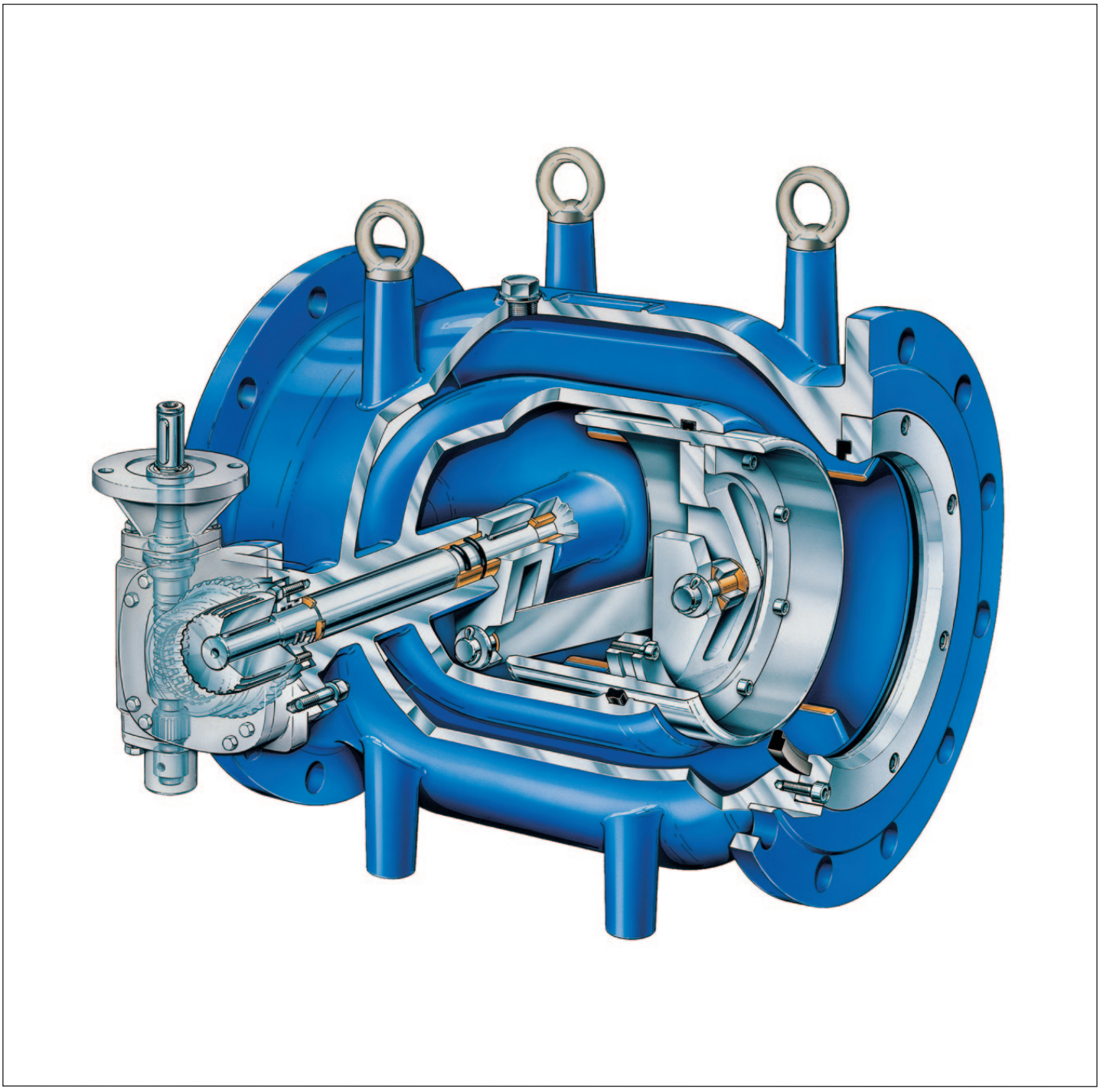
Operating and maintenance instructions

VAG RIKO® Plunger Valve



KAT-B 2010 Edition 7-1 / 01-18

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 standards - German association for gas and water , directives VDI - German association for engineers, directives VDMA - German association for engineering and installation 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 2014-A).

Valves produced by VAG are designed and manufactured in accordance with international design and engineering standards. Therefore they are principally operation safe. However, all valves can represent a source of danger if they are used inappropriately or for other purposes than the ones which they have been designed for.

In the operator‘s company, each person associated with the installation, dismantling, operation or maintenance of the valves has to read and understand the whole operation instructions (German directives for accident prevention UVV, VBG1 § 14 and the following).

Before removing any protection device and/or beginning to work on the valves, the concerned pipeline section has to be isolated. As far as is possible all risk should be removed. Any unauthorised, mistaken or sudden operation of the valve must be prevented; care should also be taken to ensure any stored energy (pressurised air or water) is removed.

When working on installations requiring supervision, the respective laws and directives (e.g. industrial codes of practice, directives for accident prevention, technical directives for steam boilers, AD directives) have to be observed. Additionally, the local directives for accident prevention and health and safety have also to be observed.

If a valve at the end of a pressurised pipeline has to be opened, it has to be done in such a way that the emerging fluid does not cause any injury or damage. Caution must be taken when closing and end of pipeline valve: Any human interference between the body and closing piston may result in severe injury.

