

VAG EKN[®] Butterfly Valve Type AWWA



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1 General

1.1 Safety



Warning/Caution: These Operation and Maintenance Instructions must be observed and applied at all times along with the general “VAG Installation and Operation Instructions for Valves” (see www.vag-group.com / Category: Installation and Operation Instructions).

Arbitrary alterations of this product and the parts supplied with it are not allowed. VAG will not assume any liability for consequential damage due to non-compliance with these instructions. When using this valve, the generally acknowledged rules of technology have to be observed (e.g. national standards, ASME/AWWA etc.). The installation must only be carried out by qualified staff (see also Section 7.1 General safety instructions). For further technical information such as dimensions, materials or applications, please refer to the respective documentation (KAT 1321-A).

VAG valves are designed and manufactured to the highest standards and their safety of operation is generally ensured. However, valves may be potentially dangerous if they are operated improperly or are not installed for their intended use.

Everyone dealing with the assembly, disassembly, operation, maintenance and repair of the valves must have read and understood the complete Operating and Maintenance Instructions (Accident Prevention Regulations and ANSI Z535).

Before removing any protective devices and/or performing any work on the valve, depressurise the pipeline section and ensure it is free of hazards. Unauthorised, unintentional and unexpected actuation as well as any hazardous movements caused by stored energy (pressurised air, water under pressure) must be prevented.

In case of equipment that must be monitored and inspected, all relevant laws and regulations, such as the Industrial Code, the Accident Prevention Regulations, the Ordinance of Steam Boilers and instructional pamphlets issued by the Pressure Vessels Study Group must be complied with. In addition, the local accident prevention regulations must be observed.

If a valve serving as an end-of-line valve is to be opened in a pressurised pipeline, this should be done with the utmost care to prevent the emerging fluid from causing damage. Care must also be taken when closing the valve to avoid crushing or trapping.

When a valve needs to be dismantled from a pipeline, fluid may emerge from the pipeline or the valve. The pipeline must be emptied completely before the valve is dismantled. Special care needs to be taken in case of residue which may continue flowing.

1.2 Warning levels

The following warning levels are used in this manual

-  **Danger:** Used for personal injury (immediate danger).

Possible consequences if the safety instructions are not followed: Death or serious injuries

-  **Warning:** Used for personal injury (possibly dangerous situation).

Possible consequences if the safety instructions are not followed: Death or serious injuries

-  **Caution:** Used for personal injury

Possible consequences if the safety instructions are not followed: Light or minor injuries

- **Caution:** Used for property damage

Possible consequences if the safety instructions are not followed: Material damage to the unit or its surroundings

1.3 Proper use

The VAG EKN® Butterfly Valve type AWWA is a shut-off valve designed for installation in pipelines.

The VAG EKN® Butterfly Valve type AWWA is intended to shut off the medium. Its use as a control valve is only possible within certain limits.

VAG EKN AWWA Butterfly Valves are designed acc. AWWA 504 standard with maximum working pressure of 150 psig and a maximum full open velocity of 16 ft / sec. Temperature range acc. AWWA 33° - 125° F.

For any deviating operating conditions and applications, the manufacturer's written approval must be obtained!

These Operation and Maintenance Operation Instructions contain important information on the safe and reliable operation of the VAG EKN® Butterfly Valve type AWWA.

Observing these Operation and Maintenance Instructions helps you to:

- Prevent hazards
- Reduce repair costs and down-time of the valve and/or the entire equipment
- Improve the operational safety and useful life of the equipment.

1.4 Identification

According to AWWA C 504 / section 6.1 all valves bear an identification label specifying the valves size, class, body material and the manufacturer's logo.

A rating plate is attached to the body and contains at least the following information:

VAG	Manufacturer's name
Valve size	Size of the of the valve in inch
Class	Nominal pressure of the valve in psi
	Body material
	Date of manufacture

2 Transport and Storage

2.1 Transport

Caution: For transportation to its installation site, the valve must be packed in stable packaging material suitable for the size of the valve. It must be ensured that the valve is protected against atmospheric influences and external damage. When the valve is shipped under specific climatic conditions (e.g. overseas transport), it must be specially protected and wrapped in plastic film and a desiccant must be added.

The factory-applied corrosion protection and any assemblies must be protected against damage by external influences during transport and storage.

The VAG EKN® Butterfly Valve type AWWA must be transported with its disk slightly open. For transport, place the valve onto its inlet-side flange or on the flange flat base with the bearing lugs facing upwards.



Picture 1: Transport position - on inlet-side flange



Picture 2: Transport position – on flat base

If the valve is equipped with actuation assemblies, make sure the actuators are safely stored to prevent transverse loads from affecting the connections.

When selecting and using stop devices, take the weight and the stop type into account. For the respective weights of the VAG EKN® Butterfly Valve type AWWA, please refer to KAT 1321-A. The way the stop devices are used should comply with the relevant regulations.

VAG EKN® Butterfly Valves type AWWA of large nominal diame-

ters do not have their centre of gravity in the middle and therefore may swing sideways when lifted if the stop device is improperly fixed.

Avoid jerks and jolts when lifting or lowering the load, as the forces generated in the process may damage both the valve and the lifting devices.

For transport purposes and also to support assembly, lifting devices such as cables and belts must only be attached to the valve body, bearing lugs or the lifting devices provided for that purpose. The actuator or the gearbox are unsuitable for this purpose. The length and positioning of the cables/belts must ensure that the valve is in a horizontal position during the entire lifting procedure.



Picture 3: Suspension bores of the VAG EKN® Butterfly Valve

The general regulations relating to the use of lifting devices must be complied with.

The VAG EKN® Butterfly Valves type AWWA are provided with suspension bores located above the flange. As shown in Picture 3, they can be used to lift the VAG EKN® Butterfly Valve type AWWA.

For valves that have been factory-packed in transport crates (wooden crates), the centre of gravity of the entire unit must be taken into account. The centre of gravity is marked on each side of the crate at our factory and must be considered for all lifting operations.

-  **Warning:** Suspended Load!

The valve can tilt and can be damaged while being lowered! Danger of injury during lifting and transport.

- Avoid valve's tilting by always moving it cautiously during lifting and transport.
- Wear protective equipment (safety helmet, safety gloves and safety shoes).
- Make sure that no attachments can be jammed.
-  **Danger:** The valve can fall down during lifting!

Death or serious injury can result if body parts are hit and/or crushed!

- Never stand under a suspended load!
- Only use hoists and slinging tackles which are safe to support the load!
- Lift the valve carefully until it is freely suspended.
- Balance the valve carefully. Consider the center of mass!
- The valve can now be hoisted and cautiously transported to the installation site.

2.2 Storage

Caution: The VAG EKN® Butterfly Valve type AWWA type should be stored with its disk slightly open.



Picture 4: Storage of the VAG EKN® Butterfly Valve type AWWA

The elastomeric parts (seals) must be protected against direct sunlight and/or UV light as otherwise their long-term sealing function cannot be guaranteed. Store the valve in a dry and well aerated place and avoid direct heat. Protect any assembly units important for proper function such as the disk and the body seal against dust and other dirt by adequate covering.

