CAST TRUNNION
BALL VALVE SERIES

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TRUNNION BALL VALVE

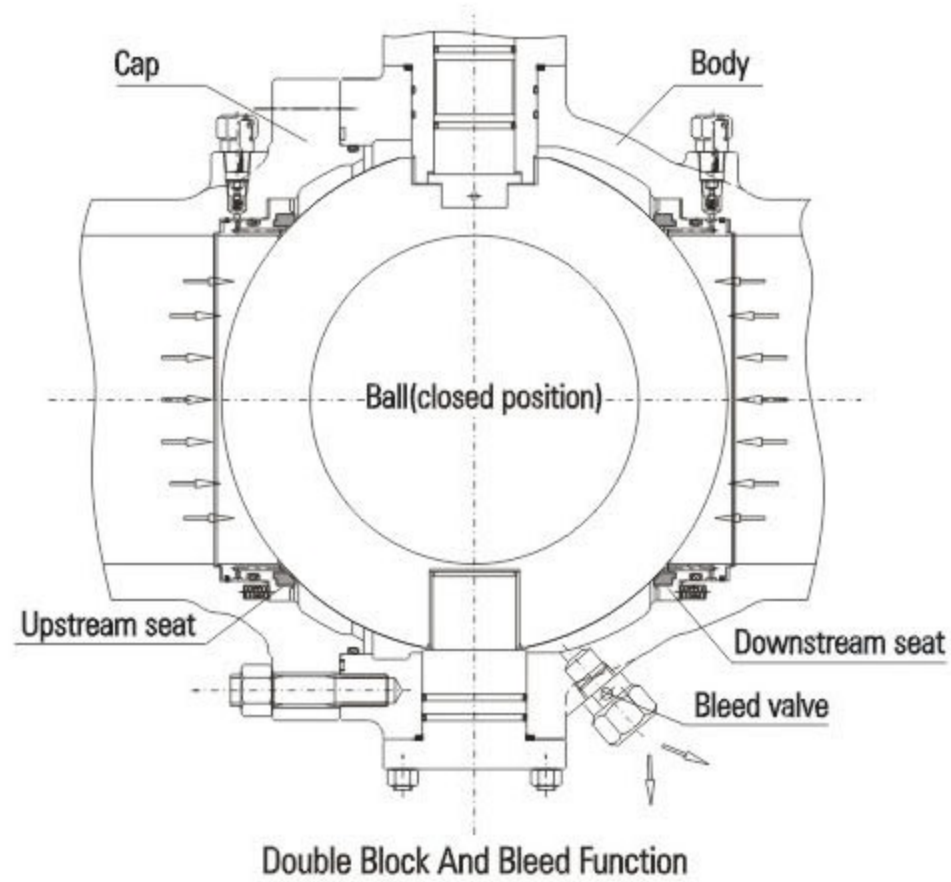
USAGE

The trunnion ball valve is used to cut off or connect the media in various pipelines of Class150～Class2500. The valves made of different materials are suitable for various media such as water, steam, oil, liquefied gas, natural gas, coal gas, nitric acid, oxidizer, urea and etc. The driving modes include manual operation, worm and worm gear transmission, pneumatic operation and electric operation. The connection ends can be flange or butt welding.

STRUCTURAL FEATURES

1、Double Block And Bleed (DBB)

When the valve is closed and the middle cavity is emptied through the discharge valve, the upstream and downstream seats will independently block the fluid at the inlet and outlet to realize double block function. Another function of the discharge device is that the valve seat can be checked if there is any leakage during the test. In addition, the deposits inside the body can be washed and discharged through the discharge device to reduce damage to the seat by impurities in the medium.



Double Block And Bleed Function

2、Low Operating Torque

The trunnion pipeline ball valve adopts the trunnion ball structure and floating valve seat, so as to achieve lower torque under operating pressure. It uses self-lubricating PTFE and metal sliding bearing to reduce the friction coefficient to the lowest in conjunction with the high intensity and high fineness stem.

