MODEL AL-31, 31H
SAFETY RELIEF VALVE

Thank you very much for choosing the Yoshitake's product. To ensure the correct and safe use of the product, please read this manual before use. This manual shall be kept with care for future references.
The symbols used in this manual have the following meanings.

Warning	This symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
Caution	This symbol indicates a hazardous situation that, if not avoided, may result in minor or moderate injury or may result in only property damage.

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YOSHITAKE

■EPDT-436■

1. Specifications

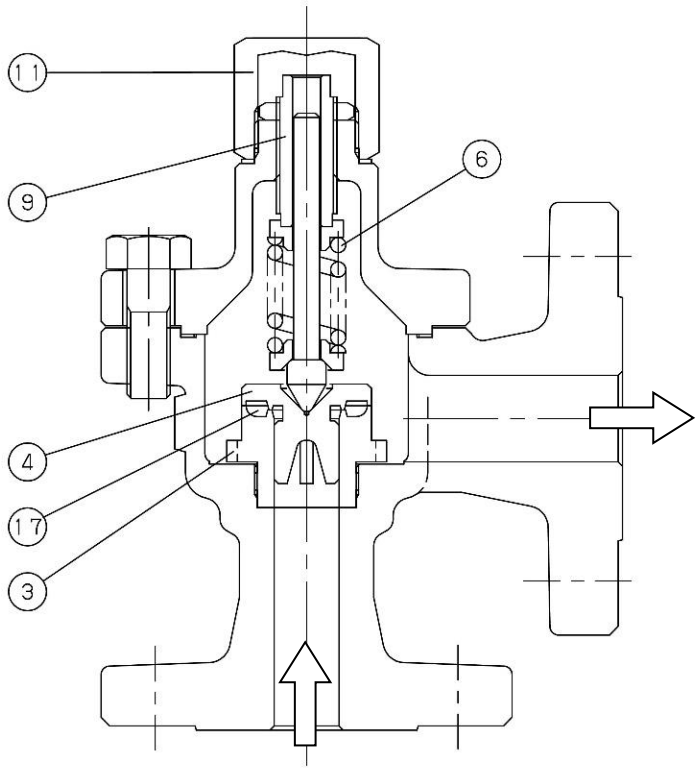
Model	AL-31	AL-31H
Structure	Closed type *	
Application	Steam, Air, Cold and hot water, Oil, Other non-dangerous fluids	
Working pressure	0.05 ~ 1.0 MPa	1.0 ~ 2.0 MPa
Maximum temperature	220 ˚C **	
Connection	JIS 10K RF	JIS 16K RF JIS 20K RF
Nominal size	15 - 50A	

***** The structure in which the fluid is discharged only from the outlet.
****** The maximum temperature is 150˚C when the fluid is liquid.

⚠ Caution

1. Please confirm that the indications on the product correspond with the specifications of the ordered product model before use.
   * If they are different, do not use the product and contact us.
2. Do not apply the product to devices which do not allow any valve seat leakage.
   * This product is compliant with the 'JIS B 8210 Safety Valves' standard, which allows valve seat leakage and does not close completely (valve seat leakage cannot be zero).
3. Do not use the product for equipment or device which vibrates excessively.
   * Failure to follow this notice may result in malfunction.
4. Do not adjust or change the set pressure.
   * Failure to follow this notice may result in damage to the equipment.

2. Operation



3	Valve Seat
4	Valve
6	Spring
9	Adjusting Screw
11	Cap
17	Pressure Groove

Fig.1 Structure

■ Blowout operation

As the inlet pressure approaches the blowout pressure, the force of fluid pushing up the valve [4] approaches the force of the spring [6] pressing down the valve [4]. The safety relief valve commences to blow when the inlet pressure reaches around 3% below the blowout pressure.

The fluid accumulates gradually on the pressure groove [17] and when the fluid pressure reaches the blowout pressure the valve [4] pops.

■ Closing operation

Since the inlet pressure of the safety relief valve decreases when the fluid is released into the atmosphere by the pop action of valve [4], the force of fluid lift is lowered. At this point, the repelling force of the spring [6] becomes larger than the force of fluid lift and thus the valve closes. In addition, while the safety relief valve discharges, pressure of fluid entering into the back of the valve [4] (back pressure) adds to the closing force.

