Check Valve Manual

1. Purpose, Performance and Character

The trim of the valve (Disc) can automatic prevent the backflow of the medium by using the medium force. The check valve is a valve that automatically prevents medium from flowing back. The disc of the check valve is opened by medium force, and the medium flows from the import side to export side. When the import side pressure is lower than the export side, the disc will automatic closed to prevent medium backflow in the factor of the medium pressure and gravity itself.

The role of check valve is only allowing medium to flow in one direction. Usually the type of this check valve is automatic. Under a direction of flow of medium pressure, the disc is opened. When medium is flowing in the opposite direction, the medium pressure and the disc act on the seat, thereby cutting off the flow.

The primary function of the check valve is to prevent backflow of the medium pipe, therefore, a check valve is often selected at the export side of the pump and the export side of the suction and exhaust pipelines. It is characterized by automatically opening and closing by the force generated by the flow of the medium itself in the pipelin.

In accordance with the structure, check valve is divided into lift type check valve and Swing check valve.

Lift type check valve: Disc is floating along the vertical center line of the body

Swing check valve: Disc is swing around the outside pin of the seat

Double plate check valve: Two discs is swinging around the center shaft.

2. The Principle and Main Structure

2.1 The Basic Principle

A check valve is a valve that automatically opens and closes by the flowing medium to

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prevent the medium from flowing back.

2.2. Advantage of Structure

(a) Good sealing performance, can be sealed in a larger pressure and temperature.

(b) Simple and compact structure, small volume, and low weight. Easy to realize quick open/close, reliable sealing, and excellent performance.

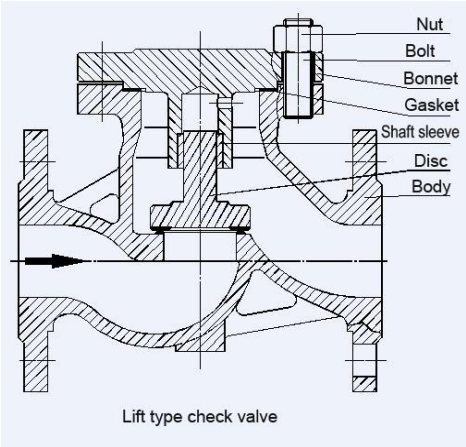
（c）The reliability of sealing is improved under the role of the spring force.

（d）Trim can withstand the high pressure differences when the valve is open/close.

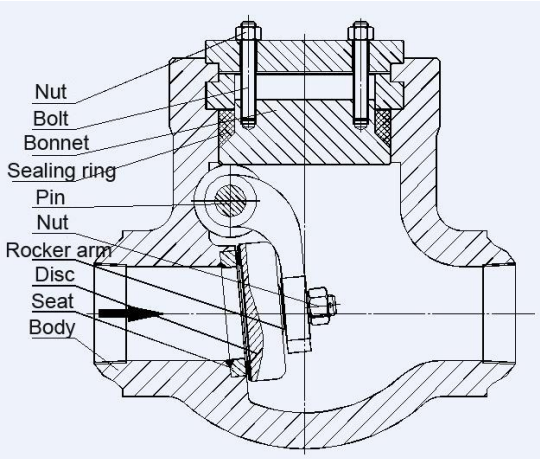
（e）The pin and disc of swing check valve adopt in-packing structure, no outside leakage point, reliable use.

（f）Wild applications.