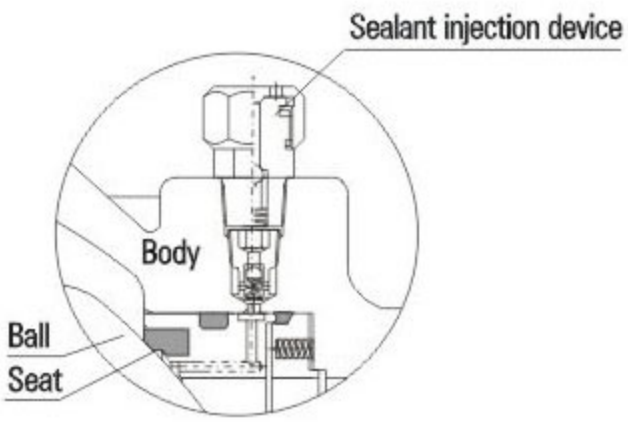
3、Emergency Sealing Device

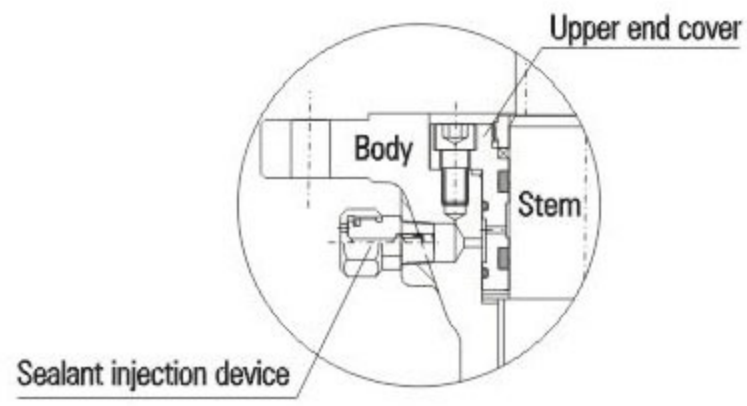
The ball valves with the diameter more than or equal to 6" (DN150) are all designed with sealant injection device on stem and seat. When the seat ring or stem O ring is damaged due to accident, the corresponding sealant can be injected by the sealant injection device to avoid medium leakage on seat ring and stem. If necessary, the auxiliary sealing system can be used for washing and lubricating the seat to maintain its cleanliness.

TRUNNION BALL VALVE

STRUCTURAL FEATURES

Sealant Injection Device

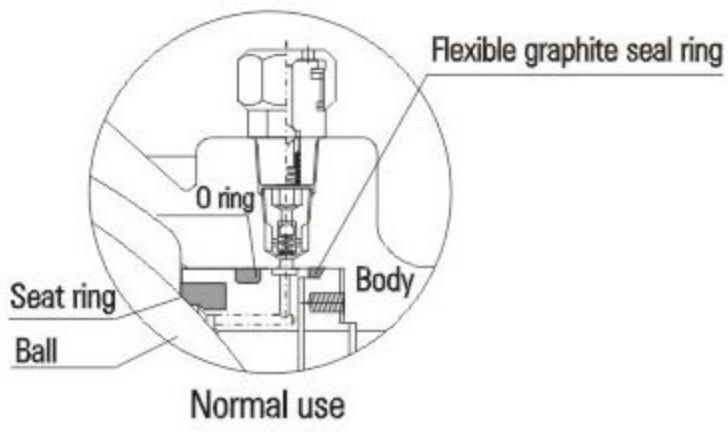




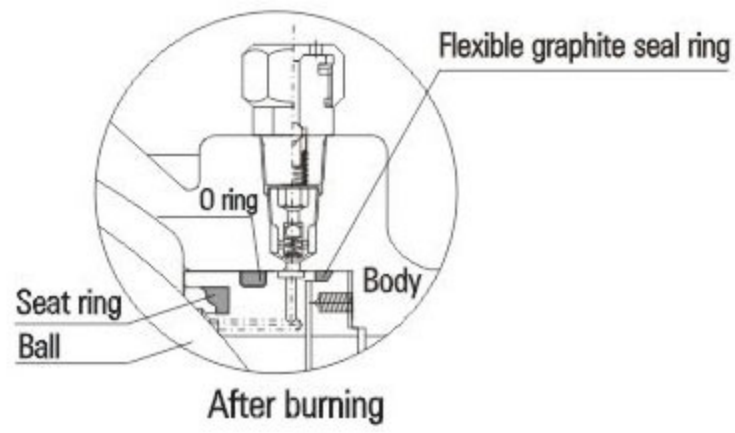
4、Fireproof Structure Design

In case of fire during the use of valve, the seat ring, stem O ring and middle flange O ring made of PTFE, rubber or other non-metal materials will be decomposed or damaged under high temperature. Under pressure of the medium, the ball valve will push the seat reatainer rapidly towards the ball to make the metal seal ring contact the ball and form the auxiliary metal to metal sealing structure, which can effectively control valve leakage. The fireproof structure design of trunnnion pipeline ball valve conforms to requirements in API 607, API 6FA, BS 6755 and other standards.

