot water, or relief valve.

## ■ Operation of safety valve



## - Structure and definition of safety valve and relief valve

Structure	Definition
Closed type	Structure in which a part of blowout fluid is not discharged from other than outlet.
Closed lever type	
Closed handle type	
Open type	Structure in which a part of blowout fluid is discharged from other than outlet.
Open lever type	

## - Set pressure of safety valve for alarm use (at outlet side of PRV for steam)

Set pressure of PRV (MPa)	Set pressure of safety valve (MPa)
0.1 or less	Set pressure of PRV + 0.05 or more
More than 0.1, to 0.4 or less	Set pressure of PRV + 0.08 or more
More than 0.4, to 0.6 or less	Set pressure of PRV + 0.1 or more
More than 0.6, to 0.8 or less	Set pressure of PRV + 0.12 or more
More than 0.8	Set pressure of PRV + 15%

\* When safety valve is installed for alarm use at the outlet side of PRV, there is no laws or regulations specified to comply with. In this case, select a safety valve with discharge capacity around 10% of maximum flow rate of PRV.

## Lift type Safety Valve -AL-150 Series-

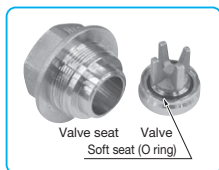
Step  
0

## Usages are as follows:

Safety device for pressure vessel or measuring instrument of steam, air, water, oil at building equipment, factory equipment.

Versatile safety relief valve can be used for fluid such as steam, air, water or oil. Long life and high corrosion resistance due to stainless steel used for adjusting spring, valve and valve seat.

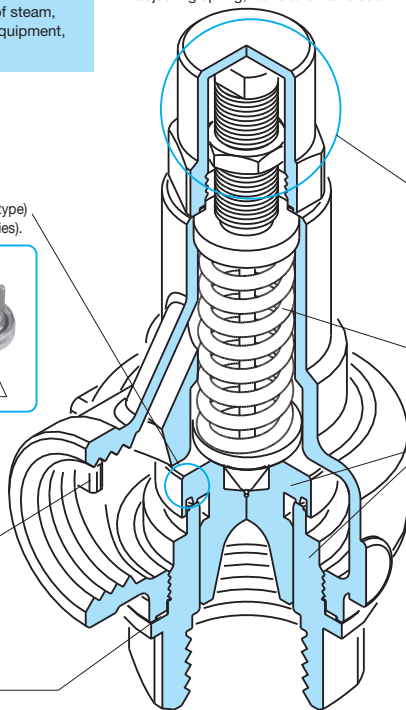
\* Non leak type (soft seat type) is available (AL-150T series).



## Prevention Measure

Installed as product protection. Stopper for over tightening is attached.

## PTFE Gasket (Fluorine Resin)



## Closed, Lever, Handle

Type can be selected according to usage.

## Stainless Steel Spring

## Material of valve and valve seat is SCS14A.

Due to adoption of SCS14A (equivalent to SUS316) as standard product, corrosion resistance is superior. Because material indication is made, environmental aspect (recycle) is considered.

## Small, lightweight, simple structure, usable for various fluid, versatile type

· Variation for various requirement



Lever type  
AL-150L type



High pressure type  
AL-150H type



Soft seat type  
AL-150T type



Handle type soft seat type  
AL-150TR type



Stainless steel made  
AL-140, AL-140H type

## Full Bore Type Safety Valve -AF-5 Series-

3

Safety Relief Valve

### Usages are as follows:

Use as safety device for steam boiler, various pressure vessel or measuring instrument.

AF-5 series safety valve is full bore type and small, lightweight (50 % of conventional product), high capacity and high quality type.

#### Operational Check

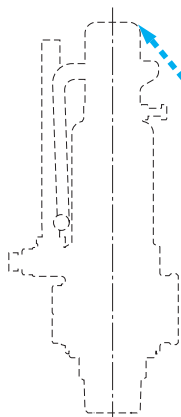
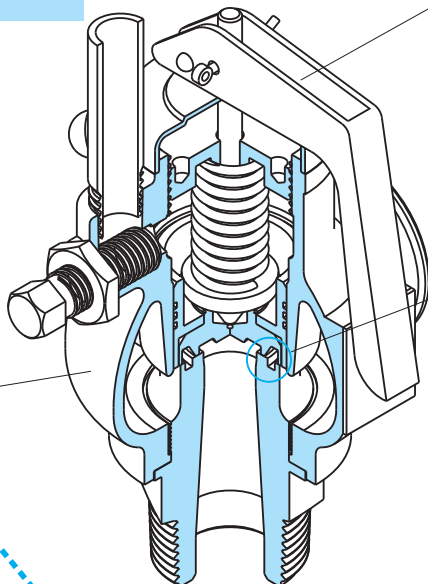
Due to lever type, manual discharge inspection can be made. In addition, lever position can be rotated freely.

#### High Sealing Design

Valve prevents valve leakage of heat expansion due to feather touch shape. Heat treated and long life.

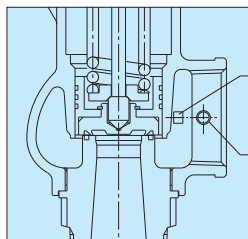
#### Compact Design

Due to spring case shape discharging fluid effectively, this type has small shape but large discharge capacity.



Size and weight are about half of conventional product.

#### Design considering piping arrangement and construction!



Stopper for over tightening  
For product function protection

Fixing Screw  
For loosening protection of outlet side piping

## Relief Valve -AL-280 Series-

Step  
03  
Safety Relief Valve

## Usages are as follows:

Relief valve for the purpose of pressure regulation of pump.

## Smooth and Secure Operation

Due to adoption of special valve structure, it has profound impact on the line with large pulsation or pressure fluctuation. Chattering or hunting can be prevented.

## Sealed, Safety

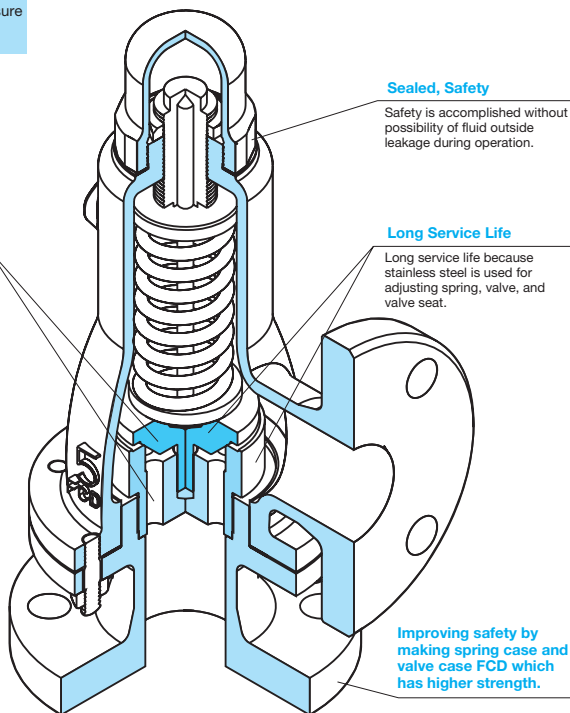
Safety is accomplished without possibility of fluid outside leakage during operation.

## Long Service Life

Long service life because stainless steel is used for adjusting spring, valve, and valve seat.

## Structure of trim part (dash-pot)

Without popping action against fluid pressure change, the structure can discharge continuously.



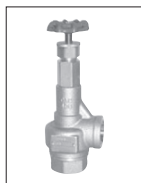
## · Variation for various requirements



AL-27



AL-260



AL-260R



AL-250

















AL-250R













## Safety Relief Valve ID-Charts

3

Safety Relief Valve

	Model	Type	Fluid	Material (Body)	Press. (MPa)	Max. Temp. (°C)	Connection	Nominal Size	Feature	Page		
	AL-150	Lift type	Steam, Air	CAC406	0.05-1.0	220°C	JIS Rc	15-50A	· Stainless steel spring · High durability · General purpose	3-15		
			Cold and hot water, Oil			150°C						
	AL-150H		Steam, Air		1.0-1.6	220°C		15-50A	· High pressure type of AL-150	3-20		
			Cold and hot water, Oil			150°C						
	AL-150L		Steam, Air		0.05-1.0	220°C		15-50A	· Lever type of AL-150	3-21		
	AL-150T		Air, Cold and hot water, Oil		0.05-1.0	120°C		15-50A	· Soft seat type of AL-150 · Leakage "Zero" by O ring seat of fluoro-rubber	3-16		
	AL-150T-N		Cold and hot water		0.05-1.0	100°C					15-50A	
	AL-150TR		Cold and hot water, Oil		0.05-1.0	90°C		15-50A	· Handle type of AL-150T	3-17		
	AL-150TML		Air, Cold and hot water, Oil		0.05-1.0	120°C		15-50A	· Lever type of AL-150T	3-18		
	AL-150TML-N		Cold and hot water		0.05-1.0	100°C					15-50	
	AL-140	Steam, Air	SCS14A or SCS13	0.05-1.0	220°C	15-50A	· All stainless steel made type of AL-150	3-23				
		Cold and hot water, Oil			150°C							
	AL-140H	Steam, Air	SCS13	1.0-2.0	220°C	15-50A	· High pressure type of AL-140	3-23				
		Cold and hot water, Oil			150°C							
	AL-140T	Air, Cold and hot water, Oil	SCS14A or SCS13	0.05-1.0	120°C	15-50A	· Soft seat type of AL-140 · Leakage "Zero" by O ring seat of fluoro-rubber	3-25				
	AL-140T-N	Cold and hot water			0.05-1.0				100°C	15-50		
	AL-140TML	Air, Cold and hot water, Oil	SCS14A or SCS13	0.05-1.0	120°C	15-50A	· Lever type of AL-140	3-26				
	AL-140TML-N	Cold and hot water			0.05-1.0				100°C	15-50A	· Lever type of AL-140T	3-27
	AL-140TML-N	Cold and hot water			0.05-1.0				100°C	15-50		3-27

\* Contact us for any other fluid or connection than the above.

	Model	Type	Fluid	Material (Body)	Press. (MPa)	Max. Temp. (°C)	Connection	Nominal Size	Feature	Page
	AL-17	Lift type	Steam, Air	FCD450	0.05-1.6	220°C	JIS Rc	15-50A		3-34
			Cold and hot water, Oil			150°C				
	AL-10	Lift type	Steam	FCD450	0.05-1.0	220°C	JIS Rc	15-50A	· Lever type	3-36
									· Without lever	
	AL-300	Lift type	Steam	FCD450	0.05-1.0	220°C	JIS 10KFF	15-50A		3-40
	AL-301		Steam		0.05-1.6	220°C	*1 (JIS 16KFF)	15-50A	· Stainless steel trim parts type of AL-300	3-40
	AL-300T		Air		0.05-1.0	150°C	JIS 10KFF	15-50A	· Soft seat type of AL-300	3-41
			Cold and hot water, Oil		150°C					
	AL-301T		Air		0.05-1.3	150°C	*1 (JIS 16KFF)	15-50A	· Stainless steel trim parts type of AL-300T	3-41
		Cold and hot water, Oil	150°C							
	AL-4	Lift type	Steam	FCD450	0.05-1.5	220°C	*1 (JIS 16KFF)	65-150A		3-53
					For 150A, maximum press. 0.8 MPa					
	AL-4T				Air, Cold and hot water, Oil					
			For 150A, maximum press. 0.8 MPa							
	AL-4S	Lift type	Steam	FCD450	0.05-2.0	220°C	JIS 20KFF	65-100A		3-55
	AL-4ST		Air, Cold and hot water, Oil		0.05-2.0	150°C	JIS 20KFF	65-100A	· Soft seat type of AL-4S	3-55
	AL-5	Lift type	Steam	FCD450	0.05-1.0	220°C	JIS 10-16KFF	20-50A	· Lever type	3-58
					0.05-1.5					









\*1 Connection when applying pressure is more than 1.0 MPa \* Contact us for any other fluid or connection than the above.














## Safety Relief Valve ID-Charts

3

Safety Relief Valve


	Model	Type	Fluid	Material (Body)	Press. (MPa)	Max. Temp. (°C)	Connection	Nominal Size	Feature	Page
	AL-6	Lift type	Steam	FCD450	0.05-1.5	220°C	JIS 10-16KFF	65-150A	· Large size type of AL-5 · Lever type	3-59
	AL-31	Lift type	Steam, Air Cold and hot water, Oil	SCS13	0.05-1.0	220°C 150°C	JIS 10KFF	15-50A	· Flanged type · All stainless steel made	3-46
	AL-31H		Steam, Air Cold and hot water, Oil			1.0-2.0	220°C 150°C	JIS 16-20RF	15-50A	· High pressure type of AL-31
	AL-32	Lift type	Steam, Air Cold and hot water, Oil	SCS14A or SCS13	0.05-1.0	220°C 150°C	JIS 10K	15-50A	· All stainless steel type with loose flange.	3-48
	AL-32T		Air, Cold and hot water, Oil	SCS14A or SCS13		0.05-1.0				
	AL-32T-N		Cold and hot water				100°C	JIS 10K	15-50A	
	AL-32ML	Lift type	Air, Cold and hot water, Oil	SCS14A or SCS13	0.05-1.0	120°C	JIS 10K	15-50A	· Lever type of AL-32	3-50
	AL-32TML		Air, Cold and hot water, Oil			0.05-1.0	120°C	JIS 10K	15-50A	· Soft seat type of AL-32ML · Leakage "zero" by O-ring seat of fluoro-rubber
	AL-32TML-N		Cold and hot water				100°C	JIS 10K	15-50A	
	AL-260	Relief type	Cold and hot water, Oil	CAC406	0.05-1.0	120°C	JIS Rc	15-50A	· For pump relief	3-30
AL-260R	90°C					15-50A		· Handle type of AL-260 · For pump relief	3-30	
	AL-250	Relief type	Cold and hot water, Oil	SCS14A or SCS13	0.05-1.0	120°C	JIS Rc	15-50A	· For pump relief · All stainless steel made	3-29
AL-250R	90°C					15-50A		· Handle type of AL-250 · For pump relief	3-29	

\* Contact us for any other fluid or connection than the above.

	Model	Type	Fluid	Material (Body)	Press. (MPa)	Max. Temp. (°C)	Connection	Nominal Size	Feature	Page
	AL-27	Relief type	Cold and hot water, Oil	FCD450	0.05-1.6	120°C	JIS Rc	15-50A	· For pump relief · High pressure type	3-32
	AL-280	Relief type	Cold and hot water, Oil	FCD450	0.05-1.0	120°C	JIS 10KFF	15-50A	· Flanged type · For pump relief	3-43
	AL-24	Relief type	Cold and hot water	CAC406	0.1-0.7	60°C	JIS Rc	15-25A	· Diaphragm type · Quick opening and closing	3-38
	AL-24F		Cold and hot water, Oil			120°C		15-25A	· FKM (viton) type of AL-24 · High temperature type	
	AF-5	Full bore type	Steam	CAC406	0.1-2.0	220°C	Inlet JIS R Outlet JIS Rc	20-50A	· Full bore type, for general purpose · Lever type	3-61
			Air		0.1-1.0					
	AF-5S		Steam, Air	SCS13	0.1-1.0			20-50A	· All stainless steel type of AF-5	3-61
	AF-1	Full bore type	Steam	FCD450	0.18-1.6	220°C	Inlet JIS R Outlet JIS Rp	20-50A	· Lever type	3-65
	AF-2	Full bore type	Steam	FCD450	0.18-1.6	220°C	Inlet JIS 10K RF *1 (Inlet JIS 20K RF) Outlet JIS 10K FF	65-80A	· Lever type	3-66
	AF-4	Full bore type	Steam, Air	FCD450	0.1-1.0	220°C	JIS 10K FF or JIS 10K RF	25-150A	· Lever type	3-63
	AF-4M							25-150A	· Without lever	3-63
	AF-7	Full bore type	Steam, Air	SCPH2	0.1-1.0	350°C	Inlet JIS 10K RF *1 (Inlet JIS 20K RF) Outlet JIS 10K FF	25-100A	· Lever type	3-67
	AF-7M		Air			300°C		25-100A	· Without lever	3-67

\*1 Connection when applying pressure is more than 1.0 MPa \* Contact us for any other fluid or connection than the above.

## Safety Relief Valve

	Model	Type	Fluid	Material (Body)	Press. (MPa)	Max. Temp. (°C)	Connection	Nominal Size	Feature	Page
	<b>AF-9EN</b>	Full bore type	Steam, Air	Equivalent to FC250	0.045-1.0	250°C	Inlet BSEN PN16 Outlet BSEN PN10	20-150A	- Conforming product to ISO 4126-1	<b>3-69</b>

\*1 Connection when applying pressure is more than 1.0 MPa \* Contact us for any other fluid or connection than the above.

## Calculation Formula for Selecting Nominal Size

### Formula for certified capacity (JIS B 8210:2017)

#### Boiler Structure Standard

$$Q_m = 5.25 \times C' \times K_{dr} \times AP_0$$

#### Pressure Vessel Structure Standard

[Steam]

$$Q_m = 5.25 \times C' \times K_{dr} \times AP_0$$

[Gas]

$$Q_m = C'' K_{dr} P_0 A K_b \sqrt{\frac{M}{Z T_0}}$$

Qm: Certified capacity (kg/h)

C': Coefficient depending on steam properties, which is shown in Table-5 on 8-74.

K<sub>dr</sub>: Certified derated coefficient of discharge (= measured value x 0.9)

[Lift type: 0.883(AL-150H: 0.816) Full bore type: 0.777]

(AL-150 Series 40A: 0.844

AL-32 Series 50A: 0.874

A : Flow area (mm<sup>2</sup>)

P<sub>0</sub> : Absolute flow rating pressure (MPa)

For boiler, (set pressure x 1.03 + 0.101) or (set pressure + 0.015 + 0.101), whichever larger.

For pressure vessel, (set pressure x 1.1 + 0.101) or (set pressure + 0.020 + 0.101), whichever larger.

However, if allowable over pressure is specified, it shall be followed.

Qm: Certified capacity (kg/h)

C'': Coefficient depending on adiabatic exponent (k), which is evaluated by the following formula.

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

When adiabatic exponent (k) is unknown, supposing that k = 1.001, C'' = 23.96.

K<sub>dr</sub>: Certified derated coefficient of discharge (=measured value x 0.9)

[Lift type: 0.883(AL-150H: 0.816) Full bore type: 0.777]

(AL-150 Series 32A: 0.844

AL-32 Series 40A: 0.872

50A: 0.874

A : Flow area (mm<sup>2</sup>)

P<sub>0</sub> : Absolute flow rating pressure (MPa)

P<sub>0</sub> = (set pressure x 1.1 + 0.101) or (set pressure x 0.020 + 0.101), whichever larger.

However, if allowable over pressure is specified, it shall be followed.

M : Molecular weight of gas (kg/mol)

Z : Compression coefficient (if unknown, Z = 1.0)

T<sub>0</sub> : Absolute temperature of gas at flow rating pressure (K)

K<sub>b</sub> : Corrective coefficient of back pressure

When  $\frac{P_2}{P_0} > \left( \frac{2}{k+1} \right)^{\frac{k}{k-1}}$

$$K_b = \frac{55.83}{C''} \sqrt{\frac{k}{k-1}} \left( \frac{P_2}{P_0} \right)^{\frac{k}{k-1}} \left( \frac{P_0}{P_2} \right)^{\frac{k+1}{k}}$$

When  $\frac{P_2}{P_0} \leq \left( \frac{2}{k+1} \right)^{\frac{k}{k-1}}$

K<sub>b</sub> = 1.0

### Yoshitake standard (for liquid)

(Except for AL-150, 150T, 140, 140T, 32 series)

(When 25% accumulation)

$$V = \frac{AK}{12.4 \sqrt{\frac{G}{P}}}$$

V: Discharge capacity (m<sup>3</sup>/h)

A: Flow area (mm<sup>2</sup>)

K: 0.7 (Flow rate coefficient)

G: Specific gravity

P: Opening pressure (MPa)

### AL-150, 150T, 140, 140T, 150TML, 150TR, AL-32 series Calculation formula for liquid

$$V = 0.161AK\sqrt{PG}$$

V: Discharge capacity (m<sup>3</sup>/h)

A: Flow area (mm<sup>2</sup>)

K: Flow rate coefficient:

0.5 (when set pressure is 0.1 MPa or less)

0.6 (when set pressure is more than 0.1 MPa)

P: Pressure to determine discharge capacity (MPa):

Opening pressure x 1.25

G: Specific gravity

### Calculation formula for Viscosity correction

First, calculate the discharge capacity (V) without considering viscosity. Next, find viscosity index (Iv).

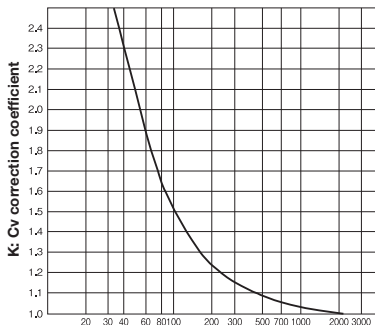
$$Iv = \frac{72780}{Mcst} \left( \frac{\Delta P}{G} \right)^{\frac{1}{3}} v^{\frac{1}{3}}$$

Obtain K, by using Fig.1 viscosity correction curve, from Iv calculated in the above formula.

The calculated discharge capacity (V) divided by this K is the value of the corrected flow rate.

Corrected discharge capacity: V' = V/K (m<sup>3</sup>/h)

Fig.1 Viscosity correction curve



Iv: Viscosity index

V: Discharge capacity (m<sup>3</sup>/h)

A: Flow area (mm<sup>2</sup>)

K: Correction coefficient

G: Specific gravity

P: Opening pressure (MPa)

ΔP: P<sub>1</sub> - P<sub>2</sub> (MPa)

Cv: Cv value

Iv: Viscosity index

Mcst: Viscosity [cSt]

**Definition** (extract from "Safety devices for protection against excessive pressure - Direct spring loaded safety valves for steam and gas service")



Step  
2

3

- Start to Discharge Pressure** : The inlet pressure at which the safety valve actually starts to discharge and outflow of an extremely small quantity of fluid (steam or gas) is detected at the outlet. The extremely small quantity means a minimum amount of visually or audibly detectable steam, or a minimum amount of gas that can be detected audibly or by using soap solution. The outflow does not mean the leakage from the valve seat.
- Opening Pressure** : The inlet pressure at which the valve disc "Pops." The opening pressure is also called "popping pressure." "Popping" is an action of discharging fluid inside the valve due to the sudden rise of the valve disc.
- Set pressure** : The opening pressure or start to discharge pressure determined in designing.
- Closing Pressure** : The inlet pressure fallen down to the level at which the valve disc and the valve seat are in contact and the lift becomes zero. It is also called "reseating pressure."
- Blowdown** : The difference between opening pressure or start to discharge pressure and closing pressure.
- Over Pressure** : The increasing pressure that exceeds the set pressure of the safety valve.
- Allowable Over Pressure** : The over pressure within the allowable range.
- Coefficient of Discharge** : The coefficient used to calculate the actual discharge capacity from the theoretical discharge capacity. The coefficient is the ratio between the two capacities, and it counts the frictional resistance.
- Certified Derated Coefficient of Discharge** : The coefficient of discharge to be applied to calculate the certified capacity.
- Flow Rating Pressure** : The inlet pressure taken as the basis for determining the certified capacity of the safety valve, which is the sum of the set pressure and the allowable over pressure.
- Back Pressure** : The pressures existing at the outlet of the safety valve. There are two types as the following:  
(a) Accumulated back pressure: The pressure existing at the outlet of a safety valve caused by the resistance of the outlet side when the safety valve has been relieved.  
(b) Existing back pressure: The pressure which has already been superimposed at the outlet before the safety valve is relieved.
- Theoretical Discharge Capacity** : The discharge capacity calculated supposing that the fluid is free from friction and its flow rate coefficient is 1, and that the valve discharges the ideal gas of fixed specific heat with isentropic change.
- Certified Capacity** : The certified discharge capacity for each safety valve, according to any of the followings:  
(a) Measured Discharge Capacity x Derated Coefficient  
(b) Theoretical Discharge Capacity x Derated Coefficient  
(c) Theoretical Discharge Capacity x Certified Derated Coefficient of Discharge
- Lift** : The amount of travel, in axial direction of the valve or valve rod, away from the closed position to the opened position during discharge of the safety valve.
- Rated Lift** : The lift determined in designing, at which the certified capacity is exercised.
- Seat Diameter** : The inside diameter of setting surface of a valve with valve seat.
- Throat Diameter** : The diameter of the smallest portion of a nozzle from intake opening of fluid to valve seat face.
- Throat Area** : The flow passage area calculated using the throat diameter.
- Seat Flow Area** : The cylindrical or conical flow passage area between the valve and the valve seat secured when the valve lifts up. It is also called "curtain area."
- Flow Area** : The area of the part which determines the flow capacity that passes through a safety valve and is used to calculate the certified capacity.

