AF－7・7M

FULL BORE SAFETY VALVE

Instruction Manual

Thank you very much for purchasing our safety valves.
Please read this instruction manual thoroughly before using the safety valve, so that you may do so correctly and safely. Please carefully store this manual in a handy place.

－－－－－－The following safety symbols are used in this manual.－－－－－

⚠ Warnings	This symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
⚠ Cautions	This symbol indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. (“Caution” may also be used to indicate other unsafe practices or risks of property damage.)

Contents

Yoshitake INC.

Overview

Suited for installation on steam boilers, various pressure vessels, instrumentation apparatus, and the secondary side of pressure reducing valves. Yoshitake's Safety Relief Valves prevent accidents due to the abnormal rise in piping pressure.

1. Features
   (1) The product is designed according to JIS B 8210 for spring loaded safety relief valves for steam boilers and gas pressure vessels.
   (2) The sealed structure of model AF-7M prevents any external leakage of fluid during operation.

2. Specifications

Model		AF-7	AF-7M
Type		Open lever type*1	Enclosed type*2
Fluids		Steam, air, and other non-corrosive gases	Air and other non-corrosive gases
Pressure range		0.1 ~ 1.0 MPa	
Temperature range		5 ~ 350 ℃	5 ~ 300℃
Super imposed back pressure		0 MPa	
Connections		Inlet: JIS 10K RF flange or JIS 20K RF flange (JIS B 2238) Outlet: JIS 10K FF flange (JIS B 2238)	
Size (mm)		25, 40, 50, 65, 80, 100	
Material	Body	Carbon steel casting	
	Valve & valve seat	Stainless steel	

*1 A safety valve which is so constructed that a part of the fluid blown off from the valve seat opening is also discharged outside from other part than the valve outlet.

*2 A safety valve which is so constructed that the fluid blown off from the valve seat opening is not allowed to discharge outside from other part than the valve outlet.

⚠Warnings

(1) Do not use this product on equipment and apparatus that do not allow any valve seat leakage.
 ＊This product has valve seat leakage within tolerance, and cannot be sealed completely (Zero valve seat leakage cannot be obtained).
 This product cannot be used for apparatus and facilities with considerable vibration.
 ＊Vibration may cause the product to make errors.

⚠ Cautions

Please confirm that the indications on the product name plate coincide with the specifications of the ordered product model before usage.
＊ In case they do not coincide, do not use the product and contact us.

