

VAG ERI[®]plus Penstock



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VAG reserves the right to make technical changes and use materials of similar or better quality without express notice. The pictures are non-binding.

1 General

1.1 Safety



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

Arbitrary alterations of this product and the parts supplied with it are not allowed. VAG does not assume any warranty or liability for consequential damage arising from non-compliance with these instructions. When using this valve, the generally acknowledged rules of technology have to be observed (e.g. DIN standards, DVGW guidelines, VDI directives, etc.). The valve must only be installed by qualified, specially trained staff. For further technical data and information such as dimensions, materials or applications, please refer to the respective documentation (KAT 2453-A).

VAG valves are designed and manufactured to the state of the art and their safety of operation is ensured in general. However, valves may be potentially dangerous if they are operated improperly or are not applied for the intended use.

Everyone dealing with the assembly, disassembly, operation, maintenance and repair of the valves at the operator's plant must have read and understood the complete Operating and Maintenance Instructions (Accident Prevention Regulations, VBG 1 §14 ff [Regulations issued by the Trade Associations]).

The pressure in the pipeline section must be relieved and hazards must be eliminated before protective devices are removed and/or work is performed on the valves. 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 for which monitoring is mandatory, the relevant laws and regulations such as the Industrial Code, Accident Prevention Regulations, Boiler Inspection Regulations, AD Data Sheets (AD = Boiler Study Group) etc. must be complied with. In addition to this, local accident prevention regulations must be complied with.

If you use a special version of the ERI^{plus} Penstock, please observe the order-related instructions which will either be enclosed as separate documentation or will be included in the order documentation. Arbitrary alterations of this product or of the parts and accessories supplied with it are not allowed.

VAG-Armaturen GmbH does not assume any liability for any hazards and damage resulting from the improper use of the product and from non-compliance with the instructions contained in this document.

1.2 Proper use

The VAG ERI^{plus} Penstock is a shut-off and modulating valve.

Its standard version is suitable for shutting off openings in structures on four sides (as a penstock) or on three sides (as a channel penstock).

For the respective technical application ranges (e.g. operating pressure, medium, temperature etc.) please refer to the product-related documentation (KAT-A 2453).

Any deviating operating conditions and applications require the manufacturer's prior written consent!

These Installation and Operation Instructions contain important information on the safe and reliable operation of the VAG ERI^{plus} Penstock.

Compliance with these Installation and Operation Instructions helps:

- To prevent hazards
- To reduce repair costs and down-times of the valve and/or the entire equipment
- To improve the operational safety and useful life of the equipment

1.3 Identification

According to DIN EN 19, all valves bear an identification label specifying the nominal diameter (DN), nominal pressure (PN), 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
DN	Nominal diameter of the valve
PN	Nominal pressure of the valve
	Date of manufacture

2 Transport and storage

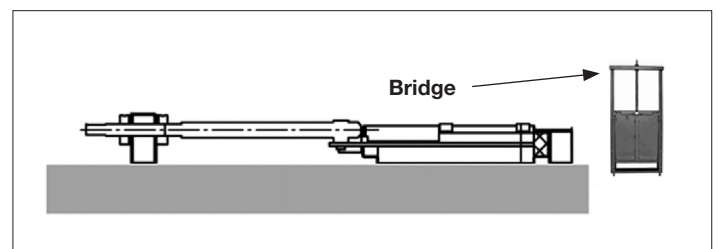
2.1 Transport



For transportation to its installation site, the valve must be packed on/in stable packaging material suitable for the size of the valve. The packaging also needs to ensure that the valve is protected against atmospheric influences and damage. When the valve is transported over long distances (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 VAG ERI^{plus} Penstock must be transported lying flat on its rear side and in almost closed position (cf. Picture 1). Special varieties and penstocks of nominal sizes, which due to their overall size cannot be transported in a lying position, will be delivered in a special transportation rack.



