TAV®

Special Safety Valve

Instruction Manual

Please read carefully this Manual before use.

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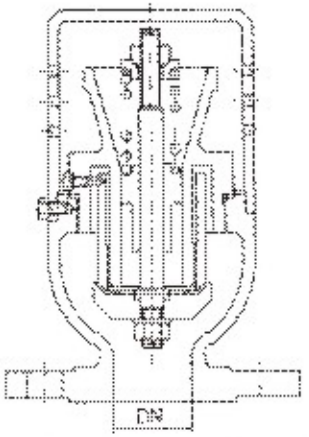
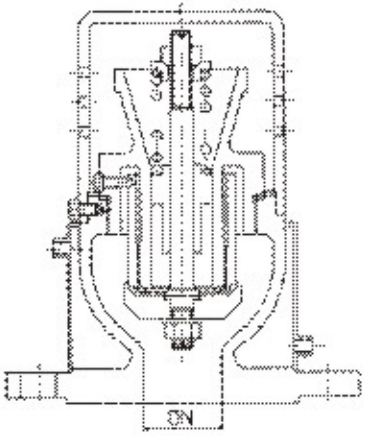
V. Installation & Use

1. Before installation, check if the parameters on nameplate are consistent with the applicable working conditions.
2. The test medium for pressure test which is conducted by professional institution shall be gas, and remember that the import of test medium shall be completely different from the ordinary spring type safety valve.
3. Do not block or cove the inlet of the negative pressure safety valve during the use.



Negative pressure safety valve



Heating jacket negative pressure safety valve

Pilot Safety Valve

I. Usage

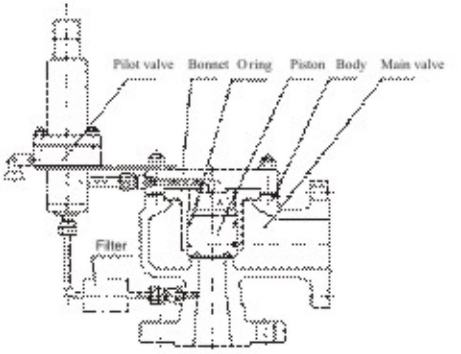
Pilot Safety Valve is mainly applied to such trades as petroleum, natural gas, electricity, and city gas. It is an automatic pressure relieving devise for pressure vessels or pipelines. When the pressure exceeds the allowable value in the system to be protected, the valve will automatically open and discharge some redundant medium to lower down the pressure, and automatically close until the pressure drops to a set value, so as to ensure the system runs normally.

II. Structure & Operational Principle

Pilot Safety Valve is made up of main valve and pilot valve, which improves the sensibility of the valve's open and close by shifting direct function of spring to indirect function of pilot valve. The main valve is of unbalanced float piston structure. The top of the piston is designed larger than the bottom. The piston top and bottom are under the same inlet operating pressure until the set value is reached. However, the net force presses the piston tightly against the valve seat due to the larger size of the top. So the bigger the inlet pressure, the tighter the main valve is sealed.

When the set value is reached, the pilot valve opens and the medium will be released from the chamber A. Here the net force is upwards to lift the piston disc and relieve the medium from the main valve. When the medium pressure is lower than the set value, the pilot valve is closed and the medium pressure acts on the upper chamber of the piston (Part A), then the main valve is sealed.

The pilot valve is of the flowing type and non-flowing type



III. Main Performance Specification

(1)Standard & Criteria

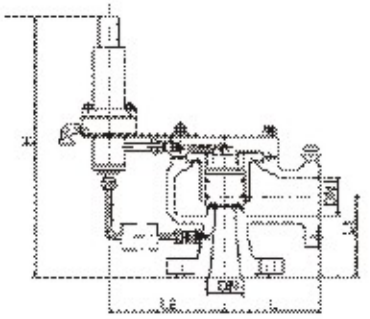
design criterion	API520/ASME Ⅴ Ⅷ/API526	GB/T 12241
structural length standard	API526	JB/T 2203 or manufacturer's standard
flange standard	ANSI B 16.5	JB/T 79、HG20592
inspection and test standard	API527	GB/T 12242