## Guidelines for Installing Safety Valve

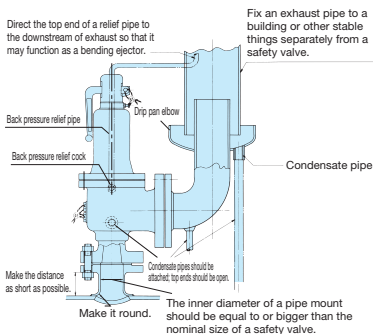
**Step**  
**3**

### ■ Pipe Mount for Installing Safety Valve

1. Pipe mount of a safety valve should have sufficient strength and rigidity against compression, shear stress, and bending stress caused by reaction because the pipe mount is subject to the reaction which is caused along the center line of outlet of a blowout pipe connected to the safety valve in the direction contrary to the discharging direction.
2. The pressure loss in the pipe mount for a safety valve makes the discharge quantity decreased and the function of the safety valve unstable. Therefore a safety valve should be installed vertically as near as possible to a vessel, a header, etc. (See Fig.1.)

### ■ Exhaust Pipe of Safety Valve

An exhaust pipe and a drip pan elbow should be installed so that a safety valve may not be subject to stress caused by the thermal expansion of a boiler or equipment and by the expansion or contraction of a discharge pipe due to the thermal action of blowout of the safety valve. (See Fig.1.) The inner diameter of an exhaust pipe should be as large as possible than that of an outlet pipe of a safety valve, and the exhaust pipe should be lead to outside or a safe place.


**Fig. 1**

### ■ Installation of Safety Valve

1. Do not remove the blind plate before completing the preparation for installation so that any foreign matter does not come into a safety valve.
2. Be sure to remove foreign matter completely from equipment, pipes, and vessels by washing their insides before installation.
3. In installing a safety valve, do not apply a pipe wrench, etc. to the places other than the specified ones.
4. Do not apply any force from the outside.
5. Equip a valve casing and a exhaust pipe with a drain pipe for each to prevent raindrops and dirt, etc. from accumulating.

### Caution before use

### SAFETY VALVE

1. Do not disassemble or readjust the product unnecessarily because pressure adjustment is completed. If disassembling and readjusting the product unnecessarily, it is dangerous because function of the product is not accomplished, such as not discharged at set pressure, or discharge at less than set pressure.
2. Most of problems with the pressure reducing valve are caused by foreign substances and scale in the piping. Be sure to remove them before using the product. Note that the customer is required to pay repair charge for any defect that occurs due to foreign substance inside piping or scale.
3. Install the product so that the product cannot receive excessive load, torque or vibration.
4. Install the product correctly, checking fluid flow direction and direction of inlet and outlet.

Before installing the product, remove foreign substances inside piping!

Leakage happens by foreign substances or scratch!

### Caution during use

### SAFETY VALVE

1. Do not use the product for device or equipment which cannot accept valve seat leakage because the product which do not use soft seat on valve seat face have valve seat leakage within acceptable range.
2. Except for handle type, do not rotate adjusting screw. If doing so, the product may discharge at lower than set pressure, or not discharge at set pressure.
3. Do not remove the cap unnecessarily since without cap, fluid may discharge from adjusting screw part.

Install the product on place where vibration is not transmitted!

Vibration is too much!

### Caution at disassembly and inspection

### SAFETY VALVE

1. Ask professionals or us for disassembly and inspection. Residual pressure may lead to injury or scalds.

# AL-150

3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Flush-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■Features

1. Versatile type, compatible with fluids such as steam, air, water, and oil.
2. Achieved the highest performance by segmentalize the pressure range and finished by ultra-precision technique.
3. The trim parts (valve and valve seat) and adjusting spring are made of stainless steel. Used for the trim parts is SCS14A (equivalent to SUS316) with outstanding corrosion resistance.
4. Closed structure prevents fluid leakage to outside.

## ■Specifications

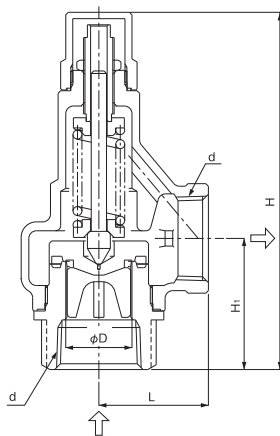
Structure	Closed type		
Application	Steam, Air, Hot and cold water, Oil, Other non-dangerous fluids		
Working pressure	0.05-1.0 MPa		
Working temperature	5-220°C *1		
Material	Spring case	Bronze	
	Valve, Valve seat	Stainless steel (SCS14A)	
	Adjusting spring	Stainless steel	
Connection	JIS Rc screwed		

\*1 The maximum temperature is 150°C when using for water, oil, or other liquids.

· Please refer to the chart in P.8-82 for set pressure range.

## ■Dimensions and Weights

Nominal size	Dimension (mm)					Flow area $\pi D \ell$ (mm <sup>2</sup> )	Weight (kg)
	d	D	L	H <sub>1</sub>	H		
15A	Rc 1/2	16	34	40	128	20.1	0.7
20A	Rc 3/4	21	38	43	128.5	34.6	0.8
25A	Rc 1	26	43	51.5	144.5	53.0	1.1
32A	Rc 1-1/4	33	50	61.5	181.5	93.3	1.8
40A	Rc 1-1/2	41	60	60	205	135.2	2.8
50A	Rc 2	51	75	76	245.5	208.2	4.7



# AL-150T, 150T-N

Soft seat type



 JWWA approval  
(AL-150T-N)

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Safety relief valve with excellent airtightness ensured by the valve seat incorporating soft seat. Most suitable for applications where valve seat leakage is not tolerated.
2. The trim parts (valve and valve seat) and adjusting spring are made of stainless steel. Used for the trim parts is SCS14A (equivalent to SUS316) with outstanding corrosion resistance.
3. Simple structure and easy to handle.
4. Closed structure prevents fluid leakage.



## ■Specifications

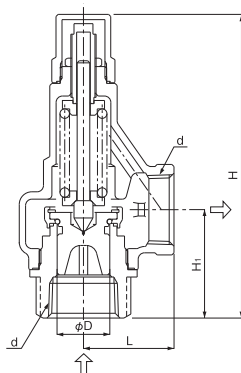
Model	AL-150T	AL-150T-N	
Structure	Closed type		
Application	Air, Cold and hot water, Oil, Other non-dangerous fluids *	Cold and hot water	
Working pressure	0.05-1.0 MPa		
Working temperature	5-120°C	5-100°C	
Material	Spring case	Bronze	
	Valve, valve seat	Stainless steel (SCS14A)	
	Adjusting spring	Stainless steel	
	O-ring	FKM	
Connection	JIS Rc screwed		

\* Please contact us when using for oil.

· Please refer to the chart in P. 82 for set pressure range.

## ■Dimensions and Weights

Nominal size	Dimension (mm)					Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	d	D	L	H <sub>1</sub>	H		
15A	Rc 1/2	16	34	40	128	20.1	0.7
20A	Rc 3/4	21	38	43	128.5	34.6	0.8
25A	Rc 1	26	43	51.5	144.5	53.0	1.1
32A	Rc 1-1/4	33	50	61.5	181.5	93.3	1.8
40A	Rc 1-1/2	41	60	60	205	135.2	2.8
50A	Rc 2	51	75	76	245.5	208.2	4.7



### Soft seat is used for the trim parts!

Soft seat (O-ring) is used for the trim parts, ensuring the reliable airtightness of the valve seat.



Soft seat (O-ring)



# AL-150TR

Soft seat type

3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■ Features

1. Handle type relief valve, pressure can be changed easily.
2. Excellent airtightness ensured by the valve seat incorporating soft seat. Most suitable for applications where valve seat leakage is not tolerated.
3. The trim parts (valve and valve seat) and adjusting spring are made of stainless steel. Used for the trim parts is SCS14A (equivalent to SUS316) with outstanding corrosion resistance.
4. Simple structure and easy to handle.
5. Closed structure prevents fluid leakage.



## ■ Specifications

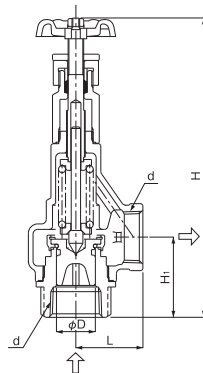
Structure	Closed type with a handle	
Application	Cold and hot water, Oil, Other non-dangerous fluids *	
Working pressure	0.05-1.0 MPa	
Working temperature	5-90°C	
Material	Spring case	Bronze
	Valve, valve seat	Stainless steel (SCS14A)
	Adjusting spring	Stainless steel
	O-ring	FKM
Connection	JIS Rc screwed	

\* Please contact us when using for oil.

· Please refer to the chart in P. 8-82 for set pressure range.

## ■ Dimensions and Weights

Nominal size	Dimension (mm)					Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	d	D	L	H <sub>1</sub>	H		
15A	Rc 1/2	16	34	40	184	20.1	1.0
20A	Rc 3/4	21	38	43	186	34.6	1.1
25A	Rc 1	26	43	51.5	203	53.0	1.4
32A	Rc 1-1/4	33	50	61.5	239	93.3	2.1
40A	Rc 1-1/2	41	60	60	276	135.2	3.2
50A	Rc 2	51	75	76	314	208.2	5.1



### Soft seat is used for the trim parts!

Soft seat (O-ring) is used for the trim parts, ensuring the reliable airtightness of the valve seat.



Soft seat (O-ring)

# AL-150TML,AL-150TML-N

Soft seat type


**JWWA approval**  
**(AL-150TML-N)**

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Lever type safety relief valve. A discharge inspection can be manually performed when the difference between the set pressure and the inlet pressure is as shown in Table 1 below.
2. Excellent airtightness ensured by the valve seat incorporating soft seat. Most suitable for applications where valve seat leakage is not tolerated.
3. The trim parts (valve and valve seat) and adjusting spring are made of stainless steel. Used for the trim parts is SCS14A (equivalent to SUS316) with outstanding corrosion resistance.
4. Simple structure and easy to handle.
5. Closed structure prevents fluid leakage.


**[Table 1] Required differential pressure at a discharge inspection**

Nominal size	Difference between set pressure and inlet pressure
15A-25A	1.0 MPa or less
32A, 40A	0.6 MPa or less
50A	0.4 MPa or less

## ■Specifications

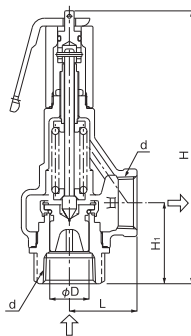
Model		AL-150TML	AL-150TML-N
Structure		Closed type with a lever	
Application		Air, Cold and hot water, Oil, Other non-dangerous fluids*	Cold and hot water
Working pressure		0.05-1.0 MPa	
Working temperature		5-120°C	5-100°C
Spring case		Bronze	Bronze (NPB treated)
Material	Valve, valve seat	Stainless steel (SCS14A)	
	Adjusting spring	Stainless steel	
	O-ring	FKM	
Connection		JIS Rc screwed	

\* Please contact us when using for oil.

· Please refer to the chart in P. 81-82 for set pressure range.

## ■Dimensions and Weights

Nominal size	Dimension (mm)						Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	d	D	L	H <sub>1</sub>	H			
15A	Rc 1/2	16	34	40	157	20.1	0.8	
20A	Rc 3/4	21	38	43	158	34.6	0.9	
25A	Rc 1	26	43	51.5	174	53.0	1.3	
32A	Rc 1-1/4	33	50	61.5	212	93.3	1.9	
40A	Rc 1-1/2	41	60	60	246	135.2	3.0	
50A	Rc 2	51	75	76	286	208.2	4.9	



■ Certified Capacity Table

· AL-150 for steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	15	20	29	40	50	60	70	80	90	100	109
20A	27	35	51	69	87	104	121	138	155	172	189
25A	42	54	78	105	133	159	186	212	237	263	289
32A	70	91	132	178	224	268	313	356	400	443	487
40A	105	136	198	266	335	402	468	534	599	664	729
50A	163	211	306	411	518	621	723	824	924	1025	1126

· AL-150 · 150T · 150TML for air (20°C) <Pressure vessel structure standard>

(kg/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	25	33	48	65	81	98	114	131	147	164	181
20A	44	57	83	111	140	169	197	226	254	283	311
25A	67	87	127	171	215	258	302	346	390	433	477
32A	113	147	214	288	362	435	509	582	656	730	803
40A	169	221	321	431	542	652	762	872	982	1093	1203
50A	262	341	496	666	836	1006	1176	1346	1516	1687	1857

· AL-150 · 150T · 150TML · 150TR for water (accumulation: 25%) <Yoshitake standard>

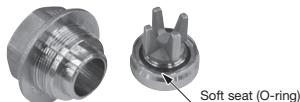
(m<sup>3</sup>/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	0.4	0.5	0.9	1.1	1.3	1.5	1.6	1.8	1.9	2.0	2.1
20A	0.6	0.9	1.6	2.0	2.3	2.6	2.8	3.1	3.3	3.5	3.7
25A	1.0	1.5	2.5	3.1	3.6	4.0	4.4	4.7	5.1	5.4	5.7
32A	1.8	2.6	4.5	5.5	6.3	7.1	7.8	8.4	9.0	9.5	10.0
40A	2.7	3.8	6.5	7.9	9.2	10.3	11.3	12.2	13.0	13.8	14.6
50A	4.1	5.9	10.0	12.3	14.2	15.9	17.4	18.8	20.1	21.3	22.4

· Please refer to P. 8-12 for the calculation procedure for nominal size selection.

**Soft seat is used for the trim parts!**

Soft seat (O-ring) is used for the trim parts, ensuring the reliable airtightness of the valve seat.



# AL-150H

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■Features

1. Popping structure ensures reliable discharge.
2. Used for the trim parts is SCS14A (equivalent to SUS316) with outstanding corrosion resistance.
3. Simple internal structure facilitates adjustment, maintenance and handling.
4. Closed structure prevents fluid leakage to outside.

## ■Specifications

Structure	Closed type		
Application	Steam, Air, Cold and hot water, Oil, Other non-dangerous fluids		
Working pressure	1.0-1.6 MPa		
Maximum temperature	220°C *		
Material	Spring case	Bronze	
	Valve, valve seat	Stainless steel (SCS14A)	
Connection	JIS Rc screwed		

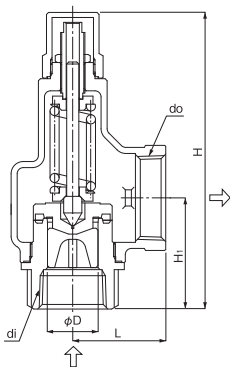
\* The maximum temperature is 150°C when using for water, oil, or other liquids.

· Please refer to the chart in P.83-82 for set pressure range.

## ■Dimensions and Weights

Nominal size	Dimension (mm)					Flow area $\pi D \ell$ (mm <sup>2</sup> )	Weight (kg)
	di x D x do	L	H <sub>1</sub>	H	H <sub>2</sub>		
15A	Rc 1/2 x 16 x Rc 3/4	36	42	126	22.9	0.8	
20A	Rc 3/4 x 21 x Rc 1	38	47	131	39.5	0.9	
25A	Rc 1 x 26 x Rc 1-1/4	46	55.5	147.5	60.6	1.3	
32A	Rc 1-1/4 x 33 x Rc 1-1/2	54	61.5	167.5	97.7	1.9	
40A	Rc 1-1/2 x 41 x Rc 2	63	67	193.5	150.8	2.9	
50A	Rc 2 x 51 x Rc 2-1/2	77	80	241.5	233.4	5.0	

· Screwed connection size of the outlet side is 1 size larger than the nominal size.



# AL-150L

3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■ Features

- The trim parts (valve and valve seat) and adjusting spring are made of stainless steel. Used for the trim parts is SCS14A (equivalent to SUS316) with outstanding corrosion resistance.
- Due to lift lever mechanism a discharge inspection can be manually performed at more than 75% of the opening pressure.

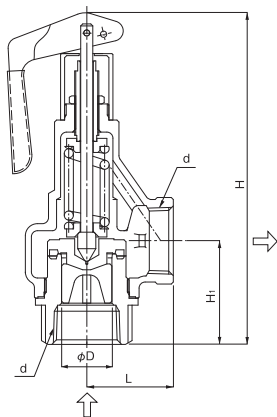
## ■ Specifications

Structure	Open type with a lever	
Application	Steam, Air	
Working pressure	0.05-1.0 MPa	
Maximum temperature	220°C	
Material	Spring case	Cast bronze
	Valve, valve seat	Stainless steel (SCS14A)
Connection	JIS Rc screwed	

· Please refer to the chart in P.8-82 for set pressure range.

## ■ Dimensions and Weights

Nominal size	d	Dimension (mm)				Flow area $\pi D^2 l$ (mm <sup>2</sup> )	Weight (kg)
		D	L	H <sub>1</sub>	H		
15A	Rc 1/2	16	34	40	148	20.1	0.8
20A	Rc 3/4	21	38	43	148	34.6	0.9
25A	Rc 1	26	43	51.5	165	53.0	1.2
32A	Rc 1-1/4	33	50	61.5	201	93.3	1.9
40A	Rc 1-1/2	41	60	60	226	135.2	2.9
50A	Rc 2	51	75	76	266	208.2	4.8



**■ Certified Capacity Table**
**· AL-150L for steam (saturation temperature) <Pressure vessel structure standard>**

(kg/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	15	20	29	40	50	60	70	80	90	100	109
20A	27	35	51	69	87	104	121	138	155	172	189
25A	42	54	78	105	133	159	186	212	237	263	289
32A	70	91	132	178	224	268	313	356	400	443	487
40A	105	136	198	266	335	402	468	534	599	664	729
50A	163	211	306	411	518	621	723	824	924	1025	1126

**· AL-150H for steam (saturation temperature)**

(kg/h)

Pressure MPa Nominal size	1.0	1.1	1.2	1.3	1.4	1.5	1.6
15A	115	126	136	146	156	167	177
20A	199	217	235	252	270	288	306
25A	306	333	360	387	415	442	469
32A	493	537	581	625	669	713	757
40A	761	830	897	965	1033	1100	1168
50A	1179	1284	1389	1494	1599	1703	1808

**· AL-150L for air (20°C) <Pressure vessel structure standard>**

(kg/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	25	33	48	65	81	98	114	131	147	164	181
20A	44	57	83	111	140	169	197	226	254	283	311
25A	67	87	127	171	215	258	302	346	390	433	479
32A	113	147	214	288	362	435	509	582	656	730	803
40A	169	221	321	431	542	652	762	872	982	1093	1203
50A	262	341	496	666	836	1006	1176	1346	1516	1687	1857

**· AL-150H for air (20°C)**

(kg/h)

Pressure MPa Nominal size	1.0	1.1	1.2	1.3	1.4	1.5	1.6
15A	190	208	225	243	260	278	295
20A	328	359	389	419	449	479	509
25A	504	550	597	643	689	735	782
32A	813	888	962	1037	1111	1186	1260
40A	1255	1370	1485	1600	1715	1831	1946
50A	1943	2121	2299	2477	2655	2833	3011

**· AL-150H for water (accumulation: 25%) <Yoshitake standard>**

 (m<sup>3</sup>/h)

Pressure MPa Nominal size	1.0	1.1	1.2	1.3	1.4	1.5	1.6
15A	2.4	2.5	2.7	2.8	2.9	3.0	3.1
20A	4.2	4.4	4.6	4.8	5.0	5.2	5.3
25A	6.5	6.8	7.1	7.4	7.7	8.0	8.2
32A	10.5	11.0	11.5	12.0	12.4	12.9	13.3
40A	16.2	17.0	17.8	18.5	19.2	19.9	20.6
50A	25.2	26.4	27.6	28.7	29.8	30.8	31.8

· Please refer to P. 12 for the calculation procedure of nominal size selection.

# AL-140, 140H

3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■ Features

1. Safety valve of all stainless steel made. SCS14A (equivalent to SUS316) with outstanding corrosion resistance is used for the rim parts.
2. Popping structure ensures reliable discharge.
3. Simple structure and easy to handle.
4. Closed structure prevents fluid leakage.



AL-140



AL-140H

## ■ Specifications

Model	AL-140	AL-140H
Structure	Closed type	
Application	Steam, Air, Cold and hot water, Oil, Other non-dangerous fluids	
Working pressure	0.05-1.0 MPa	1.0-2.0 MPa
Maximum temperature	220°C *	
Material	Spring case	Cast stainless steel
	Valve, valve seat	Cast stainless steel (SCS14A)
Connection	JIS Rc screwed	

\* The maximum temperature is 150°C when using for water, oil, or other liquids.

· Please refer to the chart in P. 81-82 for set pressure range.

## ■ Dimensions and Weights

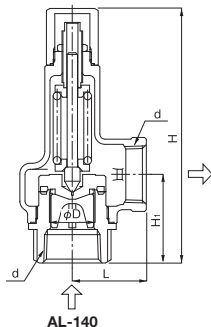
### · AL-140

Nominal size	Dimension (mm)						Flow area πDℓ (mm <sup>2</sup> )	Weight (kg)
	d	D	L	H <sub>1</sub>	H			
15A	Rc 1/2	16	34	40	128.5	20.1	0.7	
20A	Rc 3/4	21	38	42	129	34.6	0.8	
25A	Rc 1	26	43	51.5	148	53.0	1.1	
32A	Rc 1-1/4	33	50	61.5	182	93.3	2.0	
40A	Rc 1-1/2	41	60	64	206	135.2	3.0	
50A	Rc 2	51	75	76	246.5	208.2	5.0	

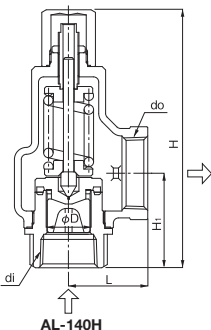
### · AL-140H

Nominal size	Dimension (mm)						Flow area πDℓ (mm <sup>2</sup> )	Weight (kg)
	d <sub>i</sub> x D x d <sub>o</sub>	L	H <sub>1</sub>	H				
15A	Rc 1/2 x 16 x Rc 3/4	36	42	126.5	20.1	0.9		
20A	Rc 3/4 x 21 x Rc 1	38	46	130.5	34.6	1.0		
25A	Rc 1 x 26 x Rc 1-1/4	46	55	150.5	53.0	1.5		
32A	Rc 1-1/4 x 33 x Rc 1-1/2	54	61.5	195	93.3	2.5		
40A	Rc 1-1/2 x 41 x Rc 2	63	67	227.5	135.2	4.6		
50A	Rc 2 x 51 x Rc 2-1/2	77	80	303.5	208.2	8.8		

· Screwed connection size of the outlet side is 1 size larger than the nominal size.