If a valve has to be dismantled from the pipeline, some fluid may leak out from the pipeline or from the valve. The pipeline has to be completely emptied before dismantling the valve. Take care of later coming residues!

1.2 Proper use

The VAG RIKO® Plunger valve is a valve designed for installation in pipelines. Plunger Valves are designed to fulfil special control functions in water supply systems. The technical application limits (e.g. working pressure, medium, temperature etc.) are described in the product related documentation (KAT 2014-A). Solids in the medium can lead to increased wear of the valve. Depending on the type, load and particle size, these must be taken into account when selecting the valve and planning the system. For any deviating operating conditions and applications the user must obtain the manufacturer‘s prior written approval.

1.3 Marking

According to DIN EN 19, every valve is marked with the nominal width (DN), the nominal pressure (PN), the body material and the manufacturer. The name plate on the body provides the following information:

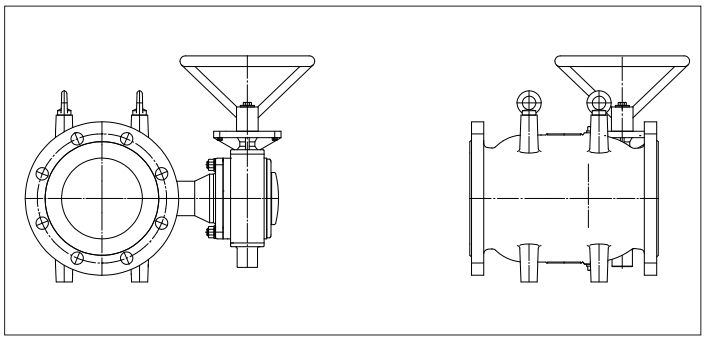
VAG	Name of the manufacturer
DN	Nominal width of the valve
PN	Nominal pressure of the valve
	Controlling equipment
	Material of the body
	Date of manufacturing

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 RIKO® Plunger Valve needs to be transported with the feets on the floor (cf. Pictures 1). The factory-applied corrosion protection coating and mountings (e.g. gearbox or electric actuator) need to be specially protected.



Picture 1: Preferred transport position

2.2 Storage

The RIKO® Plunger Valve is to be stored horizontally on its feet (cf. Pictures 1). 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 plunger must be protected against dust and other kinds of dirt by appropriate covers.

The valves have to be stored in a dry location, protected from dirt and accidental damage. Protection caps and wrapping material around the connection parts have to be removed immediately before installation. Lifting gear such as ropes and belts must be attached only to the body or the eye-bolts of the valve, not to the actuator or gearbox.

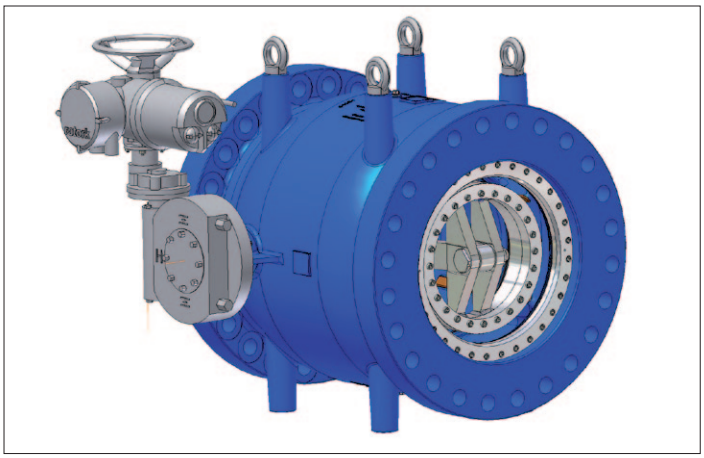
3 Product and function description

3.1 Features and function description

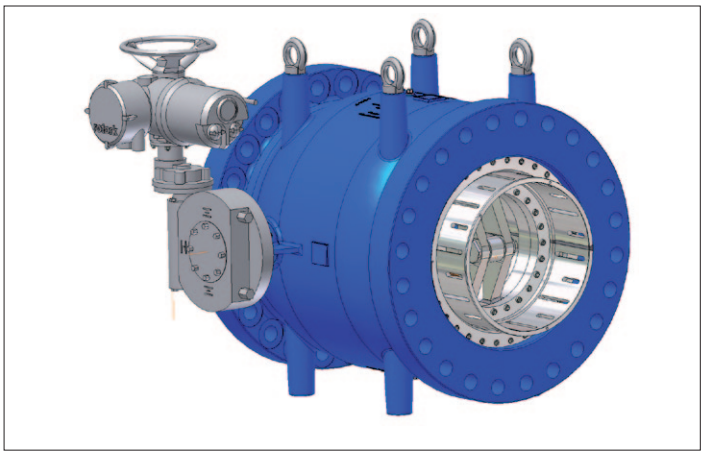
Plunger valves are designed to fulfill regulating functions in the water supply. Unlike butterfly or gate valves assuming

only shut-off functions in pipeline systems, plunger valves meet the special requirements of regulating operations. The compact and single-piece body is made of high quality ductile iron EN-JS 1030 (GGG 40). Up to DN 600 all inner parts are made of stainless steel. An essential advantage is the new piston guid: armour-coated with bronze.