Fireproof Structure Of Seat

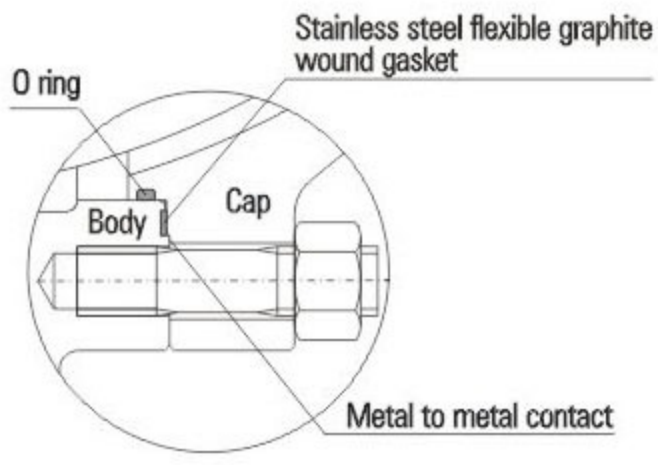


Normal use

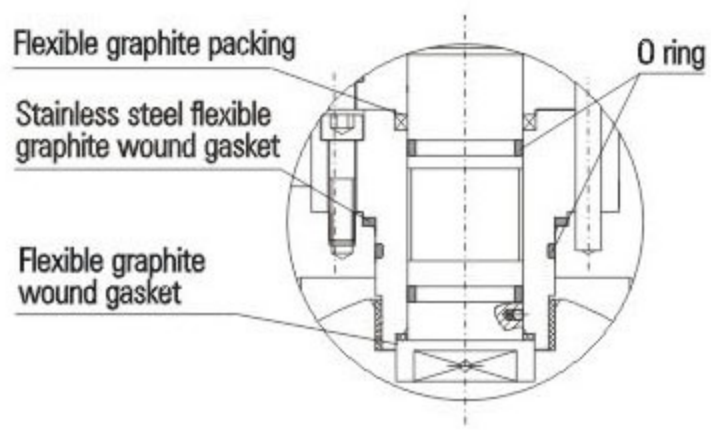


After burning

Fireproof Structure Of Middle Flange



Fireproof Structure Design Of Stem



STRUCTURAL FEATURES

5、Anti-static Structure

The ball valve is provided with the anti-static structure and adopts the static electricity discharge device to directly form a static channel between the ball and body or form a static channel between the ball and body through the stem, so as to discharge the static electricity produced due to friction during the opening and closing of ball and seat through the pipeline, avoiding fire or explosion that may be caused by static spark and ensuring system safety.

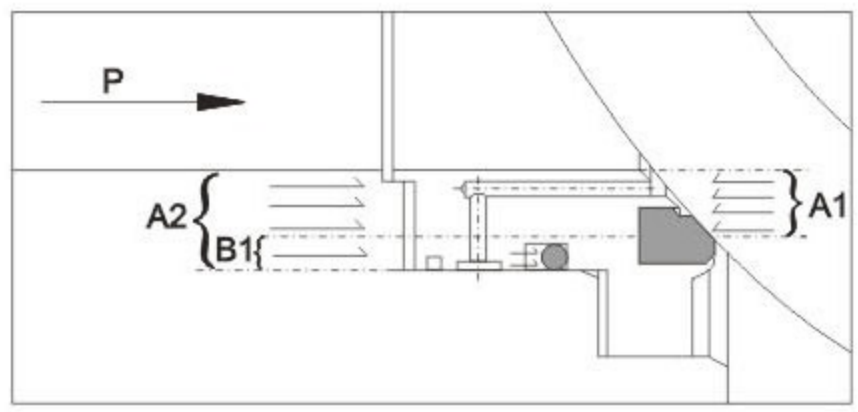
6、Reliable seat sealing structure

The seat sealing is realized through two floating seat retainers. They can float axially to block the fluid, including ball sealing and body sealing. The low pressure sealing of valve seat is realized by spring pre-tightening. In addition, the piston effect of valve seat is designed reasonably, which realizes high pressure sealing by the pressure of the medium itself. The following two kinds of ball sealing can be realized.

7、Single Sealing (automatic Pressure Relief In Middle Cavity Of Valve)

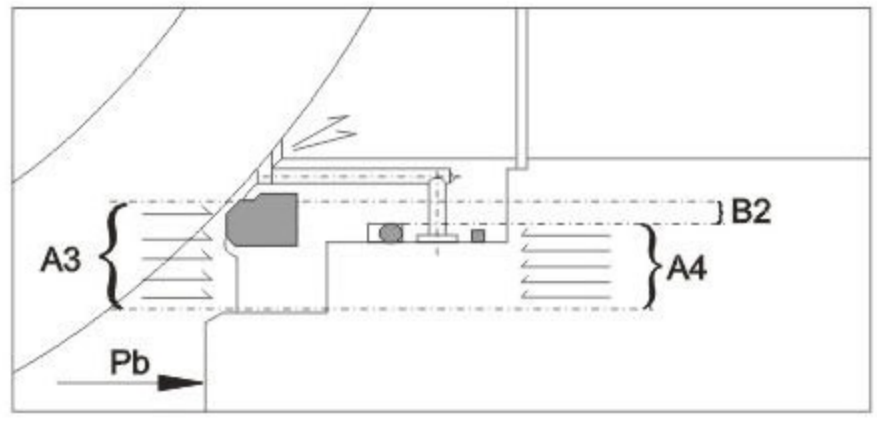
Generally, the single sealing structure is used, that is, there is only the upstream sealing. As the independent spring loaded upstream and downstream sealing seats are used, the over-pressure inside valve cavity can overcome the pre-tightening effect of the spring, so as to make the seat release from the ball and realize automatic pressure relief towards the downstream part.