Do not remove the protective caps of the connections / flanges and the packaging materials until immediately prior to assembly into the pipeline.

The valve can be stored in ambient temperatures ranging from -4° F to 122°F (-20 °C to +50 °C) (protected by adequate covers). If the valve is stored at temperatures below 32° F (0 °C), it should be warmed up to at least 41° F (+5° C) before installation and before it is put into operation.

3 Product features

3.1 Features and function description

The VAG EKN® Butterfly Valve type AWWA is a fully flanged butterfly valve and can therefore be used both between two flanges and as an end-of-line valve without counter-flange and at full operating pressure.

The design of the VAG EKN® Butterfly Valve is that of an offset valve with a double offset bearing of the disk. In closed position, the disk is perpendicular to the direction of flow. To close or open the valve, the disk must be turned by 90°.

The body is sealed with an endless profile seal ring which in the standard version is fixed by a retaining ring.

In closed position, the elastic profile sealing ring is pressed to the conical seat surface inside the body and safely seals in both flow directions. Due to the double offset bearing of the disk, the profile seal ring is completely unstressed when the valve is in open posi-

tion. If required, the profile seal ring can be disassembled without having to dismantle the valve.

In case of epoxy-coated VAG EKN® Butterfly Valves type AWWA, the sealing seat is made corrosion-resistant by high-alloy weld overlay and is also resistant to mechanical damage. In the steel-welded type of the body, the sealing seat is made of stainless steel.

3.2 Applications

In its standard version, the VAG EKN® Butterfly Valve type AWWA is equipped with EPDM seals.

The VAG EKN® Butterfly Valve should only be used in media in which there is no risk of clogging.

The butterfly valve can be used for the following media:

- Water,
- Raw and cooling water (with appropriate corrosion protection)
- Weak acids and alkaline solutions (with according corrosion protection)

Caution: The use of the valve with media containing gas or oil may result in the destruction of the EPDM seals (rubber lining) and O-rings and is therefore not permissible.

VAG EKN AWWA Butterfly Valves are designed acc. AWWA 504 standard with maximum working pressure of 150 psi g and a maximum full open velocity of 16 ft / sec. Temperature range acc. AWWA is 33° - 125° F.

In case of differing operating conditions, the manufacturer needs to be consulted. If in doubt, consult the manufacturer to inquire about the appropriate sealing materials for your application.

3.3 Performance limits

3.3.1 Cavitation

Caution: VAG EKN® Butterfly Valves are mainly used to shut off flow. If a VAG EKN® Butterfly Valve is used to control flow, the operational limits of the maximum flow velocity as well as the cavitation limits must be observed. However, in this case VAG will void any warranty issues, unless VAG authorized the operating mode in writing.

The operational limits can be calculated either using the VAG UseCAD® or the following calculation rules:

Cavitation limits

After the upstream and downstream pressures of the valve as well as the flow rate have been determined, the cavitation value is calculated as follows:

Calculation of the σ -Value acc. AWWA M49:

$$\sigma = \frac{P_u - P_v}{P_u - P_d}$$

σ = cavitation index [dimensionless]

P_d = downstream pressure [psig (kPa)]

P_v = vapor pressure adjusted for temperature and atmospheric pressure, psig (kPa) = - 14.2 psig (-97.5 kPa) for water at 60°F (16°C), measured at sea level

P_u = upstream pressure [psig (kPa)]

The VAG EKN® Butterfly Valve has the correct dimensions when the computed σ -value lies above the limit curve of σ_k . The recommended control range lies between 10-100% opening degree. Below that no reasonable control can be guaranteed. If cracking noises or vibrations occur while the valve is being put into operation, the actual operation conditions should be checked. In case of changed operation conditions, the equipment may have to be recalculated. If the computed σ -value lies below the limit curves of σ_k cavitation will occur.

To remedy the problems, we recommend:

- Changing the downstream pressure
- Choosing a different place of installation

If the σ -value lies above the limit curves of σ_k the noise is caused by other criteria and the pipeline will have to be checked.

3.3.2 Maximum permissible flow velocity

While the medium flows through or against the valve disk, the disk is exposed to forces of flow whose impact is determined by the flow velocity of the medium in the pipeline. Similar to a wing profile, a greater lift (or buoyancy) is generated at higher flow velocity and a changed angle of incidence. The same is true for the disk inside the valve. The buoyancy generated is perceived as torque at the drive shaft.

Caution: VAG EKN® Butterfly Valves type AWWA are designed/sized for the following velocities in liquid media:

- Pressure rating class 150 A: 8 ft/s (2,4 m/s)
- Pressure rating class 150 B: 16 ft/s (4,9 m/s)

3.4 Permissible and impermissible modes of operation / Caution

VAG EKN AWWA Butterfly Valves are designed acc. AWWA 504 standard with maximum working pressure of 150 psi g and a maximum full open velocity of 16 ft / sec. Temperature range acc. AWWA is 33° - 125° F.

The VAG EKN® Butterfly Valve has its limit stop in the gearbox. This stop limits both the open and the closed position. Due to the automatic lock of the gear, it suffices to touch the end position. Do not tighten it as this will not improve the tightness of the valve.

Do not permit operation of any valve at pressure above the rated pressure of the valve. Do not exceed 300 ft.-lb. input torque on actuators with wrench nuts, 200 lb. rim pull input torque for handwheels and chainwheels. If portable auxiliary actuators are used, size the actuator or use a torque limiting device to prevent application of torque exceeding 300ft. lbs. If an oversize actuator with no means of limiting torque is used, stop the actuator before valve is fully opened or closed against stops and complete the operation manually. Be sure to check actuator directional switch against direction indicated on wrench nut, handwheel or records before applying opening and closing torque.

Permanent operation of the valve in throttle position will result in its increased wear and tear. The throttling operational limits according to Section 3.3.1 need to be established.

4 Installation into the pipeline

-  **Danger:** Danger of bruise between valve body and pipeline (-flanges) during installation!

Death or serious injury can result if persons remain between valve and pipeline!

- Never stand under a suspended load!
- Lift the valve carefully until it is freely suspended.
- Avoid valve's tilting by always moving it cautiously during lifting and transport.
- Make sure that no person stays in hazardous area.

4.1 Conditions required on site

When installing the valve between two pipeline flanges, these must be coplanar and in alignment. If the pipes are not in alignment, they must be aligned before installation of the valve, as otherwise this may result in impermissibly high loads acting on the valve body during operation, which may eventually even lead to fracture.

Caution: When installing the valve into the pipeline, make sure it is as stress-free as possible. In plant piping, install so as to minimize bending of valve connection with pipe loading. It is recommended that valves be installed into piping system in accordance with AWWA M-44 in order to prevent any undue piping stress, deflection or bending that may affect the performance of the valve. Make sure valve disc, when opened, will not contact pipe port. This is especially necessary on pipe with linings and when wafer valves are used. Check manufacturer for minimum pipe I.D. required for clearance.

Prepare pipe ends and install valves in accordance with the pipe manufacturer's instructions for the joint used. Do not deflect pipe/valve joint. Do not use valve as jack to pull pipe into alignment.

In case of works around the valve causing dirt (e.g. painting, masonry or working with concrete), the valve must be protected by adequate covering.