3. Nominal Size Selection Table

3.1 AL-31

■ **For steam (at saturated temperature)**

Capacity <Pressure vessel structure standard> [kg/h]

Nominal size	Blowout area [mm^2]	Set pressure [MPa]										
		0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	20.1	15	20	29	40	50	60	70	80	90	100	109
20A	34.6	27	35	51	69	87	104	121	138	155	172	189
25A	53.0	42	54	78	105	133	159	186	212	237	263	289
32A	85.5	67	87	127	170	215	257	300	342	383	425	467
40A	132.0	104	135	196	263	332	397	463	528	592	656	721
50A	204.2	161	209	303	407	513	615	716	817	916	1016	1116

■ **For air (at 20˚C)**

Capacity <Pressure vessel structure standard> [kg/h]

Nominal size	Blowout area [mm^2]	Set pressure [MPa]										
		0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	20.1	25	33	48	65	81	98	114	131	147	164	181
20A	34.6	44	57	83	111	140	169	197	226	254	283	311
25A	53.0	67	87	127	171	215	258	302	346	390	433	477
32A	85.5	108	141	205	276	347	417	448	558	629	699	770
40A	132.0	168	218	317	426	535	644	753	862	971	1080	1189
50A	204.2	259	338	491	660	828	997	1166	1334	1503	1671	1840

■ **For water (at 20˚C, accumulation: 25%)**

Capacity <Yoshitake standard> [m^3/h]

Nominal size	Blowout area [mm^2]	Set pressure [MPa]										
		0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	20.1	0.2	0.3	0.5	0.6	0.7	0.8	0.8	0.9	1.0	1.0	1.1
20A	34.6	0.4	0.6	0.8	1.0	1.2	1.3	1.5	1.6	1.7	1.8	1.9
25A	53.0	0.6	0.9	1.3	1.6	1.8	2.1	2.3	2.5	2.6	2.8	2.9
32A	85.5	1.0	1.5	2.1	2.6	3.0	3.4	3.7	4.0	4.3	4.5	4.8
40A	132.0	1.6	2.3	3.3	4.0	4.7	5.2	5.7	6.2	6.6	7.0	7.4
50A	204.2	2.5	3.6	5.1	6.3	7.2	8.1	8.9	9.6	10.3	10.9	11.5

[Example for water] When the set pressure of 1.0 MPa, and the valve size is 25A.

The capacity is 2.9 m^3/h, when the inlet pressure reaches 1.25 MPa (accumulation becomes 25%) after the fluid pressure reaches the set pressure of 1.0 MPa.

3.2 AL-31H

■ For steam (at saturated temperature)

Capacity <Pressure vessel structure standard> [kg/h]

Nominal size	Blowout area [mm²]	Set 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	20.1	119	129	139	149	149	158	168	178	188	198	207
20A	34.6	206	222	239	256	256	273	290	306	324	340	357
25A	53.0	315	341	367	363	393	418	444	470	496	522	547
32A	85.5	509	550	592	634	634	675	716	758	800	842	883
40A	132.0	786	850	914	979	979	1042	1106	1171	1236	1300	1364
50A	204.2	1216	1315	1414	1514	1514	1612	1712	1811	1912	2011	2110

■ For air (at 20˚C)

Capacity <Pressure vessel structure standard> [kg/h]

Nominal size	Blowout area [mm²]	Set 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	20.1	181	197	214	230	247	264	280	297	313	330	347
20A	34.6	311	340	368	397	426	454	483	511	540	568	597
25A	53.0	477	521	565	608	652	696	740	783	827	871	915
32A	85.5	770	841	911	982	1052	1123	1193	1264	1335	1405	1476
40A	132.0	1189	1298	1407	1516	1625	1734	1843	1952	2061	2170	2279
50A	204.2	1840	2008	2177	2345	2514	2682	2851	3020	3188	3357	3525

■ For water (at 20˚C, accumulation: 25%)

Capacity <Yoshitake standard> [m³/h]

Nominal size	Blowout area [mm²]	Set 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	20.1	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6
20A	34.6	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.6	2.7
25A	53.0	2.9	3.1	3.2	3.4	3.5	3.6	3.7	3.9	4.0	4.1	4.2
32A	85.5	4.8	5.0	5.2	5.5	5.7	5.9	6.1	6.2	6.4	6.6	6.8
40A	132.0	7.4	7.8	8.1	8.4	8.8	9.1	9.4	9.7	9.9	10.0	10.5
50A	204.2	11.5	12.0	12.6	13.1	13.6	14.1	14.5	15.0	15.4	15.8	16.3

[Example for water] When the set pressure of 2.0 MPa, and the valve size is 25A.