The upstream side: When the seat moves axially along the valve, the pressure P exerted on the upstream part (inlet) produces a reverse force on A1. As A2 is higher than A1, A2-A1=B1, the force on B1 will push the seat to the ball and realize tight sealing of the upstream part.



A2>A1

The downstream side: Once the pressure Pb inside the valve cavity increases, the force exerted on A3 is higher than that on A4. As A3-A4=B2, the pressure differential on B2 will overcome the spring force to make the seat release from the ball and realize pressure relief of valve cavity to the downstream part. Afterwards, the seat and ball will be sealed again under the spring action.



A3>A4

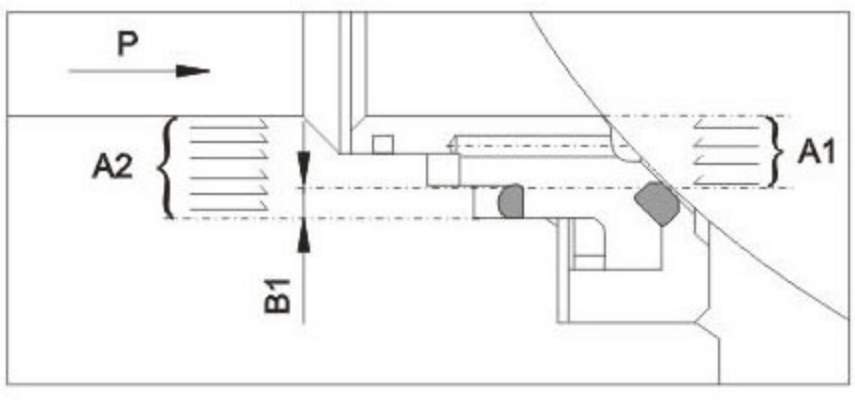
STRUCTURAL FEATURES

8、Double Sealing (double Piston)

The trunnion pipeline ball valve can be designed with the double sealing structure before and after the ball for some special service conditions and user requirements. It has double piston effect. Under normal condition, the valve generally adopts primary sealing. When the primary seat sealing is damaged and causes leakage, the secondary seat can play the function of sealing and enhance the sealing reliability.

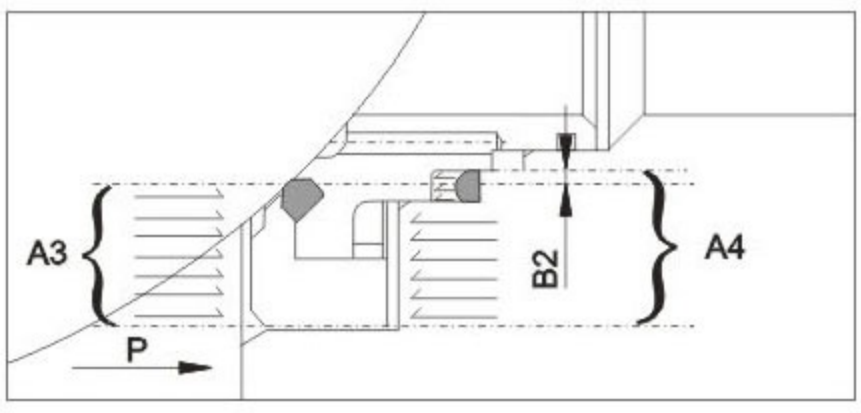
The seat adopts the combined structure. The primary seal is metal to metal seal. The secondary seal is fluorine rubber O ring that can ensure the ball valve can reach the bubble level sealing. When the pressure differential is very low, the sealing seat will press the ball through the spring action to realize primary sealing. When the pressure differential rises, the sealing force of seat and body will increase accordingly so as to tightly seal the seat and ball and ensure good sealing performance.

Primary sealing: Upstream. When the pressure differential is lower or there is no pressure differential, the floating seat will move axially along the valve under the spring action and push the seat towards the ball to keep tight sealing. When the pipeline pressure P increases, the force exerted on the area A2 of valve seat is higher than the force exerted on the area A1, A2-A1=B1. Therefore, the force on B1 will push the seat towards the ball and realize tight sealing of the upstream part.