AL-140



AL-140H

■ Certified Capacity Table for AL-140, AL-140H

• AL-140 for steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Nominal size	Pressure MPa										
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	15	20	29	40	50	60	70	80	90	100	109
20A	27	35	51	69	87	104	121	138	155	172	189
25A	42	54	78	105	133	159	186	212	237	263	289
32A	70	91	132	178	224	268	313	356	400	443	487
40A	105	136	198	266	335	402	468	534	599	664	729
50A	163	211	306	411	518	621	723	824	924	1025	1129

• AL-140H for steam (saturation temperature)

(kg/h)

Nominal size	Pressure MPa										
	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
15A	109	119	129	139	149	158	168	178	188	198	207
20A	189	206	222	239	256	273	290	306	324	340	357
25A	289	315	341	367	393	418	444	470	496	522	547
32A	487	531	574	617	661	704	747	791	835	878	921
40A	729	795	860	924	990	1054	1119	1184	1250	1315	1380
50A	1126	1227	1327	1427	1528	1627	1728	1828	1930	2030	2130

• AL-140 for air (20°C) <Pressure vessel structure standard>

(kg/h)

Nominal size	Pressure MPa										
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	25	33	48	65	81	98	114	131	147	164	181
20A	44	57	83	111	140	169	197	226	254	283	311
25A	67	87	127	171	215	258	302	346	390	433	477
32A	113	147	214	288	362	435	509	582	656	730	803
40A	169	221	321	431	542	652	762	872	982	1093	1203
50A	262	341	496	666	836	1006	1176	1346	1516	1687	1857

• AL-140H for air (20°C)

(kg/h)

Nominal size	Pressure MPa										
	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
15A	181	197	214	230	247	264	280	297	313	330	347
20A	311	340	368	397	426	454	483	511	540	568	597
25A	477	521	565	608	652	696	740	783	827	871	915
32A	803	877	950	1024	1098	1171	1245	1318	1392	1466	1539
40A	1203	1313	1423	1533	1644	1754	1864	1974	2084	2195	2305
50A	1857	2027	2197	2367	2537	2707	2877	3047	3217	3388	3558

• AL-140 for water (accumulation: 25%) <Yoshitake standard>

(m<sup>3</sup>/h)

Nominal size	Pressure MPa										
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	0.4	0.5	0.9	1.1	1.3	1.5	1.6	1.8	1.9	2.0	2.1
20A	0.6	0.9	1.6	2.0	2.3	2.6	2.8	3.1	3.3	3.5	3.7
25A	1.0	1.5	2.5	3.1	3.6	4.0	4.4	4.7	5.1	5.4	5.7
32A	1.8	2.6	4.5	5.5	6.3	7.1	7.8	8.4	9.0	9.5	10.0
40A	2.7	3.8	6.5	7.9	9.2	10.3	11.3	12.2	13.0	13.8	14.6
50A	4.1	5.9	10.0	12.3	14.2	15.9	17.4	18.8	20.1	21.3	22.4

• AL-140H for water (accumulation: 25%)

(m<sup>3</sup>/h)

Nominal size	Pressure MPa										
	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
15A	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.0
20A	3.7	3.9	4.0	4.2	4.4	4.5	4.7	4.8	5.0	5.1	5.2
25A	5.7	6.0	6.2	6.5	6.7	7.0	7.2	7.4	7.6	7.8	8.0
32A	10.0	10.5	11.0	11.4	11.9	12.3	12.7	13.1	13.5	13.8	14.2
40A	14.6	15.3	15.9	16.6	17.2	17.8	18.4	19.0	19.5	20.1	20.6
50A	22.4	23.5	24.6	25.6	26.6	27.5	28.4	29.3	30.1	30.9	31.8

• Please contact us for the calculation procedure for nominal size selection.



# AL-140T, 140T-N

Soft seat type


**JWWA approval**  
 (AL-140T-N)


Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■ Features

1. Safety relief valve of all stainless steel made, offering high corrosion resistance and durability in particular.
2. Excellent airtightness ensured by the valve seat incorporating soft seat. Most suitable for applications where valve seat leakage is not tolerated.
3. Close structure prevents fluid leakage to outside.

## ■ Specifications

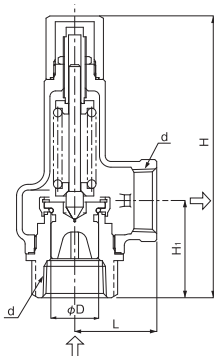
Model	AL-140T	AL-140T-N
Structure	Closed type	
Application	Air, Cold and hot water, Oil, Other non-dangerous fluids *	Cold and hot water
Working pressure	0.05-1.0 MPa	
Working temperature	5-120°C	5-100°C
Material	Spring case	Stainless steel
	Valve, valve seat	Stainless steel (SCS14A)
	Adjusting spring	Stainless steel
	O-ring	FKM
Connection	JIS Rc screwed	

\* Please contact us when using for oil.

· Please refer to the chart in P.81-82 for set pressure range.

## ■ Dimensions and Weights

Nominal size	Dimension (mm)						Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	d	D	L	H <sub>1</sub>	H	H		
15A	Rc 1/2	16	34	40	128	20.1	0.7	
20A	Rc 3/4	21	38	42	128.5	34.6	0.8	
25A	Rc 1	26	43	51	148	53.0	1.1	
32A	Rc 1-1/4	33	50	61.5	181.5	93.3	1.8	
40A	Rc 1-1/2	41	60	64	205	135.2	2.8	
50A	Rc 2	51	75	76	245.5	208.2	4.7	



### Soft seat is used for the trim parts!

Soft seat (O-ring) is used for the trim parts, ensuring the reliable airtightness of the valve seat.



Soft seat (O-ring)

# AL-140ML

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■ Features

1. Lever type safety relief valve. A discharge inspection can be manually performed when the difference between the set pressure and the inlet pressure is as shown in Table 1 below.
2. Safety relief valve of all stainless steel made. Used for trim parts is SCS14A (equivalent to SUS316) with outstanding corrosion resistance.
3. Closed structure prevents fluid leakage.

[Table 1] Required differential pressure at a discharge inspection

Nominal size	Difference between set pressure and inlet pressure
15A-25A	1.0 MPa or less
32A, 40A	0.6 MPa or less
50A	0.4 MPa or less

## ■ Specifications

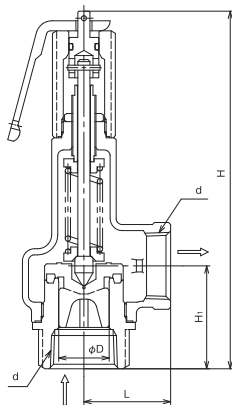
Structure	Closed type with a lever	
Application	Air, Cold and hot water, Oil, Other non-dangerous fluids *	
Working pressure	0.05-1.0 MPa	
Working temperature	5-120°C	
Material	Spring case	Stainless steel
	Valve, valve seat	Stainless steel (SCS14A)
	Adjusting spring	Stainless steel
Connection	JIS Rc screwed	

\* Please contact us when using for oil.

· Please refer to the chart in P. 82 for set pressure range.

## ■ Dimensions and Weights

Nominal size	Dimension (mm)						Flow area $\pi D^2/4$ (mm <sup>2</sup> )	Weight (kg)
	d	D	L	H <sub>1</sub>	H			
15A	Rc 1/2	16	34	40	158	20.1	0.8	
20A	Rc 3/4	21	38	42	158	34.6	0.9	
25A	Rc 1	26	43	51	177	53.0	1.3	
32A	Rc 1-1/4	33	50	61.5	211	93.3	1.9	
40A	Rc 1-1/2	41	60	64	246	135.2	3.0	
50A	Rc 2	51	75	76	286	208.2	4.9	



# AL-140TML, 140TML-N

Soft seat type


**JWWA approval**  
**(AL-140TML-N)**


3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■ Features

1. Lever type safety relief valve. A discharge inspection can be manually performed when the difference between the set pressure and the inlet pressure is as shown in Table 1 below.
2. Excellent airtightness ensured by the valve seat incorporating soft seat. Most suitable for applications where valve seat leakage is not tolerated.
3. Safety relief valve of all stainless steel made. Used for trim parts is SCS14A (equivalent to SUS316) with outstanding corrosion resistance.
4. Closed structure prevents fluid leakage.

**[Table 1] Required differential pressure at a discharge inspection**

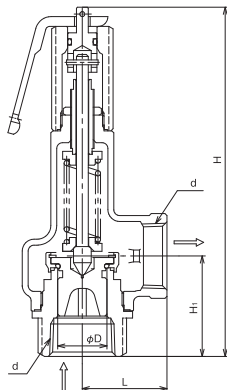
Nominal size	Difference between set pressure and inlet pressure
15A-25A	1.0 MPa or less
32A, 40A	0.6 MPa or less
50A	0.4 MPa or less

## ■ Specifications

Model	AL-140TML	AL-140TML-N
Structure	Closed type with a lever	
Application	Air, Cold and hot water, Oil, Other non-dangerous fluids *	Cold and hot water
Working pressure	0.05-1.0 MPa	
Working temperature	5-120°C	5-100°C
Material	Spring case	Stainless steel
	Valve, valve seat	Stainless steel (SCS14A)
	Adjusting spring	Stainless steel
	O-ring	FKM
Connection	JIS Rc screwed	

\* Please contact us when using for oil.

· Please refer to the chart in P.83 -82 for set pressure range.



## ■ Dimensions and Weights

Nominal size	d	D	Dimension (mm)				Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
			L	H <sub>1</sub>	H	$\phi D$		
15A	Rc 1/2	16	34	40	158	20.1	0.8	
20A	Rc 3/4	21	38	42	158	34.6	0.9	
25A	Rc 1	26	43	51	177	53.0	1.3	
32A	Rc 1-1/4	33	50	61.5	211	93.3	1.9	
40A	Rc 1-1/2	41	60	64	246	135.2	3.0	
50A	Rc 2	51	75	76	286	208.2	4.9	

**■ Certified Capacity Table**

· AL-140T, AL-140ML, AL-140TML for air (20°C) &lt;Pressure vessel structure standard&gt;

(kg/h)

Pressure Mpa \ Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	25	33	48	65	81	98	114	131	147	164	181
20A	44	57	83	111	140	169	197	226	254	283	311
25A	67	87	127	171	215	258	302	346	390	433	477
32A	113	147	214	288	362	435	509	582	656	730	803
40A	169	221	321	431	542	652	762	872	982	1093	1203
50A	262	341	496	666	836	1006	1176	1346	1516	1687	1857

· AL-140T, 140T-N, 140ML, 140TML, 140TML-N for water (accumulation 25%) &lt;Yoshitake standard&gt;

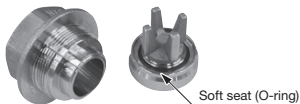
 (m<sup>3</sup>/h)

Pressure Mpa \ Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	0.4	0.5	0.9	1.1	1.3	1.5	1.6	1.8	1.9	2.0	2.1
20A	0.6	0.9	1.6	2.0	2.3	2.6	2.8	3.1	3.3	3.5	3.7
25A	1.0	1.5	2.5	3.1	3.6	4.0	4.4	4.7	5.1	5.4	5.7
32A	1.8	2.6	4.5	5.5	6.3	7.1	7.8	8.4	9.0	9.5	10.0
40A	2.7	3.8	6.5	7.9	9.2	10.3	11.3	12.2	13.0	13.8	14.6
50A	4.1	5.9	10.0	12.3	14.2	15.9	17.4	18.8	20.1	21.3	22.4

\* Please refer to P. 8-12 for the calculation procedure for nominal size selection.

**Soft seat is used for the trim parts!**

Soft seat (O-ring) is used for the trim parts, ensuring the reliable airtightness of the valve seat.



# AL-250,250R

3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■ Features

1. Relief valve of stainless steel made, offering high corrosion resistance and durability in particular.
2. Remarkably effective for lines of heavy pulsation or considerable pressure fluctuation due to unique valve structure. Prevents chattering and hunting.
3. Stable operation can be maintained against back pressure changes produced in continuous blow.
4. Simple structure, easy to handle.
5. Since the AL-250R is equipped with a handle, pressure change is easy.



AL-250

AL-250R

## ■ Specifications

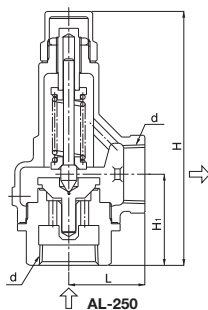
Model	AL-250	AL-250R
Structure	Closed type	Closed type with a handle
Application	Cold and hot water, Oil, Other non-dangerous fluids (Less than 20 cst)	
Working pressure	0.05-1.0 MPa	
Maximum temperature	120°C	90°C
Material	Spring case	Stainless steel
	Valve, valve seat	Stainless steel
Connection	JIS Rc screwed	

· Please refer to the chart in P.8-82 for set pressure range.

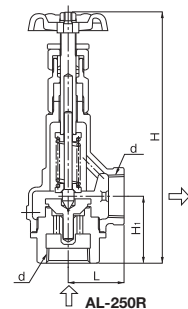
## ■ Dimensions and Weights

Nominal size	d	L	H <sub>i</sub>	H	Weight (kg)
15A	Rc 1/2	34	41.0	129 (185)	0.7 (0.9)
20A	Rc 3/4	38	45.0	132 (188)	0.9 (1.1)
25A	Rc 1	43	51.5	148 (203)	1.2 (1.4)
32A	Rc 1-1/4	50	63.5	184 (241)	2.2 (2.5)
40A	Rc 1-1/2	60	68.5	210 (278)	3.2 (3.7)
50A	Rc 2	75	80.0	250 (314)	5.6 (6.0)

· The values in parentheses are the dimensions and weights of the AL-250R.



AL-250



AL-250R

## · Dashpot structure

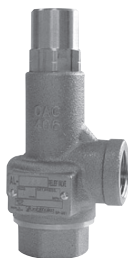


# AL-260,260R

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Stainless steel is used for the trim parts, and corrosion-resistant material for all wetted parts.
2. Remarkably effective for lines of heavy pulsation or considerable pressure fluctuation due to unique valve structure. Prevents chattering and hunting.
3. Stable operation can be maintained against back pressure changes produced in continuous blow.
4. Simple structure, easy to handle.
5. Since the AL-260R is equipped with a handle, pressure change is easy.



AL-260



AL-260R

## ■Specifications

Model	AL-260	AL-260R
Structure	Closed type	Closed type with a handle
Application	Cold and hot water, Oil, Other non-dangerous fluids (Less than 20 cst)	
Working pressure	0.05-1.0 MPa	
Maximum temperature	120°C	90°C
Material	Valve case	Bronze
	Spring case	Bronze
	Valve, valve seat	Stainless steel
Connection	JIS Rc screwed	

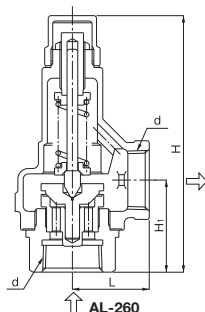
· Please refer to the chart in P.8-82 for set pressure range.

## ■Dimensions and Weights

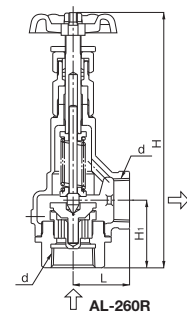
(mm)

Nominal size	d	L	H <sub>i</sub>	H	Weight (kg)
15A	Rc 1/2	34	41.0	129 (185)	0.7 (1.0)
20A	Rc 3/4	38	45.0	131 (190)	0.9 (1.2)
25A	Rc 1	43	51.5	145 (200)	1.2 (1.5)
32A	Rc 1-1/4	50	63.5	184 (245)	1.9 (2.2)
40A	Rc 1-1/2	60	68.5	210 (280)	2.8 (3.2)
50A	Rc 2	75	80.0	250 (315)	4.9 (5.3)

· The values in parentheses are the dimensions and weights of the AL-260R.



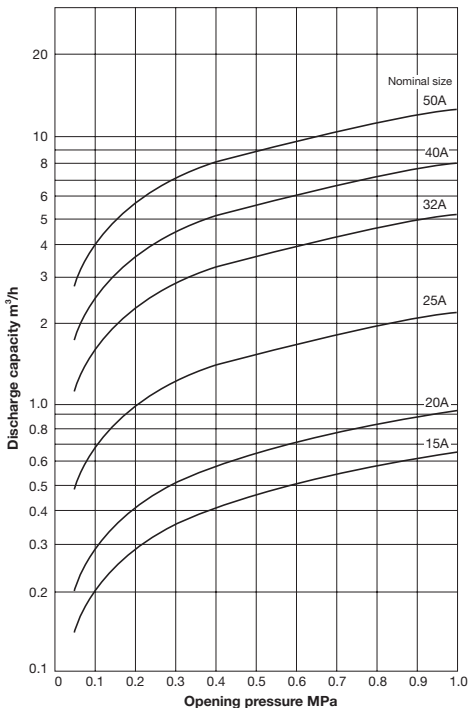
AL-260



AL-260R

### ■ Flow rate chart [water] (AL-250 · 250R · 260 · 260R)

Shown in the chart is the flow rate at 25% accumulation.  
For flow rates at other accumulation levels, use the approximate flow rate magnification chart.

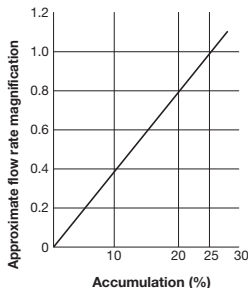


#### · Dashpot structure



#### Approximate flow rate magnification chart

When the accumulation is not 25%, select an approximate flow rate magnification matching the accumulation based on this chart, and multiply the flow rate at 25% accumulation by the selected magnification.



#### · Discharge capacity (accumulation: 25%)

(m<sup>3</sup>/h)

Nominal size	Opening pressure (MPa)										
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	0.14	0.20	0.29	0.35	0.41	0.46	0.50	0.54	0.58	0.62	0.65
20A	0.20	0.29	0.41	0.51	0.59	0.66	0.72	0.78	0.83	0.88	0.93
25A	0.49	0.69	0.98	1.20	1.38	1.54	1.69	1.83	1.96	2.07	2.19
32A	1.14	1.62	2.29	2.81	3.24	3.63	3.97	4.29	4.59	4.87	5.13
40A	1.79	2.53	3.58	4.39	5.07	5.67	6.21	6.71	7.17	7.61	8.02
50A	2.80	3.96	5.60	6.86	7.92	8.86	9.71	10.49	11.21	11.89	12.53

# AL-27

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Relief valve, designed for pressure up to 1.6 MPa.
2. Remarkably effective for lines of heavy pulsation or considerable pressure fluctuation due to unique valve structure. Prevents chattering and hunting.
3. Stable operation can be maintained against back pressure changes produced in continuous blow.

## ■Specifications

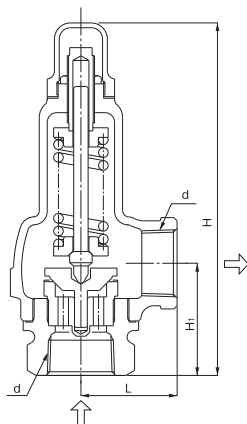
Structure	Closed type	
Application	Cold and hot water, Oil, Other non-dangerous fluids (Less than 20 cst)	
Working pressure	0.05-1.6 MPa	
Maximum temperature	120°C	
Material	Valve case	Ductile cast iron
	Spring case	Ductile cast iron
	Valve, valve seat	Stainless steel
Connection	JIS Rc screwed	

· Please refer to the chart in P. 82 for set pressure range.

## ■Dimensions and Weights

Nominal size	d	L	H <sub>1</sub>	H	Weight (kg)
15A	Rc 1/2	40	40	143	0.9
20A	Rc 3/4	45	50	162	1.3
25A	Rc 1	50	60	182	1.7
32A	Rc 1-1/4	60	70	220	2.9
40A	Rc 1-1/2	65	75	238	3.9
50A	Rc 2	80	85	272	6.4

### · Dashpot structure

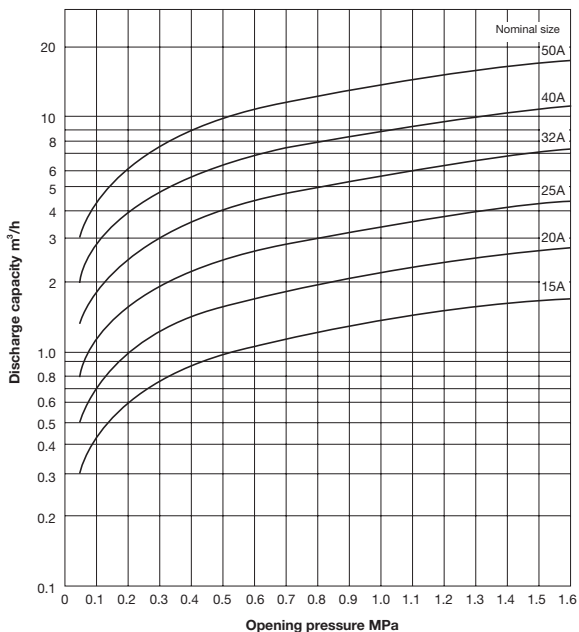




### Flow Rate Chart [water]

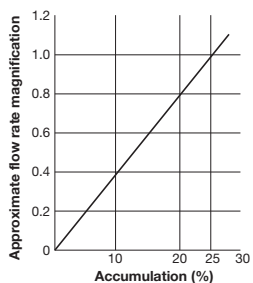
Shown in the chart is the flow rate at 25% accumulation.

For flow rates at other accumulation levels, use the approximate flow rate magnification chart.



#### Approximate flow rate magnification chart

When the accumulation is not 25%, select an approximate flow rate magnification matching the accumulation based on this chart, and multiply the flow rate at 25% accumulation by the selected magnification.



# AL-17

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■ Features

1. Safety relief valve with the trim parts (valve and valve seat) of stainless steel, offering high corrosion resistance and durability in particular.
2. Popping structure ensures reliable discharge.
3. Blowdown can be adjusted with adjustable ring (seat ring).



## ■ Specifications

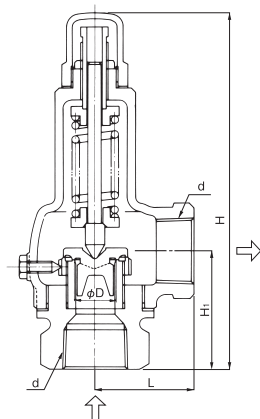
Structure	Closed type	
Application	Steam, Air, Cold and hot water, Oil, Other non-dangerous fluids	
Working pressure	0.05-1.6 MPa	
Maximum temperature	220°C *	
Material	Spring case	Ductile cast iron
	Valve, valve seat	Stainless steel
	Connection	JIS Rc screwed

\* The maximum temperature is 150°C when using for water, oil, or other liquids.

· Please refer to the chart in P.81-82 for set pressure range.

## ■ Dimensions and Weights

Nominal size	Dimension (mm)					Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	d	D	L	H <sub>1</sub>	H		
15A	Rc 1/2	16	40	40	143	20.1	0.9
20A	Rc 3/4	21	45	50	162	34.6	1.2
25A	Rc 1	26	50	60	182	53.0	1.7
32A	Rc 1-1/4	33	60	70	220	85.5	2.9
40A	Rc 1-1/2	41	65	75	238	132.0	3.8
50A	Rc 2	51	80	85	272	204.2	6.3



■ Certified Capacity Table for AL-17

· For steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Pressure MPa Nominal size	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
15A	15	20	29	40	50	60	70	80	90	100	109	119	129	139	149	158	168
20A	27	35	51	69	87	104	121	138	155	172	189	206	222	239	256	273	290
25A	42	54	78	105	133	159	186	212	237	263	289	315	341	367	393	418	444
32A	67	87	127	170	215	257	300	342	383	425	467	509	550	592	634	675	716
40A	104	135	196	263	332	397	463	528	592	656	721	786	850	914	979	1042	1106
50A	161	209	303	407	513	615	716	817	916	1016	1116	1216	1315	1414	1514	1612	1712

· For air (20°C) <Pressure vessel structure standard>

(kg/h)

Pressure MPa Nominal size	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
15A	25	33	48	65	81	98	114	131	147	164	181	197	214	230	247	264	280
20A	44	57	83	111	140	169	197	226	254	283	311	340	368	397	426	454	483
25A	67	87	127	171	215	258	302	346	390	433	477	521	565	608	652	696	740
32A	108	141	205	276	347	417	488	558	629	699	770	841	911	982	1052	1123	1193
40A	168	218	317	426	535	644	753	862	971	1080	1189	1298	1407	1516	1625	1734	1843
50A	259	338	491	660	828	997	1166	1334	1503	1671	1840	2008	2177	2345	2514	2682	2851

· For water (accumulation: 25%) <Yoshitake standard>

(m<sup>3</sup>/h)

Pressure MPa Nominal size	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
15A	0.2	0.3	0.5	0.6	0.7	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4
20A	0.4	0.6	0.8	1.0	1.2	1.3	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4
25A	0.6	0.9	1.3	1.6	1.8	2.1	2.3	2.5	2.6	2.8	2.9	3.1	3.2	3.4	3.5	3.6	3.7
32A	1.0	1.5	2.1	2.6	3.0	3.4	3.7	4.0	4.3	4.5	4.8	5.0	5.2	5.5	5.7	5.9	6.1
40A	1.6	2.3	3.3	4.0	4.7	5.2	5.7	6.2	6.6	7.0	7.4	7.8	8.1	8.4	8.8	9.1	9.4
50A	2.5	3.6	5.1	6.3	7.2	8.1	8.9	9.6	10.3	10.9	11.5	12.0	12.6	13.1	13.6	14.1	14.5

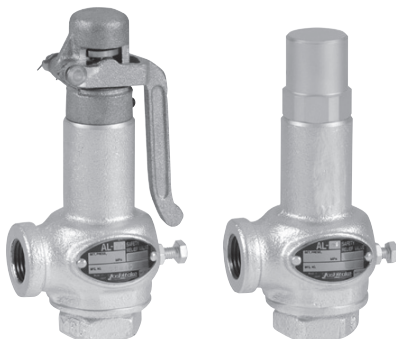
\* Please refer to P. 12 for the calculation procedure for nominal size selection.