3. Dimensions and Weights

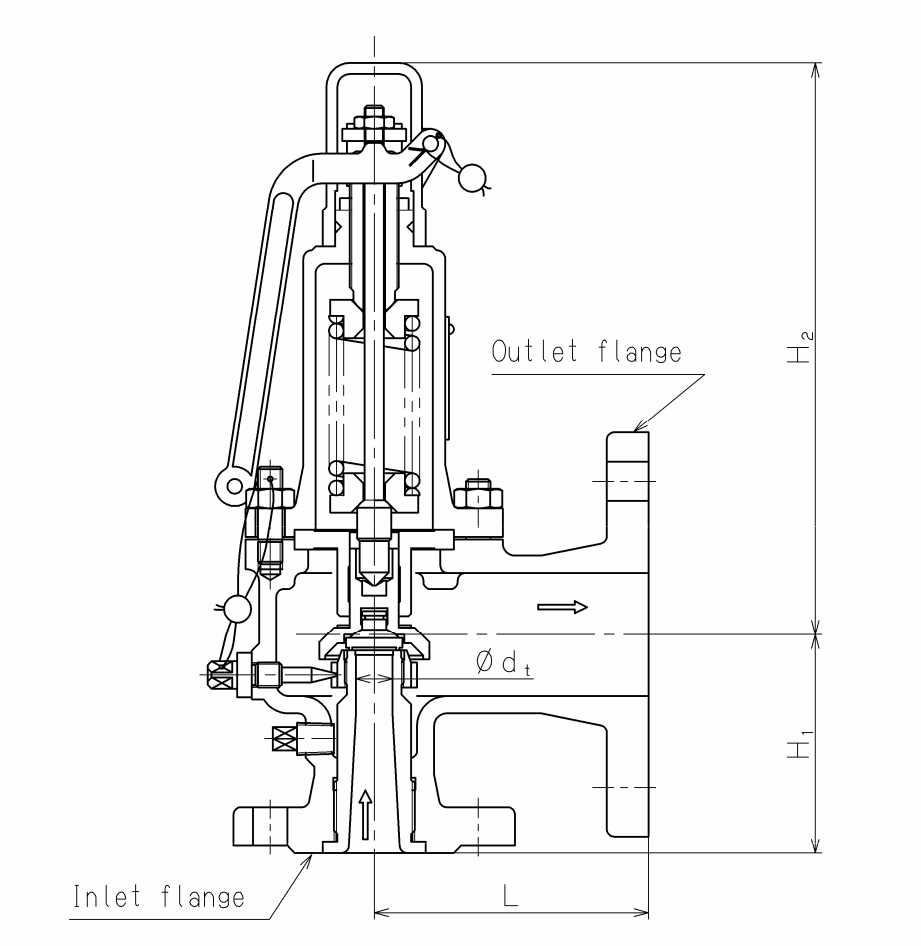

Figure 1 Dimensions (Model AF-7)

Size (mm)	Connection flange Inlet × Outlet	dt (mm)	Blowout area (mm^2)	Rated lift (mm)	L (mm)	H_1 (mm)	＊H_2 (mm)		Weight (kg)
							AF-7	AF-7M	
25	25×32	16	200.9	4.0	100	85	226	231	10
40	40×50	25	490.6	6.3	120	110	273	270	20
50	50×65	32	803.8	8.0	135	120	325	321	25
65	65×80	40	1256.0	10.0	160	125	366	361	40
80	80×100	50	1962.5	12.5	170	135	375	370	52
100	100×125	65	3316.6	16.3	205	160	612	580	75

＊ All values for types AF-7 and AF-7M are identical except dimension of H_2.

