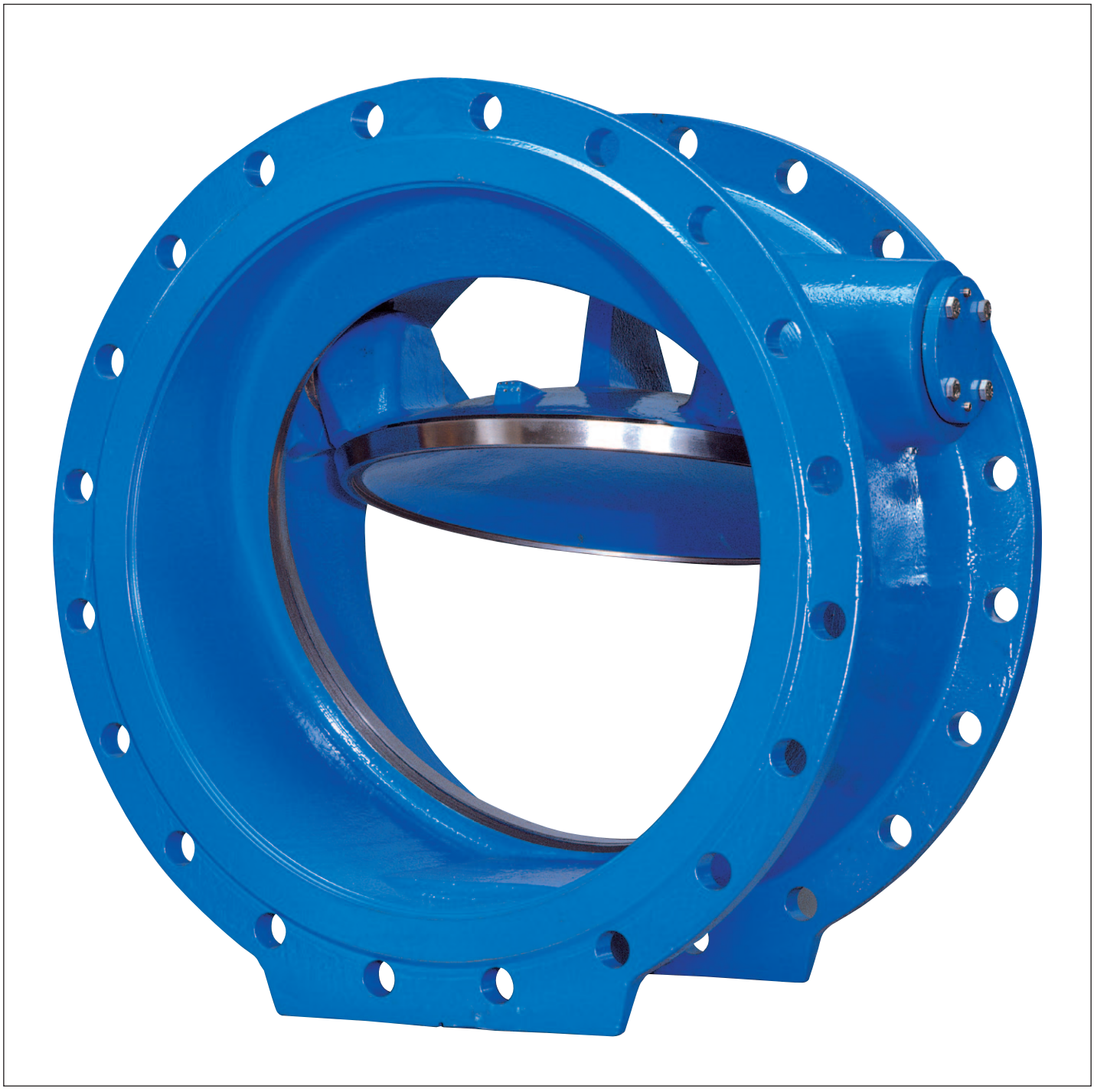
Operating and maintenance instructions

VAG SKR Slanted Seat Tilting Disk Check Valve



KAT-B 1510 Edition 4 - 01/2018

Content

1 General

1.1 Safety

These operating and maintenance instructions must be observed at all times and used jointly with the VAG Installation and Operating Instructions for Valves.

The user must not change or modify this product or the mounting parts / fittings supplied with it. VAG does not assume any warranty or liability for consequential damage arising from the non-compliance with these instructions.

For the use of this valve, the generally accepted technical rules (e.g. DIN standards, DVGW data sheets, VDI guidelines etc.). The valves must only be installed by qualified, specially trained staff. For further specifications and information such as dimensions, materials and fields of application, please refer to the related documentation (KAT-A 1510).

1.2 Proper use

The VAG SKR Slanted Seat Tilting Disk Check Valve is a valve designed for installation in pipelines.

The standard model can be used to allow the flow of the medium in one direction in pressurized pipelines and to prevent the back-flow automatically.

The technical application limits (e.g. working pressure, medium, temperature etc.) are described in the product-related documentation (KAT-A 1510).

For any deviating operating conditions and applications the user must obtain the manufacturer‘s prior written approval.