Picture 1: Transportation position of the VAG ERI^{plus} Penstock

When actuators are mounted to the penstock, safe storage of the actuators needs to be ensured to prevent the joints from being exposed to transverse loads.

For transportation purposes and also to support assembly, lifting devices such as cables and belts must always only be attached

to the bridge of the Penstock (see Picture 1). The actuator, which may have been assembled, is not suitable for this purpose. The length and positioning of the cables/belts must ensure that the valve is in a vertical position during the entire lifting procedure.

For valves that have been factory-packed in transport boxes (wooden crates), the centre of gravity of the entire unit must be taken into account.

2.2 Storage

The VAG ERI[®]plus Penstock must be stored lying flat on its rear side. Make sure that no loads act on the micro-cellular rubber seal attached to its rear to prevent the seal from being crushed during storage. This is the only way to ensure that the seal can achieve its full sealing effect after the penstock has been mounted.

The elastomeric parts (seals) must be protected against direct sunlight and/or UV radiation as otherwise their long-term sealing function cannot be guaranteed. Store the valve in a dark, dry and well-aerated place. The direct exposure of the penstock to radiation heat emitted by sources of heat should be avoided. Protect any assembly units important for proper function such as the stem, stem nut, sealing ring or gate against dust and other dirt by adequate covering.

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

3 Product features

3.1 Features and function description

The VAG ERI[®]plus Penstock is a shut-off and modulating valve. It shuts off pipelines or openings in structures up to a pressure of 10 m water column or 1.0 bar (depending on the nominal diameter).

The following pressure ratings apply for the standard versions:

- DN 150 to DN 200: up to 10 mWC (1.0 bar)
- DN 300: up to 8 mWC (0.8 bar)



Picture 2: Standard version of the VAG ERI[®]plus Penstock with compact frame design

- DN 400 to DN 800: up to 6 mWC (0.6 bar)
- DN 900, DN 1000: up to 4 mWC (0.4 bar)

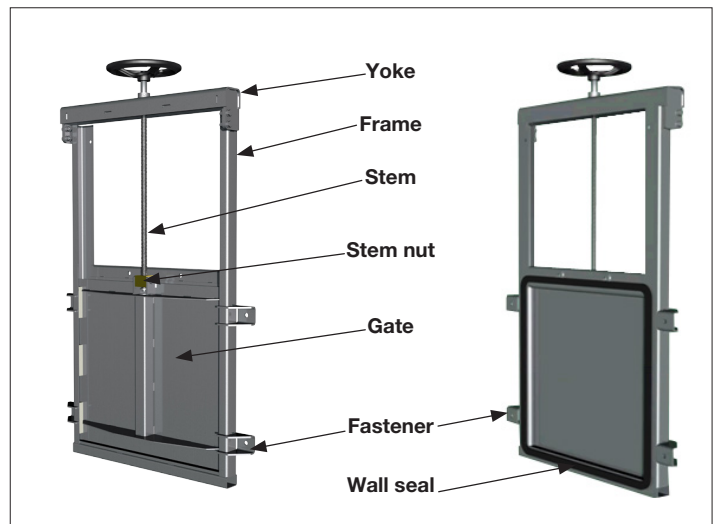
As a standard, the VAG ERI[®]plus Penstock is available with a square opening in nominal sizes from DN 150 to DN 1000 in the following versions:

- with smooth bottom passage (G)