(2) Applicable Working Condition & Characteristics

1. Pressure stage 150Lb-2500Lb, 0.05MPa~42.0MPa
2. Applicable Temperature: -29-260℃
3. Characteristics

(1)The valve seat with soft seal ensures a good seal before and after the valve opens.
(2)The allowable working pressure is close to the set value of the safety valve.
(3)Less overpressure can push the main valve to open fast and fully.
(4) The action, performance and lift are impervious to the back pressure.
(5)The pressure difference between open and close is adjustable.
(6)Non-flowing type pilot valve can reduce the pollution from the noxious medium.
(7)The valve of diaphragm type is applicable to an ultra low pressure condition.

IV. Installation Dimensions & Technical Parameters:



III. Type, Material & Main Parameters

Mated flange	Nominal pressure PN (MPa)	Type										
JB/T 79 GB/T 9115	1.0	TA72H-10C	TA72W-10P	TA72W-10P1	TA72W-10P2	TA72W-10R	TA72W-10R8	TA72W-10R3	TA72W-10T1			
	1.6	TA72H-16C	TA72W-16P	TA72W-16P1	TA72W-16P2	TA72W-16R	TA72W-16R8	TA72W-16R3	TA72W-16T1			
	2.5	TA72H-25C	TA72W-25P	TA72W-25P1	TA72W-25P2	TA72W-25R	TA72W-25R8	TA72W-25R3	TA72W-25T1			
SH3406 ANSI B 16.5	2.0	TA72H-20C	TA72W-20P	TA72W-20P1	TA72W-20P2	TA72W-20R	TA72W-20R8	TA72W-20R3	TA72W-20T1			
Main material	Body	WCB	ZG1Cr18Ni9Ti	CF8(304)	CF3(304L)	ZG1Cr18Ni12Mo2Ti	CF8M(316)	CF3M(316L)	Ti or Ti alloy			
	Seat, Disc, Stem, Adjusting ring	2Cr13	1Cr18Ni9Ti	0Cr19Ni9 (304)	00Cr19Ni11 (304L)	1Cr18Ni12Mo2Ti	0Cr17Ni12Mo2 (316)L	00Cr17Ni12Mo2 (316)L	Ti or Ti alloy			
	spring	50CrVA	50CrVA cladding PTFE									
Applicable working condition	Applicable medium	Water, steam, and oil , etc.	Corrosive mediums like nitric acid		Strong oxidizing medium	Corrosive mediums like acetic acid		Corrosive mediums like carbamide	oxidizing medium			
	Applicable temperature	≤200℃										
open pressure		-0.001 ~ -0.09MPa										
Negative pressure safety valve with insulation jacket		Indicate it by"B"in front of the corresponding type shown above, e.g. BTA72W-10P. The nominal pressure of the jacket is BTA72W-10P (may be defined according to users' requirement.)										

Negative Pressure Safety Valve
TA72 Type Negative Pressure Safety Valve & BTA72 Type
Negative Pressure Safety Valve with Insulation Jacket

I. Usage

Negative Pressure Safety Valve is used in vessels or containers that will produce negative pressures. It can protect the equipment from being flat and broken incurred by negative pressure. When the negative pressure is over the allowable value in vessels, the valve will automatically open and inhale airs, and it will automatically close with the negative pressure return to the set value.

II. Characteristics

(1) It can fast open and close, and obtain sizable discharging ability. It adopts a spring-loaded fully open structure with a disc holder, therefore, when the pressure reaches 15% of the opening pressure, the design can take fully use of the reverse thrust and reach the specified opening height. Its discharging ability is 4-5 times than that of the ordinary proportional breather valve with the same diameter.

(2) It has reasonable structure. The spring is insulated from the medium, which is to avoid the medium corrosion and ensure a stable and reliable performance of the valve.