New sealing systems for pistons, shaft bearings and seats guaranty a good corrosion protection and high performance.



Picture 2: Standard version -Type E



Picture 2.1: Version SZ (with slotted cylinder)

3.2 Fields of application

As the seals of the VAG RIKO® Plunger Valve are made of EPDM materials, the valve can be used with the following media:

- Water, raw water, cooling water,
- Air

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.

3.3 Performance limits

VAG RIKO® Plunger Valves are designed for regulating the flow rate. During operation, the cavitation limits have to be observed according to calculation diagram of the VAG UseCAD®. The cavitation value is calculated as follows, when the pressure values at entry and at exit of the valve as well as the flow-through value are known:

Calculating the σ - Value:

$$\sigma = \frac{H_2 + H_{At} - H_d}{(H_1 - H_2) + \frac{v^2}{2 * g}}$$

H1 = overpressure at entry of the valve (mWS)
H2 = overpressure at exit of the valve (mWS)
HAt = atmospheric pressure (mWS)
Hd = evaporating pressure (mWS)
v = flow rate in the pipe (m/s)
g = standard acceleration of free fall (m/s^2)

VAG RIKO® Plunger Valves are dimensioned correctly when the calculated σ - value lies above the limit curves of σ_K. We recommend a control range between 10-100% opening. Below there is no reliable control function. However, if during commissioning banging noises or severe vibration occurs, then the actual operating conditions have to be checked. It may be necessary to replace the cylinder because of differing operating conditions. If the calculated σ - value lies under the limit curves of σ_K cavitation will occur. The following remedies my help:

- replacing the orifice or slotted cylinder
- altering the back pressure
- installing the valve in another place

If the calculated σ - value lies above the limit curves of σ_K there must be another cause for the noises. The whole pipeline should be checked.

3.4 Proper and improper mode of operation

The maximum operating temperatures and pressures stated in the technical documentation (KAT 2014-A) must not be exceeded. The closed valve must only be exposed to the nominal pressure.

The maximum permissible flow velocity is that according to EN 1074-1. In addition to this, the Valve may be operated at flow velocities of up to 5 m/s irrespective of the pressure level. Exceptions are the application in bottom outlets of dams.

4 Installation at 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 stress-free as possible. The maximum pipeline forces the valve may be exposed to are those stated in the EN 1074-5 standard.

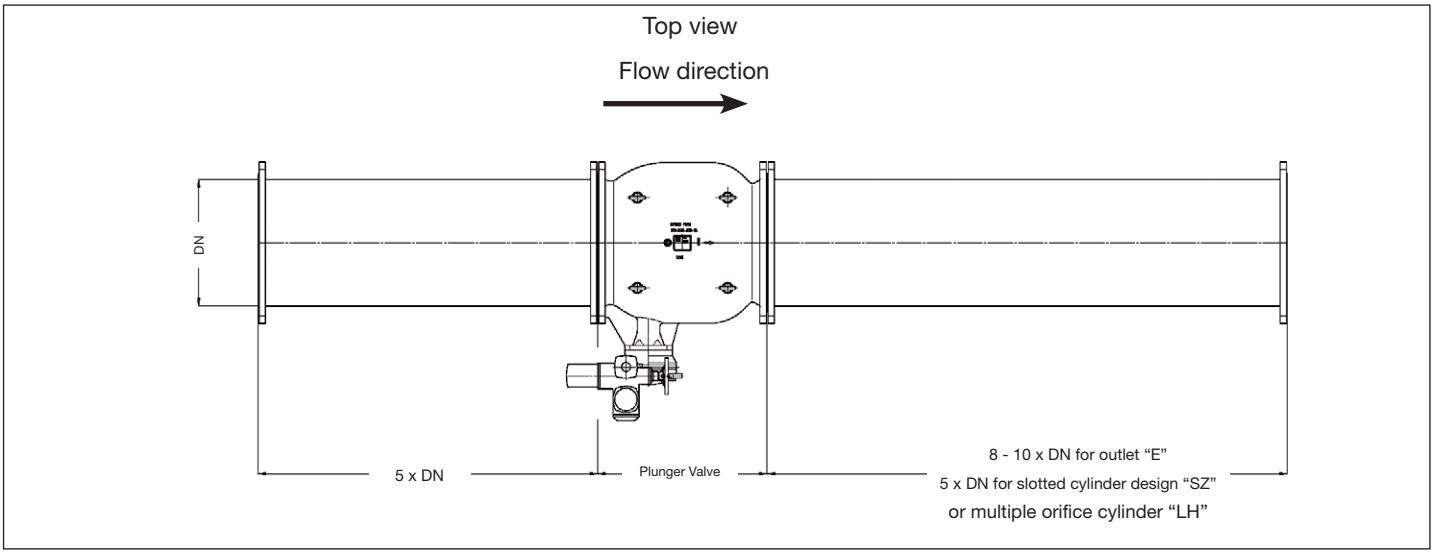
It needs to be ensured that the space left between the flanges is large enough to prevent damage of the coating of the raised faces of the flanges when the valve is installed.

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).

For open-air installation, the valve must be protected against ex-



Picture 3: Arrangememt of the VAG RIKO® Plunger Valve

treme weather conditions, such as the formation of ice, by covering it appropriately.