The capacity is 4.2 m³/h, when the inlet pressure reaches 2.5 MPa (accumulation becomes 25%) after the fluid pressure reaches the set pressure of 2.0 MPa.

4. Installation

⚠ Warning

1. Do not install any closing device such as a stop valve at inlet or outlet sides of the product.
2. Do not apply the product to devices which do not allow any valve seat leakage.
   * This product is compliant with the 'JIS B 8210 Safety Valves' standard, which allows valve seat leakage and does not close completely (valve seat leakage cannot be zero).
3. Do not disassemble the product.
4. Install an exhaust pipe on outlet side of the product, and lead it to a place where there is no risk of physical damage even if fluid blows out.
   * Failure to follow this notice may result in injury and scalds in case of fluid blow out.
5. Do not apply viscous fluid that may make fixation of the valve and valve seat.
   * Failure to follow this notice may prevent the product from functioning properly.
6. Connect the product to the pipes securely.
   * Improper connecting may cause fluid leakage from the piping joint when vibration is applied, or may cause scalds in case that fluid is hot.

⚠ Caution

1. Before installing the product, remove foreign substances and scale from the piping.
   * Failure to follow this notice may prevent the product from functioning properly.
2. When installing the product, match the direction of fluid flow with the inlet and outlet of the product respectively.
   * Failure to follow this notice may prevent the product from functioning properly.
3. Install the product vertically with the cap [11] facing upward.
   * Failure to follow this notice may prevent the product from functioning properly.
4. Securely support and fasten the pipes.
   * If an excessive stress is applied to the piping, the valve [4] or the valve seat [3] may be deformed and not open/close.
5. Lead exhaust pipe to outside of buildings if there is a risk that fluid blowout causes alarm activation or contamination of the peripheral equipment.
   * Improper placement may cause contamination of the peripheral equipment.
6. If there is a risk that condensate or rain water accumulates in exhaust pipe, attach drain pipe with the product and/or the exhaust pipe in a position where they can be drained.
   * Failure to follow this notice may cause rust and result in malfunction.
7. Inner diameters of pipe mount and of exhaust pipe shall be more than those of each inlet and outlet of the product (see Fig.2).
   * Failure to follow this notice may result in malfunction or insufficient amount of blowout.
8. Secure enough space required for maintenance or inspections.
   * Failure to follow this notice prevents maintenance and inspections being implemented.
9. Avoid rapid pressure change. Impact by a rapid pressure change, such as water hammer, may damage the product/parts.
10. Do not apply excessive load, torque or vibration to the product.

■ Cleaning the inside of the piping

1. Please clean the inside of the pipe thoroughly and remove any dust or scales before installing the product. **Please note that all repairs for disorders due to foreign substances shall be charged.**

■ Pipe mount

1. Pipe mount should have sufficient strength and rigidity against stress which are induced by reaction force in opposite direction of the exhaust through the axis of the exhaust pipe.
2. Pressure loss in pipe mount leads to decrease in the discharge volume and to unstable operation of the product. To prevent this from happening, install the product vertically as close as possible to the can body and the header. In addition, place the product in a position where maintenance and inspection can be done easily.
3. Inner diameter of pipe mount shall be more than that of the product inlet.

■ Exhaust pipe

1. Install exhaust pipe and drip pan elbow so that the product cannot be subject to the stress caused by thermal expansion of equipment and by dilatation of the exhaust pipe due to thermal action of blowout.
2. Inner diameter of exhaust pipe shall be more than that of the product outlet to avoid improper back pressure.