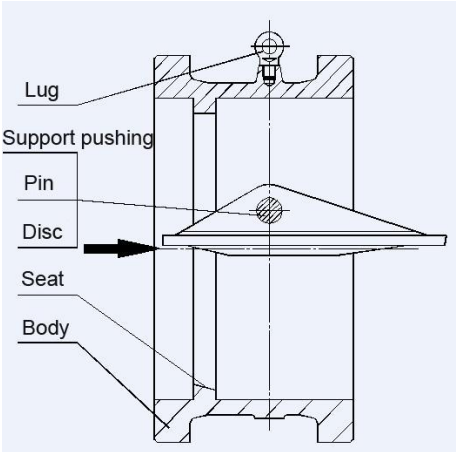
2.3 Main Structure as Following



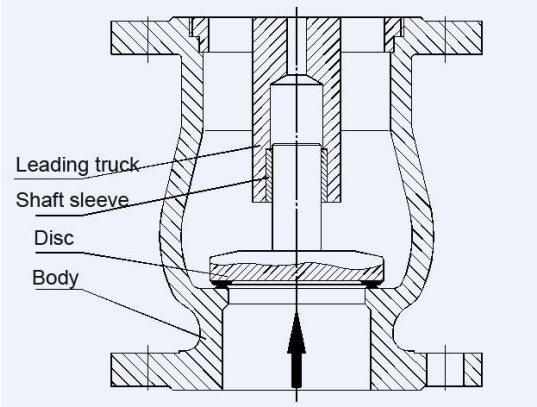
Lift type check valve



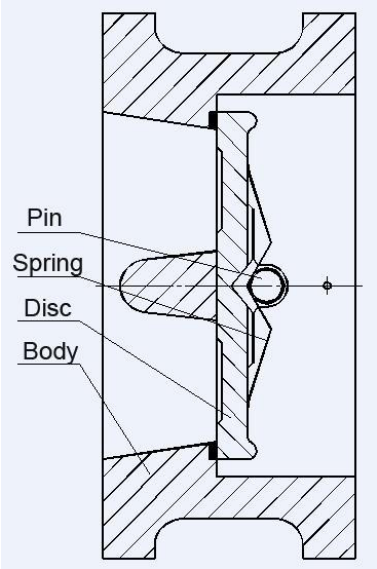
Swing type check valve

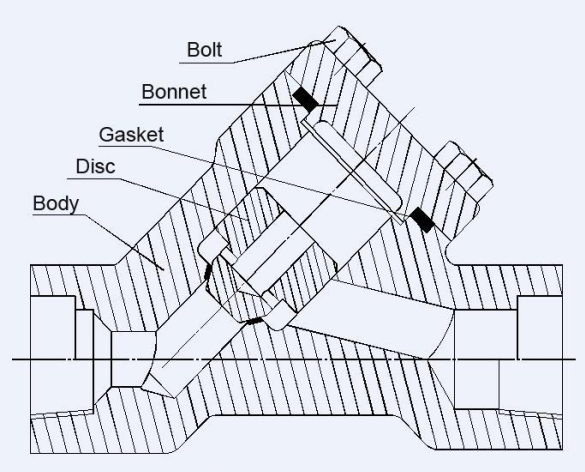


Disc type check valve



Lift check valve





Y type check valve

3. Valve Classification

3.1 According to Structure

Lift type check valve: The disc is sliding along the vertical center line of the body. Small balls can be used as disc of check valve in the condition of high-pressure and small volume. The disc of lifting type check valve is the same to that of globe valve, so its flow blockade coefficient is great.

3.2 Swing type check valve: The disc is swing around the pin of outside seat

3.3 Disc type check valve: The disc is swing along the pin of inside seat. This valve is installed on horizontal pipes which sealing capacity is low.

Pipe type check valve: The disc is sliding along the center line of body, small volume, light in weight, and good process performance, which is one of the directions of development about check valves.

Double plate check valve: The disc is along the pin at the center position of body to swing, short structure dimensions, small volume, light in weight, good process performance, quickly

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open and close, small water-hammer pressure, shorter travel, and small closed-impact pressure. It can be used in the horizontal or vertical pipes, easy installation.

4. Main Dimension and Weight (as shown in model picture)

5. Shipment and Storage

5.1 Prepare for Transfer

Exposed surface of the valve ends access is a critical part, the following measures need to be adopted:

(a) The inside of the valve should be kept clear, clean and dry.

(b) The outer machined surface shall be painted with anti-rust oil.

(c) The trim should be in a immobile state.

5.2 Movement

When move should be propriety pay attention that valves must not be thrown or falling.

5.3 Storage

Pay attention that the problem of storage and transport preparation are usually the same. Time is very important, Generally the storage period of check valve is according to the shelf-life of seal ring material. If want to extend the storage of the valve for a few weeks or months, it needs to improve the conditions of the original storage. Generally, the actual temperature of valves stored indoors is always higher than the dew point temperature. If the valve must be stored outdoors, it should be supported, not allowed to touch the ground, and protected with a waterproof cover.

6. Installation

6.1 Installation is the key to determining the service life. Improper installation is likely to cause

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performance degradation. Therefore, the following items should be confirmed before installing the valve:

(a) Carefully disassemble the packaging of valves and control materials, such as a list of specifications and schedules, check the labels or signs.