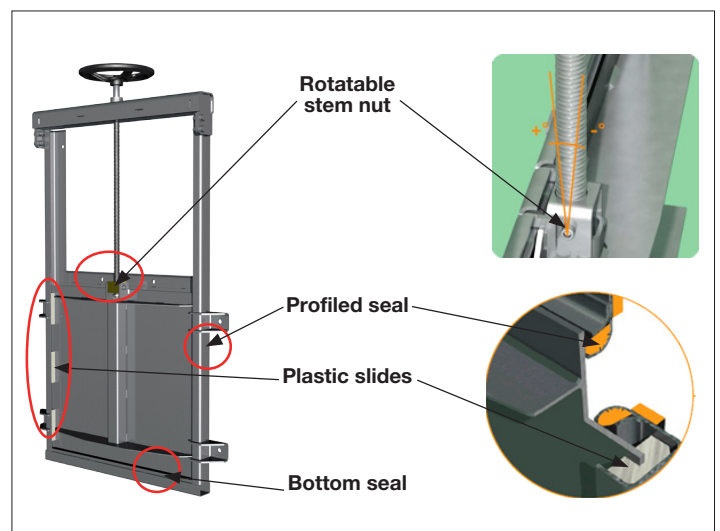
The VAG ERI[®]plus Penstock is available in the following standard version:

a) Standard version VAG ERI[®]plus (Picture 2) with closed frame design as a compact valve ready for mounting, with non-rising stem and integrated stem bearing. This version should be preferred for non-submerged installation as the stem, the stem nut and the stem bearing - its sensitive components moving relative to each other - are arranged directly on the valve and thus would be located directly in the medium in case of submerged installation, which makes maintenance work difficult. In addition to this, soiling of the operating components will increase operating torques which may make the valve inoperable, will cause increased wear and thus reduce the product's useful life.

The VAG ERI[®]plus Penstock has a stable, rigid frame design. It does not warp when mounted to walls (evenness within the tolerances of DIN EN 18202). The admissible unevenness in the surface of the wall is reliably compensated by the voluminous wall seal. The stem of the standard version shown runs on a friction bearing located in the yoke of the frame. When the stem is turned, the stem nut moves



Picture 3: Construction of the VAG ERI[®]plus



Picture 4: VAG ERI[®]plus / special technical features

the gate up and down. In the process, the gate is guided reliably and backlash-free in the side sections of the frame.

The VAG ERI[®]plus Penstock has a number of technically improved features forming the basis of its reliable and high leak-tightness and ensuring low operating torques.

- Rotatable stem nut

The rotatable stem nut ensures reduced friction and little wear between the stem and stem nut and balances the movement between the operating components and the gate.

- Profiled seal

The specially shaped profiled seal, which is integrated in the frame section, ensures the high leak-tightness of the penstock. The profiled seal can be replaced without disassembly of the penstock.

- Bottom seal

The wide, voluminous and flat bottom seal ensures reliable sealing of the gate when the valve is in closed position.

- Sliding system with plastic slides

The sliding system with its special plastic slides guides the gate vibration-free inside the frame, thus allowing for a coarse regulation of the penstock with three-side leak-tightness in intermediate positions. The pressure forces acting on both sides of the gate are absorbed by the plastic slides and thus ensure constant compression of the seal, reduce friction and wear and the operating torques.

3.2 Fields of application

The VAG ERI[®]plus Penstock is used in wastewater treatment plants, in raw and wastewater pipelines, in industrial applications and in flood protection. The special feature of the VAG ERI[®]plus Penstock is its very high and reliable leak-tightness which is less than 1% on-seat and less than 5% off-seat leakage compared to the usual leak rates admissible according to the standard relating to penstocks, sluice gates and stop logs (DIN 19569, Part 4).

Dimensions of the penstock	(mm)	150x150	200x200	300x300	400x400	500x500	600x600
maximum leakage 1% (on-seat)	Litres/Minute	0,018	0,024	0,036	0,048	0,06	0,072
maximum leakage 5% (off-seat)	Litres/Minute	0,09	0,12	0,18	0,24	0,3	0,36

Dimensions of the penstock	(mm)	700x700	800x800	900x900	1000x1000
maximum leakage 1% (on-seat)	Liter/Minute	0,084	0,024	0,036	0,048
maximum leakage 5% (off-seat)	Liter/Minute	0,42	0,48	0,54	0,6

Picture 5: Table: admissible leak rates (litres/minute) of the VAG ERI[®]plus Penstock at on-seat and off-seat pressure

As a standard, the VAG ERI[®]plus Penstock is equipped with EPDM seals. Therefore it can be used with the following media:

- Water
- Raw and cooling water
- Municipal wastewater

For use with media containing fat and oil, a variety with NBR seals is available.