A2>A1

Secondary sealing: Downstream. When the pressure differential is lower or there is no pressure differential, the floating seat will move axially along the valve under the spring action and push the seat towards the ball to keep tight sealing. When the valve cavity pressure P increases, the force exerted on the area A4 of valve seat is higher than the force exerted on the area A3, A4-A3=B1. Therefore, the force on B1 will push the seat towards the ball and realize tight sealing of the upstream part.

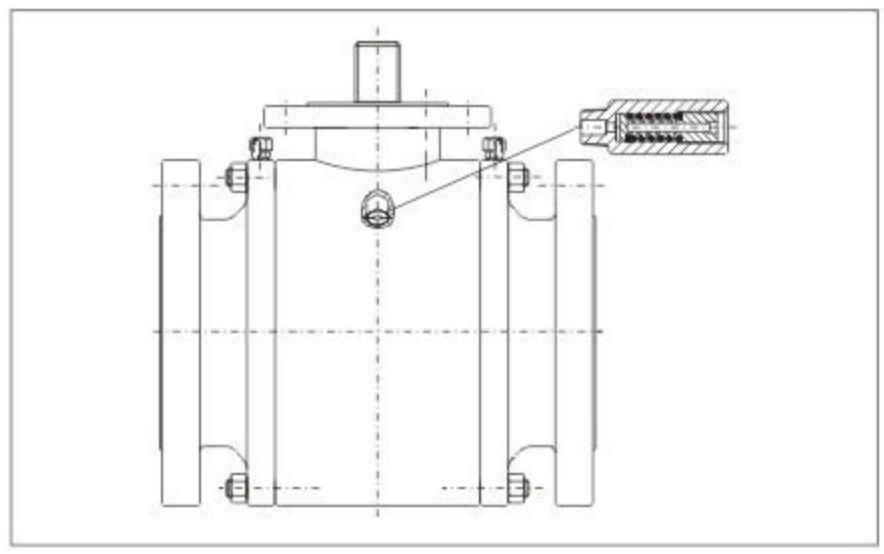


A4>A3

STRUCTURAL FEATURES

9、Safety Relief Device

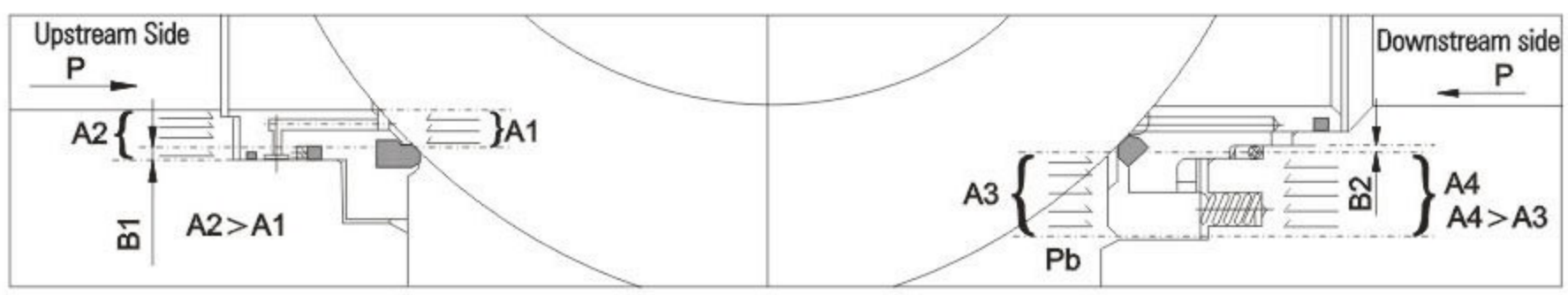
As the ball valve is designed with the advanced primary and secondary sealing that has double piston effect, and the middle cavity cannot realize automatic pressure relief, the safety relief valve must be installed on the body in order to prevent the danger of over-pressure damage inside the valve cavity that may occur due to thermal expansion of medium. The connection of the safety relief valve is generally NPT1/2. Another point to be noted is that the medium of the safety relief valve is directly discharged into the atmosphere. In case direct discharging into the atmosphere is not allowed, we suggest that the ball valve with a special structure of automatic pressure relief towards upper stream should be used. Refer to the following for details. Please indicate it in the order if you do not need the safety relief valve or if you would like to use the ball valve with the special structure of automatic pressure relief towards upper stream.