(3) Users may according to their own requirements choose springs with different rigidity, adjust the spring's pretightening force, and set the opening pressure of the valve.

(4) It adopts guide bush to control the action of moving parts and has proper sealing performance.

(5) It resists dust and rain, and is easy for installation.

(6) According to the specific requirements from users, the insulation jacket can be designed to heat up the valve chamber and thus prevent the medium in chamber from crystallizing or freezing.

(2) Main Overall Dimensions of（K）Type A46F-16/25/40 Pilot Safety Valve

nominal diameter	channel diameter	diameter			
DN/DN1	do	L	L1	L2	H
25/32	15	110	95	180	410
32/40	20	115	100	180	420
40/50	25	120	110	185	440
50/65	32	135	120	195	450
65/80	40	160	125	210	470
80/100	50	170	135	210	485
100/125	65	195	175	235	540
150/175	100	250	210	245	600
150/200	100	240	225	245	600
200/250	125	305	260	285	660
250/300	150	350	320	340	780
300/400	200	370	350	455	890
350/500	250	500	450	480	1150
400/500	300	500	450	480	1190
500/600	400	550	500	550	1300
600/800	500	800	750	800	1550

(2) Main Overall Dimensions of（K）Type A46F-64/100 Pilot Safety Valve

nominal diameter	channel diameter	diameter			
DN/DN1	do	L	L1	L2	H
25/32	15	110	100	185	415
32/40	20	130	110	200	430
40/50	25	130	120	200	440
50/65	32	135	130	210	460
80/100	40	175	160	240	520
100/125	50	195	195	270	675
150/200	65	280	265	300	780
200/250	80	300	300	320	800

(3) Main Overall Dimensions of (K)A46F-160/320 Type Pilot Safety Valve

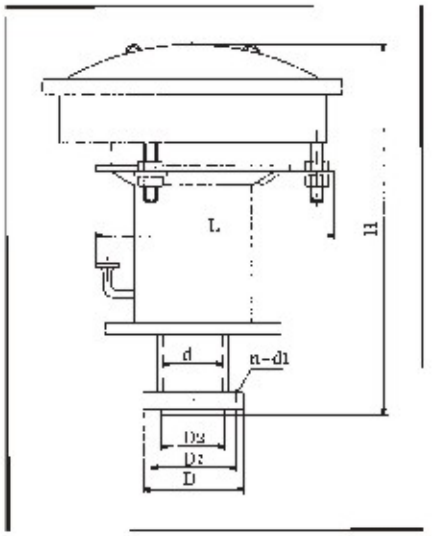
nominal diameter	channel diameter	diameter			
DN/DN1	do	L	L1	L2	H
25/32	12	100	100	200	440
32/50	15	150	150	210	490
40/60	20	165	165	220	550
50/80	25	180	180	240	570

(4) Main Overall Dimensions of (K) A46F-150LB/300LB Type Pilot Safety Valve

nominal diameter	channel diameter	diameter			
DN/DN1	Code	L	L1	L2	H
NPS1/NPS2	D	115	105	180	410
NPS2/NPS3	H	124	136	195	450
NPS3/NPS4	L	165	156	240	550
NPS4/NPS6	P	229	181	250	600
NPS6/NPS8	Q	241	240	285	660
NPS8/NPS10	T	279	276	340	780

1. The inlet and outlet flanges of the (K) A46F-16 Type Pilot Safety Valve shall adopt JB/T79. 1-94: Integral Cast-steel Pipe Flange with Male Face. The average nominal pressure of the inlet and out let pressures shall be 1.6MPa.
2. Both inlet and outlet flange of the (K) A46F-25 Type Pilot Safety Valve shall adopt JB/T79. 1-94: Integral Cast-steel Pipe Flange with Male Face. The average nominal pressure of the inlet and out let pressures shall be 2.5MPa. The outlet nominal pressure shall be 1.6MPa.