For information about temperature limits, please refer to the product-related technical documentation (KAT-A 2421 / 2422 / 2422 M / 2422 RS).

In case of deviating operating conditions and applications, consultation with the manufacturer is required.

4 Installing the valve

4.1 On-site requirements

The surface of the structure must be prepared for the assembly of the VAG ERI[®]plus Penstock. On the installation site, it must be made sure that the entire surface of the structure to which the penstock is to be mounted is even and free from pores. The concrete quality must be at least that of strength grade C 25 according to DIN 1045/DIN 1084.

Furthermore, the dimensional tolerances according to DIN EN 18202 must be observed. In this connection, Table 3 (Picture 6), surface evenness tolerances line 7 applies.

This means:

Evenness tolerance limits in mm according to DIN EN 18202, Table 3			
Distance between measuring points	Line 5	Line 6	Line 7
0,1 m	5	3	2
1 m	10	5	3
4 m	15	10	8
10 m	25	20	15
15 m	30	25	20

Picture 6: Table of tolerances in building construction (DIN 18202)

- maximum 3 mm deviation per one metre of concrete surface.
- maximum 5 mm deviation per two metres of concrete surface

The edges of the construction must not be broken off to ensure that the sealing ring rests completely on concrete. If a pipe runs into the structure, it is essential to ensure that the pipe end is flush with the structure. Existing old valve parts (e.g. old frames) need to be removed completely before the assembly of a penstock.

4.2 Installing the valve

4.2.1 Mounting the VAG ERI[®]plus Penstock with anchor bolts

First check whether the clear dimension of the opening matches the nominal diameter of the VAG ERI[®]plus Penstock. The clear dimension of the opening must never be larger than the nominal width of the VAG ERI[®]plus Penstock. The wall seal must rest completely on the even wall surface.

Before the beginning of its installation, the VAG ERI[®]plus Penstock must be opened completely. Place the penstock in front of the opening in the structure so that the opening is completely centred in the clear cross-section of the penstock. In this installation position, the design of the penstock ensures that the minimum distance from the edges is observed when the holes for the chemical anchors are drilled.

The VAG ERI[®]plus Penstock is now aligned using a level and fixed afterwards e.g. with stays. The wall seal must rest completely on the even surface of the wall of the structure.

Now the VAG ERI[®]plus Penstock serves as a drilling template. Using a suitable drill (drill diameter according to Picture 7), drill the mortices for the anchor bolts through the holes of the anchor plates. Afterwards, the mortices must be blown out. Any drilling dust remaining in the bore holes will affect the bonding strength of the chemical reaction mortar.

Any wrongly drilled mortices must be properly closed before the valve is attached. This prevents the steel reinforcement of the concrete exposed by drilling from carrying corrosion into the structure.

The anchor bolts (chemical reaction anchors) must be installed according to the rules provided by the suppliers of the chemical reaction anchors. Only use the attachment materials included in the scope of supply (see Picture 7) and observe the instructions relating to the proper handling of chemical reaction anchors (Picture 9).

When the mortar has set, lift the VAG ERI[®]plus Penstock a little off the wall to remove any excess synthetic mortar which may have emerged from the bore holes with a screw driver or chisel. Any excess mortar remaining around the bore holes will prevent the proper seat of the penstock on the structure and thus the sealing effect of the wall seal.

Now the VAG ERI[®]plus Penstock is fastened evenly and cross-wise to the wall surface until the attachment plates rest flat on the wall surface. This ensures optimum pretensioning of the wall seal on the wall surface. Before applying full load to the VAG ERI[®]plus Penstock, you must wait until the prescribed setting time of the chemical reaction anchors has expired.