4. Structure

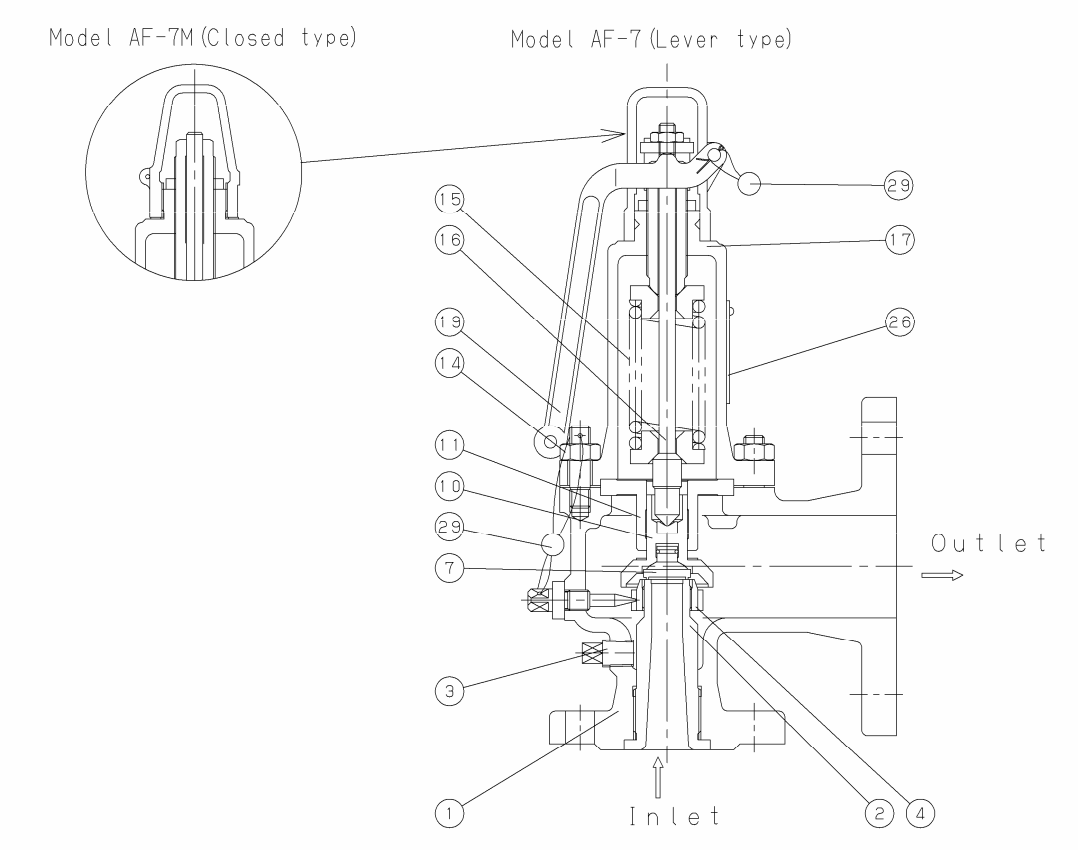

Figure 2　Structure

No.	Name of parts	No.	Name of parts
1	Body	14	Nut
2	Valve seat	15	Spring
3	Drain plug (R3/8)	16	Spindle
4	Seat ring	17	Spring chamber
7	Valve	19	Lever (on Model AF-7)
10	Valve holder	26	Name plate
11	Guide	29	Seal

5. Operation

Discharge

When the pressure at the inlet side of the safety valve rises and approaches the set pressure, the fluid pressure which pushes the valve ⑦ approaches the pressure of the spring ⑮ which is holding down the valve ⑦. Pre-leaking which is as low as 3% of the discharge pressure occurs at this point. (The pressure at this point is called the commence to discharge pressure. In case of safety valve for gases, the set pressure is generally the commence to discharge pressure.)

The fluid which has started to pre-leak gradually accumulates in the valve holder ⑩, and when it reaches the prescribed discharge pressure, the valve pops. (The pressure at this point is called the popping pressure. In case of safety valves for steam, the set pressure is generally the popping pressure.)

Closing

When the valve ⑦ pops, and the fluid is discharged into the air, the pressure on the safety valve inlet decreases, lowering the pressure of the fluid to raise the valve. Thus, the resilience of the spring ⑮ becomes stronger, and the valve closes. When the safety valve is discharging, the pressure from the fluid coming in from the back of the valve holder ⑩ (back pressure) adds to the pressure for the valve to close.

6. Size selection tables

6.1 For steam (Saturation temperature)

[Pressure vessel structure specifications] (kg/h)

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

[Boiler structure specifications] (kg/h)

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

6.2 For air (20℃) [Pressure vessel structure specifications] (kg/h)

size (mm)	Bore of throat (mm)	Blowout area (mm^2)	Set pressure (MPa)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
25	16	200.9	278	424	570	716	862	1008	1154	1300	1446	1592
40	25	490.6	680	1036	1393	1749	2106	2462	2819	3175	3532	3888
50	32	803.8	1114	1698	2282	2866	3451	4035	4619	5203	5787	6371
65	40	1256.0	1742	2654	3567	4479	5392	6305	7217	8130	9042	9955
80	50	1962.5	2722	4148	5573	6999	8425	9851	11277	12703	14129	15555
100	65	3316.6	4600	7010	9419	11829	14239	16649	19058	21468	23878	26288