(b) Carefully unpack the valve and check the labels or markings against the bill of materials and detailed list.

(b) Pay attention to the special warning labels or signs on or with the valve and take appropriate measures.

(c) Checked the flow mark, such as the flow direction indicated, which should be installed in accordance with the provisions of the flow valve.

Notice：

（1）The kind of H4（6）1H/Y type lift check valve is only be installed in level by flow.

（2）2H/Y type check valve is only able to installed on vertical pipelines.

（3）H4 (6) 4H / Y-type check valve according to flow can also be mounted vertically and level, preferably the level of the installation.

（4）(4) At both ends of passage of the valves to check the cleanliness of the internal , whether have foreign and harmful corrosion. Removal the exclusive packaging materials, such as transport and handling of the mobile valve for the prevention of obstructions.

（5）Before installed, pre-check the cleanliness of the pipe line which connects valves, whether there is any foreign body.

（6）Wash, clean pipes, so as not to damage the sealing surface.

（7）Rocker and check the activities of flexibility, lubricating grease.

6.2 Flanged Connection-Valves Installation

The sealing performance of the pipeline connection flange depends on the deformation of the gasket material between the matching flange surfaces. The mechanical force generated by the bolt connection must not only resist the normal pressure on the joint that makes the connection loose, but also maintain the necessary gasket compression stress on the gasket. It should be recognized that the principle of "firmness" is that the flange relay with insufficient bolts may not be suitable

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for bearing the load and the load maintained by the compression gasket, resulting in leakage in the connection part. To ensure a good flange connection, the following points should be noted:

(a) Check the flange surface. If there are any defects that may cause leakage (if the time to draw back the knife deep trench or misoperation resulting surface indentation), they should be repaired before installation.

(b) Check bolted size, length and suitability of materials, high temperature carbon steel bolt with flange connection may lead to premature failure to connect.

(c) Check gasket material. For the use of low-intensity bolted flange connections or low iron flange steel flange, it should not use metal gaskets (flat pads, trench-style pads, coated gaskets, spiral wound gasket or gasket waveform).

(d) Check the gasket performance that against harmful defects or damage.

(e) Careful operation to provide neutral character for flanges. Apply appropriate lubricant to the bolts and threads. During assembly, the bolts should be tightened in sequence so that the flange and gasket form initial contact and are as parallel as possible. The bolts should be tightened gradually and evenly to avoid twisting of the two flanges. Using a torque wrench to tighten the bolted flange connection helps ensure the correctness and uniformity of the final tightening.

When the valve is installed on the original pipeline, the parallelism of the flange is particularly important. It should be recognized that if the flange is not parallel and cannot be connected and sealed, some parts must be bent. Only by applying force to the flange and bolts on the pipe can the valve be bent, or bent. Especially on large-diameter pipelines, this often causes bending strength situations, which require the attention of the estimator and, if necessary, remedial measures.

Note: As mentioned above, the application of torque wrenches for tightening flange bolts. If the torque of a bolt gradually increases during tightening, and sometimes remains unchanged or increases slightly, the bolt has been bent and should be scrapped and replaced.

6.3. Installation for Welding-end Valves

The weld between the pipe and the valve body should be continuous in terms of metallography and structure.It is important that there are no "gaps" or weak links in the assembly

of pipe-valve-fitting. Therefore, when welding socket connections, the cross-sectional area of the weld is generally required to be larger than the cross-sectional area of the pipe.

Butt welds require full penetration and a weld thickness at least equal to the pipe wall thickness. If the mechanical strength of the high-strength alloy pipe is greater than the body material weld end, the weld groove must be tapered to compensate for the greater wall thickness at the valve end, otherwise the valve must be equipped with high-strength material or additional "reinforcement".

For valves and pipe welding, it is important to ensure as following:

a) Check valves and pipe material marking to confirm they are compliance with the requirements.

b) Check the surface, size and cleanliness of the welding end faces, and remove factors that may affect assembly and welding performance.

c) If additional sealing rings are required, check whether the pipe and valve materials are consistent with the sealing rings and their cleanliness.

d) In accordance with approved welding procedures to determine welding parameters, including pre and post-weld heat treatment (if required).

e) Check valve and the pipeline whether the end is in the middle, if not, adjust as required;

f) Firmly spot-welding .

g) Complete welding according to the approved welding procedure.

h) Cleaning and inspection of weld-slot

i) Perform repair welding according to the approved procedure If necessary.