The VAG ERI[®]plus Penstock is now ready for operation but any drilling dust and drilling residues must be removed, especially from the inner areas between the frame and gate and from the compression wedges.

4.2.2 Mounting VAG ERI[®]plus Penstock; checking the clearance of the gate

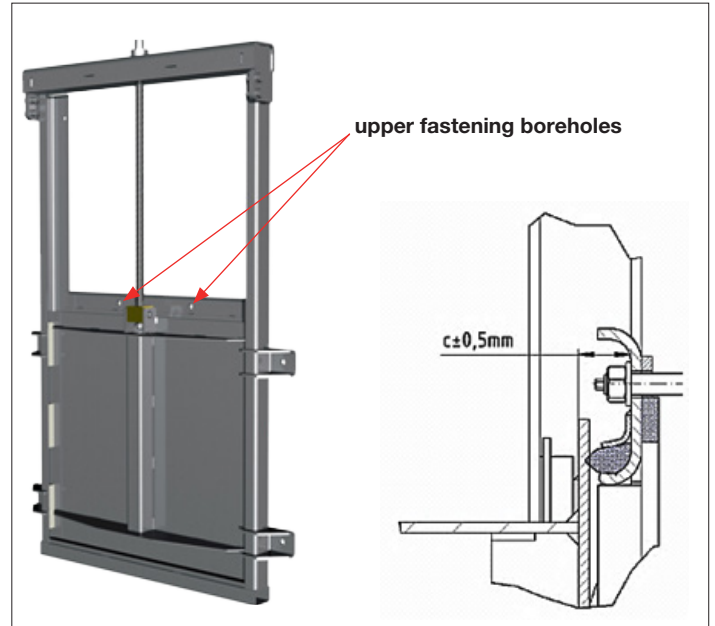
When mounting the anchor rods for the upper fastening boreholes (see Picture 8), it needs to be ensured that clearance C (see

Nominal width	Diameter of borehole	Number of boreholes	Depth of the borehole 1)	Size of anchor	max. tightening torque
150x150	Ø 14 mm	2	135 mm	M12 x 120	40 Nm
200x200	Ø 14 mm	2	135 mm	M12 x 120	40 Nm
300x300	Ø 14 mm	2	135 mm	M12 x 120	40 Nm
400x400	Ø 14 mm	4	135 mm	M12 x 120	40 Nm
500x500	Ø 14 mm	6	135 mm	M12 x 120	40 Nm
600x600	Ø 14 mm	6	135 mm	M12 x 120	40 Nm
700x700	Ø 14 mm	8	135 mm	M12 x 120	40 Nm
800x800	Ø 14 mm	10	135 mm	M12 x 120	40 Nm
900x900	Ø 14 mm	10	135 mm	M12 x 120	40 Nm
1000x1000	Ø 14 mm	12	135 mm	M12 x 120	40 Nm

Picture 7: Table of anchor bolt sizes, number and dimensions of bore holes

table above) is observed because of the risk of the gate and the anchor rod colliding.

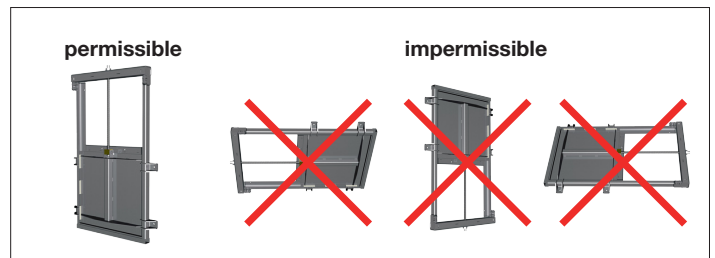
Tighten the nuts on the upper anchor rods so that distance C between the gate and the yoke is largely the same over the entire width. Open the gate a little to check whether it can be opened collision-free.