For assembly in drinking water pipelines, suitable sealing materials, lubricants and process materials must be used which are approved for use in drinking water pipelines.

Before putting the valve into operation, clean and purge the corresponding pipeline sections.

4.2 Installation location

The installation location of the valve must be selected to provide sufficient space for function checks and maintenance works (e.g. dismantling and cleaning of the valve).

If the valve is installed in the open, it must be protected against extreme atmospheric influences (e.g. formation of ice) by adequate covers.

If the VAG EKN® Butterfly Valve is installed underground, the gear must be equipped with a cover for buried installation.

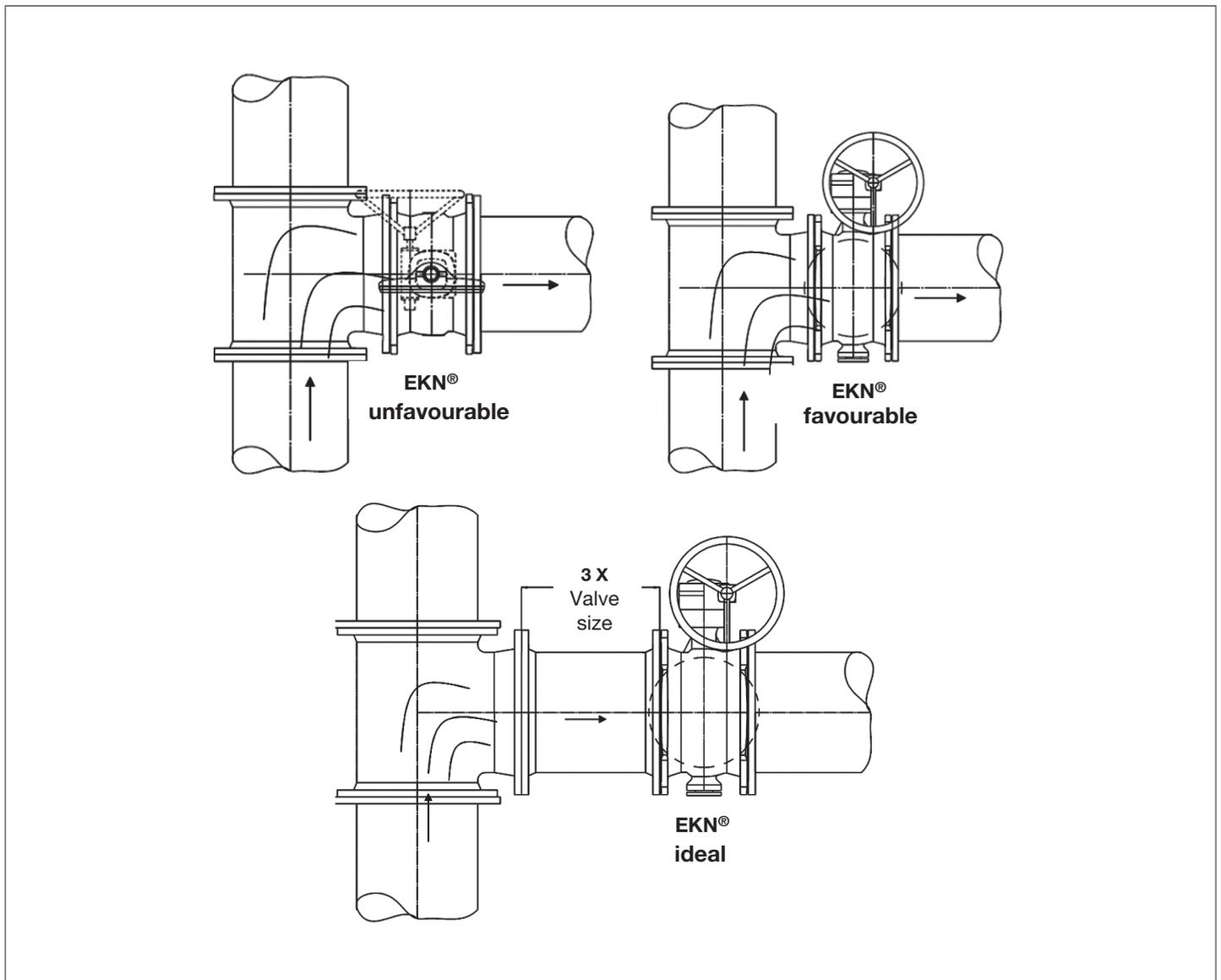
In case of submerged installation, increased actuation forces and increased wear and tear (sometimes also accompanied by corrosion) of the relatively moving parts are to be expected. This must be taken into account when determining the maintenance intervals.

If the valve is installed as an end-of-line valve, it must be ensured that its free outlet side is not accessible to interference from any source.

Caution: Installing the valve in the wrong location may cause excessive dynamic torque and damage the valve.

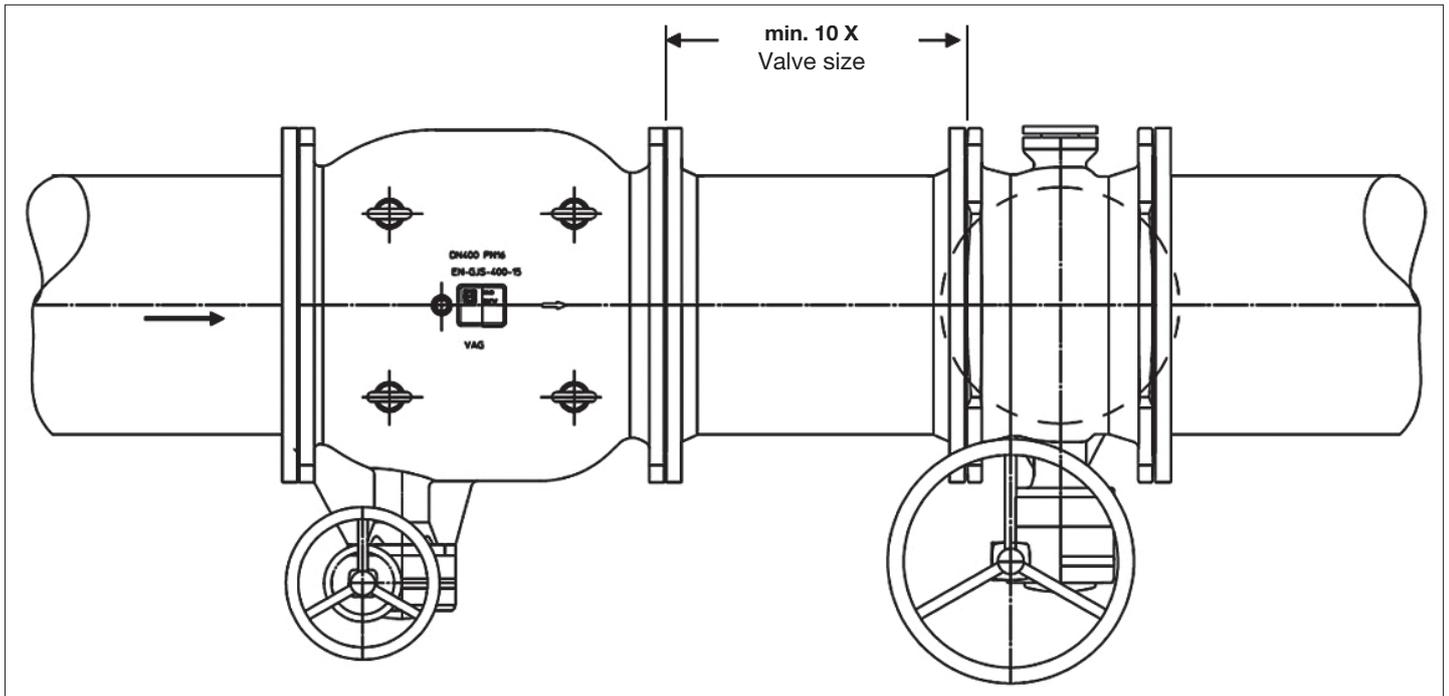
4.2.1 Installations in the pipeline upstream and downstream of the valve / **Caution**