2 Transportation and storage

2.1 Transportation

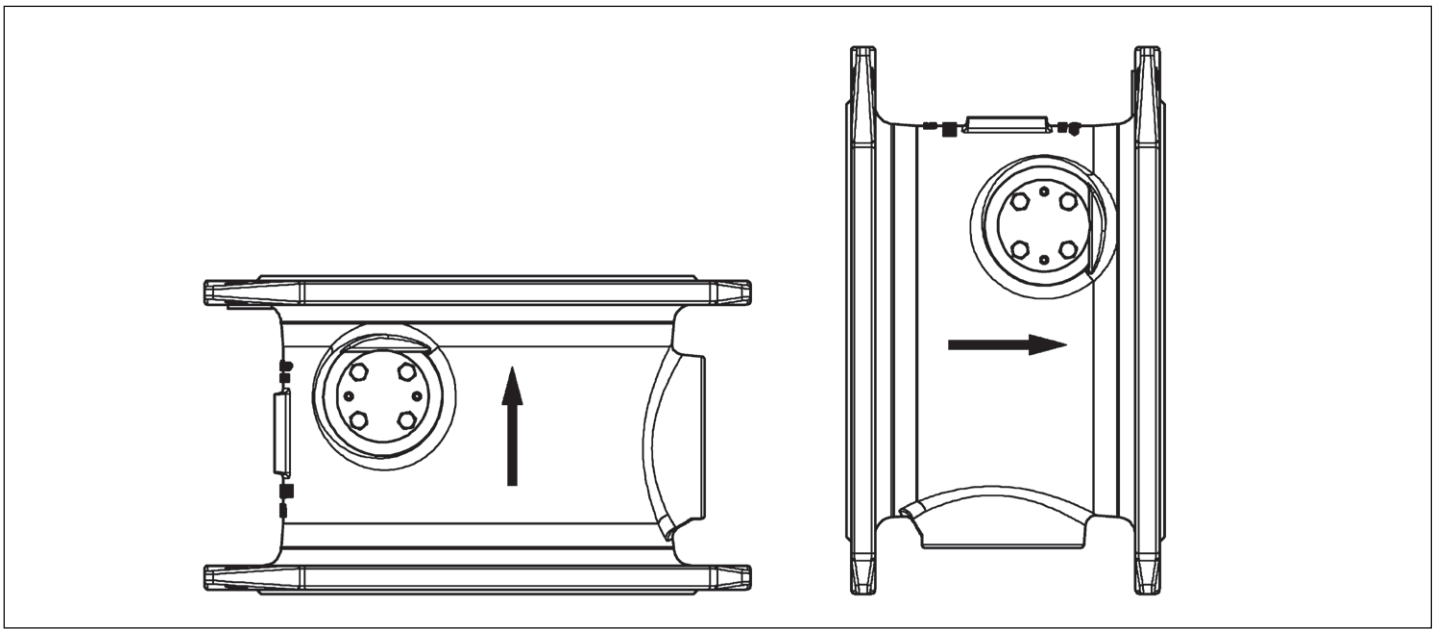
To transport the valve to its installation site, it must be packed in a stable, properly sized container. The container also needs to ensure that the valve is protected against weather influences and damage. When the valve is transported long distance (e.g. overseas) and exposed to special climatic conditions, it needs to be protected by sealing it in plastic wrapping and adding a desiccant.

The check valve needs to be transported with the disk in closed position. To ensure this, the valve is to be placed on its inlet-side flange or on its flange feet with the bearing bushes pointing to the top (cf. Picture 1).

The factory-applied corrosion protection coating and mountings (e.g. dampers) need to be specially protected.

2.2 Storage

The VAG SKR Slanted Seat Tilting Disk Check Valve is to be stored with the disk in closed position. Preferably, the valve is to be stored horizontally on its inlet-side flange or in an upright position on its flange feet with the bearing bushes pointing to the top (cf. Pictures 1a and 1 b). The valves should be stored in a dry, well-ventilated area. The direct exposure of the valves to radiation heat emitted by radiators should be avoided. The assemblies and components relevant for proper function of the valve, such as the disk and the damper units must be protected against dust and other kinds of dirt by appropriate covers.