Flange standard: JB/T79



5. During the use, it is required to frequently measure the liquid height with oil level dipstick and keep it level with the overflow tube mouth. To fill in the liquid, the plug in the overflow tube bottom shall be opened. When the liquid begins spilling over, stop filling at once and close the bottom with plug. If it is required to change the liquid, users may discharge it through the vent in the lower part of the liquid canister. Besides, users must check the vent plug and liquid canister body frequently and ensure no leakage happens. If problem is found, fix it at once.

6. The valve is designed based on a DN100 central tube.

7. The diameter of the selected hydraulic safety valve shall be the same as that of the tank's inlet and outlet tube.

8. A fire arrester shall be installed under the hydraulic safety valve.

(4) Outline & Connection Dimensions（mm）

Model	Specification	Installation size						
		d	D	D1	D2	n-d1	L	H
GYA-80	80	ϕ85	ϕ185	ϕ150	ϕ125	4-ϕ18	376	424
GYA-100	100	ϕ105	ϕ205	ϕ170	ϕ145	4-ϕ18	500	605
GYA-150	150	ϕ148	ϕ260	ϕ255	ϕ200	8-ϕ18	650	705
GYA-200	200	ϕ210	ϕ315	ϕ280	ϕ255	8-ϕ18	900	755
GYA-250	250	ϕ264	ϕ370	ϕ335	ϕ310	12-ϕ18	1050	885

3. The inlet flange of the (K) A46F-40 Pilot Safety Valve shall adopt JB/T79.2-94: Integral Cast-steel Pipe Flange with Male Face and Female Face. The flange facing is female face and the inlet nominal pressure shall be 4.0MPa. The outlet flange shall adopt JB/T79.1-94: Integral Cast-steel Pipe Flange with Male Face. The flange facing is male face and the outlet nominal pressure shall be 1.6MPa.

4. Both inlet and outlet flange of the (K) A46F-64 Pilot Safety Valve shall adopt JB/T79.2-94: Integral Cast-steel Pipe Flange with Male Face and Female Face. The flange facing is female face and the inlet nominal pressure shall be 6.4MPa. The outlet nominal pressure shall be 4.0MPa.

5. Both inlet and outlet flange of the (K) A46F-100 Pilot Safety Valve shall adopt JB/T79.2-94: Integral Cast-steel Pipe Flange with Male Face and F emale Face. The flange facing is female face and the inlet nominal pressure shall be 6.4MPa. The outlet nominal pressure shall be 4.0MPa.

6. Both inlet and outlet flange of the (K) A46F-150LB Pilot Safety Valve shall adopt ANSIB16.5 flange. The flange facing is RF face and the inlet nominal pressure shall be 150LB. The outlet nominal pressure shall be 150LB.

7. Both inlet and outlet flange of the (K) A46F-300LB Pilot Safety Valve shall adopt ANSIB16.5 flange. The flange facing is RF face and the inlet nominal pressure shall be 300LB. The outlet nominal pressure shall be 150LB.

(5) Working Pressure Range of Pilot Safety Valve

1. The working pressure of（K）A46F-16 type Pilot Safety Valve shall be: 0.05-1.6MPa

2. The working pressure of（K）A46F-25 type Pilot Safety Valve shall be: 0.05-2.5MPa

3. The working pressure of（K）A46F-40 type Pilot Safety Valve shall be: 1.6-4.0MPa

4. The working pressure of（K）A46F-64 type Pilot Safety Valve shall be: 1.6-6.4MPa

5. The working pressure of（K）A46F-100 type Pilot Safety Valve shall be: 4.0-10.0MPa

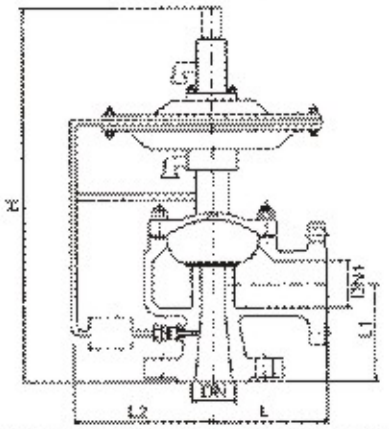
6. The working pressure of（K）A46F-160 type Pilot Safety Valve shall be: 10-16.0MPa