- If the valve is used in contaminated media, a filter with a suitable mesh size must be provided upstream of the valve in order to prevent malfunction.
- Directly upstream of (3 x Valve size) and downstream of (3 x Valve size) the VAG EKN® Butterfly Valve an inspection valve, an elbow, T-pieces and Y-filters should be provided as otherwise irregular flow may disturb the proper function of the VAG EKN® Butterfly Valve.
- A damping zone between the branch/elbow and the valve is ideal.



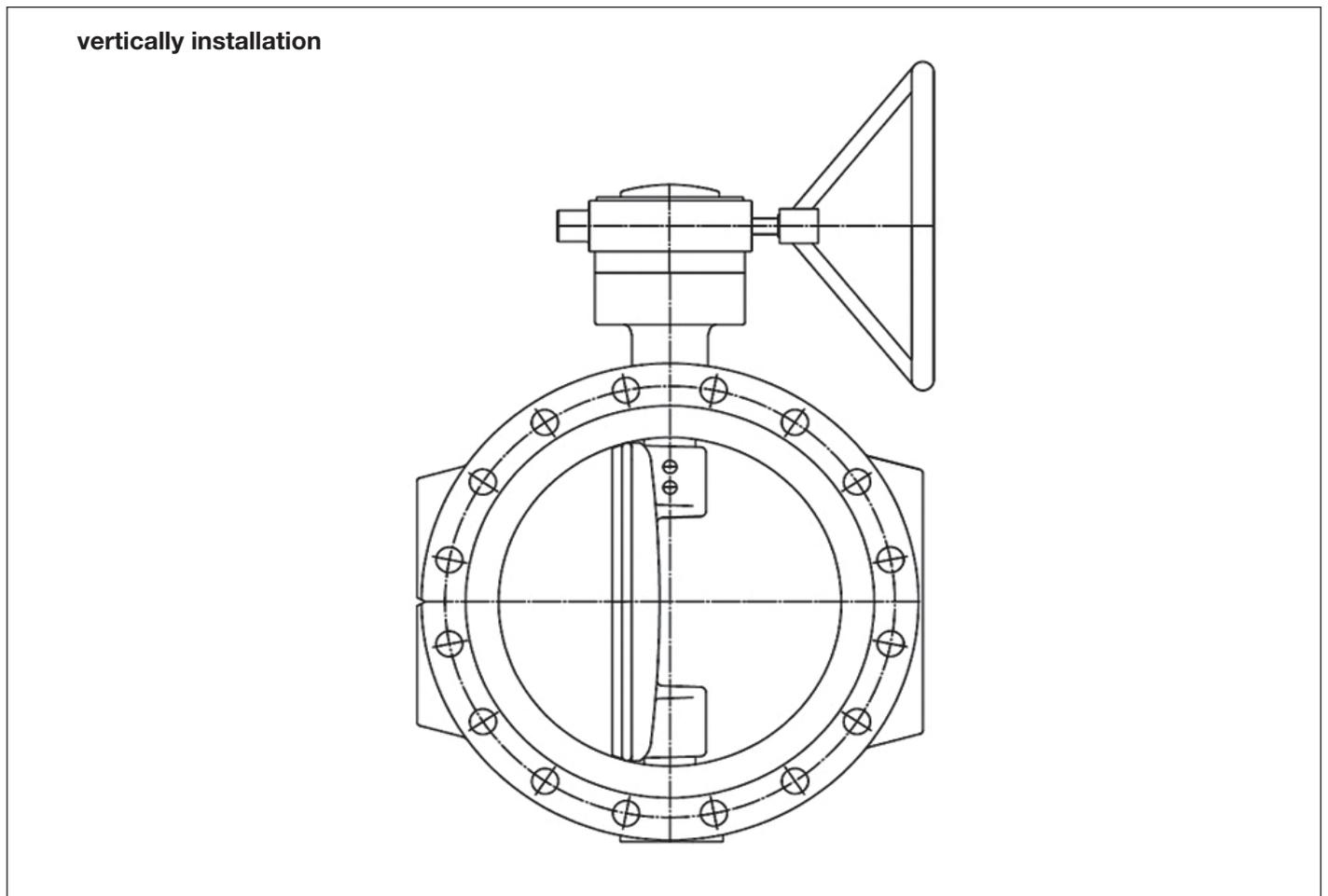
Picture 5: Installation of the VAG EKN® Butterfly Valve at elbows and branches

- When installing a butterfly valve downstream of a control valve or a plunger valve, make sure that there is enough space between them (minimum 10 x Valve size).



Picture 6: Installation of the VAG EKN® Butterfly Valve with control valves installed upstream.

- Butterfly valves of a nominal diameter of up to 42" can be installed vertically (with gear facing upwards or downwards) in pipelines.
- In case of valves with larger nominal diameters, a special design of the valve must be ordered due to the load of the disk.