Picture 1: Preferred transport position

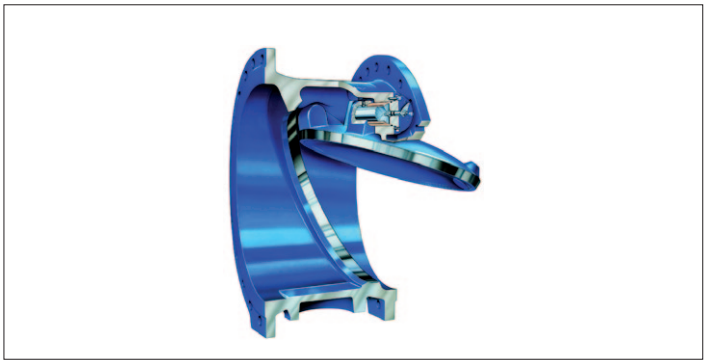
3 Product and function description

3.1 Features and function description

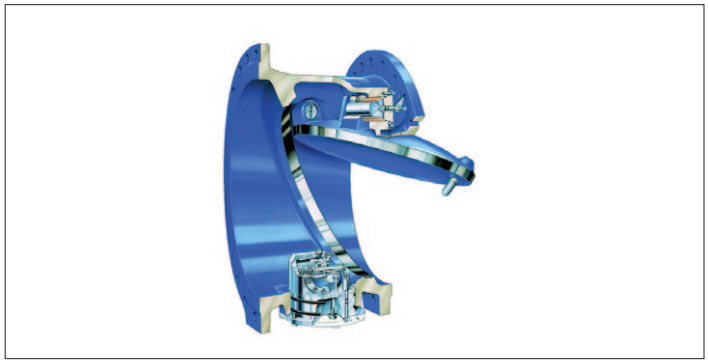
The VAG SKR Slanted Seat Tilting Disk Check Valve is a non-return valve with a full flange design and can therefore be used both between two pipeline flanges and as an end-of-line valve under full operating pressure. Due to the pressure of the medium, the disk opens automatically. To open the disk, a pressure of at least DN in mm wc (water column) is required, e.g. 500 mm wc at DN 500.

Proper sealing in the other direction is also controlled by the pressure of the medium conveyed (metal seated). To comply with the required leak rate, back-pressure of about 5 m water column is necessary. As a standard, the valve is supplied without damper unit (see Picture 2).

As an alternative, a version with an interior final position damper (see Picture 2.1) unit to reduce the effects of water hammers is available (see chapter 3.2).



Picture 2: Standard version

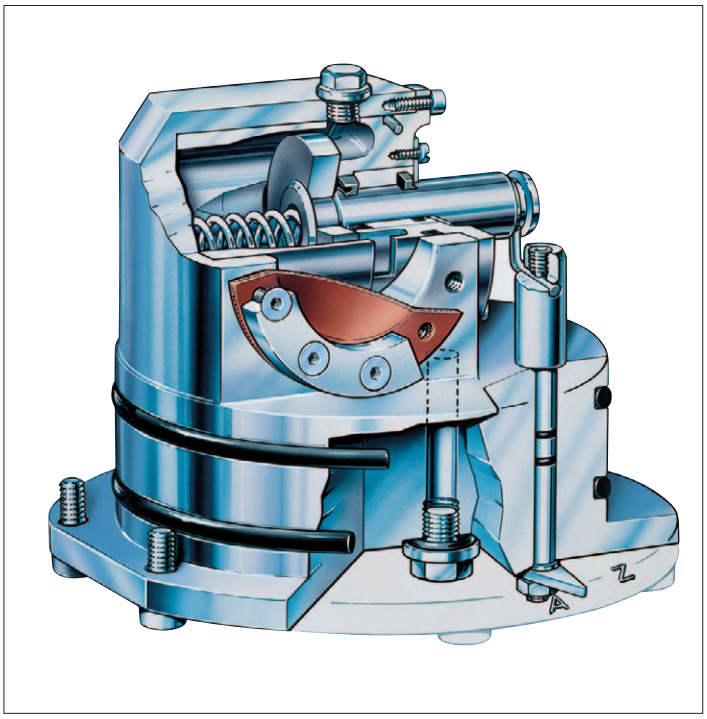


Picture 2.1: With internal damping unit

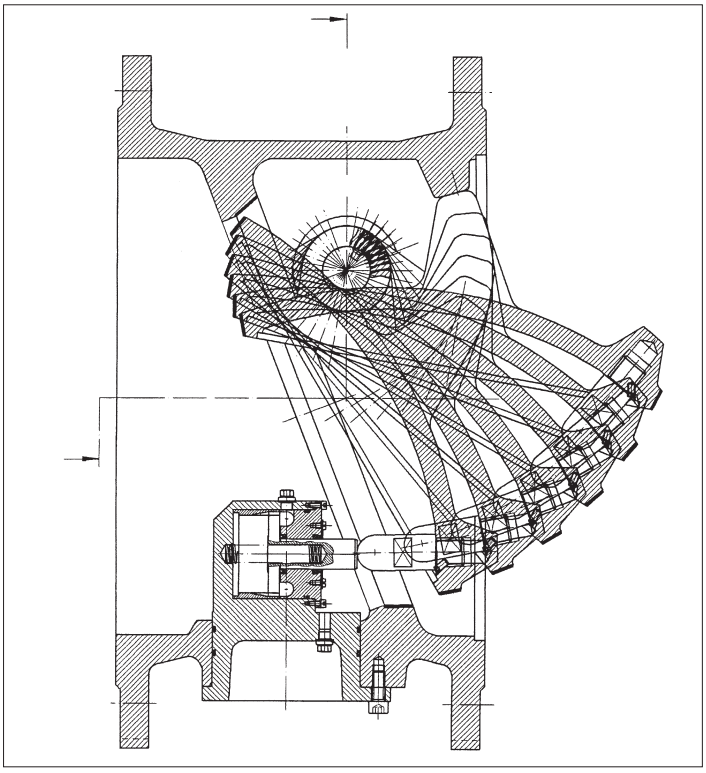
3.2 Features and function description of the internal damping unit

The function of the internal damping unit is to reduce water hammer and valve impacts and, thus, to go easy on the valves and on the pipeline. Depending on the hydraulic conditions more or less important impacts may appear in case of butterfly valves without damping. If the valve impact is inacceptable which, last but not least, does not only lead to high pressure peaks in the pipeline, the installation of the damping will become inevitable.