# AL-10

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Compact and lightweight lift safety valve, installation is easy.
2. Simple structure and easy maintenance.
3. Due to lift valve lever mechanism a discharge inspection can be manually performed at more than 75% of the opening pressure (open type with a lever).
4. Blowdown can be adjusted with adjustable ring (seat ring).



Open type with a lever

Open type without a lever

3

Safety Relief Valve

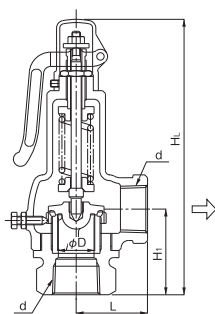
## ■Specifications

Structure	Open type	
Application	Steam	
Working pressure	0.05-1.0 MPa	
Maximum temperature	220°C	
Material	Spring case	Ductile cast iron
	Valve, valve seat	Bronze or stainless steel
Connection	JIS Rc screwed	

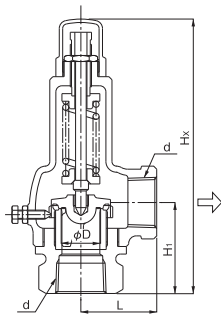
· Please refer to the chart in P.81-82 for set pressure range.

## ■Dimensions and Weights

Nominal size	Dimension (mm)						Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	d	L	H <sub>1</sub>	H <sub>L</sub>	H <sub>x</sub>	D		
15A	Rc 1/2	40	40	154	142	16	20.1	1.0
20A	Rc 3/4	45	50	173	161	21	34.6	1.5
25A	Rc 1	50	60	193	181	26	53.0	1.8
32A	Rc 1-1/4	60	70	232	219	33	85.5	3.1
40A	Rc 1-1/2	65	75	250	237	41	132.0	4.5
50A	Rc 2	80	85	284	271	51	204.2	6.2



Open type with a lever



Open type without a lever

■Certified Capacity Table for AL-10

· For steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Pressure MPa	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Nominal size											
15A	15	20	29	40	50	60	70	80	90	100	109
20A	27	35	51	69	87	104	121	138	155	172	189
25A	42	54	78	105	133	159	186	212	237	263	289
32A	67	87	127	170	215	257	300	342	383	425	467
40A	104	135	196	263	332	397	463	528	592	656	721
50A	161	209	303	407	513	615	716	817	916	1016	1116

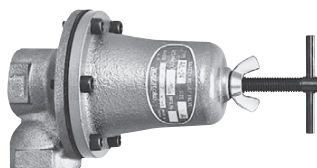
· Please refer to P. 9-12 for the calculation procedure for nominal size selection.

■At the Time of Ordering

When ordering, please specify with or without lever and the material of the valve body and valve seat in addition to the set pressure.

# AL-24,24F

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



3

Safety Relief Valve

## ■Features

1. No need to worry about rust by made of bronze for valve case and stainless steel for valve seat. Operation is reliable since the valve is diaphragm type with no sliding part.
2. Wide set pressure range is available by only one spring. Changing set pressure is easy, because the adjusting screw is handle type and lock nut is butterfly nut.
3. Opening and closing are smooth even when the valve operates continuously, and surely relief the fluid at set pressure. Also it can operate stably from small to large flow rate.
4. Diaphragm and valve materials can be selected from NBR or FKM (fluororubber) depends on the specification.
5. Can be connected in any direction (horizontal or vertical).

## ■Specifications

Model	AL-24	AL-24F	
Application	Cold and hot water	Cold and hot water, Oil, Other non-dangerous fluids	
Working pressure	0.1-0.7 MPa *1		
Maximum temperature	60°C	120°C	
Material	Valve case	Bronze *2	
	Valve	NBR	FKM
	Valve seat	Stainless steel	
	Diaphragm	NBR (heat-resistant nylon contained)	FKM (heat-resistant nylon contained)
Connection	JIS Rc screwed		

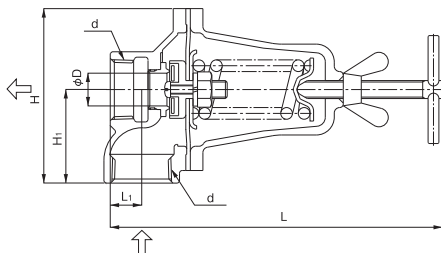
\*1 Available with working pressure between 0.05MPa and 0.1MPa.

\*2 Available with Npb-treated.

## ■Dimensions and Weights

(mm)

Nominal size	d	L	L <sub>1</sub>	H	H <sub>1</sub>	D	Weight (kg)
15A	Rc 1/2	180.5	20.5	91	46	15	1.4
20A	Rc 3/4	181.5	18.5	92	47	15	1.4
25A	Rc 1	187.5	17.5	97	52	18.2	1.6



■ Certified Capacity Table for AL-24, 24F

· Set pressure range 0.1 to 0.7 MPa (accumulation 25%)

(m<sup>3</sup>/h)

Nominal size	Set pressure (MPa)												
	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70
15A	0.31	0.38	0.44	0.49	0.54	0.58	0.63	0.66	0.70	0.73	0.77	0.80	0.83
20A	0.31	0.38	0.44	0.49	0.54	0.58	0.63	0.66	0.70	0.73	0.77	0.80	0.83
25A	0.46	0.56	0.65	0.73	0.80	0.86	0.92	0.98	1.03	1.08	1.13	1.18	1.22

· Set pressure range 0.05 to 0.1 MPa (accumulation 25%)

(m<sup>3</sup>/h)

Nominal size	Set pressure (MPa)					
	0.05	0.06	0.07	0.08	0.09	0.10
15A	1.27	1.39	1.50	1.61	1.70	1.80
20A	1.27	1.39	1.50	1.61	1.70	1.80
25A	1.87	2.05	2.21	2.37	2.51	2.65

· Calculation formula

$$V = \frac{AK}{12.4\sqrt{\frac{G}{P}}}$$

V: Discharge capacity (m<sup>3</sup>/h)

D: Seat diameter (mm)

ℓ: Lift (mm)

0.1-0.7 MPa ℓ = D/40

0.05-0.1 MPa ℓ = D/7

A: Effective area (m<sup>2</sup>)

A = πDℓ

K: 0.7 (Flow rate coefficient)

G: Specific gravity

P: Opening pressure (MPa)

Viscosity is calculated from formula for viscosity correction.

# AL-300,301

Full bore type	<b>Lift type</b>	Safety valve	Relief valve
<b>Safety relief valve</b>	Lever type	<b>Closed type</b>	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Safety valve, simple structure and easy maintenance.
2. Easy adjustment.

## ■Specifications

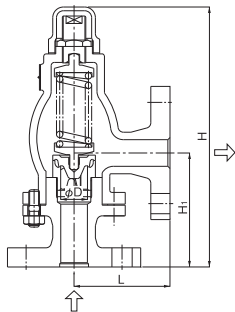
Model	AL-300	AL-301
Structure	Closed type	
Application	Steam	
Working pressure	0.05-1.0 MPa	0.05-1.6 MPa
Maximum temperature	220°C	
Material	Ductile cast iron	
	Ductile cast iron	
	Valve case	Cast bronze
Connection	JIS 10K FF flanged	JIS 10K FF flanged JIS 16K FF flanged *

\* JIS 16K FF flanged when working pressure is more than 1.0 MPa.

· Please refer to the chart in P.82 for set pressure range.

## ■Dimensions and Weights

Nominal size	Dimension (mm)				Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	L	H <sub>1</sub>	H	D		
15A	90	108	245	25	49.1	4.7
20A	90	108	245	25	49.1	5.0
25A	90	108	245	25	49.1	6.2
32A	91	115	285	37	107.6	8.6
40A	91	115	285	38	113.5	8.8
50A	105	132	311	50	196.4	12.6





# AL-300T,301T

3

Safety Relief Valve

Full bore type	<b>Lift type</b>	Safety valve	Relief valve
<b>Safety relief valve</b>	Lever type	<b>Closed type</b>	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■Features

1. Safety relief valve, simple structure and easy maintenance.
2. Easy adjustment.
3. Fluororesin disc ensures reliable seating.

## ■Specifications

Model		AL-300T	AL-301T
Structure		Closed type	
Application		Air, Cold and hot water, Oil, Other non-dangerous fluids	
Working pressure		0.05-1.0 MPa	0.05-1.3 MPa *1
Maximum temperature		150°C	
Material	Valve case, spring case	Ductile cast iron	
	Valve, valve seat	Bronze · PTFE	Stainless steel · PTFE
Connection		JIS 10K FF flanged	JIS 10K FF flanged JIS 16K FF flanged *2

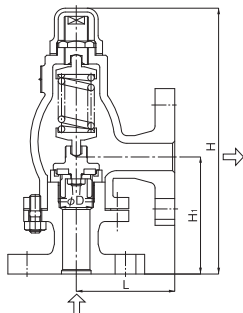
\*1 Please contact us if working pressure is between 1.31 MPa and 1.6 MPa.

\*2 JIS 16K FF flanged when working pressure is more than 1.0 MPa.

· Please refer to the chart in P. 81-82 for set pressure range.

## ■Dimensions and Weights

Nominal size	Dimension (mm)				Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	L	H <sub>1</sub>	H	D		
15A	90	108	245	29	66.1	4.7
20A	90	108	245	29	66.1	5.0
25A	90	108	245	29	66.1	6.2
32A	91	115	285	37	107.6	8.6
40A	91	115	285	37	107.6	8.8
50A	105	132	311	50	196.4	12.6



**■ Certified Capacity Table for AL-300 · 301**

· For steam (saturation temperature) &lt;Pressure vessel structure standard&gt;

(kg/h)

Pressure MPa Nominal size	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
15A	38	50	73	98	123	148	172	196	220	244	268	292	316	340	364	387	411
20A	38	50	73	98	123	148	172	196	220	244	268	292	316	340	364	387	411
25A	38	50	73	98	123	148	172	196	220	244	268	292	316	340	364	387	411
32A	85	110	160	214	270	324	377	430	482	535	588	640	693	745	798	849	902
40A	89	116	168	226	285	342	398	454	509	564	620	675	731	786	841	896	951
50A	155	201	292	392	494	592	689	785	881	977	1073	1169	1265	1360	1456	1551	1646

**■ Certified Capacity Table for AL-300T · 301T**

· For air (20°C) &lt;Pressure vessel structure standard&gt;

(kg/h)

Pressure MPa Nominal size	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
15A	84	109	159	213	268	322	377	432	486	541	595	650	704	759
20A	84	109	159	213	268	322	377	432	486	541	595	650	704	759
25A	84	109	159	213	268	322	377	432	486	541	595	650	704	759
32A	136	178	259	347	436	525	614	703	792	880	969	1058	1147	1236
40A	136	178	259	347	436	525	614	703	792	880	969	1058	1147	1236
50A	249	325	473	635	797	959	1121	1283	1445	1607	1769	1932	2094	2256

· For water (accumulation: 25%) &lt;Yoshitake standard&gt;

 (m<sup>3</sup>/h)

Pressure MPa Nominal size	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
15A	0.8	1.1	1.6	2.0	2.3	2.6	2.8	3.1	3.3	3.5	3.7	3.9	4.0	4.2
20A	0.8	1.1	1.6	2.0	2.3	2.6	2.8	3.1	3.3	3.5	3.7	3.9	4.0	4.2
25A	0.8	1.1	1.6	2.0	2.3	2.6	2.8	3.1	3.3	3.5	3.7	3.9	4.0	4.2
32A	1.3	1.9	2.7	3.3	3.8	4.2	4.7	5.0	5.4	5.7	6.0	6.3	6.6	6.9
40A	1.3	1.9	2.7	3.3	3.8	4.2	4.7	5.0	5.4	5.7	6.0	6.3	6.6	6.9
50A	2.4	3.5	4.9	6.0	7.0	7.8	8.5	9.2	9.9	10.5	11.0	11.6	12.1	12.6

· Please refer to P. 12 for the calculation procedure for nominal size selection.

# AL-280

3

Full bore type	Lift type	Safety valve	<b>Relief valve</b>
Safety relief valve	Lever type	<b>Closed type</b>	<b>Dash-pot structure</b>
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■ Features

1. Relief valve, exclusive for the pressure control of pumps with high pulsation pressure or large pressure fluctuation.
2. The trim parts (valve and valve seat) are designed to continuously discharge fluid against its set pressure change without popping (patent pending), preventing chattering and hunting.
3. Stainless steel with excellent corrosion resistance is used for the adjusting spring.

## ■ Specifications

Structure	Closed type		
Application	Cold and hot water, Oil (heavy oil A, heavy oil B, kerosene) Non dangerous fluid (Less than 20 cst)		
Working pressure	0.05-1.0 MPa		
Maximum temperature	120°C		
Material	Valve case	Ductile cast iron	
	Spring case	Ductile cast iron	
	Valve, valve seat	Stainless steel	
	Adjusting spring	Stainless steel	
Connection	JIS 10K FF flanged		

· Please refer to the chart in P.8-82 for set pressure range.

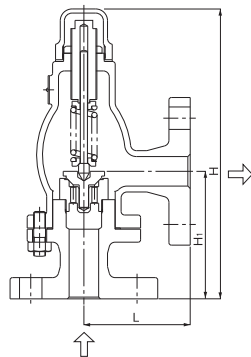
### · Dashpot structure



## ■ Dimensions and Weights

(mm)

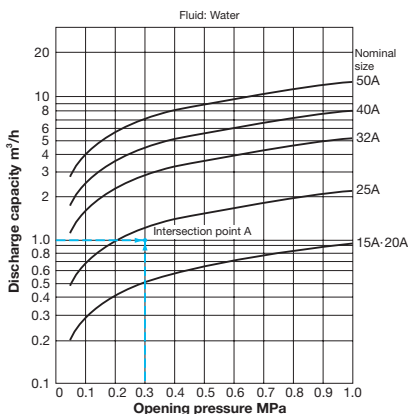
Nominal size	L	H <sub>1</sub>	H <sub>1</sub>	Weight (kg)
15A	90	245	108	4.7
20A	90	245	108	5.0
25A	90	245	108	6.2
32A	91	285	115	8.6
40A	91	285	115	8.8
50A	105	331	132	13.0



## ■ Flow rate chart

The flow rate to each nominal size when the accumulation (overpressure to the set pressure) is 25% is as shown in Fig. 1. See Fig. 2 when the accumulation is less than 25%.

Fig. 1: Nominal size selection chart



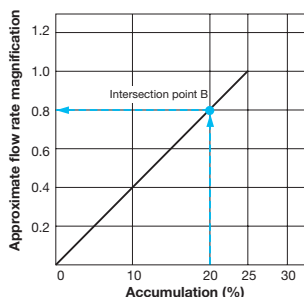
### [Example]

To select a nominal size when the working conditions are pressure: 0.3 MPa and discharge capacity: 1.0 m<sup>3</sup>/h, first find intersection point A of the pressure of 0.3 MPa on the horizontal axis and the discharge capacity of 1.0 m<sup>3</sup>/h on the vertical axis in Fig. 1.

Since intersection point A lies between the curve of nominal sizes 15A · 25A and the curve of nominal size 25A, select the larger one, 25A.

Fig. 2: Approximate flow rate magnification

When the accumulation is less than 25%, select an approximate flow rate magnification matching the accumulation based on this chart, and multiply the flow rate at 25% accumulation by the selected magnification.



### [Example]

To obtain the flow rate when the working conditions are nominal size: 25A, setting pressure: 0.1 MPa, and accumulation: 20%, first find the flow rate at an accumulation of 25% in Fig. 1. Then, mark intersection point B of the accumulation of 20% and the diagonal straight line in Fig. 2. Trace horizontally to the left from this intersection point B, and reach the point of 0.8 on the axis of approximate flow rate magnification.

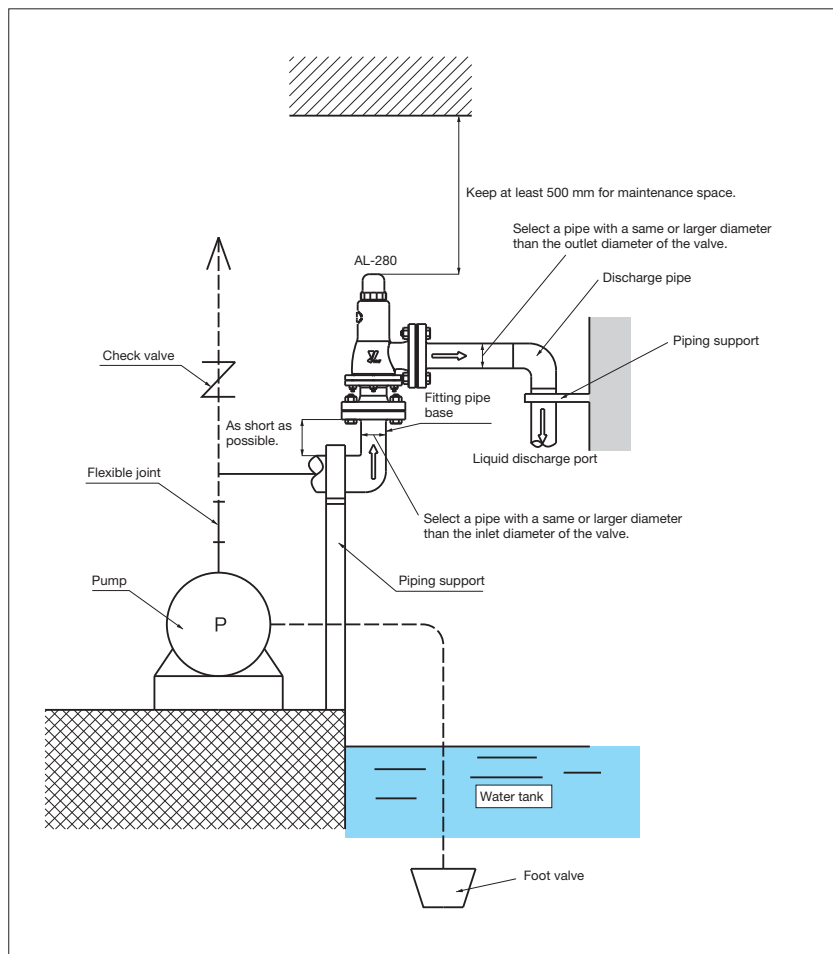
· Discharge capacity (reference) (accumulation: 25%)

(m<sup>3</sup>/h)

Nominal size	Flow area (mm <sup>2</sup> )	Opening pressure (MPa)										
		0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A-20A	16.7	0.20	0.29	0.41	0.51	0.59	0.66	0.72	0.78	0.83	0.88	0.93
25A	39.2	0.49	0.69	0.98	1.20	1.38	1.54	1.69	1.83	1.96	2.07	2.19
32A	91.9	1.14	1.62	2.29	2.81	3.24	3.63	3.97	4.29	4.59	4.87	5.13
40A	143.6	1.79	2.53	3.58	4.39	5.07	5.67	6.21	6.71	7.17	7.61	8.02
50A	224.3	2.80	3.96	5.60	6.86	7.92	8.86	9.71	10.49	11.21	11.89	12.53

### Relief Valve Discharge Piping

Select a pipe with a same or larger diameter than the outlet diameter of the valve.



# AL-31,31H

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Safety relief valve of all stainless steel made, offering high corrosion resistance and durability in particular.
2. Popping structure ensures reliable discharge.



AL-31

3

Safety Relief Valve

## ■Specifications

Model	AL-31	AL-31H
Structure	Closed type	
Application	Steam, Air, Cold and hot water, Oil, Other non-dangerous fluids	
Working pressure	0.05-1.0 MPa	1.0-2.0 MPa
Maximum temperature	220°C *	
Material	Valve case	Stainless steel
	Spring case	Stainless steel
	Valve, valve seat	Stainless steel
Connection	JIS 10K RF flanged	JIS 16K RF flanged JIS 20K RF flanged

\* The maximum temperature is 150°C when using for water, oil, or other liquids.

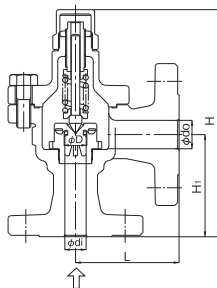
· Please refer to the chart in P.83-82 for set pressure range.

## ■Dimensions and Weights

Nominal size	Dimension (mm)				Flow area πD <sub>2</sub> <sup>2</sup> (mm <sup>2</sup> )	Weight (kg)
	di x D x do	L	H <sub>i</sub>	H		
15A	15 x 16 x 20	73	72	160	20.1	3.4
20A	20 x 21 x 25	77	74	163	34.6	4.5
25A	25 x 26 x 32	91	87	187	53.0	6.5
32A	32 x 33 x 40	96	92	238	85.5	8.1 ( 8.3)
40A	40 x 41 x 50	114	100	277	132.0	11.4 (11.7)
50A	50 x 51 x 65	116	107	315 (357)	204.2	15.0 (18.0)

· The above values in parentheses are the dimensions and weights of JIS 20K RF flanged.

· Screwed connection size of the outlet side is 1 size larger than the nominal size.



■ Certified Capacity Table for AL-31, 31H

· AL-31 for steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Pressure MPa	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Nominal size											
15A	15	20	29	40	50	60	70	80	90	100	109
20A	27	35	51	69	87	104	121	138	155	172	189
25A	42	54	78	105	133	159	186	212	237	263	289
32A	67	87	127	170	215	257	300	342	383	425	467
40A	104	135	196	263	332	397	463	528	592	656	721
50A	161	209	303	407	513	615	716	817	916	1016	1116

· AL-31H for steam (saturation temperature)

(kg/h)

Pressure MPa	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
Nominal size											
15A	109	119	129	139	149	158	168	178	188	198	207
20A	189	206	222	239	256	273	290	306	324	340	357
25A	289	315	341	367	393	418	444	470	496	522	547
32A	467	509	550	592	634	675	716	758	800	842	883
40A	721	786	850	914	979	1042	1106	1171	1236	1300	1364
50A	1116	1216	1315	1414	1514	1612	1712	1811	1912	2011	2110

· AL-31 for air (20°C) <Pressure vessel structure standard>

(kg/h)

Pressure MPa	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Nominal size											
15A	25	33	48	65	81	98	114	131	147	164	181
20A	44	57	83	111	140	169	197	226	254	283	311
25A	67	87	127	171	215	258	302	346	390	433	477
32A	108	141	205	276	347	417	488	558	629	699	770
40A	168	218	317	426	535	644	753	862	971	1080	1189
50A	259	338	491	660	828	997	1166	1334	1503	1671	1840

· AL-31H for air (20°C)

(kg/h)

Pressure MPa	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
Nominal size											
15A	181	197	214	230	247	264	280	297	313	330	347
20A	311	340	368	397	426	454	483	511	540	568	597
25A	477	521	565	608	652	696	740	783	827	871	915
32A	770	841	911	982	1052	1123	1193	1264	1335	1405	1476
40A	1189	1298	1407	1516	1625	1734	1843	1952	2061	2170	2279
50A	1840	2008	2177	2345	2514	2682	2851	3020	3188	3357	3525

· AL-31 for water (accumulation: 25%) <Yoshitake standard>

(m³/h)

Pressure MPa	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Nominal size											
15A	0.2	0.3	0.5	0.6	0.7	0.8	0.8	0.9	1.0	1.0	1.1
20A	0.4	0.6	0.8	1.0	1.2	1.3	1.5	1.6	1.7	1.8	1.9
25A	0.6	0.9	1.3	1.6	1.8	2.1	2.3	2.5	2.6	2.8	2.9
32A	1.0	1.5	2.1	2.6	3.0	3.4	3.7	4.0	4.3	4.5	4.8
40A	1.6	2.3	3.3	4.0	4.7	5.2	5.7	6.2	6.6	7.0	7.4
50A	2.5	3.6	5.1	6.3	7.2	8.1	8.9	9.6	10.3	10.9	11.5

· AL-31H for water (accumulation: 25%)

(m³/h)

Pressure MPa	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
Nominal size											
15A	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6
20A	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.6	2.7
25A	2.9	3.1	3.2	3.4	3.5	3.6	3.7	3.9	4.0	4.1	4.2
32A	4.8	5.0	5.2	5.5	5.7	5.9	6.1	6.2	6.4	6.6	6.8
40A	7.4	7.8	8.1	8.4	8.8	9.1	9.4	9.7	9.9	10.0	10.5
50A	11.5	12.0	12.6	13.1	13.6	14.1	14.5	15.0	15.4	15.8	16.3

· AL-31: 0.05-1.0 MPa

AL-31H: 1.0-2.0 MPa

· Please refer to P. 12 for the calculation procedure for nominal size selection.