6.4 Installation of NPT Valve and Pipeline

The performance of threaded pipe connections depends on the fit of the male and female threads, as well as the assembly with special soft or sticky materials. In order to obtain the most reliable leak-free system, the following points should be noted:

a) Check the shape and cleanliness of the valve body and threaded pipe fittings. Pay attention to whether there are debris or sand particles on the threaded cylindrical surface or some serrated parts that are easily deformed by collision.

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b) Pay attention to the length of the valve end and the distance from the wall. The length of the threaded pipe screwed into the valve must be carefully considered. If possible, the length of the threaded pipe end should be carefully checked to ensure that the thread length of the straight pipe part does not exceed the standard length of the threaded pipe part.

c) When assembling, correctly use the match of part of the thread. When screwing in and out of the tapered pipe thread, use an appropriate wrench to apply force until the threads engage.

d)Wrapped around the outer pipe thread sealing tape or adhesive coated thread (thread sealed with the exception of the provisions). Or adhesive tape to prevent flow into the pipe.

e) Tighten assembly joints. Plate on the valve should be located in the valve body first end, the tube is screwed into the threaded end. Note: Since there is no clear limit to the torque formed by the tapered thread connection, excessive torque may be applied to the valve body and damage the valve or pipe.

f) Repeat the above steps on the other end of the valve and screw the first screw on the plate side into the tube assembly.

7. Operation and Maintenance

Check valve is the special product that has regular movement and frictions. In order to the get satisfactory performance, some parts of machine parts shall be carefully protected.

In the proper state of pressure, medium, temperature, consecutive life-extension of a valve will be no less than 3 years.

In a Close position, the disc shall be at right position to seat.

7.1 The closure of check valve, the liquid flow speed and the speed of valve closure are interrelated , therefore, it is required on many occasions as possible as quickly as possible to close the valve. However, in this case, it is based on the closing speed of medium in the shortest possible time to determine the return. As long as the check valve can be closed faster, preferably a quick closing. In particularly difficult situations, it is necessary to use spring loads to assist the check valve to close quickly or use buffers to control the closing of the check valve to reduce the closing speed of the check valve.

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a) When the trim is from the wide-open position to wide-close position, the trip should be as short as possible. It can be seen that from the closing speed, the smaller diameter compared with similar large-diameter valves, the closing speed is more larger.

b) Check valve should be closed from the full closed positions under the greatest possible speed of the downstream medium before backflow in order to get the maximum closing time.

c) Close inertia should be as small as possible, but the closing force should be larger in order to ensure that the deceleration of the flow medium to make the fastest response.

Check valves should be selected based on the minimum or impact pressure required for closing, as well as the closing speed and closing speed characteristics.

7.2 Maintenance

Valve has the complex structure for a pressure vessel and operational machine, when maintaining the valve, occasional open/close shall be put into consideration. At the same time, static pressure state of valve shall also be considered.

When keeping the valve to a certain position, operational capacity of valve may be reduced. This is caused by accumulation of corrosive substances on moving parts. Under some circumstances, valve shall be circulated open/close periodically.

The intactness of pressure boundary requires the intactness of pressure-bearing parts, pressure-bearing shall be checked regularly.

Poor working conditions increase the difficulty and are beyond the scope of repair in this manual, so if possible, we will get better results if the working conditions are informed before manufacturing

The external structure of the valve should be easy to inspect and maintain. Appropriate measures should be taken to prevent mechanical damage to the valve, prevent sediment in the air, and prevent corrosion of the valve by chemicals or humid air. Connectors such as threads, bearings or gears should be lubricated regularly.

8. Possible Failure, Reason and Repair

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Possible Failure	Reasons	Repair
1. Leakage between disc and seat	1. Dregs adhered on sealing face 2. Sealing damaged or flushed 3. Deformation made by over-speed closure	1. Clear dregs 2. Rubbing sealing face, overlay and re-machine to standard 3. Change the disc
2. Function Failure	1. Reverse Installation	1. Re-installation to the right flow direction
3. Leakage between body and bonnet	1. Bolts not evenly fastened 2. Flange sealing face damaged 3. Gasket damaged or failed	1. Evenly fasten bolts 2. Repair Flanges 3. Change gaskets
4. Pin dumb	1. Pin abrased or deformed 2. Pin rusted	1. Change Pin 2. Take out pin, figuring of surface and lubricate