7. Installation

7.1 Example of piping

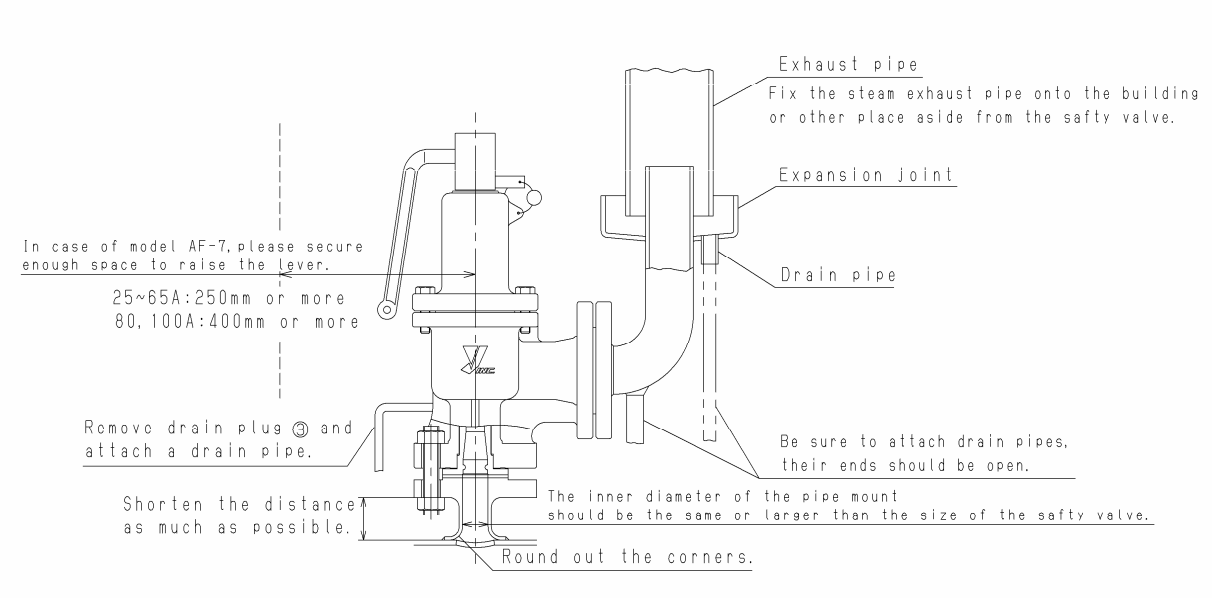

Figure 3 Figure of piping example (for steam)

7.2 Warnings and cautions for product installation

⚠Warnings

(1) This product is very heavy. Use a suspension or other device to support it securely at installation.
 ∗ The falling of the product may result in injuries.
(2) Attach an exhaust pipe onto the outlet so that the fluid is led to a safe place at discharge.
 ∗ Be aware of scalding and other injuries at discharge.

⚠ Cautions

(1) Cleanse the inside of the pipe thoroughly and remove any dust or scales before installing the product.
 ∗ Remaining dust from insufficient cleansing may obstruct proper operation of the product.
(2) Remove the caps on the inlet and outlet of the product before installation.
(3) Match the fluid flow direction with the inlet and outlet of the product to ensure proper installation.
 ∗ The product will not function if installed improperly.
(4) Please make sure that the product is installed in the proper direction.
 ∗ The product will not function if installed in an improper direction.
(5) Securely support and fasten the piping.
 ∗ Excess stress on the piping will cause deformation, obstructing proper opening and closing of the valve.
(6) Do not remove the seal ㉙ from the product.
(7) Upon installation, please choose a place with sufficient space for removal of the product.
 ∗ Insufficient space will obstruct exchange and other necessary work on the product.
(8) If the product is installed in a place where the fluid discharge may trigger the alarm or soil other equipment, extend the exhaust pipe to the outside of the building.
 ∗ Lack of consideration for the location of the exhaust pipe end can result in soiling of other equipment.
(9) Please ensure that the piping connections are secure.
 ∗ Improper connections can result in leaking from the joints with vibrations, and scalding from the fluid.
(10) Since the fluid leaks from model AF-7 upon operation, please take measures to prevent soiling of other equipment.

●Cleansing the inside of the piping

(1) Please cleanse 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 matters shall be charged.

●Installation pipe mount for the safety valve

(1) The pipe mount for the safety valve should have sufficient strength and rigidity against compression, shear and bending stress that is caused in the reaction against the exhaust flowing up through the exhaust pipe attached to the safety valve.