The internal damping reliably fulfills the corresponding requirements in an uncomplicated way.



Picture 3: Final Position Damper



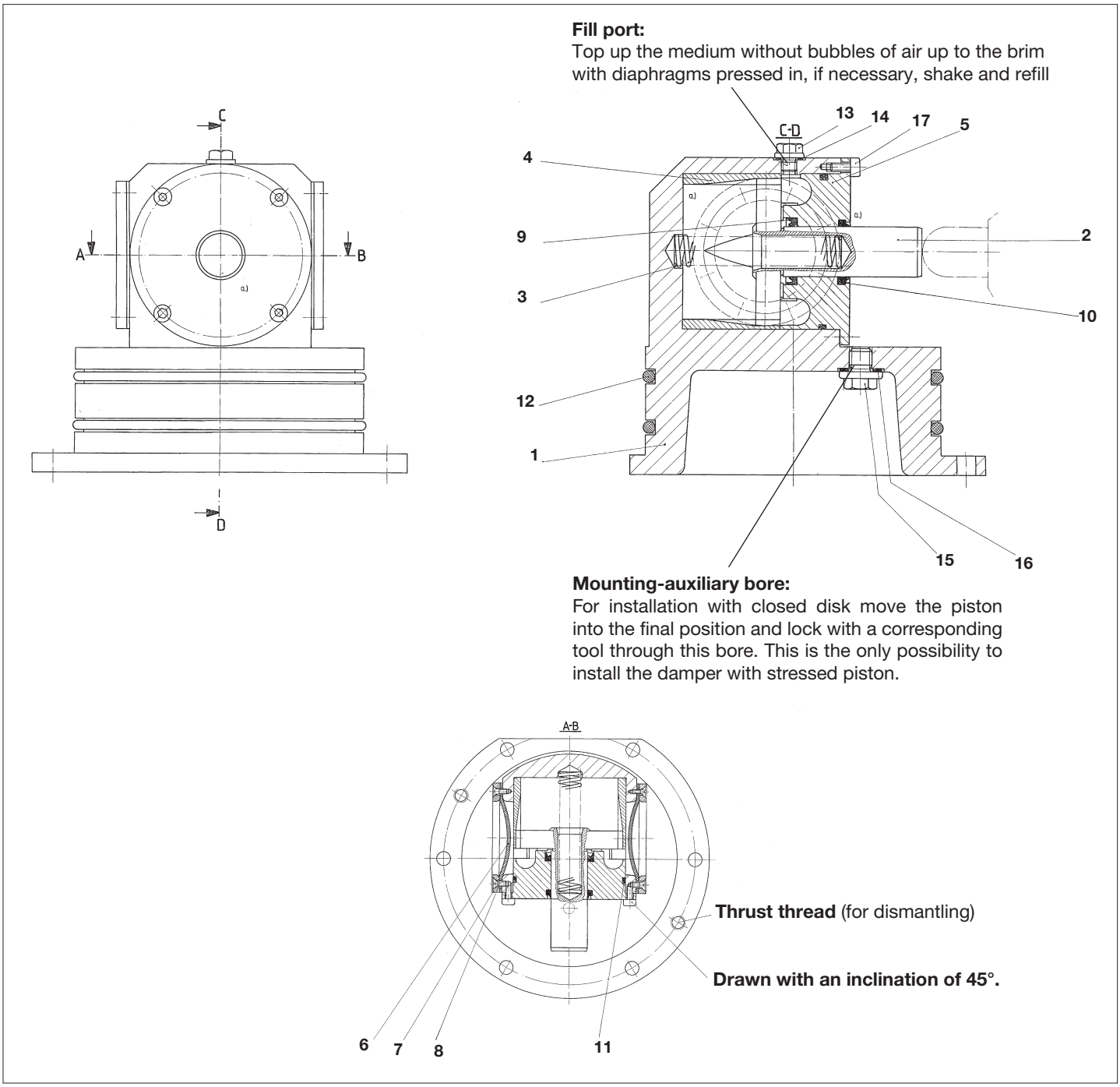
Picture 3.1: Damping movement

3.2.1 Function of the internal damping unit

The damper is topped up in the factory with liquid without bubbles of air - in the standard version water - via the plug (13) (Positions see picture 4). Diaphragms (6) must be concavely bent to the inside. In this condition the damper is already fully operative. The installation my be made with a vertical (only for flow direction from below in upward direction) as well as with a horizontal pipeline. The system pressure of the plant is not very important in this connection as it is transmitted directly to the damping medium via the diaphragm dividing surface. The damping effect is obtained as soon as the disk impact bolt strikes the piston centrically (2) making it move and presses the liquid behind the piston through the outlet surface of the specifically shaped slot contours of the bush (4) which become smaller now. The function of the diaphragms is to balance the resulting damping chamber reduction which is caused by the inserting front piston.