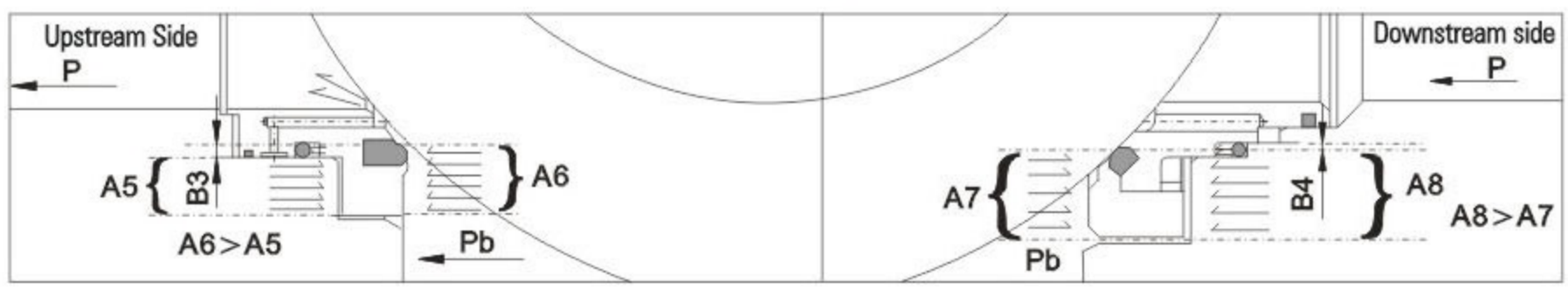
10、Secial Structure Of Automatic Pressure Relief Towards Upper Stream

As the ball valve is designed with the advanced primary and secondary sealing that has double piston effect, and the middle cavity cannot realize automatic pressure relief, the ball valve with the special structure is recommended to meet the requirement of automatic pressure relief and ensure no pollution to the environment. In the structure, the upper stream adopts primary sealing and the lower stream adopts primary and secondary sealing. When the ball valve is closed, the pressure in the valve cavity can realize automatic pressure relief to the upper stream, so as to avoid the danger caused by cavity pressure. When the primary seat is damaged and leaks, the secondary seat can also play the function of sealing. But special attention shall be paid to the flow direction of the ball valve. During the installation, note the upstream and downstream directions. Refer to the following drawings for sealing principle of the valve with the special structure.

Principle drawing of ball valve upstream and downstream sealing



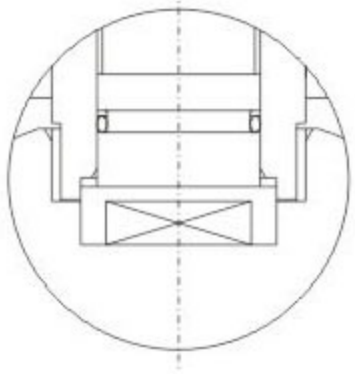
Principle drawing of ball valve cavity pressure relief to the upper stream and of downstream sealing



STRUCTURAL FEATURES

11、Blow-out Proof Stem

The stem adopts the blow-out proof structure. The stem is designed with the footstep at its bottom so that with the positioning of upper end cover and screw, the stem will not be blown out by the medium even in case of abnormal pressure rise in the valve cavity.



Blow-out proof stem

12、Corrosion Resistance And Sulfide Stress Resistance

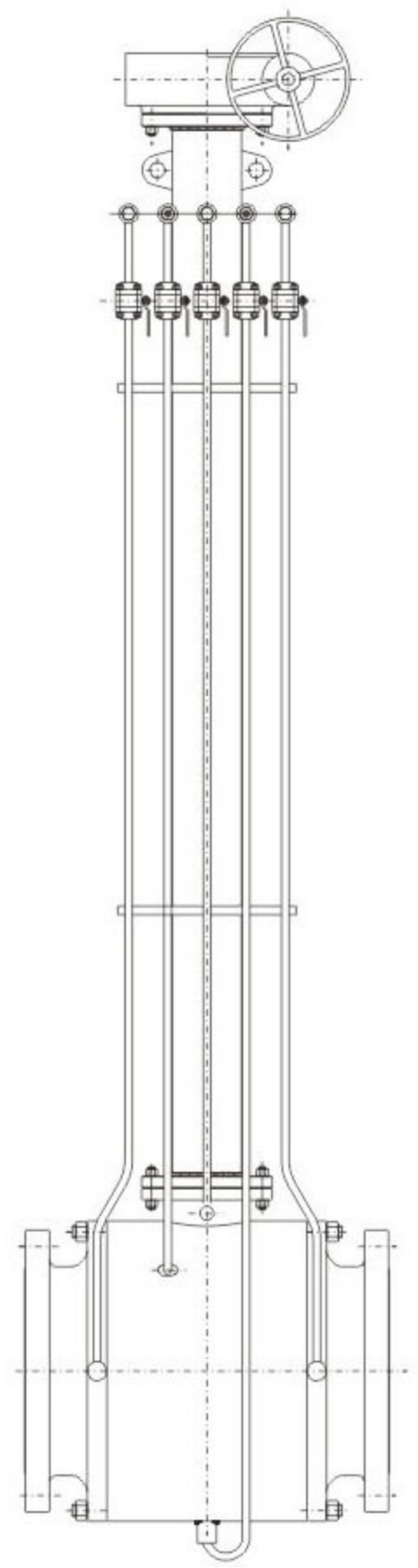
Certain corrosion allowance is left for the body wall thickness. The carbon steel stem, fixed shaft, ball, seat and seat ring are subjected to chemical nickel plating according to ASTM B733 and B656. In addition, various corrosion resistant materials are available for users to select.