# AL-32

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High-pressure gas testing product	
Diaphragm	Non-leakage		

## ■Features

1. All stainless steel (SCS14A and SUS 316 for trim parts) offering high corrosion resistance.
2. Closed structure prevents fluid leakage.

## ■Specifications

Structure	Closed type	
Application	Steam, air, water, oil, other non-dangerous fluids	
Working pressure	0.05-1.0 MPa	
Working temperature	5-220°C *	
Material	Spring case	Stainless steel
	Valve	Stainless steel (SCS14A)
	Valve seat	Stainless steel (SUS316)
	Adjusting spring	Stainless steel
Connection	JIS10K loose flange	

- \* The maximum temperature is 150°C when using for water, oil, or other fluid.  
 · Please refer to the chart in P.81-82 for set pressure range.

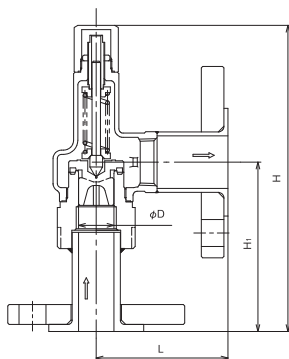
## ■Dimension and Weight

Nominal size	Dimension (mm)				Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	D	L	H <sub>1</sub>	H		
15A	16	63	97	185	20.1	2.4
20A	21	87	101	187	34.6	2.8
25A	26	92	119	215	53.0	4.4
32A	33	99	135	255	93.3	5.2
40A	41	109	140	281	135.2	6.5
50A	51	114	162	332	208.2	11.3

\* Outlet flange is 1 size up of nominal size.



AL-32



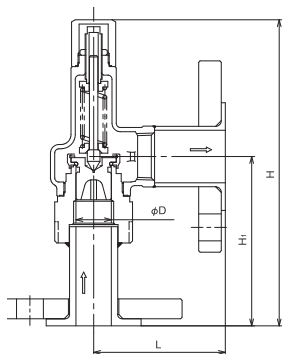


# AL-32T, 32T-N

Soft seat type


**JWWA approval**  
 (AL-32T-N)


AL-32T



3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High-pressure gas testing product	
Diaphragm	Non-leakage		

## ■ Features

1. All stainless steel (trim parts: SCS14A and SUS316) offering high corrosion resistance.
2. Excellent air tightness ensured by the valve seat incorporating soft seat. Most suitable for application where valve seat leakage is not tolerated.
3. Closed structure prevents fluid leakage.

## ■ Specifications

Model	AL-32T	AL-32T-N
Structure	Closed type	
Application	Air, water, oil, other non-dangerous fluid *	Cold and hot water
Working pressure	0.05-1.0 MPa	
Working temperature	5-120°C	5-100°C
Material	Spring case	Stainless steel
	Valve	Stainless steel (SCS14A)
	Valve seat	Stainless steel (SUS316)
	Adjusting spring	Stainless steel
	O-ring	Synthetic rubber (FKM)
Connection	JIS10K loose flange	

\* Please contact us when using for oil.

· Please refer to the chart in P. 82 for set pressure range.

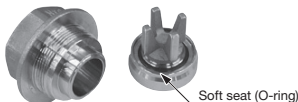
## ■ Dimensions and Weights

Nominal size	Dimension (mm)				Flow area $\pi D^2$ (mm <sup>2</sup> )	Weight (kg)
	D	L	H <sub>1</sub>	H		
15A	16	63	97	185	20.1	2.4
20A	21	87	101	187	34.6	2.8
25A	26	92	119	215	53.0	4.4
32A	33	99	135	255	93.3	5.2
40A	41	109	140	281	135.2	6.5
50A	51	114	162	332	208.2	11.3

\* Outlet flange is 1 size up of nominal size.

### Soft seat is used for the trim parts!

Soft seat (O-ring) is used for the trim parts, ensuring the reliable air tightness of the valve seat.



# AL-32ML

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High-pressure gas testing product	
Diaphragm	Non-leakage		

## Features

1. Lever type safety valve. A discharge inspection can be manually performed when the difference between the set pressure is as shown in table 1 below.
2. All stainless steel (SCS14A and SUS316 for trim parts) offering high corrosion resistance.
3. Closed structure prevents fluid leakage.

[Table 1] Required differential pressure at a discharge inspection

Nominal size	Difference between set pressure at a discharge inspection
15A-25A	1.0 MPa or less
32A, 40A	0.6 MPa or less
50A	0.4 MPa or less



AL-32ML

## Specifications

Structure	Closed type with lever		
Application	Air, water, oil, other non-dangerous fluid *		
Working pressure	0.05-1.0 MPa		
Working temperature	5-120°C		
Material	Spring case	Stainless steel	
	Valve	Stainless steel (SCS14A)	
	Valve seat	Stainless steel (SUS316)	
	Adjusting spring	Stainless steel	
Connection	JIS 10K loose flange		

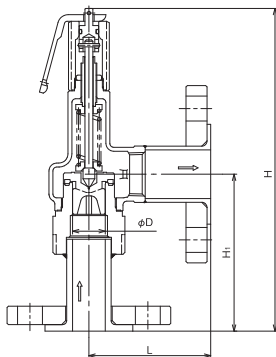
\* Please contact us when using for oil.

· Please refer to the chart in P. 82 for set pressure range.

## Dimension and Weights

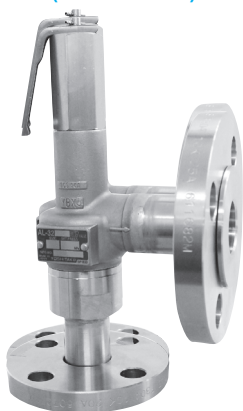
Nominal size	Dimension (mm)				Flow area $\pi D_2^2$ (mm <sup>2</sup> )	Weight (kg)
	D	L	H <sub>1</sub>	H		
15A	16	63	97	215	20.1	2.5
20A	21	87	101	217	34.6	2.9
25A	26	92	119	245	53.0	4.5
32A	33	99	135	284	93.3	5.3
40A	41	109	140	321	135.2	6.7
50A	51	114	162	372	208.2	11.5

\* Outlet flange is 1 size up of nominal size.

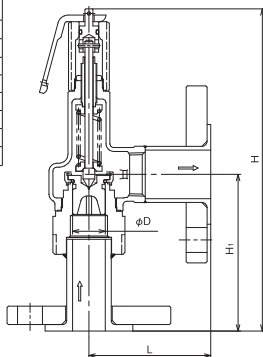


# AL-32TML, 32TML-N

Soft seat type


**JWWA approval**  
 (AL-32TML-N)


AL-32TML



3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High-pressure gas testing product	
Diaphragm	Non-leakage		

## ■ Features

1. Lever type safety valve. A discharge inspection can be manually performed when the difference between the set pressure is as shown in table 1 below.
2. Excellent air tightness ensured by the valve seat incorporating soft seat. Most suitable for application where valve seat leakage is not tolerated.
3. All stainless steel (SCS14A and SUS316 for trim parts) offering high corrosion resistance.
4. Closed structure prevents fluid leakage.

**[Table 1] Required differential pressure at a discharge inspection**

Nominal size	Difference between set pressure at a discharge inspection
15A-25A	1.0 MPa or less
32A, 40A	0.6 MPa or less
50A	0.4 MPa or less

## ■ Specifications

Model	AL-32TML	AL-32TML-N
Structure	Closed type with lever	
Working pressure	Air, water, oil, other non-dangerous fluid *	Cold and hot water
Working pressure	0.05-1.0 MPa	
Working temperature	5-120°C	5-100°C
Material	Spring case	Stainless steel
	Valve	Stainless steel (SCS14A)
	Valve seat	Stainless steel (SUS316)
	Adjusting spring	Stainless steel
O-ring	Synthetic rubber (FKM)	
Connection	JIS 10K loose flange	

\* Please contact us when using for oil.

Please refer to the chart in P. 82 for set pressure range.

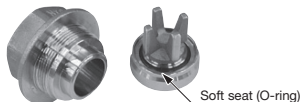
## ■ Dimension and Weights

Nominal size	Dimension (mm)				Flow area $\pi D \ell$ (mm <sup>2</sup> )	Weight (kg)
	D	L	H <sub>1</sub>	H		
15A	16	63	97	215	20.1	2.5
20A	21	87	101	217	34.6	2.9
25A	26	92	119	245	53.0	4.5
32A	33	99	135	284	93.3	5.3
40A	41	109	140	321	135.2	6.7
50A	51	114	162	372	208.2	11.5

\* Outlet flange is 1 size up of nominal size.

### Soft seat is used for the trim parts!

Soft seat (O-ring) is used for the trim parts, ensuring the reliable air tightness of the valve seat.



## -AL-32 for steam (Saturated temperature)

## &lt;Pressure vessel structure standard&gt;

(kg/h)

Pressure MPa Nominal size (mm)	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	15	20	29	40	50	60	70	80	90	100	109
20A	27	35	51	69	87	104	121	138	155	172	189
25A	42	54	78	105	133	159	186	212	237	263	289
32A	70	91	132	178	224	268	313	356	400	443	487
40A	105	136	198	266	335	402	468	534	599	664	729
50A	163	211	306	411	518	621	723	824	924	1025	1126

## -AL-32, 32T, 32TML, for air (20°C)

## &lt;Pressure vessel structure standard&gt;

(kg/h)

Pressure MPa Nominal size (mm)	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	25	33	48	65	81	98	114	131	147	164	181
20A	44	57	83	111	140	169	197	226	254	283	311
25A	67	87	127	171	215	258	302	346	390	433	477
32A	113	147	214	288	362	435	509	582	656	730	803
40A	169	221	321	431	542	652	762	872	982	1093	1203
50A	262	341	496	666	836	1006	1176	1346	1516	1687	1857

## -AL-32, 32T, 32T-N, 32ML, 32TML-N for water (accumulation 25%)

## &lt;Yoshitake standard&gt;

(m<sup>3</sup>/h)

Pressure MPa Nominal size (mm)	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	0.4	0.5	0.9	1.1	1.3	1.5	1.6	1.8	1.9	2.0	2.1
20A	0.6	0.9	1.6	2.0	2.3	2.6	2.8	3.1	3.3	3.5	3.7
25A	1.0	1.5	2.5	3.1	3.6	4.0	4.4	4.7	5.1	5.4	5.7
32A	1.8	2.6	4.5	5.5	6.3	7.1	7.8	8.4	9.0	9.5	10.0
40A	2.7	3.8	6.5	7.9	9.2	10.3	11.3	12.2	13.0	13.8	14.6
50A	4.1	5.9	10.0	12.3	14.2	15.9	17.4	18.8	20.1	21.3	22.4

\* Please refer to the chart in P. 3-12 for the calculation procedure for nominal size selection.

# AL-4,4T

3

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■ Features

1. Safety valve, simple structure and easy maintenance.
2. Easy adjustment.
3. Fluororesin disc ensures reliable seating. (AL-4T)

## ■ Specifications

### · AL-4

Structure		Close type
Application		Steam
Working pressure		0.05-1.5 MPa *1
Maximum temperature		220°C
Material	Valve case	Ductile cast iron
	Spring case	Ductile cast iron
	Valve, valve seat	Stainless steel
Connection		JIS 10K FF flanged JIS 16K FF flanged *2

\*1 Maximum working pressure for 150A type is 0.8 MPa (connection: JIS 10K FF flanged).

\*2 JIS 16K FF flanged when working pressure is more than 1.0 MPa.

· Please refer to the chart in P. 82 for set pressure range.

### · AL-4T

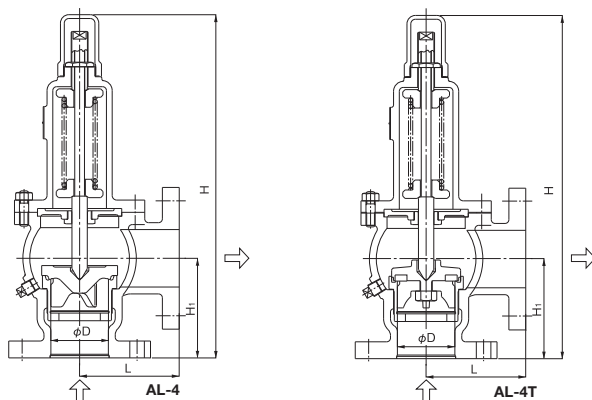
Type	Standard	With SUS trim parts
Structure	Closed type	
Application	Air, Cold and hot water, Oil, Other non-dangerous fluids	
Working pressure	0.05-1.0 MPa *1	0.05-1.5 MPa *2
Maximum temperature	150°C	
Material	Valve case	Ductile cast iron
	Spring case	Ductile cast iron
	Valve, valve seat	Cast bronze (PTFE disc incorporated)
Connection	JIS 10K FF flanged	JIS 10K FF flanged JIS 16K FF flanged *3

\*1 Maximum working pressure for 150A is 0.8 MPa (connection: JIS 10K FF flanged).

\*2 When working pressure is more than 1.2 MPa (for 65A and 80A) or 1.0 MPa (for 100A and 125A), a metal-to-metal seating is incorporated in.

\*3 JIS 16K FF flanged is used when working pressure is more than 1.0 MPa.

## ■Dimensions and Weights



### · AL-4 (JIS 10K)

Nominal size	Dimension (mm)				Flow area $\pi D \ell$ (mm <sup>2</sup> )	Weight (kg)
	L	H <sub>1</sub>	H	D		
65A	120	120	432	65	331.9	20
80A	130	130	447	75	441.8	22
100A	160	150	595	100	785.4	44
125A	200	205	779	125	1227.2	88
150A	210	215	835	150	1767.2	113

### · AL-4T (JIS 10K)

Nominal size	Dimension (mm)				Flow area $\pi D \ell$ (mm <sup>2</sup> )	Weight (kg)
	L	H <sub>1</sub>	H	D		
65A	120	120	434	65	331.9	20
80A	130	130	449	75	441.8	22
100A	160	150	597	100	785.4	44
125A	200	205	781	125	1227.2	88
150A	210	215	837	150	1767.2	113

### · AL-4 · AL-4T (JIS 16K)

Nominal size	Dimension (mm)				Flow area $\pi D \ell$ (mm <sup>2</sup> )
	L	H <sub>1</sub>	H	D	
65A	120	120	432 (434)	65	331.9
80A	132	130	449 (451)	75	441.8
100A	162	150	597 (599)	100	785.4
125A	200	205	781 (783)	125	1227.2

· The above values in parentheses are the dimensions of the AL-4T.

## ■At the Time of Ordering

When ordering, please specify with or without lever and the material of the valve body and valve seat in addition to the set pressure.

# AL-4S,4ST

3

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■ Features

1. Safety relief valve, simple structure and easy maintenance.
2. Easy adjustment.
3. Fluororesin disc ensures reliable seating. (AL-4ST)

## ■ Specifications

### · AL-4S

Structure	Closed type	
Application	Steam	
Working pressure	0.05-2.0 MPa	
Maximum temperature	220°C	
Material	Valve case	Ductile cast iron
	Spring case	Ductile cast iron *
	Valve, valve seat	Stainless steel
Connection	JIS 10K FF flanged JIS 16K FF flanged JIS 20K FF flanged	

\* Available with stainless steel.

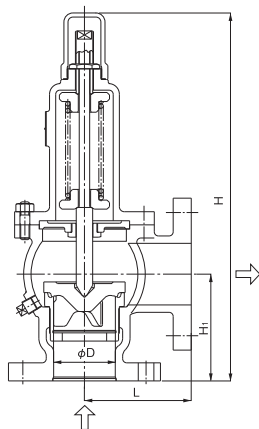
· Please refer to the chart in P. 81-82 for set pressure range.

### · AL-4ST

Structure	Closed type	
Application	Air, Water, Oil, Other non-dangerous fluids	
Working pressure	0.05-2.0 MPa *1	
Maximum temperature	150°C	
Material	Valve case	Ductile cast iron *2
	Spring case	
	Valve, valve seat	Stainless steel (PTFE disc incorporated)
Connection	JIS 10K FF flanged JIS 16K FF flanged JIS 20K FF flanged	

\*1 When working pressure is more than 1.2 MPa (for 65A and 80A) or 1.0 MPa (for 100A and 125A), a metal-to-metal seating is incorporated in.

\*2 Available with stainless steel (JIS10KFF · JIS20KFF)



The shape of AL-4ST is slightly different.

## ■ Dimensions and Weights

### · AL-4S

Nominal size	Dimension (mm)				Flow area πD <sup>2</sup> l (mm <sup>2</sup> )
	L	H <sub>1</sub>	H	D	
65A	135	125	442	65	331.9
80A	135	135	457	75	441.8
100A	160	150	597	100	785.4

### · AL-4ST

Nominal size	Dimension (mm)				Flow area πD <sup>2</sup> l (mm <sup>2</sup> )
	L	H <sub>1</sub>	H	D	
65A	135	125	444	65	331.9
80A	135	135	459	75	441.8
100A	160	150	599	100	785.4

**■ Certified Capacity Table for AL-4**

· For steam (saturation temperature) &lt;Pressure vessel structure standard&gt;

(kg/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
65A	263	340	493	663	834	1000	1165	1328	1489	1651	1814
80A	350	452	657	882	1111	1331	1550	1767	1983	2198	2415
100A	622	804	1168	1569	1975	2367	2756	3142	3525	3908	4294
125A	972	1257	1826	2451	3086	3699	4307	4910	5508	6107	6709
150A	1400	1810	2629	3530	4445	5327	6203	7071	7932	-	-

(kg/h)

Pressure MPa Nominal size	1.1	1.2	1.3	1.4	1.5
65A	1976	2138	2299	2461	2621
80A	2631	2846	3060	3276	3489
100A	4677	5059	5440	5825	6203
125A	7309	7906	8500	9102	9692
150A	-	-	-	-	-

**■ Certified Capacity Table for AL-4T**

· For air (20°C) &lt;Pressure vessel structure standard&gt;

(kg/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
65A	422	550	799	1073	1347	1621	1895	2169	2443	2717	2991
80A	562	732	1064	1428	1793	2158	2522	2887	3252	3616	3981
100A	999	1302	1891	2540	3188	3836	4484	5133	5781	6429	7077
125A	1562	2035	2955	3968	4981	5994	7007	8020	9033	10046	11059
150A	2249	2930	4256	5715	7173	8632	10091	11549	13008	-	-

(kg/h)

Pressure MPa Nominal size	1.1	1.2	1.3	1.4	1.5
65A	3264	3538	3812	4086	4360
80A	4346	4710	5075	5440	5804
100A	7726	8374	9022	9671	10319
125A	12072	13085	14098	15111	16124
150A	-	-	-	-	-

· For water (accumulation: 25%) &lt;Yoshitake standard&gt;

 (m<sup>3</sup>/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
65A	4.1	5.9	8.3	10.2	11.8	13.2	14.5	15.6	16.7	17.7	18.7
80A	5.5	7.8	11.1	13.6	15.7	17.6	19.3	20.8	22.3	23.6	24.9
100A	9.9	14.0	19.8	24.2	28.0	31.3	34.3	37.0	39.6	42.0	44.3
125A	15.4	21.9	30.9	37.9	43.8	48.9	53.6	57.6	61.9	65.7	69.2
150A	22.3	31.5	44.6	54.6	63.0	70.5	77.2	83.4	89.2	-	-

 (m<sup>3</sup>/h)

Pressure MPa Nominal size	1.1	1.2	1.3	1.4	1.5
65A	19.6	20.5	21.3	22.1	22.9
80A	26.1	27.3	28.4	29.5	30.5
100A	46.4	48.5	50.5	52.4	54.2
125A	72.6	75.8	78.9	81.9	84.8
150A	-	-	-	-	-

· Please refer to P. 12 for the calculation procedure for nominal size selection.



■ Certified Capacity Table for AL-4S

· For steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
65A	263	340	493	663	834	1000	1165	1328	1489	1651	1814
80A	350	452	657	882	1111	1331	1550	1767	1983	2198	2415
100A	622	804	1168	1569	1975	2367	2756	3142	3525	3908	4294

(kg/h)

Pressure MPa Nominal size	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
65A	1976	2138	2299	2461	2621	2783	2944	3108	3269	3430
80A	2631	2846	3060	3276	3489	3704	3919	4138	4352	4566
100A	4677	5059	5440	5825	6203	6586	6968	7357	7737	8118

■ Certified Capacity Table for AL-4ST

· For air (20°C) <Pressure vessel structure standard>

(kg/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
65A	422	550	799	1073	1347	1621	1895	2169	2443	2717	2991
80A	562	732	1064	1428	1793	2158	2522	2887	3252	3616	3981
100A	999	1302	1891	2540	3188	3836	4484	5133	5781	6429	7077

(kg/h)

Pressure MPa Nominal size	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
65A	3264	3538	3812	4086	4360	4634	4908	5182	5456	5730
80A	4346	4710	5075	5440	5804	6169	6534	6898	7263	7628
100A	7726	8374	9022	9671	10319	10967	11615	12264	12912	13560

· For water (accumulation: 25%) <Yoshitake standard>

(m<sup>3</sup>/h)

Pressure MPa Nominal size	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
65A	4.1	5.9	8.3	10.2	11.8	13.2	14.5	15.6	16.7	17.7	18.7
80A	5.5	7.8	11.1	13.6	15.7	17.6	19.3	20.8	22.3	23.6	24.9
100A	9.9	14.0	19.8	24.2	28.0	31.3	34.3	37.0	39.6	42.0	44.3

(m<sup>3</sup>/h)

Pressure MPa Nominal size	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
65A	19.6	20.5	21.3	22.1	22.9	23.6	24.4	25.1	25.8	26.4
80A	26.1	27.3	28.4	29.5	30.5	31.5	32.5	33.4	34.3	35.2
100A	46.4	48.5	50.5	52.4	54.2	56.0	57.8	59.4	61.1	62.6

· Please refer to P. 12 for the calculation procedure for nominal size selection.

# AL-5

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Due to lift lever mechanism a discharge inspection can be manually performed at more than 75% of the opening pressure.

## ■Specifications

Model	Standard	SUS
Structure	Open type with a lever	
Application	Steam	
Working pressure	0.05-1.0 MPa	0.05-1.5 MPa
Maximum temperature	220°C	
Material	Valve case	Ductile cast iron
	Spring case	Ductile cast iron
	Valve, valve seat	Bronze
Connection	JIS 10K FF flanged	JIS 10K FF flanged JIS 16K FF flanged

\* JIS 16K FF flanged when working pressure is more than 1.0 MPa.

· Please refer to the chart in P. 82 for set pressure range.