Higher pressures only occur behind the piston in the cylindrical damping piston. Thus, the diaphragms are not subjected to any damping overpressure. The damping distance corresponds to approximately 10 % of the total closing stroke of the free-swinging disk. Because of the inertia as well as the medium to be displace inside the damper the kinetic energy of the disk is reduced.

The particular shape of the inlet contours permits a soft transition from the disk striking with high speed until the final position, i. e. closed position. In this connection the damping duration results from the pressure which is built up inside the damper and the annular gap width around the piston, through which the medium must escape. As soon as the disk opens the piston is pressed back into its initial position by means of a thrust spring (3) (see picture 4) which is mounted behind the piston, thus simultaneously sucking water into the damping chamber. This suction process lasts several seconds. Afterwards, the damper is again operable.



Picture 4: Drawing internal damping unit

3.2.2 Mounting and Maintenance of the internal damping unit

The design of the damping device permits the installation and dismantling with opened as well as closed valve. The latter is interesting once the closed disk downstream is pressurized.

Dismantling:

Drain the pipeline either completely or, as described before, upstream.

Remove the cylinder screws at the damper housing and, if necessary, pull the damper housing off the body with these screws by means of provided thread bores.

The damper is disassembled as follows:

By releasing the cylinder screws (17) disassemble the guide (5) together with the piston (2). Replace worn-out parts, e.g. radial seal (9), scraper ring (10) or O-ring (11 and 12) or, if necessary, clean the existent parts. Assembly is made in reversed order. In case of a change of the two diaphragms (6) mind that they are prestressed concavely over the retaining ring (7).

Attention: The mounted but not yet installed damper must now be topped up with liquid full to the brim through the fill port (13) (in case of the standard version water) and must be tilted several times in different directions in order to make escape still existing bubbles of air through the fill port. Move the piston several times, during this obturate the fill port with the thumb.

Repeat these procedures several times and **top up with liquid again up to the brim**. The diaphragms must be **curved inwardly** in case of extended piston. Finally, mount the plug (13) together with the disc (14).

Installation:

Before installing the damper with closed disk the piston must be moved manually into its final position and must be locked. This is done by means of a mounting-auxiliary bore (15) through which a corresponding tool, e.g. an allen key or a screwdriver is put from outside until before the piston, thus, locking said piston.

For this, remove items 15 and 16.

Now the damper may be inserted again. After having tightened the cylinder screws at the damper housing the auxiliary tool will be pulled out, the piston is sitting now close to the limit bolt.

Mount again items 15 and 16.

This method of installation is only necessary once a dismantling of the valve is impossible. Generally, the damper is maintenance-free. However, an inspection and an operational test are recommended during a shutdown or other reconditioning activities.

3.3 Fields of Application

As the seals of the VAG SKR Check Valve are made of EPDM materials, the valve can be used with the following media:

- Water, raw water, cooling water, weak acids and alkaline solutions (see picture 5)
- Sea water (only fully rubber-lined model) (see picture 5.1)

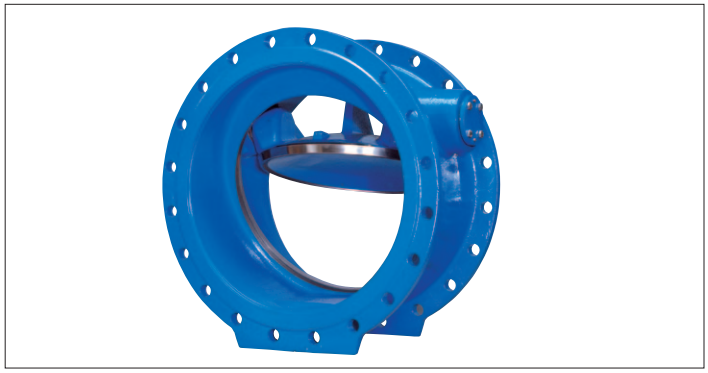
If the valve is used with media containing oil or gas, this may destroy the EPDM O-rings and therefore the use with such media is not permissible. If the valve is to be operated under deviating operating conditions and in other fields of application, the manufacturer must be consulted.

3.4 Proper and improper mode of operation

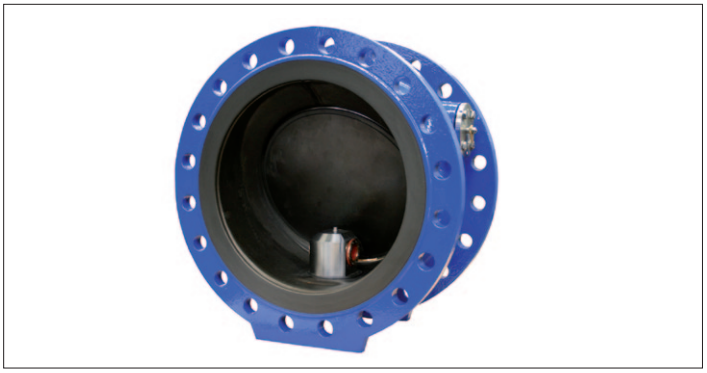
The maximum operating temperatures and pressures stated in the technical documentation (KAT-A 1510) must not be exceeded. The closed non-return valve must only be exposed to pressures within the range of its nominal pressure.