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

Installed equipment in the pipeline upstream and downstream of the VAG RIKO® Plunger Valve:

- When using polluted mediums a filter with a suitable mesh size has to be provided upstream of the valve to sustain the function of the control valve.
- Avoid installing an inspection valve, elbows, T-pieces and Y-filters directly upstream of the VAG RIKO® Plunger Valve (5 x DN) as this may cause irregular upstream flow and thus disturb the function of the control valve.
- When installing the Plunger Valve as a control valve in a closed pipeline, it has to be strictly observed that a straight outlet section is provided downstream of the Plunger Valve, i.e.:
  - for version with outlet type „E“, the length of this section should be 8 - 10 x DN.
  - for version with multiple orifice or slotted cylinder, this length should be minimum 5 x DN.
- This means that fittings like elbows, T-pieces, Butterfly Valves, Non-return Valves or Y-filters must not be installed within this pipe section. By this the turbulent flow in the flow profile influenced by the Plunger Valve can be calmed. If these preconditions cannot be fulfilled, one has to expect with more noise and damages at the corresponding components. Avoid arranging diffusers on the outlet side. In this case, VAG RIKO® Plunger Valves can be factory-mounted with a sudden enlargement. If the distances required for inlet and outlet zones can not be complied with this way, this may result in disturbances of the plant or inferior control behaviour.
- The temperature limits for the flow medium must not be exceeded.
- The nominal pressure is the max. pressure to be applied on the closed valve.
- Extending the operating elements is not allowed, by e.g. levers.

4.3 Position of installation

VAG RIKO® Plunger Valves can be installed in the vertical as well as in the horizontal position. The valve will not operate in any other pipeline position (Picture 4).

The flow-through direction arrow has to be observed. Pay attention to the direction of operation arrow on the valve body.

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.

For the assembly of the VAG RIKO® Plunger Valve it needs to be ensured that suitable lifting devices are available.

The valve may only be suspended using its eye bolts. If the valve is suspended using any other parts, this may damage or even destroy the valve.

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.

This will guarantee a regular pressure on the gaskets and thus the leakproofness of the flange connection.

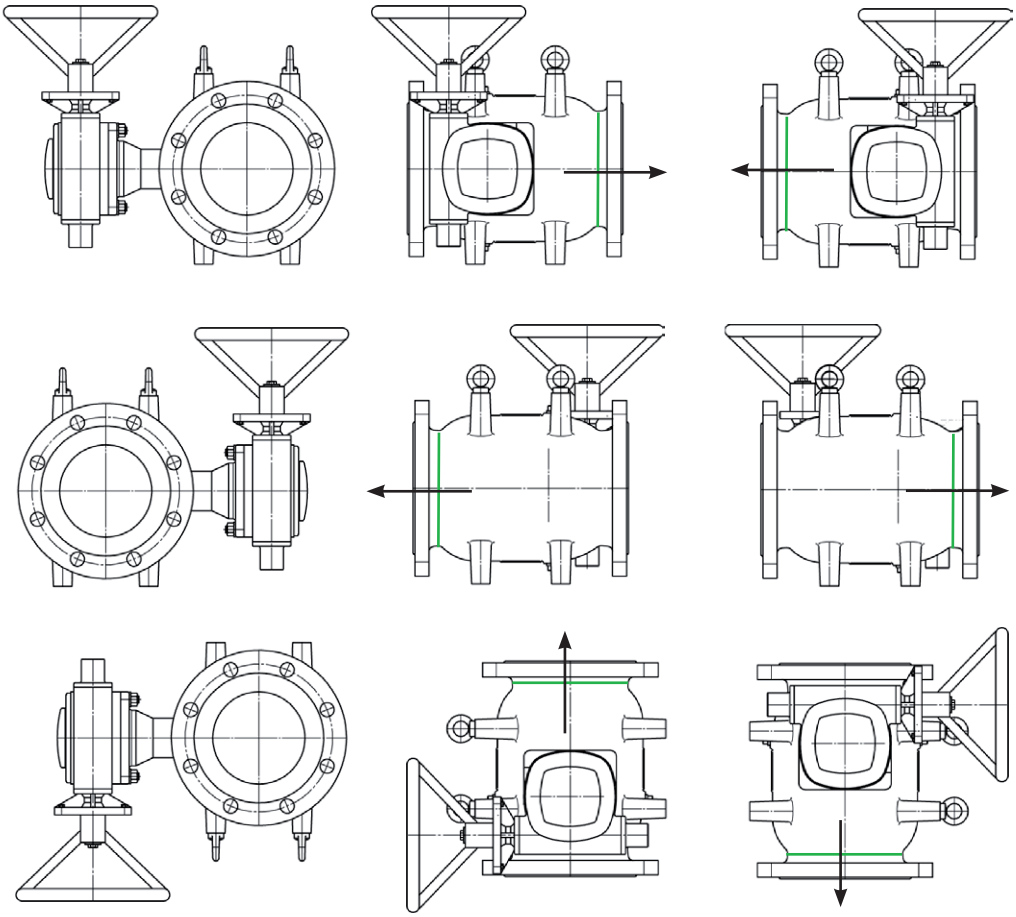
The pipeline must not be pulled towards the fitting. If the gap between the fitting and the flange is too large, this must be compensated by using thicker seals. VAG recommends using steel-reinforced rubber seals to DIN EN 1514-1 Form IBC. If flared flanges are to be used, these seals are mandatory.