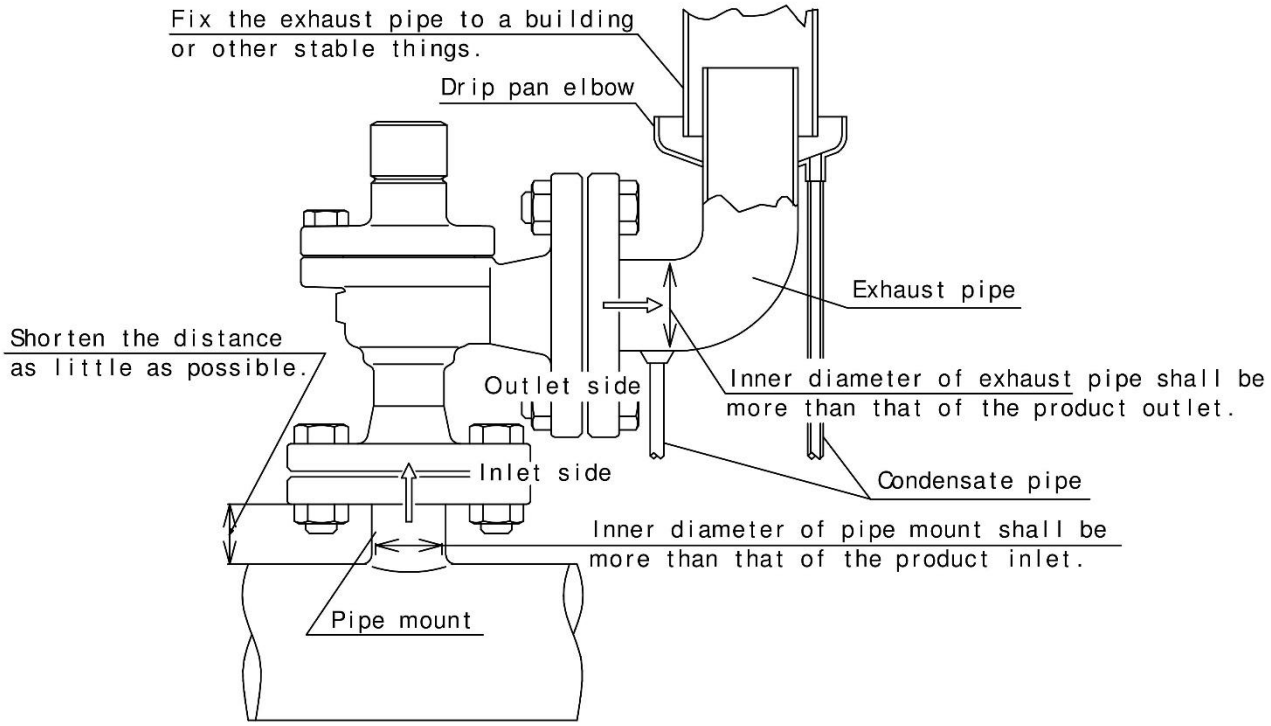


Fig.2 Piping example

5. Maintenance

⚠ Warning

1. Do not touch the product/pipes with bare hands.
   * Failure to follow this notice may result in scalds or injury in case that fluid is hot.
2. When checking the operation of the product, wear earplugs and stand clear of exhaust pipe end during inspection. Do not look down or touch the open end of the exhaust pipe.
   * Failure to follow this notice may result in scalds or injury due to blow-off. Be aware that the product makes a loud noise at start-up.
3. Do not remove the cap [11].
   * Failure to follow this notice may cause danger due to blow-off from the adjusting screw [9].
4. Do not disassemble the product.
   * Please contact us if any abnormal condition is observed.

⚠ Caution

1. Before applying higher pressure fluid to the product, check that no problems have occurred in the equipment on the piping.
   * Failure to follow this notice may damage the equipment.
2. Completely discharge fluid from the product and piping before leaving the product not operated for a long time.
   * Failure to follow this notice may cause foreign substances and scale inside of the piping and may result in malfunction of the product.
3. If the product is not operated for a long time, perform test working before starting operation.

5.1 Daily inspection

Check the following items while the system is in operation.

- Corrosion or crack on the product
- Leakage from the product under normal working pressure (check it visually and aurally).
- Leakage from joints between the product and piping.
  * Please contact us if any abnormal condition is observed.

5.2 Monthly inspection

1. Check that there is no loose piping at inlet and outlet side of the product. In addition, check that the cap [11] is fastened securely.
2. Check the operation of the product by raising fluid pressure to the set pressure.
   * Please contact us if any abnormal condition is observed.