The maximum permissible flow velocity is that according to EN 1074-1. In addition to this, the check valve may be operated at flow velocities of up to 5 m/s irrespective of the pressure level.

For the place of installation, the installation position and the minimum flow velocity, the instructions given in Section 4 below must be observed. The internal damping unit must only be operated up to the limit stated (see KAT-A 1510).



Picture 5: SKR Check Valve inside and outside with epoxy coating



Picture 5.1: SKR Check Valve with inside rubber-lining and outside with epoxy coating

4 Installation in the pipeline

4.1 Site requirements

When the valve is installed between pipeline flanges, the flanges must be plane-parallel and in true alignment. Misaligned pipelines must be put into a true alignment position before the valve is installed. Otherwise the body may be exposed to impermissibly high loads and strain during operation which may even cause the body to break.

The installation of the valve in the pipeline should be as stressfree as possible. The maximum pipeline forces the valve may be exposed to are those stated in the EN 1074-3 standard.

It needs to be ensured that the space left between the flanges is large enough to prevent damage of the coating of the raised faces of the flanges when the valve is installed.

When work is done in the valve area which may cause dirt (e.g. painting, erection of brick walls or concrete work), the valve must be protected by a suitable cover.

4.2 Place of installation

The place of installation for the valve must be selected in a way that ensures there is enough space to allow function checks and maintenance work (e.g. dismantling and cleaning of the valve, disassembly of the damper unit).

For open-air installation, the valve must be protected against extreme weather conditions, such as the formation of ice, by covering it appropriately.

To ensure proper function and a long service life of the check valve, several factors need to be considered for the best place of installation.

4.2.1 Steady flow

A smooth and even flow ensures the stable position of the disk in open position. To achieve steady and even flow, a straight damping zone of 5 x DN should be provided upstream of the check valve (Picture 6).

If it is not possible to have a damping zone according to Picture 6, flow turbulences may expose the disk to shock which may shorten its service life. To prevent this, the flow velocity should be increased (cf. Section 4.2.2).

4.2.2 Flow velocity

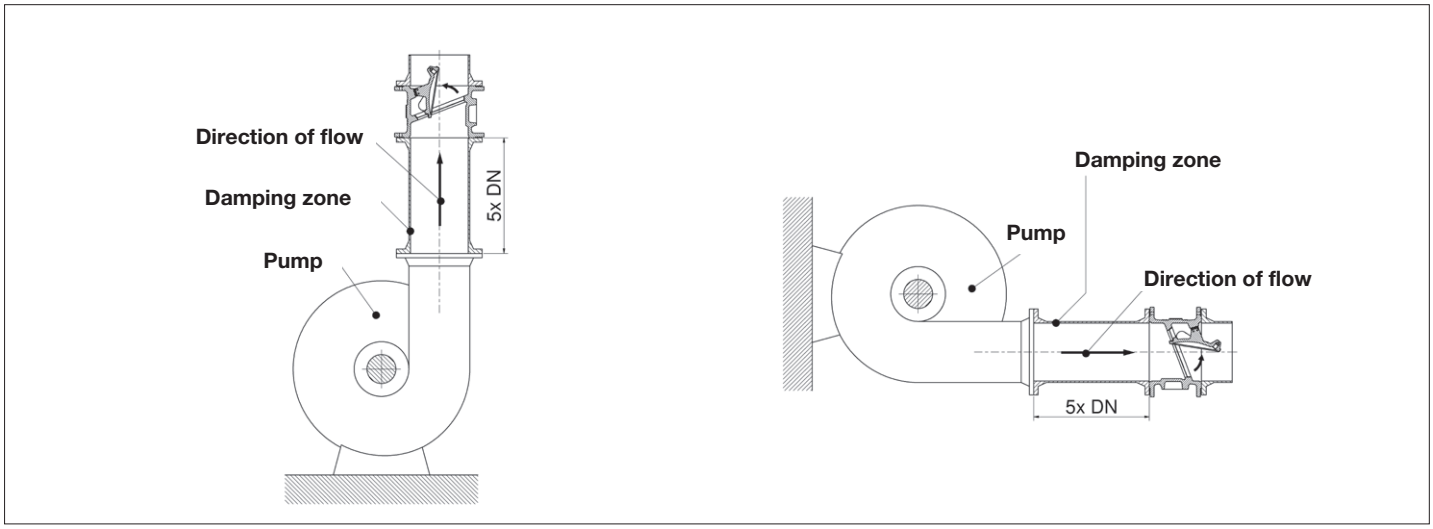
The VAG SKR Check Valve is suitable for operation at a maximum flow velocity of 5 m/s (cf. Section 3.4). To make the disk remain in close and secure contact with the body, a flow velocity of at least 1.6 m/s is required.