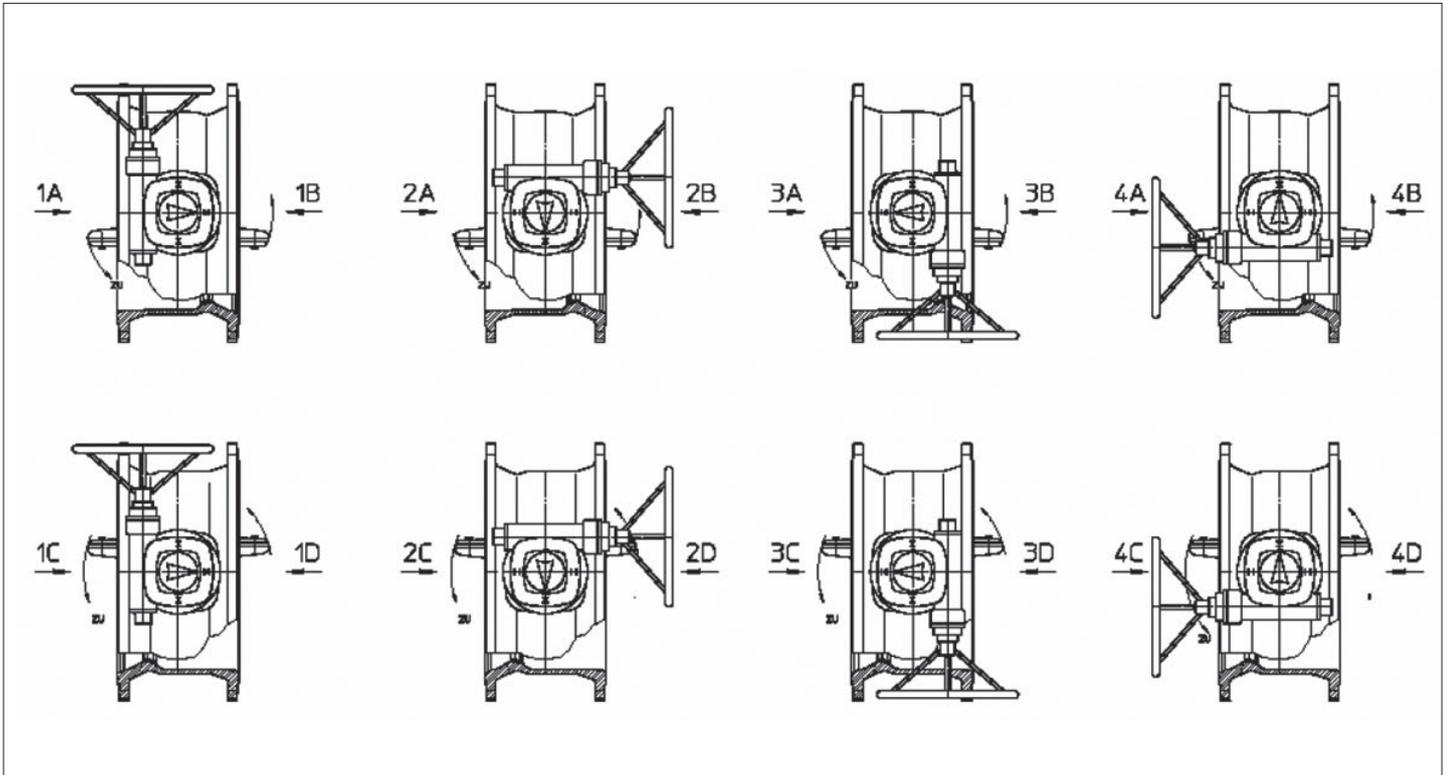


Picture 7: Vertical installation of the VAG EKN® Butterfly Valve

4.2.2 Gear positions

The gear can be turned by 90° around the drive shaft.

- **A:** Flow on shaft side, seat surface on the outlet side, gear on the right
- **B:** Flow on the side away from the shaft, seat surface on the inlet side, gear on the left
- **C:** Flow on the side away from the shaft, seat surface on the inlet side, gear on the right
- **D:** Flow on shaft side, seat surface on the outlet side, gear on the left



Picture 8: Possible gear positions

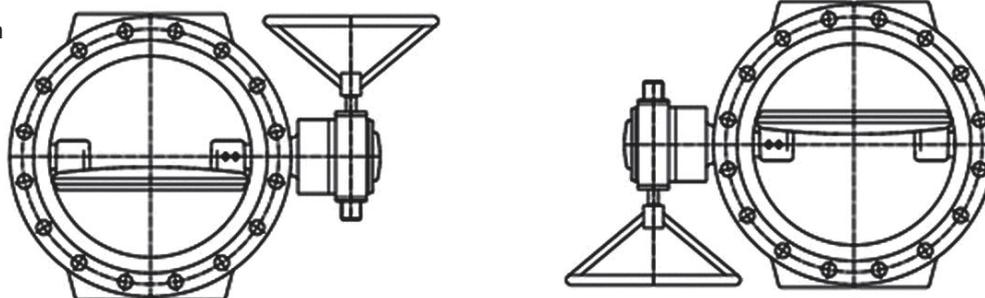
4.3 Installation position

Caution: VAG EKN® Butterfly Valves type AWWA of all nominal widths can be installed in horizontal position (with the gear facing up or down).

Up to a valve size of 42", EKN® Butterfly Valves type AWWA may be installed in vertical position without restrictions (with the gear facing up or down) in the pipelines. In case of valves with larger nominal diameters, a special design of the valve must be selected due to the load of the disk. Please consult VAG before placing your order.

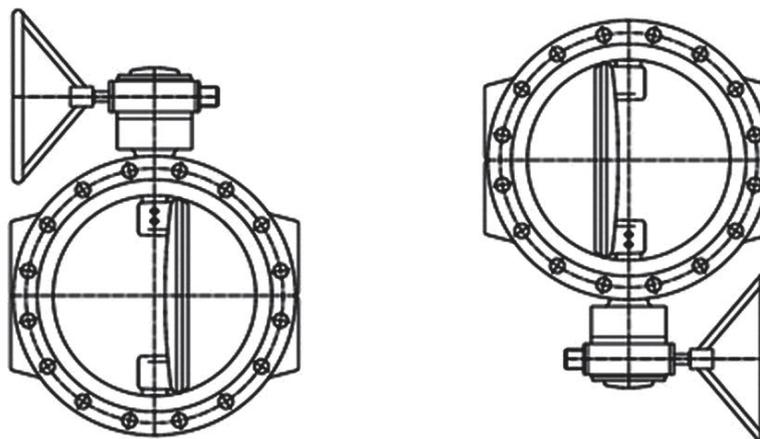
permissible

horizontal installation position



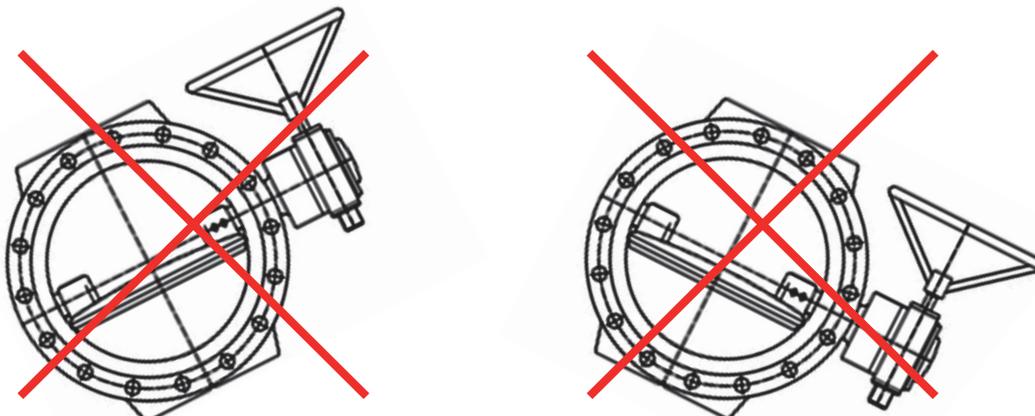
vertical installation position

- Permissible up to valve size 42" without restrictions.
- Valves with nominal diameters exceeding valve size 42" require a special design of the valve disk. Please contact the manufacturer before placing your order.



impermissible

> valve size 42"



Picture 9: Installation positions

4.4 Assembly instructions and fittings

Caution: Check the valve for possible damage that it may have suffered during transport and storage. Protect the valve against dirt caused on the construction site by adequate covering until installation. Prior to installation all components essential for proper function, such as the seat and the sealing ring of the disk must be thoroughly cleaned to remove all dirt particles. VAG does not assume any liability for consequential damage caused by dirt, shot-blasting gravel residues etc.