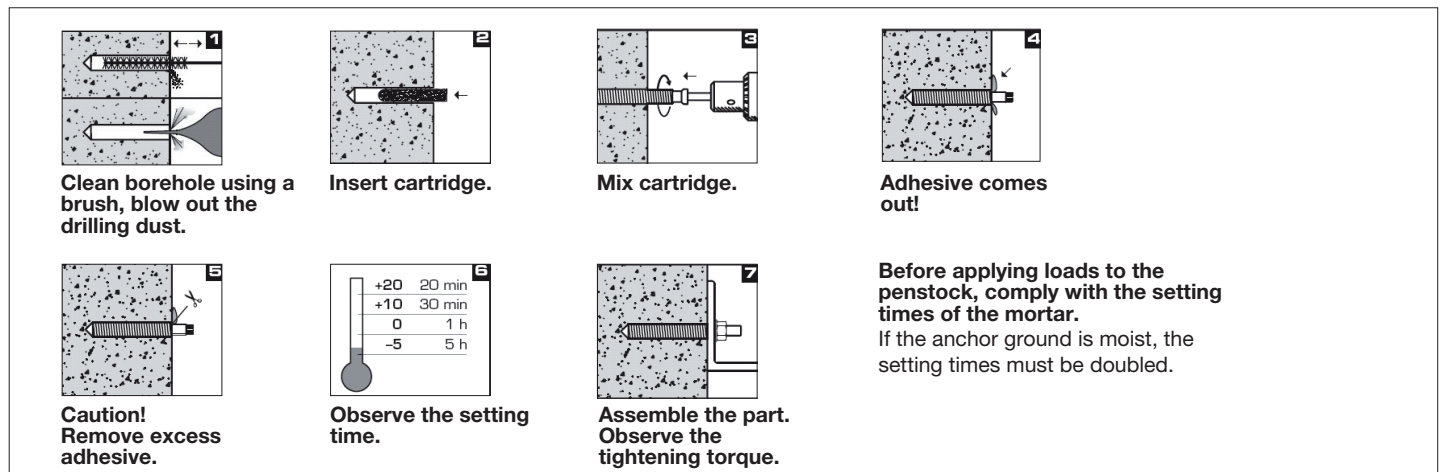
Picture 8: Mounting the anchor rods for the upper fastening borehole

4.3 Installation position

The VAG ERI[®]plus Penstock is mounted vertically, i.e. with the stem in a perpendicular position, to the opening in the structure. Should installation only be possible in other positions, please consult the manufacturer.



Picture 10: Installation position of the VAG ERI[®]plus Penstock



Picture 9: Proper handling when using chemical anchors

4.4 Assembly instructions and fasteners

Check the valve before assembly for any damage that it may have suffered during transport and storage. Protect the valve against dirt on the construction site by adequate covering until installation. During installation, all components essential for proper function, such as the stem, stem nut, gate, sliding elements and the wall seal must be thoroughly cleaned to remove all dirt particles. VAG does not assume any liability or warranty for consequential damage caused by dirt, shot-blasting gravel residues etc.

The operability of the functional parts must be checked prior to installation.

Should the valves be repainted later on, it must be made sure that no paint is applied to the functional 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, it must be ensured that the solvents do not destroy the seals of the pipeline or the valve.

When installing the VAG ERI[®]plus Penstock, it must be made sure that suitable load suspension devices and transport and lifting devices are available.

5 Set-up and operation

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.

The valves have been factory-lubricated for assembly, storage and transport purposes. Depending on their condition, they may have to be relubricated at set-up.

Recommended lubricants:

- Stem, stem nut: Klüberplex BE 31-502
- Seal, gate: Fuchs Chemplex Si 2
Fuchs Notropeen Si 1
Klüberbeta VR 67-17002

5.2 Function check and pressure test

Before installation, the function parts of the valve have to be opened and closed completely at least one time and their operability has to be checked.