Both factors require the installation of the valve with an upstream damping zone (cf. Section 4.2.1, Picture 6). If the installation of the valve with a damping zone is impossible, the minimum flow velocity must be increased according to the installation conditions (e.g. > 2 m/s when installed behind elbows).

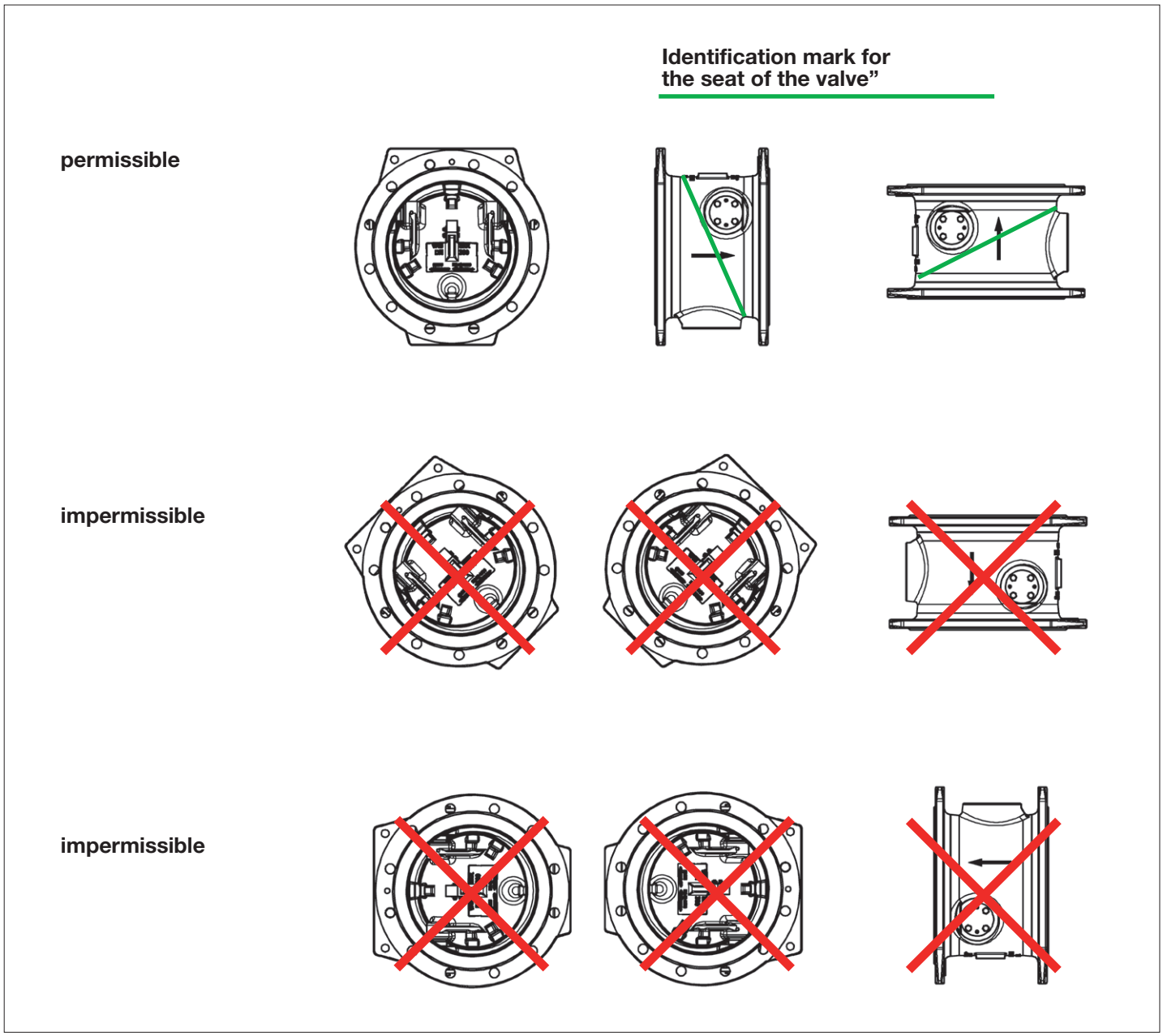
Non-compliance with these instructions may cause slamming of the disk which subjects the valve to increased wear and tear and may destroy it after a short time.

4.3 Position of installation

The VAG SKR Check Valve can be installed in horizontal or ascending pipelines up to an angle of inclination of 90° (see flow arrow and position of shaft bearings). The valve will not operate in any other position (Picture 7).



Picture 6: Steady flow



Picture 7: Permissible and impermissible positions of installation

4.4 Assembly instructions, fittings

Before the valve is installed, it must be checked for transport or storage damage. While being stored on the construction site before its installation, the valve must be protected against dirt by an appropriate cover. When the valve is installed it must be free of dust and dirt. VAG does not assume any liability for consequential damage caused by dirt, grit etc.

The proper motion and function of the function parts should be checked before installation. If the valves are painted later on, it must be made sure that the function parts are not painted over.