According to customer requirements, the valve materials can be selected according to NACE MR 0175/ISO 15156 or NACE MR 0103, and strict quality control and quality inspection should be carried out during the manufacturing so as to fully meet the requirements in the standards and meet the service conditions in sulfurization environment.

13、Extension Stem

As for the embedded valves, the extension stem can be supplied if ground operation is needed. The extension stem is composed of stem, sealant injection valve, and drainage valve that can be extended to the top for the convenience of operation. Users should indicate the extension stem requirements and length when placing orders.

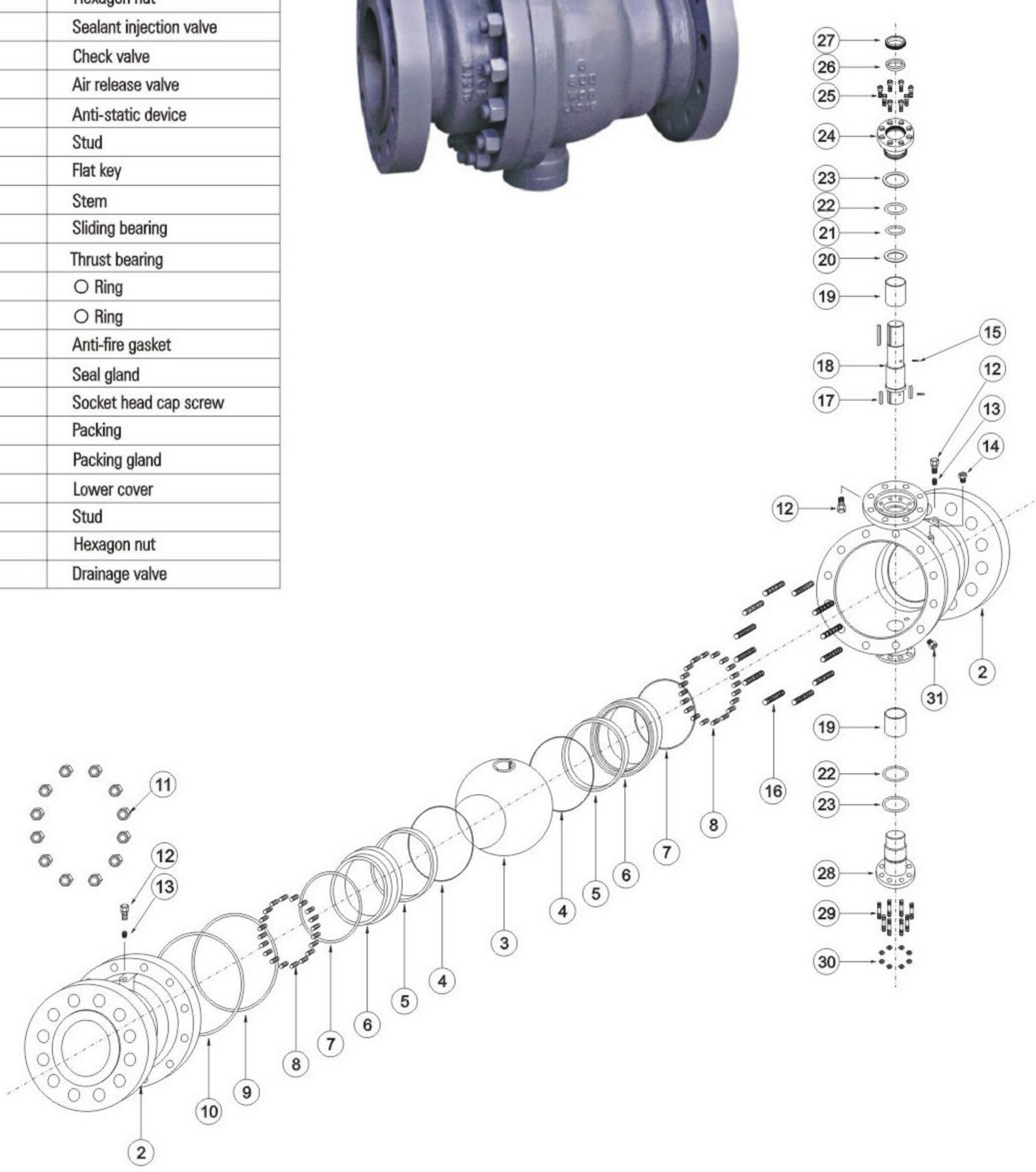
For ball valves driven through electric, pneumatic and pneumatic-hydraulic operations, the extension stem length should be from the centre of pipeline to top flange.