The sealing and operational parts should be checked for proper operation prior to installation.

Should the valves be repainted later on, You should ensure that no paint is applied to the sealing and operational parts. The identification plates must not be painted over either. If the equipment is sand-blasted for cleaning prior to installation, these parts must be adequately covered. If solvents are used for cleaning, You should ensure that the solvents do not destroy the seals of the pipeline or the valve.

For the assembly of the VAG EKN® Butterfly Valve type AWWA it must be ensured that proper load suspension devices as well as means of transport and lifting devices are available.

In open position, the disk of the VAG EKN® Butterfly Valve type AWWA protrudes beyond the overall length. It needs to be made sure that there is sufficient space between the disk and other installations in the pipeline.

Suspending the valve by its disk may lead to damage to or destruction of the disk or valve.

When connecting the valve with the pipeline flanges, hexagon bolts and nuts with washers from flange to flange must be used in the through holes. Fasten the bolts evenly and crosswise to prevent unnecessary tension and the resulting cracks or breaks. The pipeline must not be pulled towards the valve. Should the gap between valve and flange be too wide, this should be compensated by thicker seals.

The material of the seal needs to be selected according to the operation conditions.

The operator needs to select bolts and nuts suitable for the respective operation pressure, temperature, the flange material, the operational loads and the seal. As depending on the seal materials used and whether they are used in main friction connections or secondary friction connections, very different tightening torques of the flange bolts result, the operator must choose the tightening torque of the flange bolts according to the above parameters.

Do not over-tighten the bolts of the flanges as this may result in the flanges cracking.

While the valve is being installed, it must be ensured that the flanges of the pipeline it is connected to are aligned and level with each other. Welding works on the pipeline must be performed before the valves are installed to prevent damage to the seals and the corrosion protection. Welding residue must be removed before the equipment is put into operation.

The pipeline must be laid in a way that prevents harmful pipeline forces from being transmitted to the valve body. Should construction works near or above the valve not be completed yet, the valve must be covered to protect it from dirt.

5 Set-up and operation of the valve

5.1 Visual inspection and preparation

Before putting the valve and the equipment into operation, perform a visual inspection of all functional parts. Check whether all

bolted connections have been properly fastened.

5.2 Function check and pressure test

Prior to installation, the function parts of the valve have to be opened and closed completely at least once and should be checked for trouble-free operation.

Caution: When a pressure test is performed in the pipeline with a test pressure exceeding the admissible nominal pressure in closing direction, the pressure must be compensated by way of a bypass.

If the VAG EKN® Butterfly Valve type AWWA is operated in dry state, higher actuation torques may be expected.

Newly installed pipeline systems should first be thoroughly purged to remove all foreign particles. Residue or dirt particles present in the pipeline may impair the function of the valve or prevent its free movement.

In particular after repair work or upon the commissioning of new equipment, the pipeline system should be purged again with the valve being fully open position. If detergents or disinfectants are used it must be ensured they do not attack the valve materials. As a standard, the valve is closed by turning clockwise at the gear.

The dimensions of the stems and actuators allow operation of the valve by one person via the handwheel. Extensions for operation are not permissible as they may damage the valve due to excessive force. The 90° turn is limited by a limit stop located at the gear. If it is turned further using excessive force, this may cause damage. Proper function is to be checked by opening and closing the valve several times.

5.3 Putting electric actuators into operation

Turn the valve into medium intermediate position by hand. Check the rotary motion at the gear and thus the direction of rotation of the motor by shortly starting the actuator electrically. If the direction of rotation is wrong, reverse the polarity of the motor connection.

By short electrical start-up, check the direction of rotation again by checking the direction of motion.

Check the switch-off function of the torque and limit switches in both directions by manually operating the switches in intermediate position. Reverse the polarity, if necessary. The valve must not be operated over its entire travel until the direction of rotation and the switch-off function are correct.

Caution: If the direction of rotation is wrong, the limit and torque switches have no effect at all!

6 Actuators



Warning: Non compliance of these directives may cause danger to life and limb and/or cause damage to material or pipeline system.

6.1 General

Actuators (gears, pneumatic, hydraulic and electric actuators) are designed for flow velocities according to AWWA Class 150 B (valves used for water supply; requirements relating to fitness for use). Any deviating operating conditions need to be specified. The adjustment of the limit stops (OPEN, CLOSE) must not be changed without the manufacturer's consent.

Caution: Danger of damages to the VAG Butterfly Valve!. False settings of limit stops may cause mechanical risk of injury of the valve and gearbox.

If valves are installed without gear units it must be ensured that the valve is not pressurised.

-  **Warning:** Uncontrolled rotation of the valve shaft! Danger of damage to the VAG Butterfly Valve / Pipeline system! Death or serious injury can result if body parts or pieces of clothing get caught up in rotating shaft.
 - Never operate the butterfly valve without gearbox in a pressurised pipeline!
 - Make sure that no pressure is in the pipeline when you dismantle the gearbox from the valve!

For detailed information on gears and actuators, please refer to the operation manuals issued by the manufacturers of these components (e.g. AUMA, Rotork).

The VAG EKN® Butterfly Valve has an adjustment angle of 90°. The valve itself is not equipped with position limiters.

The actuator must be equipped with limit stops. The actuator must be designed so that it turns counter-clockwise in relation to the valve shaft!

The limit position adjustment is to be done in compliance with the operating manuals issued by the respective gear manufacturers, such as AUMA, Rotork etc. In case a gear is retrofitted, its nominal torque and the adjustment of the limit stops “OPEN” and “CLOSE” must be adapted to the valve.

Non-compliance with these regulations may endanger life and limb and/or cause damage to the pipeline system. If actuators powered by external sources of energy (electric, pneumatic or hydraulic) have to be disassembled from the valve, the safety instructions under Section 1.1 needs to be observed and the external source of energy must be switched off and isolated.

6.2 Operating torques

Operating torques are the maximum required torques acting on the actuator stem at full differential pressure including a safety factor of 1.5. If required, you can contact us for information about the respective torques and/or controlling torques for electric actuators.

6.3 Emergency manual operation (handwheel)

-  **Caution:** If the valve is operated via the handwheel of the electric multiturn actuator, the torque switches do not have any safety function.

Operation via the emergency handwheel is intended for short periods only, for commissioning and for exceptional situations.

The emergency handwheel is not suitable for continuous operation.

If, in intermediate position, a foreign body gets jammed in the valve, this may result in higher operating forces – especially with heavily geared down actuators – which in turn may damage the actuation components. Therefore:

If you meet any resistance while operating the valve with the emergency handwheel, turn the handwheel in the opposite direction for some turns and then turn it in the direction again in which the disturbance was found (washing out of the foreign body). Continue operation very carefully, never use excessive force and repeat washing, if necessary.

6.4 Assembly of the electric actuator

The electric actuator is mounted to the input flange of the gear unit. The actuator size is selected according to the maximum actuation elements.