Please note, the pipeline flanges to be connected to the valve have to be aligned in axial and in parallel position.

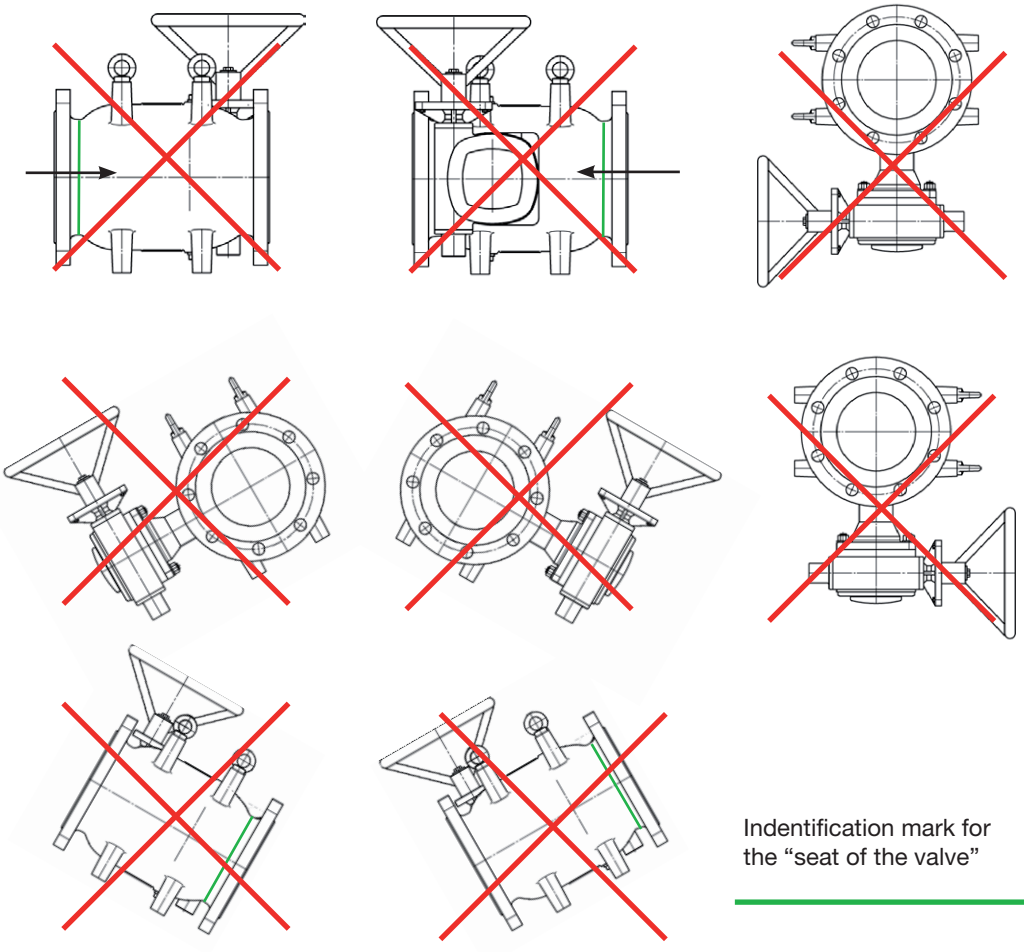
Any remedial welding work carried out on the valve should be completed before installation of the valve, in order to prevent damage to the gaskets or to the valves protective coating. Remove any welding splashes before putting the valve into service.

The pipeline installation has to be carried out in such a way that no

permissible



impermissible



Picture 4: Permissible / impermissible positions of installation and flow directions

harmful strains occur upon the valve body. In the event that continued installation occurs near or above the valve, the valve has to be covered for protection from accidental damage.

Should repainting of the installation be required, make sure that no name or type plates are covered by the paint. If the installation is blasted before painting, these plates have to be covered for protection. If any detergents are used for cleaning, ensure that no detergent damages the gaskets of the pipeline or of the valve.

5 Putting into operation and 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.

Before taking a new installation into operation and especially after preparation works, open the valves completely and purge the pipeline system. When using cleaning or disinfecting agents, take care that these do not attack the materials of the valve. Valves are generally closed by turning the gear wheel clockwise.

Shafts and drives are designed in that way that the valves can be operated by a person via a handwheel. Extensions for operation are not admitted as they may cause damages on the valve by over tension. The 90° movement of the disk is limited by a limit stop in the actuator or gearbox. Excessive forced movement beyond the limits will cause damage. Check the proper functioning of the valve by opening and closing it a few times.

5.2 Function check and pressure test

Before the installation of the valve, its function parts should be completely opened and closed at least once and their proper running should be tested.

Caution!! When closed, the Valve must only be exposed to pressures not exceeding its nominal pressure (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 valve, the pressure compensation must be effected via a bypass.

Carefully purge all newly installed pipeline systems in order to remove any foreign particles. Should residues or dirt particles be in the pipeline they may clog installations such as multiple orifice cylinders or slotted cylinders when the pipeline is flushed. This may have a negative effect on the function of the valve or even block it completely.