7. The working pressure of（K）A46F-320 type Pilot Safety Valve shall be: 16.0-32MPa

8. The working pressure of（K）A46F-150LB type Pilot Safety Valve shall be: 0.05-2.0MPa

9. The working pressure of（K）A46F-300LB type Pilot Safety Valve shall be: 2.0-5.0MPa

V. AG46X Diaphragm Type Pilot Safety Valve



Usually Low-pressure type pilot safety valve is of diaphragm type. The main valve uses diaphragm instead of piston as the unbalanced moving part inside the valve. The disc and flexible diaphragm is integrally made. The upper pilot valve acts as a sensor medium pressure, working under the same principle of the piston valve. Due to the difference forces on the diaphragm surface, the sealing force and operational pressure increase in proportion.

(1) Main Overall Dimensions of (K) A46F-150LB Diaphragm Type Pilot Safety Valve

nominal diameter	channel diameter	diameter			
DN/DN1	Code	L	L1	L2	H
NPS1/NPS1	O	115	105	230	700
NPS2/NPS3	H	124	136	250	800
NPS3/NPS4	L	165	156	290	850
NPS4/NPS6	P	229	181	300	900
NPS6/NPS8	Q	241	240	340	960
NPS8/NPS10	T	279	276	390	1100

8. The sealing liquid which has the same volume will produce the liquid sealing of H inspiratory height in inner ring, and bring such a sealing of H expiratory height, so the relationship among liquid canister, separation canister and central tube diameter shall be calculated as below:

$$\frac{\pi}{4}(d_2^2-D_1^2)\cdot Hi = \frac{\pi}{4}(d_3^2-D_3^2)\cdot He$$

9. The overflow tube is designed in liquid canister to control the depth of sealing liquid, and an oil level dipstick is inserted into the filler pipe. For easily checking the height of liquid sealing, a mark is made in the place equaling to the height of overflow tube mouth.

10. In the outer ring, an oil level dipstick is inserted to measure the depth that the separation canister is immersed in the sealing liquid. Ensure the end of the dipstick be level with the root of separation canister mouth. As the dipstick is not graduated, it is necessary to use a steel ruler to measure the immerged section. The dipstick shall only be employed for adjusting the immerging depth of the separation canister.

III. Use & Maintenance

1. The hydraulic safety valve shall be strictly installed onto the top of tank in the vertical direction. The liquid canister bottom shall level with the ground and no obviously transformation is allowed to liquid canister and separate canister.

2. For this hydraulic safety valve, its expiratory and inspiratory pressures are +220mm water column and -65mm water column separately. The gravity of the sealing liquid is subjected 0.88. After filling in the required sealing liquid in each hydraulic safety valve, users shall not use the valve before retesting and adjusting the immerging depth of separation canister according to the method hereof until the difference between them and the set value is less than □3mm water column. When adjusting the separation canister, make sure it is stable without any deflexion.

3. After installation, pull tight the rod in fixed valve and then pour into the sealing liquid.

4. When pouring sealing liquid, users must first open the oiling hole (or other mouth) of the tank to balance the pressures outside and inside the tank, and then open the funnel cover.