The valve is switched off:

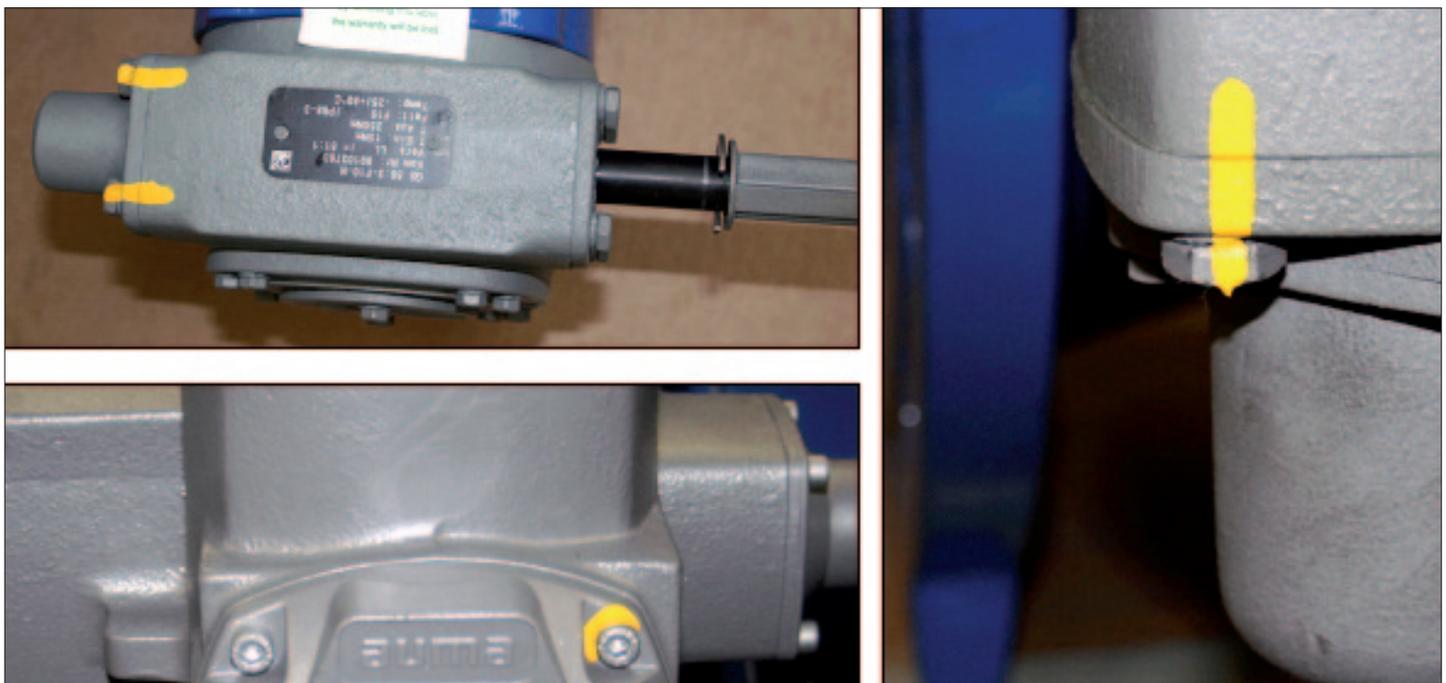
- position-dependent in Open position
- position-dependent in Closed position

The switch settings are factory-adjusted. The torque switches serve as overload protection in the intermediate positions. If the valve is retrofitted with an electric actuator, the position switches have to be adjusted after the actuator has been mounted. For the adjustment procedure, please refer to the operating manual issued by the manufacturer of the electric actuator.

The relevant safety regulations and the instructions of the manufacturer of the electric actuator must be observed.

When the items are delivered, the adjustment screws and the connection bolts of the gear and the electric actuator are sealed with labels and/or identified by colour markings. The removal or breaking of these identifications will result in the loss of the manufacturer's warranty.

-  **Caution:** Non-observance of the warnings and notes may result in serious injuries or damage. Qualified personnel must be thoroughly familiar with all warnings and notes in these operation instructions.



Picture 10: Gearbox markings

7 Maintenance and repair

7.1 General safety instructions

Caution: Prior to the performance of inspection and maintenance work on the valve or its assemblies, shut-off the pressurised pipeline, depressurise it and secure it against inadvertent activation. Depending on the type and risk of the fluid conveyed, comply with all required safety regulations! After completing the maintenance works and before resuming operation, check all connections for tightness. Perform the steps described for initial set-up as described under Section 5 "Set-up and operation". A VAG EKN® Butterfly Valve type AWWA not equipped with a gear unit is not self-locking. The actuator/the gear unit may not be disassembled as long as the valve is pressurised. This also applies in case the valve is completely dismantled. Statutory and local provisions as well as the safety and accident prevention regulations must be observed and complied with at all times. Couplings and connections must never be disassembled when they are under pressure. Servicing, maintenance and inspection work as well as the replacement of spare parts must only be done qualified staff. The plant operator is responsible for determining the suitability of the staff or for ensuring the relevant qualifications.

In case the operator's employees do not have the qualifications required, they need to attend a training course. This training course can e.g. be held by VAG Service employees. In addition to this, the plant operator needs to ensure that all employees have understood these Operation and Maintenance Instructions as well as all further instructions referred to in them. Protective equipment such as safety boots, safety helmets, goggles, protective gloves etc. must be worn during all work requiring such protective equipment or for which such protective equipment is prescribed. Improper or wrong use of the valve should be avoided. Prior to the performance of any work on the valve and equipment it must be ensured that the relevant pipeline section has been depressurised and/or de-energised.

- ⚠ **Danger:** Danger of bruise between valve body and pipeline (-flanges) during removing the valve!

Death or serious injury can result if persons remain between valve and pipeline!

- Never stand under a suspended load!
- Lift the valve carefully until it is freely suspended.
- Avoid valve's tilting by always moving it cautiously during lifting and transport.
- Make sure that no person stays in hazardous area.
- ⚠ **Danger:** Dangers from electrical current!
Death or serious injury can result when coming into contact with energised parts.
- ⚠ **Warning:** Suspended Load! All parts of the valve can tilt and can be damaged while being lowered!
Danger of injury during lifting and transport.