When the final position damper unit is assembled later on, its operation and maintenance instructions must be observed. Retrofitting of the damper unit is only possible, if the valve is prepared for retrofitting of this unit upon delivery.

For the assembly of the VAG SKR Check Valve it needs to be ensured that suitable lifting devices are available. Suspending the valve at its disk or final damper unit may result in their destruction.

When the valve is connected to the pipeline flanges, the hexagonal screws and bolts used in the bore holes must be screwed in using washers from flange to flange.

The screws must be fastened crosswise to prevent unnecessary tension and cracks or breaks that may result. The pipeline must not be pulled towards the fitting. If the gap between the fitting and the flange is too large, this must be com pensated by using thicker seals.

VAG recommends using steel-reinforced rubber seals to DIN EN 1514-1 Form IBC. If flared flanges are to be used, these seals are mandatory.

5 Putting the valve into operation

5.1 Visual inspection

Before putting the valve and the equipment into operation, all functional parts must be subjected to visual inspection. All screwed connections need to be checked as to whether they are tightly fastened.

5.2 Function check and pressure test

Before the installation of the valve, its function parts (disk, internal damping unit) should be completely opened and closed at least once and their proper running should be tested.

Caution !! When closed, the check valve must only be exposed to pressures not exceeding its nominal pressure (cf. Table 1). When a pipeline pressure test is performed during which the test pressure exceeds the permissible nominal pressure in the closing direction of the check valve, the pressure must be balanced via a bypass. Pressure tests during which the pipeline is filled in flow (opening) direction are unproblematic.

6 Maintenance and servicing

6.1 General safety instructions

Prior to any inspection and maintenance work to be performed on the valve or mounted parts and attachments, the pressurized pipeline must be shut off, the pressure must be relieved and the system must be secured against unintentional switching on. Depending on the kind and criticality of the medium or fluid conveyed, all the required safety regulations must be complied with!

Upon completion of the maintenance work and prior to resuming operation, all connections must be checked for proper fastening and leak-freeness.

The individual steps as stated under Section 5 need to be performed.

6.2 Inspection and actuation intervals

The leak-freeness, smooth operation and corrosion protection of the valve should be checked at least once per year (DVGW Technical Rules W 392). The same applies to the function of the internal damping unit.

Under extreme operating conditions, inspection needs to be done at shorter intervals. The body seals can be replaced, if required, depending on the type of fluid conveyed.

6.3 Maintenance and replacement of parts

The spare parts needed can be found in the spare parts list KAT-E 1510.

6.3.1 Inspection of disk and seat area

In line with the intervals recommended above, the valve is to be dismantled and cleaned. The metal seated parts of the disk and body need to be cleaned especially carefully.

6.3.2 Leaking body seals

After a longer period of operation, material fatigue may cause the body seals to leak. Seals are located in the bearing covers as well as in the cover of the final position damper unit. They can be replaced after the respective part has been disassembled.

6.3.3 Damaged bearing

Due to unsuitable or unfavourable installation conditions (cf. Section 4) violent slamming of the disk may damage the bearing bushes or shafts over time. To replace the bearing, the valve must be disassembled from the pipeline, the bearing covers and the threaded pins at the disk must be removed. The bearing bushes can be replaced after the shafts have been pulled out and after the disk has been disassembled. The valve is reassembled in reverse order.

6.3.4 Cleaning, lubrication

To ensure proper function, the body of the valve should be cleaned at the recommended intervals and the bearings should be slightly greased after each cleaning.

Recommended lubricant:

KLÜBERSYNTH VR 69-252 (KTW-approved for drinking water)

Factory test of the valve to DIN EN 12266-1					
DN	PN	Permissible working overpressure	Permissible working temperature	Test pressure with water	
				in the body	in the seat
mm	bar	°C	bar	bar	bar
200-1200	10	50	15	15	11
200-1200	16	50	24	24	17,6

Table 1: Factory test of the valve to DIN EN 12266-1

7 Trouble-shooting

For all maintenance and repair work please observe the general safety instructions under Section 6.1!

Problem	Cause	Remedial action
Disk does not seal properly	Foreign particle(s) jammed in the seat area	Purge valve, dismantle, if necessary and remove foreign particle(s)
	Deposits from the medium have settled on the seat or disk	Dismantle valve and clean seat area and disk
	Back-pressure too low	To achieve the specified leak rate, the back-pressure must be at least 5 m water column
	Unfavourable flow at the valve disk and obstruction of the closing movement	Change installation position (cf. Section 4)
	Final position damper unit blocked	Disassemble damper unit according to operating instructions and unblock it
	Obstruction of the closing movement due to worn bearing	Replace bearing (cf. Section 6.3.3)
Disks slams	Unfavourable installation position and thus unfavourable flow at the disk (e.g. installed too closely behind the elbow)	Change installation position (cf. Section 4)
	Flow velocity of the medium too low	Install valve with smaller nominal diameter or increase flow velocity in the system within the permitted range of the valve
Body leaks	Deteriorated seals	Replace seals (cf. Section 6)

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