2. The main structure of the hydraulic safety valve is shown below (Fig. 1).
The central tube and liquid canister form a ring-type liquid sealing chamber, which is divided into two chambers (the inner ring and the outer ring) by the separation canister on the bonnet. Sealing liquid is filled to the liquid canister at certain depth, and the liquid shall be fixed oils with low freezing point (such as light diesel oil and engine oil), which is lower to the local lowest temperature.
3. When the pressures outside and inside of the tank are balanced, the liquid level of the outer ring and inner ring keeps the same, and the distance between the liquid level and the mouth of the separate canister is H平 (the canister edge is toothed, so the calculation of the liquid level shall be subject to the root.
4. When the pressure increases in the tank, the gas in tank will push the sealing liquid of the inner ring to the outer one, and from the slot in separation canister discharge through the sealing liquid of outer ring into the atmosphere. Here the sealing liquid of outer ring will lift. The height from liquid level to the separate canister mouth is the H expiration height (He), which is the expiration action pressure of the hydraulic safety valve (liquid column height) (see Fig. 2).
5. When the pressure drops to negative pressure, the atmosphere beyond the tank will push the sealing liquid of the outer ring into the inner one, and from the slot in separation canister discharge through the liquid of inner ring into the tank. Here the sealing liquid will lift in the inner ring, and the liquid level to the separate canister mouth is the H inspiratory height(Hi), which is the inspiratory action pressure of the hydraulic safety valve (liquid column height) (see Fig. 3).
6. The relationship between liquid depths of the hydraulic safety valve is calculated as follows:

$$Hb = \frac{He \times Hi}{He + Hi} \qquad Hb: \text{unite mmH20}$$

7. The action pressure of hydraulic safety valve shall subject to the water column height (mm), and shall be conversed as follows into liquid column height of sealing liquid, if required:

$$h_{\text{sealing liquid}} = \frac{H_{\text{water column}}}{\gamma_{\text{sealing liquid}}} \qquad \gamma_{\text{sealing liquid}} = \text{Gravity of sealing liquid}$$

(2)Connection Flange & Flange Surfacing Shape
Both inlet and outlet flange of the AG46X-150LB Diaphragm Type Pilot Safety Valve shall adopt ANSIB16.5 flange. The flange facing is RF face and the inlet nominal pressure shall be 150LB. The outlet nominal

pressure shall be 150LB.
(3) Working Pressure Range of Diaphragm Type Pilot Safety Valve
The working pressure of AG46X-150LB type Pilot Safety Valve shall be: 0.01-2.0MPa
(4) Working Range of Diaphragm Type Pilot Safety Valve
The temperature of AG46X-150LB type Pilot Safety Valve shall be: 0-90℃.
VI. Selection of Pilot Safety Valve
1. The applicable medium for pilot safety valve includes: natural gas, coal gas, air, petroleum gas and steam, etc. No liquid or solid matters shall be included.
2. When the working pressure is especially low, diaphragm type pilot safety valve is recommended.
3. When solid crystal is contained, the pilot safety valve with filter shall be selected.
4. Usually pilot safety valve is of soft sealing structure. Users may choose metal seal based on different working conditions. If the medium is against the surrounding environment, users may choose the valve that allows the medium to be discharged from the pilot valve to the main valve outlet.
VII. Installation & Debugging of Pilot Safety Valve
1. Before installation, check if the parameters on nameplate are consistent with the applicable working conditions.
2. Test pressure before installation (usually tested by professional institutions). The test medium shall be gas instead of liquid. Check each connection and tighten the loosened one.
3. The valve shall be vertically installed in the highest position of the pressure vessel and pipeline.
4. The outdoor valve shall be well protected from the wind, frost, rain and snow, to ensure its normal working.
5. The main valve shall be tightly fixed on the support, which will stand the reaction produced by main valve exhausting.
6. The exhaust shall be equipped with special hanger frame. The weight of exhaust shall not press on the main valve. The connection flange between main valve and exhaust shall be able to remove any additional prestressing force.

VIII. Common Trouble & Troubleshooting of Pilot Safety Valve

Troubles	Causes	Troubleshooting
Pilot valve or main valve leaking	Sealing surface of main valve or pilot valve is damaged	Change main valve or pilot valve disc
Pilot valve can trip but main valve cannot start.	The upper chamber of main valve cannot relieve pressure with the pilot at the same time	Adjust the medium flow in the pilot valve inlet, and check if the connection between main and pilot valves is blocked.
Main valve can open but pilot valve cannot work.	The set pressure of the pilot valve is too large or its inlet is blocked.	Lower down the opening pressure of the pilot valve or adjust the medium flow of inlet.
The main valve delays open or close.	The upper chamber of main valve disc fails to relieve pressure with the pilot at the same time	Adjust the medium flow in the pilot valve outlet, and the lift of the pilot valve.
Diaphragm type pilot safety valve: the pilot valve doesn't work but the main valve can open.	The diaphragm damaged	Change a pilot or main valve diaphragm.