5.3 Troubleshooting

Trouble	Cause	Remedy
Leakage detected visually/aurally at the outlet *	1. Foreign substance or scale stuck on contact surface between the valve [4] and valve seat [3].	1. Follow the procedure described in 5.2.2. to operate the product and eliminate the foreign substance and scale. Please contact us if the trouble does not stop.
	2. Damage on contact surfaces of the valve [4] and valve seat [3].	2. The product needs to be disassembled and its parts need to be replaced. Please contact us.
	3. Excessive vibration applied to the piping where the product is installed.	3. The product should not be used on device or equipment that vibrates excessively.
	4. The pressure difference between the set pressure and the normal working pressure is too small.	4. Increase the pressure difference. If the set pressure needs to be readjusted, please contact us.
	5. The pressure momentarily exceeds the set pressure because of fluid pulsation.	5. In view of fluid pulsation, the set pressure needs to be raised (readjusted) or the normal working pressure needs to be lowered. To raise (readjust) the set pressure, please contact us.
	6. Fluid flows into the outlet piping.	6. Change the piping layout to keep the fluid from flowing into the outlet piping.
Blows at a pressure lower than the set pressure.	1. The pressure gauge is out of order.	1. Calibrate the pressure gauge or replace it with a new one.
	2. The product does not keep the accuracy of its set pressure.	2. The set pressure needs to be readjusted. Please contact us.
Does not operate at the set pressure.	1. The pressure gauge is out of order.	1. Calibrate the pressure gauge or replace it with a new one.
	2. Sliding parts of the valve [4] and valve seat [3] do not move smoothly.	2. The product needs to be disassembled and cleaned. Please contact us for repair.
	3. There is a back pressure at the piping of the product outlet.	3. Remove the back pressure. Change the piping layout not to allow the back pressure exist.
	4. The product does not keep the accuracy of its set pressure.	4. The set pressure needs to be readjusted. Please contact us.
Does not stop blowing.	1. Foreign substance or scale stuck on contact surface between the valve [4] and valve seat [3].	1. Follow the procedure described in 5.2.2. to operate the product and eliminate the foreign substance and scale. Please contact us if the trouble does not stop.
	2. Sliding parts of the valve [4] and valve seat [3] do not move smoothly.	2. The product needs to be disassembled and cleaned. Please contact us.
	3. The normal working pressure exceeds the closing pressure.	3. Increase the difference between the set pressure and normal working pressure. If the set pressure needs to be readjusted, please contact us.
	4. The product is installed at outlet side of pressure reducing valve which is out of order, and the reduced pressure of the valve is getting higher than expected.	4. The pressure reducing valve needs to be repaired. If it is Yoshitake's product, please contact us.

* This product is compliant with the 'JIS B 8210 Safety Valves' standard, which allows valve seat leakage and does not close completely (valve seat leakage cannot be zero).

Warranty Information

1. Limited warranty

   This product has been manufactured using highly-advanced techniques and subjected to strict quality control. Please be sure to use the product in accordance with instructions on the manual and the label attached to it.

   Yoshitake warrants the product to be free from any defects in material and workmanship under normal usage for a period of one year from the date of receipt by the original user, but no longer than 24 months from the date of shipment from Yoshitake's factory.

2. Parts supply after product discontinuation

   This product may be subject to discontinuation or change for improvement without any prior notice. After the discontinuation of the product, Yoshitake supplies the repair parts for 5 years otherwise individually agreed.

3. This warranty does not cover the damage due to any of below:
   (1) Valve seat leakage or malfunction caused by foreign substances inside piping.
   (2) Improper handling or misuse.
   (3) Improper supply conditions such as abnormal water pressure/quality.
   (4) Water scale or freezing.
   (5) Trouble with power/air supply.
   (6) Any alteration made by other than Yoshitake.
   (7) Use under severe conditions deviating from the design specifications
   (e.g. in case of corrosion due to outdoor use).
   (8) Fire, flood, earthquake, thunder and other natural disasters.
   (9) Consumable parts such as O-ring, gasket, diaphragm and etc.

   Yoshitake is not liable for any damage or loss caused by malfunction or defect of the product.

YOSHITAKE