6 Operators

6.1 General

Operators such as manual gearboxes, pneumatic or electric actuators are designed for flowing rates according to EN 1074-1 table 2 (valves for water supply, requirements for usability). The manufacturer should be informed of any differing operating conditions than those for which the valve was designed. The setting of the limit stops for open („AUF“) and close („ZU“) must not be altered without the agreement of the manufacturer. If a valve without an operator is to be installed, it is essential that the valve will cannot be pressurised. VAG RIKO® Plunger Valves are designed with an angular adjustment of 90°. The valve itself has no limit stops; therefore the drive has to be equipped with limit stops. The drive has to have been designed for rotation in anti-clockwise direction in relation to the valve shaft.

The adjustments of the limit stops have to be in accordance with the operating instructions for AUMA worm gears. When retrofitting a gear, the nominal torque and the limit stops for open („AUF“) and close („ZU“) have to be adjusted accordingly to the valve. Non compliance of these directives may cause danger to life and limb and/or cause damage to the pipeline system. If operators fed by separate power supply (electric, pneumatic or hydraulic) have to be dismantled from the valve, the safety directives in 1.1 have to be observed and the separate power supply must be switched of and isolated.

6.2 Operating torque

The values given in table 2 (following page) are the maximum required torque [in Nm] at the drive shaft at full differential pressure with an included safety factor of 1.5.

6.3 Installation of an electric actuator

The electric actuator is to be installed onto the input flange of the gear box. The size of the actuator should be selected according to the maximum operating torques listed in table 2.

The valve is shut-off:

- in open position depending on the limit
- in close position depending on the limit.

These switches are adjusted at VAG factory. The torque switches act as overload protection in the intermediate positions. In case a valve is retrofitted with an electric actuator, the limit switches must be adjusted after the installation of the actuator. For adjustment, see the operating instructions of the electric actuator manufacturer.

Observe the respective safety directions of VDI / VDE and the instructions of the electric actuator manufacturer.

DN mm	PN nominal pressure bar	Max. operating pressure bar	Max. operating temperature for neutral liquides °C	Test pressure in bar with water in body	 in seat
150…2000	10	10	50	15	11
150…2000	16	16	50	24	18
150…1800	25	25	50	37,5	28
150…1200	40	40	50	60	44

Table 1 Factory test of the valve to DIN EN 12266

DN	150	200	250	300	400	450	500	600	700	800	900	1000	1200	1600	1800	2000
PN 10 max. operating torque [Nm] at input of gear box	20	20	20	20	20	25	25	25	40	50	30	40	30	200	130	190
turns/stroke	20,5	20,5	20,5	20,5	20,5	20,5	26,8	52	52	52	155	155	212	212	424	424
PN 16 max. operating torque [Nm] at input of gear box	20	20	20	20	25	30	25	30	55	70	40	60	40	230	150	210
turns/stroke	20,5	20,5	20,5	20,5	20,5	20,5	26,8	52	52	52	155	155	212	212	424	424
PN 25 max. operating torque [Nm] at input of gear box	20	20	20	25	45	50	40	40	70	90	45	90	55	260	175	250
turns/stroke	20,5	20,5	20,5	20,5	20,5	20,5	26,8	52	52	52	155	155	212	212	424	424
PN 40 max. operating torque [Nm] at input of gear box	20	25	35	35	50	60	45	45	90	120	70	110	75	-	-	-
turns/stroke	20,5	20,5	20,5	20,5	20,5	20,5	26,8	52	52	52	155	155	212	-	-	-

Table 2

7 Maintenance and servicing

7.1 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.

Please note, a plunger valve is not self-locking. Therefore neither the drive nor the gear must be dismantled while the valve is pressurised. This section also applies when the valve is completely dismantled.

7.2 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).