Hydraulic Safety Valve

I. Usage

As a safety backup for (flapper type) breather valve, Hydraulic safety valve has slightly higher inspiratory and expiratory pressures. When the breather valve does not work or the flapper is frozen in winter, the liquid seal of the hydraulic safety valve is broken to protect the oil tank from damage.

II. Structure & Principle

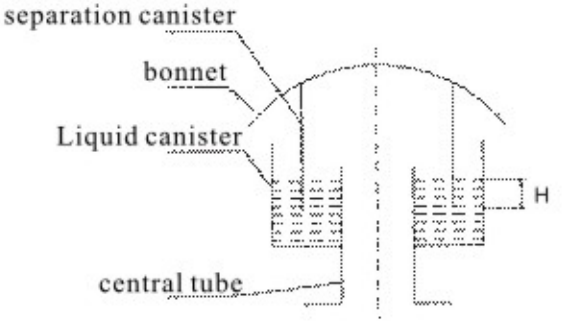


Fig 1

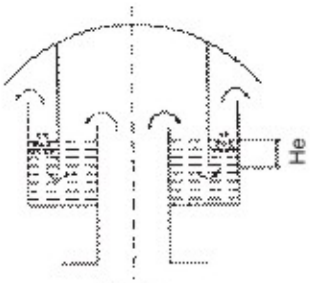


Fig 2

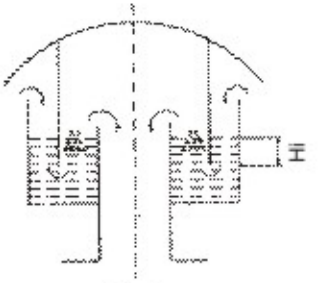


Fig 3

VIII. Installation Instruction

1. Main safety valve shall be mated with impulse safety valve. The outlet tube of impulse safety valve shall keep rather far from the inlet tube of main safety valve, and the distance between the electro connecting pressure gauge and inlet tube of main safety valve shall be at least 5 times of the inlet diameter, so that to prevent pressure gauge and impulse safety effectively from the influence of exhaust when the main safety valve acts.
2. Clean pipelines before installation.
3. Both main safety valve and impulse safety valve shall be installed vertically.
4. The main safety valve shall be tightly fixed on the support, which will stand the reaction produced by main valve exhausting. A special hanger frame shall be set in the exhaust pipe, the weight of which and other forces shall not press on the flanges between the main safety valve (and safety valve) and the exhaust pipe. To avoid the water attach from the valve exhausting, the water drain shall be considered at the lowest point of the pipe.
5. The impulse safety valve shall be mounted on a special support with the electromagnetism. The connection between the lever and the electromagnetism shall be smooth without stuck. The impulse valve shall be installed in the place where is easy for maintenance and debugging, clean, dry, and stable, and with an ambient temperature that is less than 70℃ and the relative humidity no more than 80%.

Main Safety Valve

I. Usage

The main safety valve working with the impulse safety valve and other parts and accessories constitutes an impulse safety device, which is used in steam boiler of different pressures to protect the boiler from insecurity when the medium pressure in boiler exceeds the allowable value.

II. Characteristics

The main safety valve shall work with the impulse safety valve, and characterized by sizable discharging ability, handy adjustability, double protection of mechanical and electrical appliances, and easy to be installed and maintained, etc.

III. Operational Principle

When the medium pressure exceeds the allowable value in boiler, the impulse safety valve will open first to let in the steam to the piston chamber of the main safety valve. Then the main valve is opened and begins discharging. After the residual pressure is relieved, the impulse safety valve closes and stops the steam into piston chamber. Now the main safety valve automatically closes with the co-action of the spring and medium.