Ensure that no objects are present near the opening of the structure, which might block the movement of the gate



Warning! The pressure exerted on the closed valve must not exceed its nominal pressure (see technical data sheet KAT-A 2453).

When operating the penstock for the first time, ensure that the gate in the seal support and any assembled actuating components move evenly, vibration-free and without noise. These components must never be jammed and their movement must neither be blocked nor otherwise be impaired.

Especially after repair work but also during the set-up of new equipment, the pipeline system must be cleared again with the

valve fully open. As a standard the valve is closed by turning the operating square end clockwise (via an operating key, a handwheel or an electric actuator).

The dimensions of the stems and actuators allow the operation of the valve by one person using a handwheel. Extensions for operation are not permissible and may cause damage to the valve due to excessive loads.

Limit stops in the valve limit the travel. Trying to turn the valve beyond the limit stops using excessive force may damage the penstock. Check the proper function of the limit stops by opening and closing the valve several times.

6 Actuators

6.1 General

Directly mounted actuators or REMO remote control units of many different types are available for the VAG ERI[®]plus Penstock.

Actuators mounted directly to the penstock bridge (pneumatic, hydraulic or electric actuators) are delivered with default settings suitable for the operating conditions specified in the order. The adjustment of the limit stops (OPEN, CLOSED) must not be changed without the manufacturer's consent.

If the penstock and actuator are delivered separately, e.g. on a headstock, the limit stops need to be adjusted on site prior to set-up.

The limit stops have to be adjusted in compliance with the operation instructions supplied by the respective manufacturer of the actuator, such as AUMA, Rotork etc. If an actuator is retrofitted, its nominal torque and the adjustment of the limit stops (OPEN and CLOSED) must be adapted to the valve.

For detailed information about the actuators, please refer to the manufacturer's (e.g. AUMA,...) operating instructions.

Non-compliance with these instructions may lead to physical injury or death and/or cause damage to the equipment. If actuators powered by external energy (electric, pneumatic, hydraulic) have to be disassembled from the valve, the safety instructions in Chapter 1.1 must be observed and the external energy source must be switched off.

6.2 Operating torques

Operating torques are the maximum required torques [in Nm] at the operating stem at full differential pressure and including a safety factor. If required, please contact us to enquire about the respective torques and/or controlling torques for electric actuators.

6.3 Assembly of the electric actuator

The electric actuator is mounted to the bridge or to remote control components such as the REMO headstock.

The valve is switched off

- path-dependent in open position
- torque-dependent in closed position.

The switching points of remote control components

have to be adjusted on site. The torque switches serve as overload protection in intermediate positions.

If the valve is retrofitted with an electric actuator, the limit switches have to be adjusted after the assembly of the actuator. For information about adjustment, please refer to the operating instructions of the manufacturer of the electric actuator.

The relevant safety regulations of the VDI/VDE and the instructions of the manufacturer of the electric actuator must be complied with.

The electric actuator must only be operated with a control unit connected. If limit switches and torque switches are not connected and properly adjusted, the valve and the electric actuator may be damaged. In this case the manufacturer does not assume any liability or warranty.

Upon delivery, the adjustment screws and connection bolts of the electric actuator are sealed by adhesive labels or identified by colour markings. If these identifications are broken later on, this will result in the loss of the manufacturer's warranty.

7 Maintenance and repair

7.1 General safety instructions

Prior to any inspection and maintenance work on the valve or its assemblies, the valve must be de-pressurised. Depending on the kind and dangerousness of the fluid conveyed, all required safety regulations must be complied with!

After completing the maintenance works and before resuming operation, check all connections for proper fastening and leak-tightness. Perform the steps described for initial set-up as described under Section 5 "Set-up and operation".

The statutory and local regulations as well as the safety and accident prevention regulations must be observed and complied with at all times.

Damage that may be caused by electric current and current flow must be prevented. Couplings and connections must never be disconnected while they are under pressure or energised.