## ■Dimensions

Nominal size	Dimension (mm)				Flow area $\pi D_2^2 / 4$ (mm <sup>2</sup> )
	L	H <sub>1</sub>	H	D	
20A	90	75	276	21	34.6
25A	95	90	295	25	49.1
32A	100	95	331	35	96.2
40A	110	105	347	40	125.6
50A	115	110	388	50	196.4

## ■AL-5 Certified Capacity Table

· For steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Nominal size \ 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
	20A	27	35	51	69	87	104	121	138	155	172	189	206	222	239	256
25A	38	50	73	98	123	148	172	196	220	244	268	292	316	340	364	387
32A	76	98	143	192	241	290	337	384	431	478	525	572	619	666	713	759
40A	99	128	186	250	315	278	440	502	563	625	686	748	809	870	931	991
50A	155	201	292	392	494	592	689	785	881	977	1073	1169	1265	1360	1456	1551

<Boiler structure standard>

(kg/h)

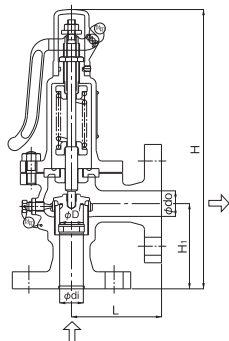
Nominal size \ Pressure MPa	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
	20A	26	34	50	66	83	98	114	130	146	162	178	194	209	225	241
25A	37	49	71	94	117	140	163	185	208	230	253	275	297	320	342	365
32A	74	96	140	185	230	274	319	363	407	451	495	539	583	627	671	715
40A	96	125	183	242	301	358	416	474	532	589	647	704	762	819	876	934
50A	151	196	287	378	471	560	652	742	832	921	1012	1102	1191	1280	1371	1461

· Please refer to P. 12 for the calculation procedure for nominal size selection.

## ■At the Time of Ordering

When ordering, please specify with or without lever and the material of the valve body and valve seat in addition to the set pressure.

Also please specify the usage either pressure vessel standard or boiler structure.



# AL-6

3

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■ Features

1. Due to lift lever mechanism, a discharge inspection can be manually performed at more than 75% of the opening pressure.

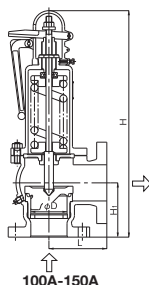
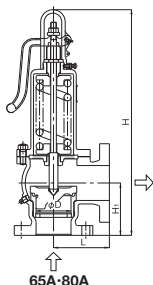
## ■ Specifications

Structure	Open type with a lever	
Application	Steam	
Working pressure	0.05-1.5 MPa *1	
Maximum temperature	220°C	
Material	Valve case	Ductile cast iron
	Spring case	Ductile cast iron
	Valve, valve seat	Cast stainless steel
Connection	JIS 10K FF flanged JIS 16K FF flanged *2	

\*1 Maximum working pressure for 150A is 0.8 MPa. (JIS 10KFF)

\*2 JIS 16K FF flanged when working pressure is more than 1.0 MPa.

· Please refer to the chart in P. 82 for set pressure range.



## ■ Dimensions and Weights

Nominal size	Dimension (mm)				Flow area $\pi D_L^2$ (mm <sup>2</sup> )	Weight (kg)
	L	H <sub>1</sub>	H	D		
65A	120	120	479	65	331.9	20.2
80A	130	130 (132)	493 (495)	75	441.8	24.0
100A	160	150 (152)	626 (628)	100	785.4	44.0
125A	200	205 (207)	835 (837)	125	1227.2	88.0
150A	210	215 (217)	845 (847)	150	1767.2	113.0

· The values in parentheses are the dimensions of JIS 16K FF flanged.

### ■ Certified Capacity Table for AL-6

· For steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Pressure MPa Nominal size	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
65A	263	340	493	663	834	1000	1165	1328	1489	1651	1814	1976	2138	2299	2461	2621
80A	350	452	657	882	1111	1331	1550	1767	1983	2198	2415	2631	2846	3060	3276	3489
100A	622	804	1168	1569	1975	2367	2756	3142	3525	3908	4294	4677	5059	5440	5825	6203
125A	972	1257	1826	2451	3086	3699	4307	4910	5508	6107	6709	7309	7906	8500	9102	9692
150A	1400	1810	2629	3530	4445	5327	6203	7071	7932							

<Boiler structure standard>

(kg/h)

Pressure MPa Nominal size	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
65A	255	332	486	640	796	947	1101	1254	1407	1557	1710	1862	2013	2164	2317	2469
80A	339	442	647	851	1059	1261	1466	1670	1873	2073	2276	2479	2680	2881	3084	3286
100A	604	786	1150	1514	1884	2242	2607	2968	3330	3686	4047	4407	4765	5122	5483	5843
125A	944	1228	1797	2366	2944	3504	4074	4638	5204	5760	6324	6886	7446	8003	8567	9129
150A	1359	1769	2588	3407	4239	5046	5866	6680	7494							

· Please refer to P. 12 for the calculation procedure for nominal size selection.

### ■ At the time of ordering

· When ordering, please specify the usage either pressure vessel or boiler structure.

# AF-5,5S

3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



AF-5



AF-5S

## ■ Features

1. Full bore safety valve with increased safety. Compact and lightweight (about half size of the previous full bore type safety valve).
2. A material of excellent quality is used for the trim parts. High performance is maintained by precision processing and heat treatment.
3. Corrosion-free due to corrosion-resistant material (the AF-5S is all stainless made, offering high corrosion resistance and durability).
4. Due to lift lever mechanism a discharge inspection can be manually performed at more than 75% of the opening pressure.

## ■ Specifications

Model		AF-5		AF-5S	
Structure		Open type with a lever			
Application		Steam	Air, Other non-dangerous fluids	Steam, Air, Other non-dangerous fluids	
Working pressure		0.1-2.0 MPa	0.1-1.0 MPa	0.1-1.0 MPa	
Maximum temperature		220°C			
Material	Spring case	Bronze		Stainless steel	
	Valve, valve seat	Stainless steel			
Connection		Inlet: JIS R screwed Outlet: JIS Rc screwed			

## ■ Dimensions and Weights

### • AF-5

Nominal size	Inlet diameter x Throat diameter x Outlet diameter di x dt x do	Valve seat diameter	Flow area $\frac{\pi}{4} dt^2$ (mm <sup>2</sup> )	Lift $\ell$ (mm)	Dimension (mm)			Plug	Weight (kg)
					L	H <sub>1</sub>	H		
20A	R 1 x 15 x Rc 1	18	176.6	3.3	38	61	136 (151)	R 1/8	1.3 (1.5)
25A	R 1-1/4 x 19 x Rc 1-1/4	22	283.3	4.4	45	70	157 (182)	R 1/8	1.9 (2.1)
32A	R 1-1/2 x 24 x Rc 1-1/2	28	452.1	5.5	52	80	183 (202)	R 1/8	2.7 (3.0)
40A	R 2 x 30 x Rc 2	35	706.5	6.8	65	98	216 (252)	R 1/4	5.1 (6.0)
50A	R 2-1/2 x 38 x Rc 2-1/2	44	1133.5	8.7	77	121	262 (314)	R 1/4	8.4 (9.5)

• The nominal size and the connection size are different.

• The values in parentheses are the values for working pressure 1.6 MPa-2.0 MPa.

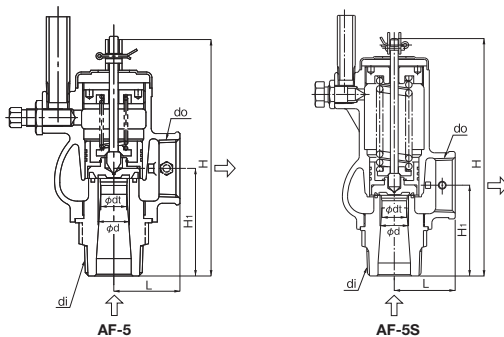
### • AF-5S

Nominal size	Inlet diameter x Throat diameter x Outlet diameter di x dt x do	Valve seat diameter	Flow area $\frac{\pi}{4} dt^2$ (mm <sup>2</sup> )	Lift $\ell$ (mm)	Dimension (mm)			Plug	Weight (kg)
					L	H <sub>1</sub>	H		
20A	R 1 x 15 x Rc 1	18	176.6	3.3	40	62	163	R 1/8	1.65
25A	R 1-1/4 x 19 x Rc 1-1/4	22	283.3	4.4	47	70	190	R 1/8	2.35
32A	R 1-1/2 x 24 x Rc 1-1/2	28	452.1	5.5	52	79	208	R 1/8	2.90
40A	R 2 x 30 x Rc 2	35	706.5	6.8	65	98	248	R 1/4	5.30
50A	R 2-1/2 x 38 x Rc 2-1/2	44	1133.5	8.7	77	121	315	R 1/4	9.20

• The nominal size and the connection size are different.

■At the Time of Ordering

When ordering, please inform set pressure and application. (If the application is steam, please also specify the usage either pressure vessel structure or boiler structure.)



■Certified Capacity Table for AF-5, 5S

· For steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Pressure MPa / Nominal size	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
20A	159	231	310	390	468	545	621	697	773	849	925	1001	1076	1152	1227	1303	1378	1455	1531	1606
25A	255	370	498	627	751	875	997	1118	1240	1362	1484	1606	1726	1849	1968	2090	2211	2335	2456	2576
32A	407	591	794	1000	1199	1396	1591	1785	1979	2175	2369	2562	2755	2950	3142	3336	3529	3726	3919	4112
40A	636	925	1242	1563	1874	2182	2487	2790	3093	3398	3702	4005	4306	4611	4910	5213	5515	5823	6125	6425
50A	1021	1484	1992	2508	3007	3501	3991	4477	4963	5453	5940	6425	6909	7398	7877	8364	8849	9343	9826	10309

· AF-5: 0.1 MPa to 1.6 MPa AF-5S: 0.1 MPa to 1.0 MPa

<Boiler structure standard>

(kg/h)

Pressure MPa / Nominal size	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
20A	155	227	299	372	443	515	587	659	729	800	872	942	1013	1084	1156	1227	1296	1367	1439	1510
25A	249	365	480	598	711	827	942	1057	1170	1284	1398	1512	1625	1740	1854	1968	2080	2193	2309	2422
32A	398	582	767	954	1136	1320	1503	1687	1867	2050	2232	2413	2594	2777	2959	3141	3319	3500	3685	3865
40A	622	910	1198	1491	1775	2063	2350	2636	2918	3204	3488	3772	4054	4340	4625	4909	5187	5470	5759	6041
50A	998	1461	1923	2393	2848	3311	3770	4229	4681	5140	5597	6052	6505	6963	7420	7876	8323	8777	9239	9692

· For air (20°C) <Pressure vessel structure standard>

(kg/h)

Pressure MPa / Nominal size	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
20A	257	374	502	630	759	887	1015	1143	1272	1400
25A	413	600	806	1011	1217	1423	1629	1835	2040	2246
32A	659	958	1286	1614	1943	2271	2600	2928	3256	3585
40A	1030	1497	2010	2523	3036	3550	4063	4576	5089	5602
50A	1654	2402	3225	4049	4872	5695	6518	7342	8165	8988

· Please refer to 12 for the calculation procedure for nominal size selection.

# AF-4,4M

3

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



AF-4

AF-4M

## ■ Features

1. Larger discharge capacity than lift type.
2. Due to lift lever mechanism a discharge inspection can be manually performed at more than 75% of the opening pressure (AF-4).
3. Blowdown pressure can be adjusted with a back pressure throttle valve.
4. A material of excellent quality is used for the trim parts. High performance is maintained by precision processing and heat treatment.

## ■ Specifications

Structure	Open type	
Application	Steam, Air, Other non-dangerous fluids	
Working pressure	0.1-1.0 MPa	
Maximum temperature	220°C *	
Material	Valve case	Ductile cast iron
	Spring case	Ductile cast iron
	Valve, valve seat	Stainless steel
Connection	JIS 10K FF flanged JIS 10K RF flanged *	

\* JIS 10K RF flanged when nominal size is more than 100A.

## ■ Dimensions and Weights

Nominal size	Inlet diameter x Throat diameter x Outlet diameter	Flow area $\frac{\pi}{4} d^2$ (mm <sup>2</sup> )	Lift/R R (mm)	Dimension (mm)				Flange			Weight (kg)
				L	H <sub>1</sub>	H <sub>L</sub>	H <sub>x</sub>	Inlet	T (mm)	Outlet	
25A	25 x 16 x 40	200.9	3.7	100	100	358	335	25A	26	40A	12
40A	40 x 26 x 65	530.6	6.0	120	120	410	408	40A	28	65A	21
50A	50 x 30 x 75	706.5	6.8	130	130	459	453	50A	30	80A	27
65A	65 x 40 x 100	1256.0	9.0	150	150	510	537	65A	32	100A	41
80A	80 x 49 x 125	1884.7	11.1	165	160	678	648	80A	32	125A	60
100A	100 x 76 x 150	4534.1	16.8	215	200	799	779	100A	26	150A	115 (119)
125A	125 x 84 x 200	5538.9	19.1	220	210	858	835	125A	28	200A	135 (143)
150A	150 x 100 x 200	7850.0	22.7	250	230	1006	966	150A	30	200A	203 (214)

· The connection flange standard is JIS B 2239 10K FF.

· The values in parentheses is JIS 10KRF.

· Connection flange standard is inlet : JIS B 2239 10KFF or JIS B 2239 10KRF but thickness of flange at inlet is thicker than JIS standard.

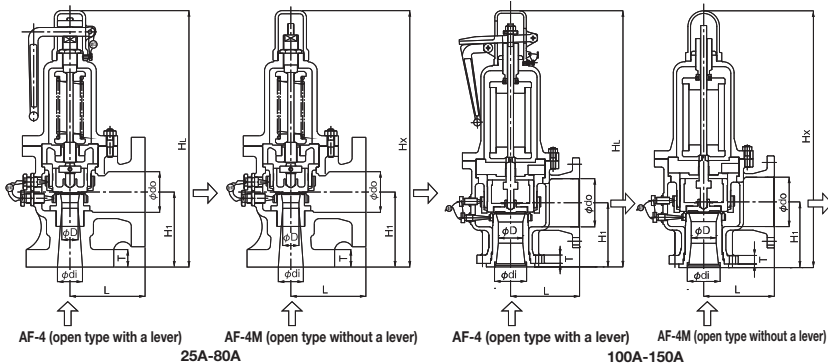
· Outlet connection is JIS B 2239 10KFF.

## ■ At the Time of Ordering

When ordering, please inform set pressure and application. (If the application is steam, please also specify the usage either pressure vessel structure or boiler structure.)

<Inlet: JIS 10K FF flanged>

<Inlet: JIS 10K RF flanged>



■ Certified Capacity Table for AF-4, 4M

· For steam (saturation temperature) <Pressure vessel structure standard>

(kg/h)

Nominal size \ Pressure MPa	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
25A	181	263	353	444	532	620	707	793	879	966
40A	478	694	932	1174	1407	1638	1868	2095	2323	2552
50A	636	925	1242	1563	1874	2182	2487	2790	3093	3398
65A	1132	1644	2208	2780	3332	3879	4422	4960	5500	6042
80A	1699	2467	3313	4171	4999	5821	6636	7444	8253	9067
100A	4087	5937	7971	10036	12028	14004	15964	17908	19855	21813
125A	4993	7252	9738	12260	14694	17108	19502	21877	24256	26647
150A	7076	10279	13801	17375	20825	24246	27640	31005	34377	37766

<Boiler structure standard>

(kg/h)

Nominal size \ Pressure MPa	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
25A	177	258	340	424	504	586	668	749	829	911
40A	467	683	900	1120	1333	1550	1764	1980	2191	2406
50A	622	910	1198	1491	1775	2063	2350	2636	2918	3204
65A	1106	1619	2131	2651	3156	3669	4177	4687	5187	5696
80A	1660	2429	3198	3978	4735	5505	6269	7033	7784	8547
100A	3995	5844	7694	9572	11393	13245	15081	16920	18728	20563
125A	4880	7139	9399	11693	13918	16180	18424	20670	22878	25120
150A	6916	10118	13321	16572	19725	22931	26111	29294	32424	35601

· For air (20°C) <Pressure vessel structure standard>

(kg/h)

Nominal size \ Pressure MPa	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
25A	293	425	571	717	863	1009	1155	1301	1447	1593
40A	774	1124	1510	1895	2280	2666	3051	3436	3822	4207
50A	1030	1497	2010	2523	3036	3550	4063	4576	5089	5602
65A	1832	2662	3574	4486	5398	6311	7223	8135	9047	9960
80A	2750	3994	5363	6732	8101	9470	10839	12207	13576	14945
100A	6616	9610	12903	16196	19489	22782	26076	29369	32662	35955
125A	8082	11739	15762	19785	23808	27831	31854	35877	39900	43923
150A	11454	16638	22339	28041	33742	39444	45146	50847	56549	62250

· Please refer to P. 12 for the calculation procedure for nominal size selection.

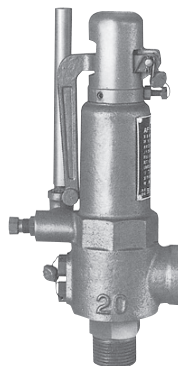


# AF-1

3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



## ■ Features

1. Larger discharge capacity than lift type.
2. Due to lift lever mechanism a discharge inspection can be manually performed at more than 75% of the opening pressure.

## ■ Specifications

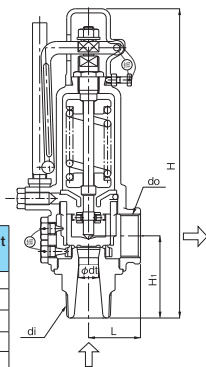
Structure	Open type with a lever	
Application	Steam	
Working pressure	0.18-1.6 MPa	
Maximum temperature	220°C	
Material	Valve case	Ductile cast iron (FCD450)
	Valve, Valve seat	Stainless steel
Connection	Inlet: JIS R screwed Outlet: JIS Rp screwed	

\* Rp is a parallel screw applicable to taper pipe thread.

## ■ Dimensions and Weights

Nominal size	Inlet diameter x Throat diameter x Outlet diameter di x dt x do	Flow area $\frac{\pi}{4} dt^2$ (mm <sup>2</sup> )	Lift $\ell$ (mm)	Dimensions (mm)				Weight (kg)
				Seat diameter	L	H <sub>1</sub>	H	
20A	R 1 x 15 x Rp 1	176.6	3.3	19	47	67	258	3.0
25A	R 1-1/4 x 19 x Rp 1-1/4	283.3	4.4	23	50	79	297	4.2
32A	R 1-1/2 x 26 x Rp 1-1/2	530.6	6.0	31	62	92	362	7.2
40A	R 2 x 30 x Rp 2	706.5	6.8	37	70	108	408	10.5
50A	R 2-1/2 x 38 x Rp 2-1/2	1133.5	8.7	46	89	123	466	18.5

\* The nominal size and the connection size are different.



## ■ Certified Capacity Table for AF-1

· For steam (saturation temperature) <Pressure vessel structure standard>

Nominal size	Pressure MPa																(kg/h)
		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	
20A		231	310	390	468	545	621	697	773	849	925	1001	1076	1152	1227	1303	
25A		370	498	627	751	875	997	1118	1240	1362	1484	1606	1726	1849	1968	2090	
32A		694	932	1174	1407	1638	1868	2095	2323	2552	2780	3008	3234	3463	3687	3915	
40A		925	1242	1563	1874	2182	2487	2790	3093	3398	3702	4005	4306	4611	4910	5213	
50A		1484	1992	2508	3007	3501	3991	4477	4963	5453	5940	6425	6909	7398	7877	8364	

<Boiler structure standard>

Nominal size	Pressure MPa																(kg/h)
		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	
20A		227	299	372	443	515	587	659	729	800	872	942	1013	1084	1156	1227	
25A		365	480	598	711	827	942	1057	1170	1284	1398	1512	1625	1740	1854	1968	
32A		683	900	1120	1333	1550	1764	1980	2191	2406	2620	2833	3045	3259	3473	3687	
40A		910	1198	1491	1775	2063	2350	2636	2918	3204	3488	3772	4054	4340	4625	4909	
50A		1461	1923	2393	2848	3311	3770	4229	4681	5140	5597	6052	6505	6963	7420	7876	

\* Please refer to P. 12 for the calculation procedure of nominal size selection.

# AF-2

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Larger discharge capacity than lift type.
2. Due to lift lever mechanism a discharge inspection can be manually performed at more than 75% of the opening pressure.
3. Blowdown pressure can be adjusted with a back pressure throttle valve.
4. A material of excellent quality is used for the trim parts. High performance is maintained by precision processing and heat treatment.

## ■Specifications

Structure	Open type with a lever	
Application	Steam	
Working pressure	0.18-1.6 MPa	
Maximum temperature	220°C	
Material	Valve case	Ductile cast iron
	Spring case	Ductile cast iron
	Valve, valve seat	Stainless steel
Connection	Inlet: JIS B 8210 10K RF flanged * Outlet: JIS B 2239 10K FF flanged	

\* JIS B 8210 20K RF flanged when working pressure is more than 1.0 MPa.

## ■Dimensions and Weights

Nominal size	Inlet diameter x Throat diameter x Outlet diameter di x dt x do	Flow area $\frac{\pi}{4} dt^2$ (mm <sup>2</sup> )	Lift ℓ (mm)	Dimension (mm)			Connection (mm)						Outlet	Weight (kg)
				L	H <sub>1</sub>	H	Inlet: JIS B 8210 10K							
							Di	Cl	gl	t <sub>i</sub>	fi	ni x hi		
65A	65 x 49 x 90	1884.7	11.1	150	142	630	200	160	105	30	2	8 x 23	100A	50.0
80A	75 x 57 x 100	2550.7	13.0	165	160	682	210	170	125	32	2	8 x 23		62.3

## ■Certified Capacity Table for AF-2

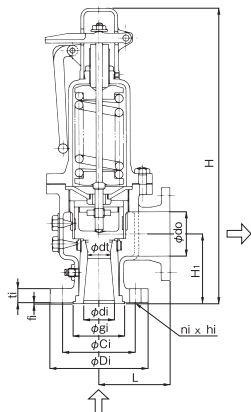
· For steam (saturation temperature) <Pressure vessel structure standard>

Nominal size \ Pressure MPa	(kg/h)															
	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	
65A	2467	3313	4171	4999	5821	6636	7444	8253	9067	9877	10684	11488	12300	13098	13907	
80A	3339	4484	5645	6766	7878	8981	10074	11170	12271	13368	14460	15547	16647	17727	18821	

<Boiler structure standard>

Nominal size \ Pressure MPa	(kg/h)															
	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	
65A	2429	3198	3978	4735	5505	6269	7033	7784	8547	9306	10063	10816	11578	12338	13096	
80A	3287	4328	5385	6409	7451	8484	9518	10535	11567	12595	13619	14638	15669	16698	17725	

· Please refer to P. 12 for the calculation procedure for nominal size selection.

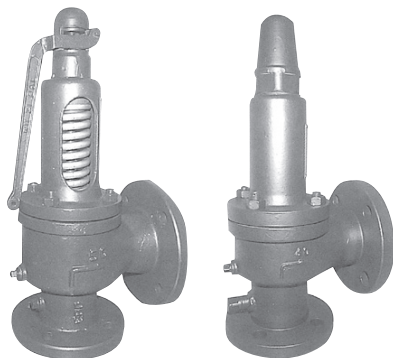


# AF-7,7M

3

Safety Relief Valve

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		



AF-7

AF-7M

## ■Features

1. Due to lift lever mechanism a discharge inspection can be manually performed at more than 75% of the opening pressure.
2. AF-7M is closed type structure which can prevent fluid leakage.

## ■Specifications

Model		AF-7	AF-7M
Structure		Open type with a lever	Closed type
Application		Steam, Air, Other non-dangerous fluids	Air, Other non-dangerous fluids
Working pressure		0.1-1.0 MPa *	
Maximum temperature		350°C	300°C
Material	Valve case	Carbon steel	Carbon steel
	Valve, valve seat	Stainless steel	Stainless steel
Connection	Inlet	JIS 10K RF flanged	JIS 10K RF flanged
	Outlet	JIS 10K FF flanged	JIS 10K FF flanged

\* Available with working pressure between 1.0 MPa and 1.6 MPa (Inlet: JIS 20K RF flanged).