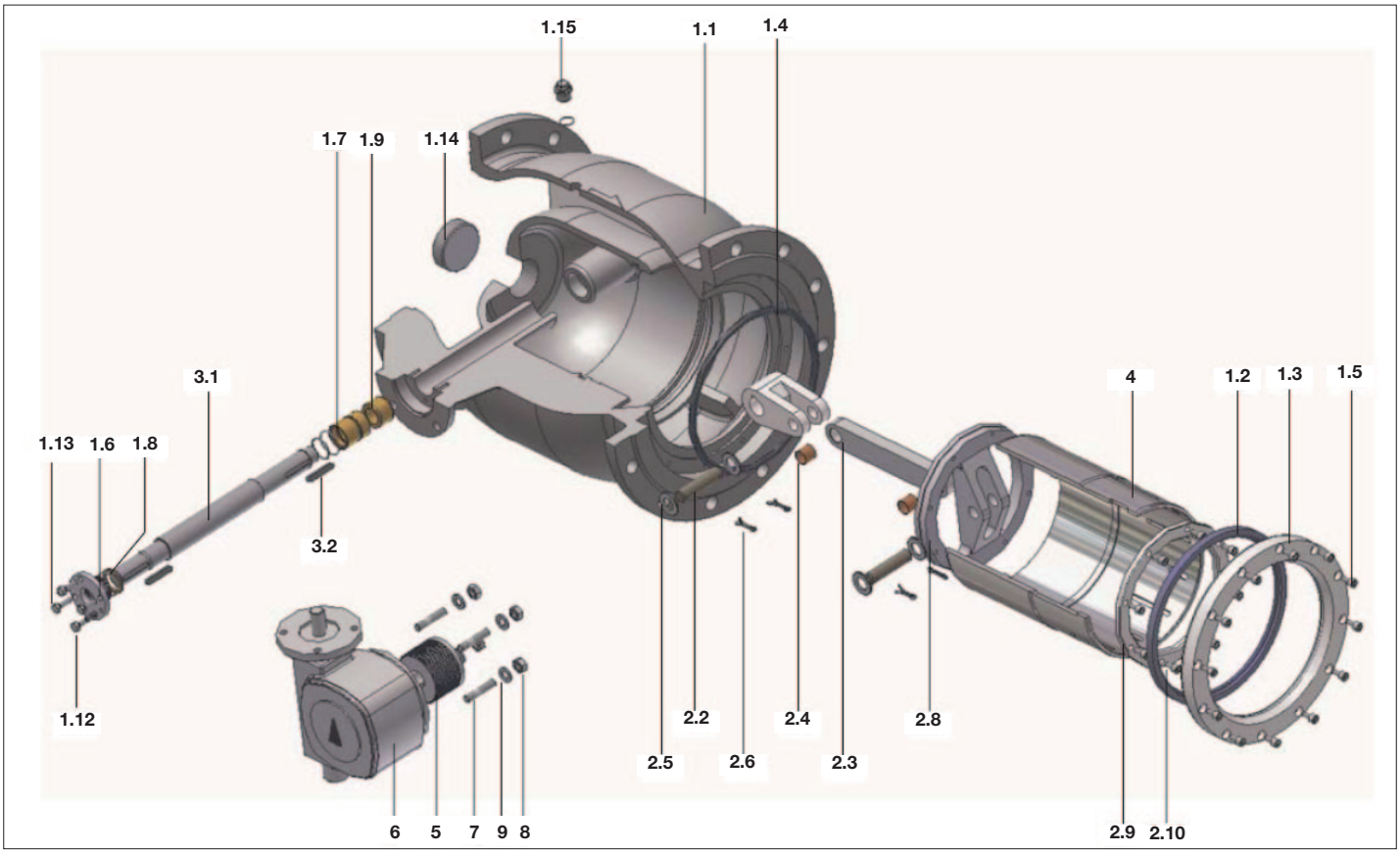
Under extreme operating conditions, inspection needs to be done at shorter intervals.

The body seals can be replaced, if required, depending on the type of fluid conveyed.

7.3 Maintenance and replacement of parts

The spare parts needed can be found in the spare parts list in chapter “7.3.1 Design”.

7.3.1 Design



Pos.	Description	Material	Spare part
1.1	Body	EN-JS 1030 (GGG 40)	
1.2	Profile sealing ring	EPDM	X
1.3	Retaining ring	1.4301	
1.4	Quad O-ring	EPDM	X
1.5	Hexagon socket head cap screw	A4-70	X
1.6	Bearing flange	EN-JS 1030 (GGG 40)	
1.7	Bearing bush	G-CuSn12	
1.8	Thrust washer	G-CuSn12	X
1.9	Counter bearing bush	G-CuSn12	
1.10	O-ring	EPDM	X
1.11	O-ring	EPDM	X
1.12	Hexagon cap screw	A4-70	
1.13	Threaded pin	A4-70	
1.14	Plug	1.0038	
1.15	Screw plug	A4-70	X
1.16	Gasket	Centellen	X
2.1	Crank	X5 CrNi18 9 (1.4301)	
2..1*	Crank from DN 700	EN-JS 1030 (GGG-40)	
2.2	Crank bolt	X20 Cr13 (1.4021)	
2.3	Piston rod	X5 CrNi18 9 (1.4301)	
2.3*	Piston rod from DN700	EN-JS 1030 (GGG-40)	
2.4	Cylinder bearing	Bronze / PTFE	X
2.5	Washer	A4-70	
2.6	Split pin	X20 Cr13 (1.4021)	X
2.7	Thrust washer	POM	X
2.8	Piston rod bearing DN150...250	X20 Cr13 (1.4021)	
2.8*1	Piston rod bearing DN300...600	X5 CrNi18 9 (1.4301)	
2.8*2	Piston rod bearing from DN 700	EN-JS 1030 (GGG-40)	
2.9	Retaining ring piston rod bearing	X5 CrNi18 9 (1.4301)	
2.10	Hexagon socket head cap screw	A4-70	X
3.1	Crank shaft	X20 Cr13 (1.4021)	
3.2	Key	X5 CrNi18 9 (1.4301)	
4	Plunger	X5 CrNi18 9 (1.4301)	
5	Coupling	C45 - AUMA	
6	Gear box	AUMA GS.3	
7	Set screw	A4-70	
8	Nut	A4-70	
9	Washer	A4-70	