Servicing, maintenance and inspection work as well as the replacement of spare parts must only be carried out by 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 first. This training course can e.g. be held by VAG Service employees.

Upon the customer's request, the penstock can also be mounted by VAG's Technical Service.

In addition to this, the plant operator needs to ensure that all employees have understood these Installation and Operating Instructions as well as all further instructions referred to in them.

Protective equipment such as safety boots, safety helmets, protective clothing, goggles, protective gloves etc. must be worn during all work requiring such protective equipment or for which such protective equipment is prescribed.

It must be ensured that improper, wrong and abrupt use of the valve is 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.

7.2 Inspection and operating intervals

The leak-tightness, operability and corrosion protection of the valve should be checked at least once per year (DVGW Guidelines W 392). In case of extreme operating conditions inspection should be performed more frequently.

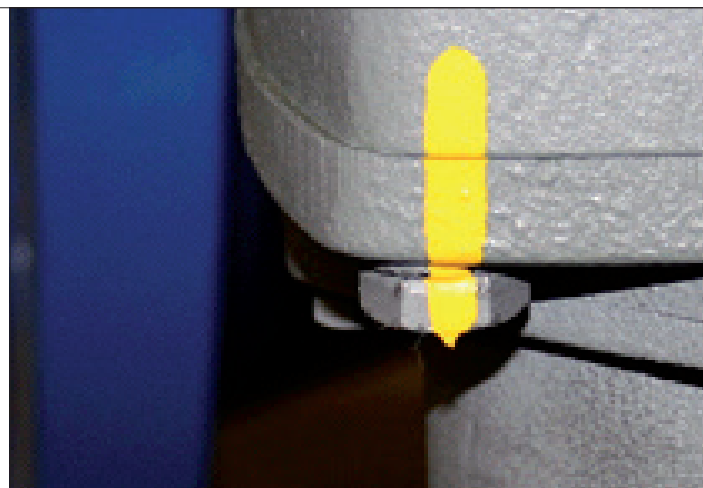
Upon the customer's request, inspection and maintenance of the penstock can also be carried out by VAG's Technical Service.

7.3 Maintenance work and replacement of parts

Spare parts and parts subject to wear and tear can be replaced. All replacement work must be done by skilled staff. Detailed instructions for the replacement of spare parts and of parts subject to wear and tear are enclosed with the order-related delivery of spare parts and parts subject to wear and tear.

All moving parts, such as the threaded stem, the stem nut and the components of the stem bearing need to be greased regularly, at least once per year, with a lubricant. We recommend the lubricant Klüberplex BE 31-102.

If the penstock is used in drinking water and flood protection applications, the seals should also be lubricated at least once per year. We recommend the following lubricants:



Picture 11: Secured bolts on the electric actuator

- Fuchs Chemplex Si 2
- Fuchs Notropeen Si 1
- Klüberbeta VR 67-17002

To maintain its proper function, the VAG ERI[®]plus Penstock needs to be operated at least once per year. Furthermore, coarse dirt must be removed from the VAG ERI[®]plus Penstock at least twice per year.

No further maintenance work is necessary.

8 Trouble shooting



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

Problem	Cause	Remedial action
Penstock hard to operate	Stem dirty	Clean stem and relubricate
	Stem nut dirty	Clean stem nut and relubricate
	Stem nut worn	Replace stem nut
	Foreign object in lateral seal groove	Clean seal groove
Penstock cannot be closed completely	Obstacle in the valve passage	Remove obstructing objects (twigs, stones ...) from the passage of the penstock
	Foreign object in lateral seal groove	Clean seal groove
	Wrong adjustment of the electric actuator	Readjust
	Penstock not closed completely	Check the torque adjustment of the electric actuator and, if required, readjust according to the manufacturer's instructions
Penstock is not leak-tight	Obstacle in valve opening	Remove obstructing objects (twigs, stones ...) from the passage of the penstock
	Seal damaged	Replace seal

9 How to contact us

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