7.2 Inspection and operation intervals

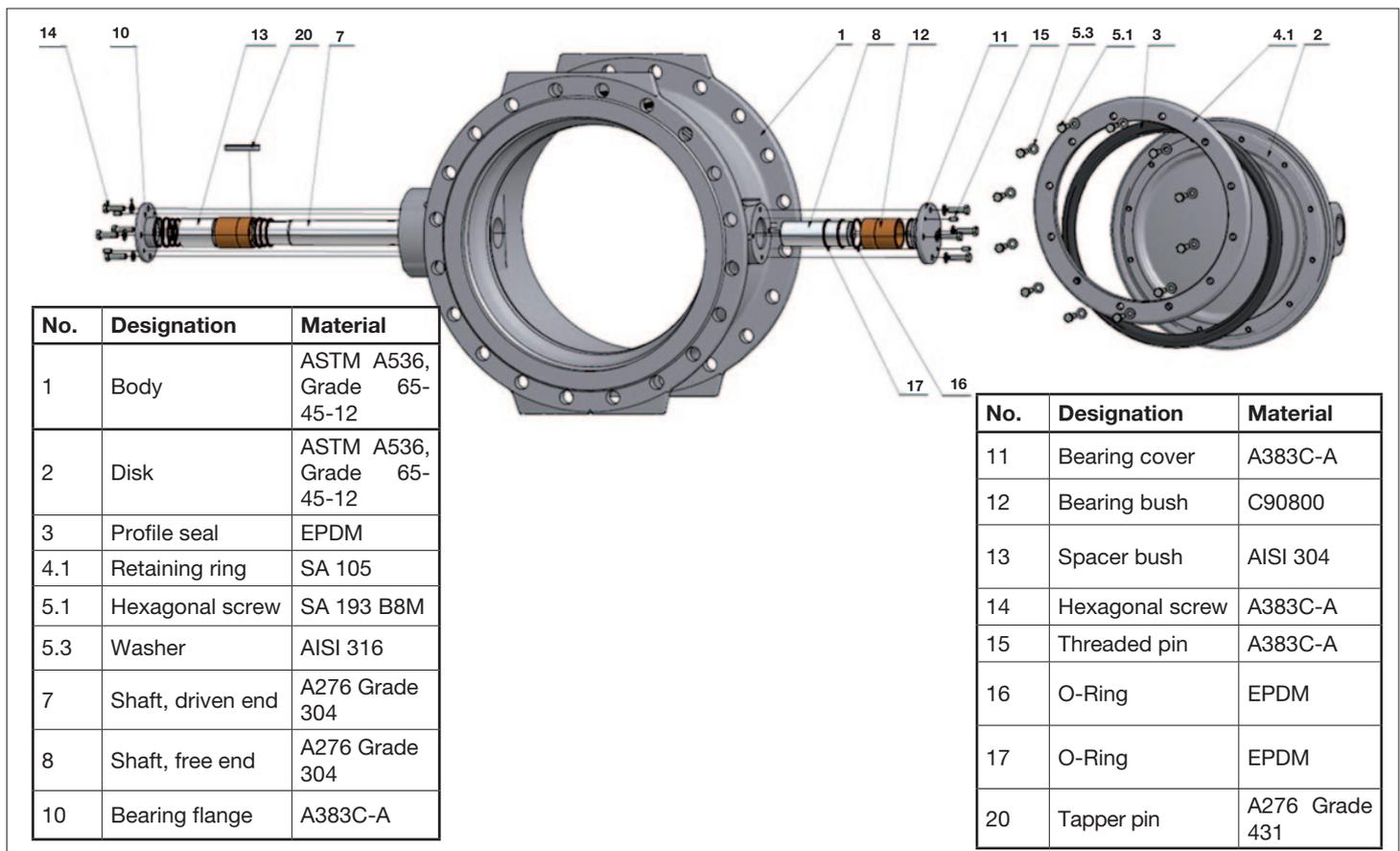
The valve should be checked for tightness, proper operation and corrosion protection "at least once per year" .

In case of extreme operating conditions inspection should be performed more frequently.

7.3 Maintenance work and replacement of parts

7.3.1 Design

The design view in Picture 11 serves as a partial overview for the descriptions of the working steps below.



Picture 11: Design and sub-assemblies

7.3.2 Recommendations for the replacement of parts

Profile seals and O-rings must be replaced whenever necessary. The replacement intervals depend on the operating conditions.

7.3.3 Cleaning and lubrication

When being replaced, the profile seal and the O-rings should always be lightly greased. Use lubricants with approval for application with foodstuffs or drinking water.

Recommended lubricants:

- For the profile seal and the O-rings: KLÜBERSYNTH VR 69-252 (NFS61-approved)

Manufacturer: Klüber Lubrication München AG, Germany.

7.3.4 Replacement of the profile seal

Due to the double-offset bearing, the profile seal can be replaced without disassembly of the disk. Valves of up to valve size 36" must either be completely dismantled from the pipeline or at least disconnected from the pipeline on one side to replace the profile seal. In the same way as for the installation of the disk, all safety precautions need to be taken.

Disassembly of the sealing ring:

- Open the disk (2) until the profile seal (3) emerges from the body
- Unfasten the retaining ring screws (5.1)
- Remove body (1) and sealing ring (3)
- Clean the disk (2) in the sealing zone
- Check the seat ring in the body for damage or deposits
- Insert the new sealing ring into the groove of the disk and slightly grease it with KLÜBERSYNTH VR 69-252 (NFS61-approved)
- Insert the hexagonal screws (5.1) and fasten them.

7.3.5 Replacement of the O-rings in the bearing

For this kind of maintenance work, the valve must be depressurised.

- Turn the butterfly valve (2) into closed position
- Unfasten the hexagonal nuts at the gear flange and pull the gear off the shaft (7)
- Loosen the threaded pin and pull off the coupling. Pull the adjustment spring (20) off the shaft
- In the depressurised pipeline, the hexagonal screws (14) are



Picture 12: Replacement of O-ring - Step 1

unfastened and the bearing flange (10) as well as the bearing cover (11) are pulled off. Slightly grease the O-rings (17 / 16) with KLÜBERSYNTH VR 69-252 before installation.



Picture 13: Replacement of O-ring - Step 2

- Reassembly is done in reverse order
- Tighten the hexagonal screws (14) only slightly to prevent tensioning the bearing bush (12) on the disk (2). Secure the flange position using the threaded pins (15).



Picture 14: Replacement of O-ring - Step 3

- Assemble the adjustment spring (20) and the coupling
- Before mounting the gear, check whether the disk position and the gear position match



Picture 15: Replacement of O-ring - Step 4

- Fasten the gear fixing screws



Picture 16: Replacement of O-ring – Step 5

- If necessary, readjust the limit stop of the gear. The limit stop must only be adjusted when the valve is in closed position. AUMA worm gear units are adjusted as specified in the AUMA 90° Gear Operation Manual.

8 Trouble-shooting

Caution: For all repair and maintenance work, please observe the general safety instructions described in Section 7.1!

Problem	Cause	Remedial action
Valve makes noise	Unfavourable installation position causing unfavourable flow around or inside the valve (e.g. installed too closely downstream of an elbow etc.)	Change installation position
	Valve operating beyond its design limits	Check design and/or operation data, change flow resistance in the valve, if required, by using different internals
Valve cannot be operated	Foreign matter jammed in the seat area	Flush valve, dismantle, if necessary, and remove foreign matter
	Gear blocked	Undo block
	No electrical connection of electric actuator	Establish electrical connection
	Unfavourable flow and impairment of movement	Change installation position
Leaks in the body seat	Valve not completely closed yet	Close valve completely
	Valve seal damaged or worn	Replace seal
Cavitation in valve	Valve operating beyond its design limits	Butterfly valve not suitable for use as control valve. Replace valve by a more suitable valve type.
	Operational data changed	
Leaks at the body	Deterioration of seals	Replace seals
High operating forces	Seat of the valve polluted by deposits	Flush valve, dismantle, if necessary, and clean seat area
	Valve is dry in pipeline, no medium present	Valve can be operated more easily when wet

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