IV. Structure Briefing

1. Main safety valve as shown below is mainly composed of valve body, disc, valve rod and piston chamber, etc.
2. The inlet of safety valve can be jointed by flange or weld, while the outlet may be single opening exhaust valve and double opening exhaust valve. Usually the outlet is of flange connection.
3. Both seat and disc sealing face shall be treated by diamond hard metal overlay welding (or spray welding). The main parts and comp onents shall be treated with nitrogen.
4. The main safety valve adopts self-seal structure. Where there is no steam in piston chamber, the higher the medium pressure, the better the sealing performance.

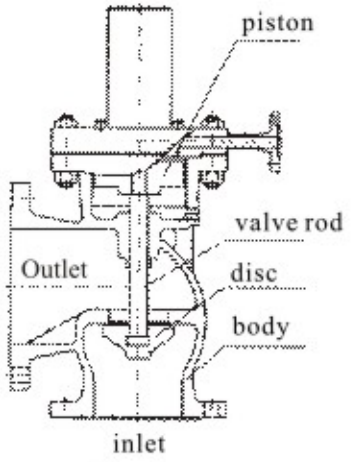


Fig 1

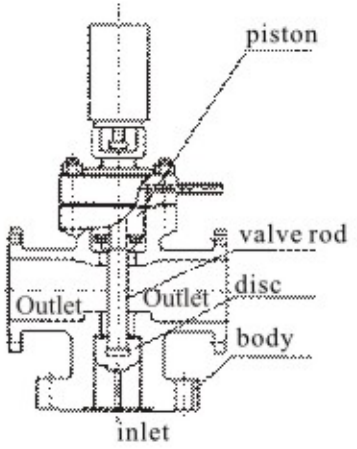


Fig 2

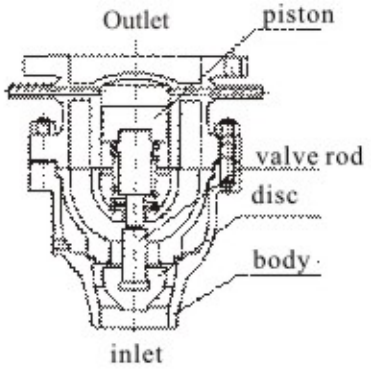


Fig 3

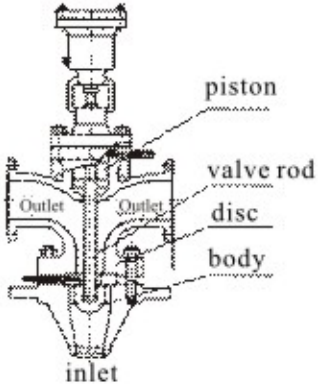


Fig 4

V. Common Main Safety Valve & Scope of Application

SN	Type	Diameter	Applicable medium	Applicable temperature	Pressure	Type of mated valve with medium-sized discharging	Applicable devices	Outside drawing
1	A49H-40	150 200 250 300	Steam	≤425℃	≤4.0 MPa	GA49H-40DN25	Temperature and pressure reducing devices	Fig 1
2	A69Y-10	150	Steam	≤425℃	≤10.0 MPa	A49H-100DN25	A49Y-10 medium-voltage temperature and pressure reducing devices	Fig 3
3	A49Y-P5410v	125	Steam	≤540℃	≤10.0 MPa	A49Y-P54 10V DN20	A49Y-P54 10V High-voltage impulse installing device	Fig 2
4	A69Y-P5414v	100	Steam	≤540℃	≤14.0 MPa	A49Y-P54 14V DN20	A49Y-P54 14V Super-voltage impulse safety device	Fig 4
5	A49Y-P543.2v	200	蒸汽	≤540℃	≤3.2 MPa	A49Y-P54 3.2V DN25	49Y-P54 3.2V Impulse safety device	Fig 1