Schematic diagram of extension stem

CAST TRUNNION BALL VALVE

1	Body
2	Bonnet
3	Ball
4	Anti-fire packing
5	Seat
6	Seat support ring
7	O Ring
8	Spring
9	O Ring
10	Anti-fire gasket
11	Hexagon nut
12	Sealant injection valve
13	Check valve
14	Air release valve
15	Anti-static device
16	Stud
17	Flat key
18	Stem
19	Sliding bearing
20	Thrust bearing
21	O Ring
22	O Ring
23	Anti-fire gasket
24	Seal gland
25	Socket head cap screw
26	Packing
27	Packing gland
28	Lower cover
29	Stud
30	Hexagon nut
31	Drainage valve



CAST TRUNNION BALL VALVE

Part Materials And Main Parameters

Nominal diameter（in）			NPS 1/2～8				
Nominal pressure（MPa）			Class150～Class900				
	No.	Part Name	Material				
			Carbon Steel	Stainless Steel			
Materials of parts	1	Body	ASTM A216 WCB	ASTM A351 CF8	ASTM A351 CF8M	ASTM A351 CF3	ASTM A351 CF3M
	2	Bonnet	ASTM A216 WCB	ASTM A351 CF8	ASTM A351 CF8M	ASTM A351 CF3	ASTM A351 CF3M
	3	Ball	ASTM A105 • ENP	ASTM A182 304	ASTM A182 316	ASTM A182 304L	ASTM A182 316L
	4	Anti-fire paking	Graphite				
	5	Seat	PTFE/NYLON/PEEK/PPL				
	6	Seat support ring	ASTM A105 • ENP	ASTM A182 304	ASTM A182 316	ASTM A182 304L	ASTM A182 316L
	7	○ Ring	VITON				
	8	Spring	17-7PH				
	9	○ Ring	VITON				
	10	Anti-fire gasket	SST+Graphite				
	11	Hexagon nut	A194 2HM	A194-8	A194 -8M	A194-8	A194-8M
	12	Sealant injection valve	Combined parts	Combined parts	Combined parts	Combined parts	Combined parts
	13	Check valve	Combined parts	Combined parts	Combined parts	Combined parts	Combined parts
	14	Air release valve	Combined parts	Combined parts	Combined parts	Combined parts	Combined parts
	15	Anti-static device	Combined parts	Combined parts	Combined parts	Combined parts	Combined parts
	16	Stud	A193 B7M	A320 B8	A320 B8M	A320 B8	A320 B8M
	17	Flat key	ANSI 1045	ANSI 1045	ANSI 1045	ANSI 1045	ANSI 1045
	18	Stem	ASTM A182 F6a	ASTM A182 304	ASTM A182 316	ASTM A182 304L	ASTM A182 316L
	19	Sliding bearing	Metal+PTFE	Metal+PTFE	Metal+PTFE	Metal+PTFE	Metal+PTFE
	20	Thrust bearing	PTFE				
	21	○ Ring	VITON				
	22	○ Ring	VITON				
	23	Anti-fire gasket	SST+Graphite				
	24	Seal gland	ASTM A105 • ENP	ASTM A182 304	ASTM A182316	ASTM A182304L	ASTM A182316L
	25	Socket head cap screw	A193 B7M	A320 B8	A320 B8M	A320 B8	A320 B8M
	26	Packing	Graphite				
	27	Packing gland	ASTM A182 F6a	ASTM A182 F6a	ASTM A182 F6a	ASTM A182 F6a	ASTM A182 F6a
	28	Lower cover	ASTM A105 • ENP	ASTM A182 304	ASTM A182 316	ASTM A182 304L	ASTM A182 316L
	29	Stud	A193 B7M	A320 B8	A320 B8M	A320 B8	A320 B8M
	30	Hexagon nut	A194 2HM	A194-8	A194 -8M	A194-8	A194-8M
	31	Drainage valve	Combined parts	Combined parts	Combined parts	Combined parts	Combined parts
Applicable service conditions		Applicable media	Water, steam, oil, gas liquefied gas, natural gas, etc.	Nitric Acid	Acetic Acid	Strong Oxidizer	Urea
		Applicable temperature	≤120℃（PTFE）、≤80℃（NYLON）、≤250℃（PEEK）、≤250℃（PPL）				
Design and manufacturing			API 608、API 6D				
Face-to-face dimensions			ASME B16.10、API 6D				
Type of connection			Flange	ASME B16.5/ASME B16.47		Butt welding	ASME B16.25
Pressure test			API 598、API 6D				
Transmission mode			Manual, worm and worm gear transmission, pneumatic, electric				