(2) Install the safety valve vertically as close as possible to the can body and header. By doing so, the pressure loss of the mount can be suppressed, preventing decrease in the discharge volume and unstable functioning of the safety valve.

●Installation of an exhaust pipe onto the safety valve

(1) Install an exhaust pipe and expansion joint so that the stress caused by the thermal expansion of the equipment or the fluctuation of the exhaust pipe due to the heat of the safety valve does not affect the safety valve.

●Installation of the flange on the safety valve inlet

(1) As the valve seat is screwed on to the flange inlet, there is a difference in level on the flange surface of this product. Upon installation, apply a flange gasket that suits the nominal size and make sure that the gasket seals the valve seat completely (See Figure 4).

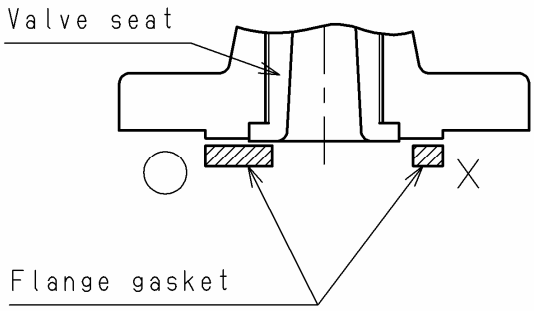

Figure 4　Installation of flange on the inlet

8. Maintenance

⚠ Cautions

(1) Be sure to wear gloves when touching the product or piping.
　＊Be aware of scalding or injuries.
(2) Wear earplugs when checking the operation of the product, and do not stand in front of the exhaust pipe .Do not look into the pipe or put your hand out to the pipe.
　＊The product makes a loud blowing noise during operation. Be aware of spluttering fluid from the product.
(3) In case of raising the fluid pressure, check beforehand that no problems will occur regarding the equipment installed onto the piping.
　＊Be aware of damage to the equipment.
(4) Do not disassemble the product.

8.1 Daily inspection

Please check to see if there is any fluid leaking from the product or piping on the outlet side of the product.

＊Please contact us if you notice anything abnormal.

8.2 Operational inspection (every half year)

(1) Check to see that installation bolts and nuts at the product inlet and outlet, as well as nuts ⑭ installed on the product are all fastened securely.

(2) In case of model AF-7 (lever type), raise the fluid pressure to 75% of the set pressure or higher, raise the lever, and check to see that the fluid blows out. In case of type AF-7M (closed type), raise the fluid pressure to the set pressure, and confirm that the product operates.

＊Please contact us if you notice anything abnormal.

8.3 Periodic inspection

Implement various voluntary inspections according to the laws. If you are a general user, please have the facility or works agent implement the inspection.

8.4 Troubleshooting

Problem	Cause	Measures and treatment
Leakage at the outlet side.	A scale is stuck between the valve ⑦ and valve seat ②.	Follow the procedures in 8.2(2) and operate the safety valve. Contact us If the leakage still fails to stop.
	The piping on which the product is installed vibr-ates.	This product cannot be used on devices and equipment that vibrate considerably.
	There is back pressure on the piping at the outlet side.	Review and change the piping layout.
Operates at pressures lower than the set pre-ssure.	Specifications of the prod-uct and conditions for usa-ge do not coincide.	Check the set pressure printed on the nameplate. Exchange the product if the conditions for usage do not coincide.
	The pressure gauge does not work properly	Calibrate or exchange the pressure gauge.
	Changes occurred in the set pressure of the prod-uct.	The readjustment of set pressure is needed. Please contact us.
Does not operate even though the pressure reaches the set pre-ssure.	Specifications of the safety valve and conditions for usage do not coincide.	Check the set pressure printed on the nameplate. Exchange the product if the usage conditions do not coincide.
	The pressure gauge does not work properly	Calibrate or exchange the pressure gauge.
	Changes occurred in the set pressure of the safety valve.	The readjustment of set pressure is needed. Please contact us.
	The valve holder ⑩ and the guide ⑪ got stuck to-gether.	The product needs to be disassembled and cleaned. Please contact us.