## ■Dimensions and Weights

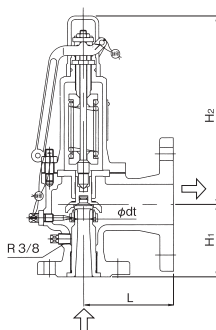
Nominal size	Inlet diameter x Lift Outlet diameter	Throat diameter dt(mm)	Flow area $\frac{\pi}{4} dt^2(\text{mm}^2)$	Lift $l(\text{mm})$	L (mm)	H <sub>1</sub> (mm)	* H <sub>2</sub> (mm)		Weight (kg)
							AF-7	AF-7M	
25A	25 x 32	16	200.9	4.0	100	85	226	231	10
40A	40 x 50	25	490.6	6.3	120	110	273	270	20
50A	50 x 65	32	803.8	8.0	135	120	325	321	25
65A	65 x 80	40	1256.0	10.0	160	125	366	361	40
80A	80 x 100	50	1962.5	12.5	170	135	375	370	52
100A	100 x 125	65	3316.6	16.3	205	160	612	580	75

· Both AF-7 and AF-7M are same value except for H<sub>2</sub>.

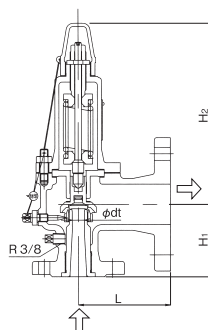
· The connection flange standard is JIS B 2238.

## ■At the Time of Ordering

When ordering, please inform set pressure and application. (If the application is steam, please also specify the usage either pressure vessel structure or boiler structure.)



AF-7 &lt;Open type with a lever&gt;



AF-7M &lt;Closed type&gt;

\* Structure will be different depends on nominal size.

**■ Certified Capacity Table for AF-7, 7M**

• For steam (saturation temperature) &lt;Pressure vessel structure standard&gt;

(kg/h)

Nominal size	Throat diameter dt (mm)	Flow area (mm <sup>2</sup> )	Set pressure (MPa)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
25A	16	200.9	181	263	353	444	532	620	707	793	879	966
40A	25	490.6	442	642	862	1085	1301	1515	1727	1937	2148	2360
50A	32	803.8	724	1052	1413	1779	2132	2482	2830	3174	3520	3867
65A	40	1256.0	1132	1644	2208	2780	3332	3879	4422	4960	5500	6042
80A	50	1962.5	1769	2569	3450	4343	5206	6061	6910	7751	8594	9441
100A	65	3316.6	2989	4342	5831	7341	8798	10244	11677	13099	14524	15956

• &lt;Boiler structure standard&gt;

(kg/h)

Nominal size	Throat diameter dt (mm)	Flow area (mm <sup>2</sup> )	Set pressure (MPa)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
25A	16	200.9	177	258	340	424	504	586	668	749	829	911
40A	25	490.6	432	632	832	1035	1232	1433	1631	1830	2026	2224
50A	32	803.8	708	1036	1364	1696	2019	2348	2673	2999	3320	3645
65A	40	1256.0	1106	1619	2131	2651	3156	3669	4177	4687	5187	5696
80A	50	1962.5	1729	2529	3330	4143	4931	5732	6527	7323	8106	8900
100A	65	3316.6	2922	4275	5628	7002	8334	9688	11032	12376	13699	15041

• For air (20°C) &lt;Pressure vessel structure standard&gt;

(kg/h)

Nominal size	Throat diameter dt (mm)	Flow area (mm <sup>2</sup> )	Set pressure (MPa)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
25A	16	200.9	293	425	571	717	863	1009	1155	1301	1447	1593
40A	25	490.6	715	1039	1396	1752	2108	2465	2821	3177	3534	3890
50A	32	803.8	1172	1703	2287	2871	3455	4038	4622	5206	5790	6374
65A	40	1256.0	1832	2662	3574	4486	5398	6311	7223	8135	9047	9960
80A	50	1962.5	2863	4159	5584	7010	8435	9861	11286	12711	14137	15562
100A	65	3316.6	4839	7029	9438	11847	14256	16665	19074	21482	23891	26300

• Please refer to P. 12 for the calculation procedure of nominal size selection.

# AF-9EN

3

Full bore type	Lift type	Safety valve	Relief valve
Safety relief valve	Lever type	Closed type	Dash-pot structure
Handle type	Stainless	High pressure gas testing products	
Diaphragm	Non-leakage		

## ■Features

1. Large discharge capacity.
2. Due to lift lever mechanism, a discharge inspection can be manually performed at least 80% of working pressure.

## ■Specifications

Model		AF-9EN		
Application	Steam, Air, Other non-dangerous fluids			
Nominal size	20A-100A	125A	150A	
Working pressure	0.045-1.6 MPa	0.045-1.25 MPa	0.045-1.0 MPa	
Max. temperature	* According to P/T rating. 250°C			
Material	Body	Cast Iron		
	Spring case	Ductile Cast Iron		
	Valve	Stainless steel		
	Valve seat	Stainless steel		
Connection	Inlet: PN16, Outlet: PN10 EN1092-2			

- Spring replacement does not need any other part replacement but gaskets, however, it requires training by Yoshitake. Only certified person is allowed to replace the spring.
- AF-9EN is not closed type.
- Please contact us for any further information.
- Since it is not a structure required by JIS B 8210, it can not be used for JIS standard boilers and pressure vessels.

## ■Spring Range

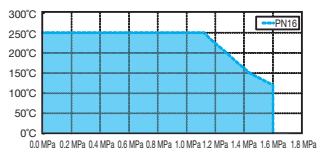
(A)	(B)	(C)	(D)
0.045-0.068	0.066-0.10	0.095-0.14	0.13-0.19
(E)	(F)	(G)	(H)
0.18-0.26	0.25-0.36	0.35-0.50	0.48-0.63
(I)	(J)	(K)	(L)
0.6-0.8	0.75-1.0	0.95-1.25	1.2-1.6

## ■Dimensions and Weights

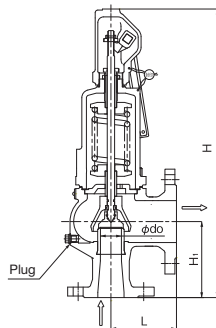
Nominal size	Inlet dia. x Throat dia. x Outlet dia.	Flow area (mm <sup>2</sup> )	Lift (mm)	Dimension (mm)			Flange		Weight (kg)
				L	H <sub>1</sub>	H	Inlet	Outlet	
20A	20 x 16 x 32	201	6	85	95	345	20A	32A	7.5
25A	25 x 20 x 40	314	7.5	95	105	395	25A	40A	9
32A	32 x 25 x 50	491	9	100	110	420	32A	50A	13
40A	40 x 32 x 65	804	11.5	115	130	495	40A	65A	19
50A	50 x 40 x 80	1257	14.5	125	145	550	50A	80A	25
65A	65 x 50 x 100	1964	18	140	150	660	65A	100A	37
80A	80 x 63 x 125	3117	23	155	170	710	80A	125A	52
100A	100 x 77 x 150	4657	28	175	180	810	100A	150A	77
125A	125 x 93 x 200	6793	34	215	220	860	125A	200A	90
150A	150 x 110 x 250	9503	40	225	245	990	150A	250A	140



## ■Pressure and Temperature Rating



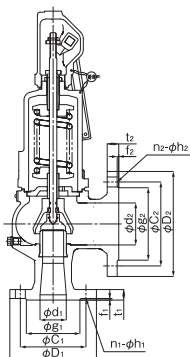
\* This chart shows PT rating of PN16 for cast iron flanges according to EN1092-2.



\* Structure will be different depends on nominal size.

**■ Dimensions (Connection)**

Nominal Size	Inlet flange BSEN PN16 RF							Outlet flange BSEN PN10 RF						
	d <sub>1</sub>	D <sub>1</sub>	t <sub>1</sub>	f <sub>1</sub>	g <sub>1</sub>	C <sub>1</sub>	n <sub>1</sub> -h <sub>1</sub>	d <sub>2</sub>	D <sub>2</sub>	t <sub>2</sub>	f <sub>2</sub>	g <sub>2</sub>	C <sub>2</sub>	n <sub>2</sub> -h <sub>2</sub>
20A	20	105	16	2	56	75	4-14	32	140	18	3	76	100	4-19
25A	25	115	16	3	65	85	4-14	40	150	18	3	84	110	4-19
32A	32	140	18	3	76	100	4-19	50	165	20	3	99	125	4-19
40A	40	150	18	3	84	110	4-19	65	185	20	3	118	145	4-19
50A	50	165	20	3	99	125	4-19	80	200	22	3	132	160	8-19
65A	65	185	20	3	118	145	4-19	100	220	24	3	156	180	8-19
80A	80	200	22	3	132	160	8-19	125	250	26	3	184	210	8-19
100A	100	220	24	3	156	180	8-19	150	285	26	3	211	240	8-23
125A	125	250	26	3	184	210	8-19	200	340	26	3	266	292	8-23
150A	150	285	26	3	211	240	8-23	250	395	28	3	319	350	12-23


**■ Certified Capacity Table for AF-9EN**

• For steam (saturation temperature) &lt;EN ISO 4126-1: 2004&gt;

(kg/h)

Nominal Size	Pressure (MPa)												
	0.045	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2
20A	115	164	268	357	446	535	623	711	798	886	974	1,060	1,147
25A	180	256	418	558	697	835	973	1,110	1,247	1,384	1,521	1,657	1,792
32A	282	401	654	872	1,090	1,306	1,521	1,736	1,950	2,165	2,378	2,590	2,802
40A	461	656	1,071	1,428	1,784	2,139	2,491	2,843	3,193	3,545	3,894	4,242	4,588
50A	721	1,026	1,674	2,233	2,790	3,344	3,895	4,445	4,993	5,542	6,089	6,631	7,173
65A	1,127	1,603	2,615	3,489	4,359	5,225	6,086	6,945	7,801	8,659	9,513	10,361	11,208
80A	1,788	2,545	4,150	5,537	6,918	8,292	9,658	11,021	12,381	13,742	15,098	16,444	17,787
100A	2,672	3,802	6,201	8,273	10,336	12,389	14,430	16,467	18,498	20,531	22,558	24,568	26,575
125A	3,897	5,546	9,045	12,067	15,077	18,072	21,049	24,019	26,982	29,948	32,904	35,837	38,764
150A	5,452	7,758	12,654	16,881	21,092	25,282	29,446	33,602	37,746	41,896	46,031	-	-

• For Air (20°C) &lt;EN ISO 4126-1: 2004&gt;

(kg/h)

Nominal Size	Pressure (MPa)															
	0.045	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.4	1.6	
20A	185	258	426	573	720	866	1,013	1,159	1,306	1,452	1,599	1,746	1,892	2,185	2,478	
25A	289	404	666	895	1,124	1,353	1,582	1,811	2,040	2,269	2,498	2,727	2,956	3,414	3,872	
32A	451	631	1,042	1,400	1,758	2,116	2,474	2,832	3,190	3,548	3,906	4,264	4,622	5,338	6,054	
40A	739	1,033	1,706	2,292	2,878	3,464	4,051	4,637	5,223	5,810	6,396	6,982	7,568	8,741	9,913	
50A	1,156	1,615	2,667	3,583	4,500	5,416	6,333	7,250	8,166	9,083	9,999	10,916	11,833	13,666	15,499	
65A	1,806	2,524	4,166	5,598	7,031	8,463	9,895	11,327	12,759	14,191	15,624	17,056	18,488	21,352	24,217	
80A	2,866	4,005	6,612	8,885	11,158	13,431	15,704	17,977	20,250	22,523	24,796	27,069	29,342	33,887	38,433	
100A	4,281	5,984	9,879	13,275	16,671	20,067	23,463	26,859	30,254	33,650	37,046	40,442	43,838	50,630	57,422	
125A	6,245	8,729	14,410	19,364	24,317	29,271	34,224	39,178	44,131	49,085	54,038	58,992	63,945	-	-	
150A	8,737	12,212	20,159	27,089	34,018	40,948	47,878	54,807	61,737	68,666	75,596	-	-	-	-	

# Safety Relief Valve - Annex

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- Calculation method of certified capacity for safety valve ..... **3**-73
- Abstract of “Construction code for pressure vessels” ..... **3**-76
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## Abstract of JIS B 8210: 2017 “Steam boilers and pressure vessels-Spring loaded safety valves”

**Warning**

Do not apply the product to devices which do not allow any valve seat leakage.

\* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).

**CAUTION**

Please refer to the manual attached to the product for procedures for installation and operation.

3

**Capability****1. Tolerance of start to discharge pressure****· Safety valve for steam**

There is no regulation for start to discharge pressure of safety valve for steam.

**· Safety valve for gas and liquid**Tolerance of start to discharge pressure of safety valve for gas is  $\pm 5\%$  (however,  $\pm 0.025$  MPa in minimum). If exceeding set pressure is not acceptable, add absolute value of positive side to one of negative. For gas, set pressure is generally start to discharge pressure.**2. Tolerance of opening (popping) pressure****· Safety valve for steam**Opening pressure tolerance of safety valve for steam is shown in Table-1 below. Opening pressure tolerance of safety valve for steam except for boilers is  $\pm 3\%$  (however,  $\pm 0.015$  MPa is minimum). If exceeding set pressure is not acceptable, add absolute value of positive side to one of negative.**Table-1 Opening pressure tolerance of safety valve for steam**

Set pressure MPa (Gauge pressure)	Tolerance MPa
Less than 0.5	$\pm 0.015$
0.5-2.3	$\pm$ (3% of set pressure)
2.3-7.0	$\pm 0.07$
7.0 or more	$\pm$ (1% of set pressure)

**· Safety valve for gas and liquid**Opening pressure tolerance of safety valve for gas is less than 1.1 times of start to discharge pressure. However, to set by set pressure, opening pressure tolerance is  $\pm 3\%$  ( $\pm 0.015$  MPa in minimum) of set pressure.**3. Blowdown****· Safety valve for steam**

Opening of safety valve for steam is shown in Table-2 below. If discharge pressure of safety valve for steam, which is used for through flow boiler, reheater and piping, exceeds 0.3 MPa, blowdown can be less than 10% of set pressure.

**Table-2 Blowdown of safety valve for steam**

Set pressure MPa (Gauge pressure)	Blowdown
0.4 or less	0.03
More than 0.4	7% (4%) or less of set pressure

If there is an agreement between the parties, the value in ( ) can be applied.

**· Safety valve for gas**

As to safety valve for gas, blowdown is generally difference between start to discharge pressure and closing pressure. However, to set by start to discharge pressure, it is different between opening pressure and closing pressure.

**Table-3 Blowdown of safety valve for gas**

Set pressure MPa (Gauge pressure)	Blowdown	
	Metal seat type	Soft seat type
0.2 or less	0.03 or less	0.05 or less
More than 0.2	15% or less of set pressure	25% or less of set pressure

**Safety valve for liquid (Yoshitake standard)**

Blowdown of safety valve for liquid is shown in Table-4 below.

**Table-4 Blowdown of safety valve for liquid**

Set pressure MPa (Gauge pressure)	Blowdown	
	Metal seat type	Soft seat type
0.2 or less	0.03 or less	0.05 or less
More than 0.2	15% or less of set pressure	25% or less of set pressure

Note 1) As to the definitions of metal seat type and soft seat type, see JIS B 0100.



## Calculation Methods of Certified Capacity for Safety Valve

<b>Warning</b>	Do not apply the product to devices which do not allow any valve seat leakage. * The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).
<b>CAUTION</b>	Please refer to the manual attached to the product for procedures for installation and operation.

3

### 1. Certified capacity for safety valve for steam

(1) To calculate by certified coefficient of discharge, use the following formula:

$$Q_m = 5.25 \times C' \times K_{dr} \times A P_0$$

$Q_m$  : Certified capacity (kg/h)

$A$  : Flow area (mm<sup>2</sup>)

$P_0$  : For boiler, (set pressure x 1.03 + 0.101) or (set pressure + 0.015 + 0.101), whichever larger.

For pressure vessel, (set pressure x 1.1 + 0.101) or (set pressure + 0.020 + 0.101), whichever larger.

However, if allowable over pressure is specified, it shall be followed.

$K_{dr}$  : Certified derated coefficient of discharge  
( $\leq$  Average measured value x 0.9)

$C'$  : Coefficient depending on the properties of steam, which is shown in Table-5 on page 3-74.

(2) If not measuring blowing coefficient, for a safety valve that satisfies all the following 3 conditions (full bore type safety valve), use  $K_{dr}' = 0.777$  in place of  $K_{dr}$  in the calculation formula (1) to calculate the nominal blow out amount.

$$D \geq 1.15 \times d_t$$

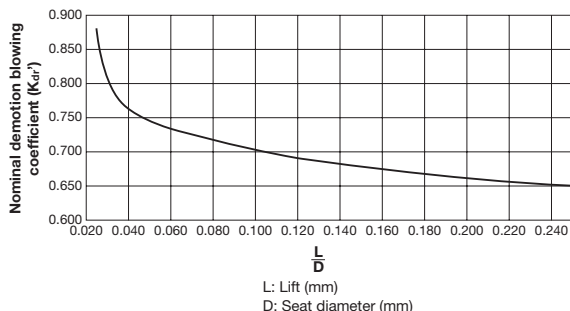
$$\pi D L \geq 1.05 \times A$$

Area of valve inlet and nozzle passage.

$D$ : Seat diameter (mm)

$L$ : Lift (mm)

$d_t$ : Throat diameter (mm)



**Fig. 1 Nominal demotion blowing coefficient**

## Calculation Methods of Certified Capacity for Safety Valve



**Warning** Do not apply the product to devices which do not allow any valve seat leakage.  
\* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).



**CAUTION** Please refer to the manual attached to the product for procedures for installation and operation.

**Table-5 Coefficient depending on properties of steam (C')**

Absolute pressure MPa	Saturation pressure	Temperature °C															
		200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500
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	0.773	0.763
1	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	0.775	0.764
1.5	0.976	0.975	0.969	0.946	0.925	0.906	0.888	0.871	0.855	0.843	0.826	0.813	0.800	0.788	0.777	0.765	0.755
2	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	0.778	0.767	0.757
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	0.780	0.769	0.759
3	0.966		0.961	0.966	0.948	0.925	0.904	0.884	0.867	0.850	0.835	0.821	0.807	0.794	0.782	0.770	0.760
4	0.964				0.957	0.953	0.939	0.915	0.895	0.875	0.857	0.841	0.826	0.811	0.798	0.785	0.773
5	0.965					0.955	0.952	0.929	0.905	0.884	0.865	0.847	0.831	0.816	0.802	0.789	0.776
6	0.968					0.962	0.953	0.943	0.917	0.893	0.873	0.854	0.837	0.821	0.807	0.793	0.780
7	0.971						0.959	0.954	0.930	0.904	0.881	0.861	0.843	0.826	0.811	0.797	0.783
8	0.975						0.968	0.956	0.944	0.915	0.890	0.869	0.849	0.832	0.816	0.801	0.787
9	0.980							0.963	0.960	0.927	0.900	0.877	0.856	0.837	0.820	0.805	0.791
10	0.987							0.972	0.962	0.941	0.911	0.885	0.863	0.843	0.825	0.809	0.794
12	1.000								0.977	0.973	0.935	0.904	0.878	0.856	0.836	0.818	0.802
14	1.019								1.005	0.982	0.964	0.926	0.896	0.870	0.848	0.828	0.811
16	1.039									1.005	1.001	0.952	0.916	0.886	0.861	0.839	0.820
18	1.068										1.044	1.007	0.977	0.933	0.903	0.875	0.851
20	1.100											1.036	1.011	0.958	0.890	0.863	0.840

Note 1) Intermediate value of pressure and temperature in this chart is calculated by proportion method.

2) Absolute pressure shall be absolute value of pressure to determine discharge capacity.

## Calculation Methods of Certified Capacity for Safety Valve



**Warning** Do not apply the product to devices which do not allow any valve seat leakage.  
\* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).



**CAUTION** Please refer to the manual attached to the product for procedures for installation and operation.

### 2. Certified capacity for safety valve for gas

(1) To calculate by certified coefficient of discharge, use the following formula:

$$Q_m = C^* \times K_{dr} \times P_0 \times A \times K_b \times \sqrt{\frac{M}{Z T_0}}$$

$Q_m$ : Certified capacity (kg/h)

$C^*$ : Coefficient depending on adiabatic exponent (k), calculated by the following formula:

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

If adiabatic exponent (k) is unknown, setting  $k = 1.001$ ,  $C^* = 23.96$

$P_0$ : Absolute flow rating pressure (MPa)

$P_1 = (\text{set pressure} \times 1.1 + 0.101)$  or  $(\text{set pressure} + 0.020 + 0.101)$ , whichever greater.

However, if allowable over pressure is specified, it shall be followed.

$K_{dr}$ : Certified derated coefficient of discharge (= measured value  $\times 0.9$ )

$A$ : Flow area (mm<sup>2</sup>)

$M$ : Molecular weight of gas (kg/kmol)

$Z$ : Compression coefficient shown in Table 2 (if unknown,  $Z = 1.0$ )

$T_0$ : Absolute temperature of gas under flow rating pressure (K)

$K_b$ : Corrective coefficient of back pressure

$$\text{In case of } \frac{P_b}{P_0} > \left( \frac{2}{k+1} \right)^{\frac{k}{k-1}}$$

$$K_b = \frac{55.83}{C^*} \sqrt{\frac{k}{k-1} \left[ \left( \frac{P_b}{P_0} \right)^{\frac{2}{k}} - \left( \frac{P_b}{P_0} \right)^{\frac{k+1}{k}} \right]}$$

$$\text{In case of } \frac{P_b}{P_0} \leq \left( \frac{2}{k+1} \right)^{\frac{k}{k-1}}$$

$$K_b = 1.0$$

(2) If not measuring certified coefficient of discharge, for lift type safety valve, calculate certified capacity using the value of  $K_{dr}'$  in Fig 2 below instead of  $K_{dr}$  in (1). For full bore type safety valve, set  $K_{dr} = 0.777$ .

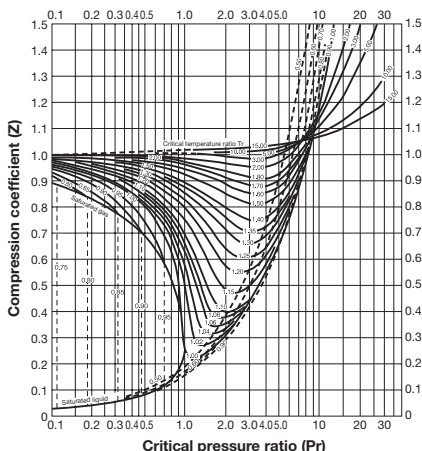


Fig. 2

Note) Critical temperature ratio  
 $T_r = \frac{\text{Discharge temperature (K)}}{\text{Critical temperature (K)}}$

Critical pressure ratio  
 $P_r = \frac{\text{Opening pressure (absolute value)}}{\text{Critical pressure (absolute value)}}$

## Abstract of “Construction code for pressure vessels”



**Warning** Do not apply the product to devices which do not allow any valve seat leakage.  
\* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).



**CAUTION** Please refer to the manual attached to the product for procedures for installation and operation.

## &lt;Reference&gt;

**[Definition of Class-1 pressure vessel]**

1. The vessels heating solids or liquids by receiving vapor or other heat media or by generating vapor, those having an internal pressure exceeding the atmospheric pressure (dizestor, sterilizer, etc);
2. The vessels generating vapor by chemical, nuclear or other reactions, those having an internal pressure exceeding the atmospheric pressure (autoclave, reactor, etc);
3. The vessels for generating vapor by heating liquids contained therein to separate components of the said liquids, those with an internal pressure exceeding the atmospheric pressure (distiller, evaporator);
4. The vessels containing liquids at a temperature exceeding their boiling points at the atmospheric pressure (steam accumulator).

**[Definition of Class-2 pressure vessel]**

The vessels containing gas with a gauge pressure of 0.2 MPa or more (excluding the class-1 pressure vessels) listed in followings:

1. The vessels with an inner cubic volume of 0.04 m<sup>3</sup> or more;
2. The vessels with a drum having inner diameter of 200 mm or more and length 1,000 mm or more (air tank, drying roller, high pressure gas tank, steam receiver, deaerator, vacuum evaporator, etc).

**[The vessels which excluded from application of CONSTRUCTION CODE FOR PRESSURE VESSEL]**

1. vessels used at a gauge pressure of 0.1 MPa or less with an inner cubic volume of 0.04 m<sup>3</sup> or less or with an inner diameter of 200 mm or less and the length 1,000 mm or less;
2. the vessels of the maximum operating gauge pressure expressed in MPa multiplied by the internal cubic volume expressed in m<sup>3</sup> are 0.004 or less.