Table 3

7.3.2 Replacing the profile sealing ring (Position 1.2)

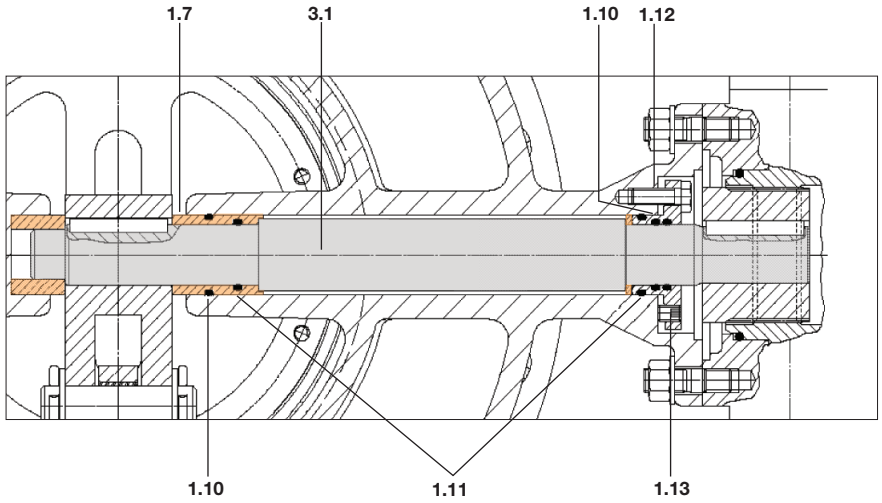
- Open the VAG RIKO® Plunger Valve completely up to the limit stop.
- Unscrew the hexagon socket head cap screws (1.5) and the retaining ring (1.3).
- Clean the parts thoroughly.
- Replace the profile sealing ring (1.2).
- Apply a thread locking substance on the hexagon socket head cap screws (1.5) and tighten them according to table 4.

7.3.3 Replacing the quad O-ring (Position 1.4)

- Dismantle the VAG RIKO® Plunger Valve as described in 7.3.2.
- Unscrew the hexagon socket head cap screws (2.10) within the plunger piston.
- Remove the retaining ring / push rod bearing (2.9).
- Remove the plunger (4). The crank drive (crank, piston rod and piston rod bearing) remains in the valve.
- Clean the parts thoroughly.
- Replace the quad O-ring (1.4).
- Re-assemble in reverse order. Tighten the screws according to table 4.

7.3.4 Replacing the O-rings (Position 1.10 and 1.1)

- Dismantle the VAG RIKO® Plunger Valve as described in 7.3.2.
- Unscrew the gear box nuts (8).
- Unscrew the hexagon cap screw (1.12) and remove the bearing flange (1.6).
- Remove the crank shaft (3.1) together with the thrust washer (1.8).
- Remove the bearing bush (1.7).
- Clean the parts thoroughly.
- Replace the O-rings (1.10 and 1.11).
- Re-assemble in reverse order. Tighten screws according to table 4.
- Observe the position of the bearing bush (1.7). The shoulder of the bearing bush must show towards the gear box.
- Attention: Insert the hexagon cap screws (1.12) only to adjust the shaft with the bearing.
- Tighten the screwed connection with the threaded pins (1.13).
- Continue re-assembling in reverse order.
- Re-install the gear box.
- Tighten the gear box nuts (8) according to table 4.
- Re-adjust the limit stops of the gear. (See operating instructions for AUMA worm gears)



Picture 5: Detail view

7.3.5 Tightening torque for the screws in [Nm]

DN	M6	M8	M10	M12	M16	M20	M24	M30	M36	M42	M48
1.5 Cylinder screw, retaining ring, body	5	10	20	35	80	160	300	-	-	-	-
1.12 Hexagon cap screw, bearing cover	4	8	15	25	60	120	-	-	-	-	-
1.13 Threaded pin, bearing cover	4	8	15	25	60	-	-	-	-	-	-
2.10 Hexagon socket head cap screw, retaining ring, piston	5	10	20	35	80	160	300	580	1000	1600	2500
8 Nut, gear box	-	-	35	60	150	290	500	950	1650	-	-

Table 4

8 Trouble-shooting

For all maintenance and repair work please observe the general safety instructions under Section 7.1.

Problem	Possible cause	Remedial action
Valve makes noises	Unfavourable installation position and thus unfavourable flow at the valve (e.g. installed to closely behind the elbow)	Change installation position (cf. Section 4.3)
	Valve operating beyond the design limits	Check design and/or operational data; if required, change resistance in valve by using other internals.
Valve can not be operated	Foreign particle jammed in the seat area	Flush valve; if required, disassemble valve and remove foreign object
	Gear blocked	Dissolving the blockage
	Electric actuator not yet connected to power supply	Connect to power supply
	Unfavourable flow at the valve and obstruction of the movement	Change installation position (cf. Section 4.3)
Leaks in the body seat	Valve not completely closed yet	Close valve completely
	Valve sealing damaged or worn	Replace sealing ring

Problem	Possible cause	Remedial action
Desired flow volume is not reached	Operational data have been changed	Check design and/or operational data; if required, change resistance in valve by using other internals.
	Dimensions of multiple-orifice or slotted cylinders too small.	
	Multiple-orifice or slotted cylinders optionally are clotted.	Flush valve; if required, disassemble valve and remove foreign object
Flow volume too high	Operational data have been changed	Check design and/or operational data; if required, change resistance in valve by using other internals.
	Dimensions of multiple-orifice or slotted cylinders to large	
Desired back pressure too high	Operational data have been changed	Check design and/or operational data; if required, change resistance in valve by using other internals.
	Dimensions of multiple-orifice or slotted cylinders to large	
Cavitation in valve	Valve operating beyond the design limits	Check design and/or operational data; if required, change resistance in valve by using other internals.
	Operational data have been changed	