(Safety Valves and Alternative Safety Devices)

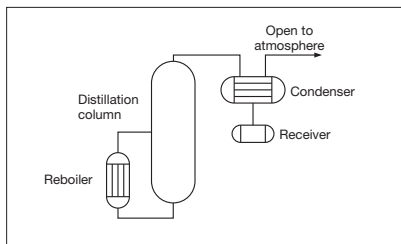
**Article 64.**

1. Any Class-1 pressure vessel shall be equipped with a safety valve or an alternative safety device for each of those parts which are subject to exposure to different levels of pressure, to ensure that the internal pressure working on any of such parts will not rise above the maximum allowable working pressure. However, this provision does not apply to those parts of a Class-1 pressure vessel (other than a reactor) which are connected with a boiler or some other source of pressure and of which the maximum allowable working pressure is not lower than that of such pressure source.
2. Safety valves for Class-1 pressure vessels shall be attached to those parts of the vessel itself or of its tubing which are easily accessible for checkup purposes, and shall be installed in such a manner that their stems will be upright.
3. Safety valves for those Class-1 pressure vessels in which flammable or toxic vapours may be generated shall be hermetically sealed or so configured that they can burn, absorb or otherwise dispose of such vapours safely.

**52 Related to Article 64**

- (1) Related to paragraph 1
- A Capacity of safety valve and other safety equipment shall be in accordance with the provision of 12.1.6 (1) of JIS B 8270. However, the provisions pertaining to (2) and (3) in the same provision shall not be applied.

- B. Regarding pressure vessel equipped with more than two safety valve, a part of it shall be able to be made to safety valve with a spring pilot. In this case, half or more of total discharge capacity of safety valve required for the above pressure vessel shall be by spring type safety valve other than safety valve with a spring pilot. The above safety valve with spring pilot shall work securely by steam pressure on the place the above safety valve is installed on.
- C. In case that pipe side (the side connecting to distillation column) is open for atmosphere via the distillation column and condenser as shown in the figure below, and maximum using pressure on pipe side is over than pressure under part of distillation column, safety valve does not need to be installed to pipe side of reboiler pursuant to the proviso of paragraph 1.  
In case that heating and evaporating liquid by water vapor for jacketted pressure vessel, and maximum using pressure on the side of liquid to be heated is over than saturated pressure of the liquid at maximum temperature of heating water vapor, it is acceptable even if safety device is not installed on the side of the liquid to be heated.
- D. Reactor vessel without factor raising pressure inside shall be excluded from reactor vessel of the proviso of paragraph 1.
- E. Discharge capacity of safety valve shall be over than maximum capacity of gas flowing into pressure vessel or maximum capacity of gas generating inside pressure vessel, and as calculation method, for example, the following shall be considered:



- (a) Maximum amount of flow-in gas shall be calculated by the following formula:

$$G = 0.0028 \text{ vpd}^2$$

In this formula, G, v, p and d shall mean following value by each:

- G Gas sending amount (unit: kg/h)  
v Flow velocity of gas. 20 or more for saturated steam, 30 or more for overheated steam, and 10 or more for normal gas (unit: m/s)  
p Density of gas (unit: kg/m<sup>3</sup>)  
d Inner diameter of piping (unit: mm)

## Abstract of “Construction code for pressure vessels”

**Warning**

Do not apply the product to devices which do not allow any valve seat leakage.  
 \* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).

**CAUTION**

Please refer to the manual attached to the product for procedures for installation and operation.

3

- (b) Maximum evaporation amount of direct fire type Class-1 pressure vessel shall be calculated by the following formula:

$$W = \frac{HQ\eta}{i_1 - i_2}$$

( In this formula, W, H, Q,  $\eta$ ,  $i_1$  and  $i_2$  shall mean following value by each:  
 W Maximum evaporation amount of steam (unit: kg/h)  
 H Heat generation amount of fuel (unit: kJ/kg)  
 Q Use amount of fuel (unit: kg/h)  
 $\eta$  Heat efficiency of the above pressure vessel  
 $i_1$  Enthalpy of generating steam (unit: KJ/kg)  
 $i_2$  Enthalpy that internal liquid had before heating (unit: KJ/kg)

- F. As calculation method for discharge capacity of safety valve for steam, for example, there shall be a method according to the stipulation of JIS B 8210 appendix (Calculation method of certified capacity for safety valve).

- G. As “other safety device”, for example, there shall be following things:

- Device which stops pressure rise automatically
- Pressure reducing valve with safety valve is installed at its outlet side.
- Alarm device with safety valve used.
- Relief valve (limited to its nominal size is 15 mm or more) or relief pipe.

For relief valve, the term “0.02 MPa” in 12. 1. 6 (1) of JIS B 8270 shall be deemed to be replaced with “0.034 MPa”.

- Rupture disc (limited to the case that content of pressure vessel makes working of safety valve difficult)
- H. Pressure regulating device, temperature regulating device, etc shall not fall on (a) of G.
- I. It shall be acceptable to install stop valve between pressure vessel and safety valve in (b) of G.
- J. F and the provision of Article 65 shall not apply to the safety device stipulated in (b) and (c) of G.
- K. Rupture disc in (e) of G shall conform to the stipulation of JIS B 8226 (rupture disc type safety device).
- L. Because it is difficult to guarantee the maximum usage pressure of steam accumulator by safety valve, in case that the maximum usage pressure of system accumulator is smaller than the maximum usage pressure of boiler, safety device in (b) of G shall be installed.
- M. Regarding vessels of indirect heating such as coloring tank or storage tank, in case that vapor does not almost originate on heated side of high temperature fluid, it is acceptable to admit relief valve as alternative safety device of safety valve.  
 Also, regarding relief valve installed on storage tank etc, it is acceptable to consider that there is no limitation about valve diameter.

- N. In case of installing safety valve on piping annexed on Class-1 pressure vessel, closing device such as relief valve shall not be installed between safety valve and vessel.

Provided, however, that this shall not apply when the case falls under any of the followings:

- In case that installing the device equipped with two or more safety valve, and, they cannot be closed on the same time.

- As for workplace that head of relevant labor standards supervision office admits performance check can be conducted during operation, regarding Class-1 pressure vessel installed on the said workplace, is always open other than when closing devices are closed during minimum necessary time for inspection or repair of safety valve, and, in order to prevent this from being operated without reason, locked, sealed or implementing measures of the same as or more than them, and also, installing the plate indicating no-operation.

Moreover, when closing devices are closed, implement all the measures as follows:

- Operation of the said Class-1 pressure vessel shall be made stable, and operation condition shall not be changed;
- Pressure of the said Class-1 pressure vessel and related equipment shall be monitored in any time, and measures at the time of pressure abnormal rise shall be prepared in advance.
- If removing safety valve for the purpose of inspection or repair, preparing spare safety valve in advance, measures to shorten closing time as possible shall be implemented such as rapid installation.

- (2) Related to Article 3

As “structure can be treated safely”, there shall be structures that eliminate danger of catching fire or explosion, for example, dispersing steam blown from safety valve to the places without fire or other things can become ignition source such as altitude of outdoors.

(April 30, 2003 Labor Standards Bureau Notification No. 0430004)

## Abstract of “Construction code for boilers”



Do not apply the product to devices which do not allow any valve seat leakage.  
\* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).



Please refer to the manual attached to the product for procedures for installation and operation.

(Safety Valve)

**Article 62.**

1. Steam boilers shall be equipped with at least two safety valves to ensure that its internal pressure will never exceed the maximum allowable working pressure. For those steam boilers which have a heating surface area not larger than 50 m<sup>2</sup>, however, the number of safety valves to be installed may be reduced to one.
2. Safety valves shall be attached directly to proper parts of the boiler itself which are easily accessible for inspections and care shall be taken to ensure that their spindles will be upright.
3. All safety valves, when used for steam boilers generating flammable vapours, shall be either hermetically sealed or so configured as to send exhausts from them into a safe place outside the boiler room.

**43 Related to Article 62**

(1) Related to paragraph 1

- A. As capacity of safety valve can maintain internal pressure at maximum usage pressure or less, for example, there shall be capacity according to the stipulation of 15.1 in JIS B 8201 (except for the stipulations after annex). In this case, the term “35 kPa” in the same stipulation shall be deemed to be replaced with “0.034 MPa”.
- B. Discharge capacity of safety valve for steam boiler shall be maximum evaporation amount of the said boiler or more. If maximum evaporation amount is not clear, it shall be obtained from actual measurement of fuel consumption amount, etc. However, if it burns wood debris and it is difficult to obtain maximum evaporation amount, it is acceptable to follow the table below:

Kind of boiler	Evaporation amount per heat-transfer area 1 m <sup>2</sup> (unit: kg/h)					
	Boiler body			Water-cooled furnace wall		
	Hand ring	Stoker ring	Burning of oil, gas or pulverized coal	Hand ring	Stoker ring	Burning of oil, gas or pulverized coal
Boiler other than water tube boiler	25	35	40	40	50	70
Water tube boiler	30	40	50	40	60	80

In addition, maximum evaporation amount of waste heat boiler shall be calculated on the basis of flow rate of waste gas and specific enthalpy of waste gas.

- C. As a method to calculate discharge capacity of safety valve of steam boiler, for example, there shall be a method according to the stipulation of annex 2 of JIS B 8210 (Spring safety valve for steam and for gas), and moreover, this shall be according to (a) and (b) as follows:
  - (a) To decide discharging coefficient by measurement, it shall be nominal discharge coefficient stipulated in JIS B 8210 (Safety valves-Measuring methods for coefficient of discharge), or coefficient decided by method can be deemed equal to this.
  - (b) In case that steam pressure is less than 0.4 MPa and fluid is saturated steam, coefficient by steam character (C) shall be C value at temperature corresponding to steam pressure 0.4 MPa in table 1 of JIS B 8210 annex.
- D. As method to calculate discharge capacity of safety valve of dowertherm boiler, for example, there shall be a method according to the stipulation of annex 3 of JIS B 8210. Regarding flow rating pressure, absolute pressure value of 1.1 times as much as designed pressure or absolute pressure value which is designed pressure added to 0.02 MPa, whichever greater.
- E. Because flow area of lift type safety valve is  $\pi D l$  (D: diameter of valve seat hole, l: lift), if sectional area of steam incoming port  $\pi D'2/4$  (D': diameter of steam incoming port) is larger than this value, it shall be acceptable that  $D' < D$ . However, if  $D'$  is too small, rapid change of steam flow velocity shall be prevented.
- F. As nominal diameter of safety valve of steam boiler, for example, nominal size shall be 25A or more. In this case, regarding safety valve of steam boiler according to the stipulation of 15.6 in JIS B 8201, and full bore type safety valve and lift type safety valve with lift which is 1/15 or more of seat diameter. Its nominal size shall be able to be made 20A or more.
- G. To install more than one safety valve on the common pipe mount, sectional area of steam passage on the mount shall be equal to or larger than sum of total area of steam incoming port of safety valve. However, total area of safety valve is less than effective sectional area but equal to or larger than area of safety valve required for boiler, it is acceptable to admit it.

(2) Related to paragraph 3

\*“Safety place” shall mean high place at outdoors, without fire or other ignitable articles, and the place where danger of ignition and explosion of steam by diffusion can be eliminated.

(Relief Valve or Safety Valve for Hot Water Boilers)

(April 30, 2003 Labor Standards Bureau Notification No. 0430004)

**Article 65.**

1. Any hot water boiler not exceeding 120°C in working water temperature shall be equipped with a relief valve that is immediately actuated whenever the pressure in the boiler reaches the maximum allowable working pressure and keeps the internal pressure not exceeding the maximum allowable working pressure. However, this provision does not apply where a water relief pipe that keeps the internal pressure not exceeding the maximum allowable working pressure is installed at the part of such boiler which is easily accessible for inspections.
2. Hot water boilers exceeding 120°C in working water temperature shall be equipped with a safety valve.

## Abstract of “Construction code for boilers”

 **Warning**

Do not apply the product to devices which do not allow any valve seat leakage.  
 \* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).

 **CAUTION**

Please refer to the manual attached to the product for procedures for installation and operation.

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**46 Related to Article 65**

- (1) As relief valve or relief pipe in accordance with paragraph 1, for example, there shall be followings:
- A. For relief valve, nominal size (15A at smallest) and quantity shall be decided without exceeding the value of hot water boiler pressure plus 10% or more of maximum usage pressure (0.034 MPa when this value is less than 0.034 MPa). Size of relief valve shall be on annex 1 "calculation formula to determine the size of relief valve for hot water".
- B. Internal diameter of relief pipe shall conform to the stipulation of 15. 15 in JIS B 8201.
- (2) As safety valve equipped with hot water boiler in paragraph 2, for example, nominal size shall be 20A or more and 100A or less, and its discharge capacity calculation shall conform to annex 2 of JIS B 8210. However, in this case, evaporation amount (unit: kg/h) shall be the value obtained by dividing heat output by difference between specific enthalpy of saturated steam corresponding to maximum usage pressure and specific enthalpy of water supply.
- (3) Regarding hot water boiler using heat medium such as oil, in case that temperature of the said heat medium exceeds boiling point at atmospheric pressure, it shall be handled as what safety valve is installed on in conformity with paragraph 2. However, as discharge capacity in this case, for example, it shall conform to the stipulation of JIS B 8210 annex 3, and steam amount (unit kg/ h) in this case shall be the value obtained by dividing heat output by difference between specific enthalpy of saturated steam corresponding to maximum usage pressure and specific enthalpy of water supply.

(April 30, 2003 Labor Standards Bureau Notification No. 0430004)

• **Reference: calculation formula to determine the size of relief valve for hot water (related to boilers)**

(1) Using required discharge capacity of valves

$$S = \frac{W}{87.7\sqrt{(P_1 + 0.1)\kappa Y_1}} \cdots \cdots (1)$$

S : Flow area (mm<sup>2</sup>)

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

P<sub>1</sub> : Discharge capacity deciding pressure<sup>(1)</sup> (MPa)

κ : Difference between saturated temperature ts°C of discharge capacity deciding pressure P<sub>1</sub> and hot water temperature at inlet side of valve Δt°C correction coefficient for t1°C, conforming to Table 1.

Y<sub>1</sub> : Density of hot water at inlet side of valve (kg/l), conforming to Table 1.

However, at formula 1, if the value of (P<sub>1</sub> + 0.1) K MPa exceeds the value of difference between discharge capacity deciding pressure P<sub>1</sub> MPa and pressure at outlet side of valve P<sub>2</sub> MPa, (P<sub>1</sub> + 0.1) K shall be replaced by (P<sub>1</sub> - P<sub>2</sub>) and calculated.

(Notice)<sup>(1)</sup> The said discharge capacity deciding pressure means, at construction code for boilers and construction code for pressure vessels, the set pressure of relief valve plus the value corresponding to its 10% (0.034 MPa at minimum).

**Remark**

Only for hot water boiler, relief valve for hot water is applied to in case that hot water temperature is 120°C or less. Exceeding 120°C, according to the article 65 paragraph 2 of construction codes for boilers, safety valve shall be equipped. Its largeness can be obtained by the formula to calculate discharge capacity of safety valve stipulated in L, second, 43 (1) 3. In this case, according to the article 65 paragraph 2 of construction codes for boilers, required discharge capacity of safety valve W (kg/h) is obtained by the following formula:

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

Q : Heat output (kJ/h)

h<sub>1</sub> : Enthalpy of saturated steam corresponding to maximum usage pressure of boiler (kJ/kg)

h<sub>2</sub> : Enthalpy of water supply (kJ/kg)

$$S = \frac{Q\varepsilon}{87.7C\sqrt{(P_1 + 0.1)\kappa Y_1}} \cdots \cdots (2)$$

Q : Heat input of pressure vessel or heat output of boiler for hot water (kJ/h)

ε : Coefficient of volume expansion for water, conforming to Table 2.

C : Specific heat at constant pressure for water (kJ/kg °C)

**Warning**

Do not apply the product to devices which do not allow any valve seat leakage.  
 \* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).

**CAUTION**

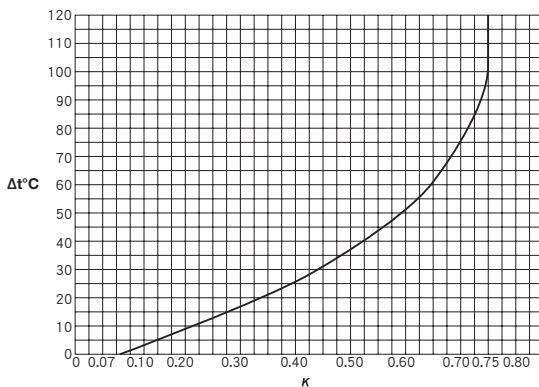
Please refer to the manual attached to the product for procedures for installation and operation.

Table-6 Density of hot water

(kg/L)

Pressure MPaA Temperature °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	0.988	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	0.887	0.888	0.888	0.888
190							0.876	0.876	0.876	0.876	0.877	0.877	0.877
200								0.865	0.865	0.865	0.865	0.865	0.865
210										0.853	0.853	0.853	0.853
220													0.841

Remark Intermediate value of this table shall be calculated by proportional method.

Fig. 3 Correction coefficient  $\kappa$ 



**Warning**

Do not apply the product to devices which do not allow any valve seat leakage.  
 \* The product has allowable valve seat leakage and does not close completely (valve seat leakage cannot be zero).

**CAUTION**

Please refer to the manual attached to the product for procedures for installation and operation.

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Safety Relief Valve

Table-7 Specific heat at constant pressure and coefficient of volume expansion

Temperature °C	Specific heat at constant pressure kJ/kg°C	Coefficient of volume expansion L/°C
40	4.179	0.00039
50	4.181	0.00046
60	4.185	0.00053
70	1.190	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

Remark Intermediate value of this table shall be calculated by proportional method.

## Apply Pressure Classification List for Each Safety Valve Model

(unit: MPa)

Model	Nominal size	A	B	C	D	E	F	G	H
AL-150-150L-140 AL-140ML AL-32/32TML	15A	0.05-0.2	$\frac{0.21-0.3}{0.31-0.4}$	0.41-0.55	0.56-0.75	0.76-1.0			
	20A	0.05-0.2	0.21-0.35	0.36-0.45	0.46-0.6	0.61-0.75	0.76-1.0		
	25A	0.05-0.2	0.21-0.35	0.36-0.45	0.46-0.55	0.56-0.8	0.81-1.0		
	32A	0.05-0.2	$\frac{0.21-0.3}{0.31-0.4}$	0.41-0.65	0.66-1.0				
	40A-50A	0.05-0.2	$\frac{0.21-0.3}{0.31-0.4}$	0.41-0.65	0.66-0.8	0.81-1.0			
AL-150H	15A						1.0-1.6		
	20A-25A							1.0-1.6	
	32A					1.0-1.6			
	40A-50A						1.0-1.6		
AL-140H	15A						1.0-1.3	1.31-2.0	
	20A-25A							1.0-1.6	1.61-2.0
	32A					1.0-1.6	1.61-2.0		
	40A-50A						1.0-1.6	1.61-2.0	
AL-150T-150T-N-150TR AL-150TML AL-140T-140TML AL-32T-32TML	15A	0.05-0.2	0.21-0.4	0.41-0.55	0.56-0.75	0.76-1.0			
	20A	0.05-0.2	0.21-0.35	0.36-0.45	0.46-0.6	0.61-0.75	0.76-1.0		
	25A	0.05-0.2	0.21-0.35	0.36-0.45	0.46-0.55	0.56-0.8	0.81-1.0		
	32A	0.05-0.2	0.21-0.4	0.41-0.65	0.66-1.0				
	40A-50A	0.05-0.2	0.21-0.4	0.41-0.65	0.66-0.8	0.81-1.0			
AL-17-27	15A-50A	0.05-0.2	0.21-0.4	0.41-0.65	0.66-1.0	1.01-1.6			
AL-10	15A-40A	0.05-0.2	0.21-0.4	0.41-0.65	0.66-1.0				
	50A	$\frac{0.05-0.1}{0.11-0.2}$	0.21-0.4	0.41-0.65	0.66-1.0				
AL-250-250R AL-260-260R	15A	0.05-0.2	0.21-0.4	0.41-0.55	0.56-0.75	0.76-1.0			
	20A	0.05-0.2	0.21-0.35	0.36-0.45	0.46-0.6	0.61-0.75	0.76-1.0		
	25A	0.05-0.2	0.21-0.35	0.36-0.45	0.46-0.55	0.56-0.8	0.81-1.0		
	32A	0.05-0.2	0.21-0.4	0.41-0.65	0.66-1.0				
	40A-50A	0.05-0.2	0.21-0.4	0.41-0.65	0.66-0.8	0.81-1.0			
AL-300-301	15A-50A	0.05-0.25	0.26-0.5	0.51-0.75	0.76-1.6				
AL-300T-301T	15A-50A	0.05-0.25	0.26-0.5	0.51-0.75	0.76-1.3				
AL-280	15A-20A	0.05-0.2	0.21-0.35	0.36-0.45	0.46-0.6	0.61-0.75	0.76-1.0		
	25A	0.05-0.2	0.21-0.35	0.36-0.45	0.46-0.55	0.56-0.8	0.81-1.0		
	32A	0.05-0.2	0.21-0.4	0.41-0.65	0.66-1.0				
	40A-50A	0.05-0.2	0.21-0.4	0.41-0.65	0.66-0.8	0.81-1.0			
AL-4-4T	65A	0.05-0.1	0.11-0.25	0.26-0.55	0.56-1.0	1.01-1.5			
	80A-125A	0.05-0.1	0.11-0.2	0.21-0.4	0.41-0.8	0.81-1.5			
	150A	0.05-0.1	0.11-0.2	0.21-0.4	0.41-0.8				
AL-4S-4ST	65A	0.05-0.1	0.11-0.25	0.26-0.55	0.56-1.0	1.01-2.0			
	80A-100A	0.05-0.1	0.11-0.2	0.21-0.4	0.41-0.8	0.81-1.6	1.61-2.0		
AL-5	20A	0.05-0.12	0.13-0.21	0.22-0.35	0.36-0.63	0.64-0.99	1.0-1.5		
	25A	0.05-0.08	0.09-0.15	0.16-0.25	0.26-0.45	0.46-0.75	0.76-1.0	1.01-1.1	1.11-1.5
	32A	0.05-0.08	0.09-0.17	0.18-0.25	0.26-0.45	0.46-0.75	0.76-1.0	1.01-1.1	1.11-1.5
	40A	0.05-0.08	0.09-0.15	0.16-0.4	0.41-0.7	0.71-1.0	1.01-1.1	1.11-1.5	
	50A	0.05-0.09	0.1-0.25	0.26-0.5	0.51-0.7	0.71-1.0	1.01-1.1	1.11-1.5	
AL-6	65A	0.05-0.1	0.11-0.25	0.26-0.55	0.56-1.0	1.01-1.5			
	80A	0.05-0.1	0.11-0.2	0.21-0.4	0.41-0.8	0.81-1.0	1.01-1.5		
	100A	0.05-0.1	0.11-0.2	0.21-0.4	0.41-0.8	0.81-1.0	1.01-1.5		
	125A	0.05-0.1	0.11-0.2	0.21-0.4	0.41-0.8	0.81-1.0	1.01-1.5		
	150A	0.05-0.1	0.11-0.2	0.21-0.4	0.41-0.8				
AL-31-31H	15A	0.05-0.15	$\frac{0.16-0.25}{0.26-0.35}$	$\frac{0.36-0.45}{0.46-0.55}$	$\frac{0.56-0.65}{0.66-0.75}$	$\frac{0.76-0.85}{0.86-1.0}$	1.0-1.3	$\frac{1.31-1.6}{1.61-2.0}$	
	20A	0.05-0.2	0.21-0.3		$\frac{0.31-0.4}{0.41-0.5}$	0.51-0.7	0.71-1.0	$\frac{1.0-1.3}{1.31-1.6}$	1.61-2.0
	25A	0.05-0.2	0.21-0.3	0.31-0.45	0.46-0.55	$\frac{0.56-0.65}{0.66-0.8}$	0.81-1.0	1.0-1.6	1.61-2.0
	32A-50A	0.05-0.2	0.21-0.3	0.31-0.5	0.51-0.65	0.66-0.8	0.81-1.0	1.0-1.6	1.61-2.0