

Original Operating, Servicing and Assembly Instructions

Penstock

RPS FX /T 1 to 6 Steel-Stainless Steel



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1 General information

1.1 Warranty

The manufacturer will be liable to the extent provided by law for defects on the armatures. Neither liability nor any warranty claims will be accepted if based on one or more of the following reasons:

- Improper use of the system.
- Incorrect assembly, commissioning, operation or servicing of the system.
- Operation of the system with defective safety installations, incorrectly fitted safety devices or protective devices which are not in working order.
- Failure to follow the instructions in the operating manual with regard to transport, storage, assembly, start of operation, servicing and installation of the system.
- Unauthorised structural alterations to the system.
- Unauthorised modifications of the safety components and the overall design and build.
- Incorrectly executed repairs.
- Disasters caused by the impact of foreign objects and forces beyond human control.
- Use of spare parts which were not purchased through IBS.

As a general principle, the wearing parts (e.g. gaskets, sealing elements, springs, bearings, etc.) are not covered by the warranty. Please also take note of our general Terms & Conditions in this regard.

1.2 Safety information

The statutory health & safety and accident prevention regulations apply independently of the information contained in these operating instructions.

Every person instructed by the owner to operate, service or repair the product must first have read and understood the operating instructions, especially [Section 2 "Safety"](#). More detailed explanations are given in [Section 1.7 "Information on the briefing of operating personnel and the keeping of mandatory records"](#).

Anyone who repairs the product is in principle responsible for ensuring their own health and safety.

Due regard for all the relevant safety regulations and legal requirements is essential to avoid injury to personnel and damage to the product during servicing and repair work.

Maintenance engineers must have read and understood these regulations before starting work.

Duly trained and qualified personnel are required in order for repairs to the IBS products to be carried out correctly. Responsibility for training lies with the owner and maintenance engineers, who are required to ensure that the operators and any future maintenance engineers are appropriately trained to work on the product.

No warranty claims for damage caused by improper operation will be accepted.

The warranty will also be invalidated in the event of unauthorised repair work and/or invasive action, and the use of accessories and spare parts which are not designed for use with our product.

Defects must be repaired immediately in order to minimise the extent of the damage and to preserve the safety of the product.

Failure to take prompt action will nullify any further warranty claims.

We reserve the right to make modifications in the interests of making technical improvements.

We have flagged up all the safety information and warning signs for you.

We have used the following symbols and warning words:



Caution



Electric current



Suspended load

1.3 Structural alterations to the machine

The consent of the manufacturer must be obtained before making any modifications to the armatures, fitting anything to them or making alterations to them.

This applies most notably to welding on load-bearing parts.


Machine parts which are not in perfect condition must be replaced immediately.


The only spare and wearing parts which may be used are original parts sourced from the manufacturer.


	WARNING
	<p>Externally sourced parts cannot be guaranteed to be appropriate for the type of duty and to meet the safety requirements in terms of their design and build.</p>


1.4 Guide to signs and symbols

The following symbols and words are used in the operating instructions to flag up particularly important information.

	NOTE
	<p>This symbol is used to flag up information which is very important but does not relate to any immediate danger.</p>

	CAUTION
	<p>The word CAUTION is used to warn of potential danger categorised as low risk which could lead to minor or slightly more severe injury or damage to property if not averted.</p>

	WARNING
	<p>The word WARNING is used as an alert for potential danger categorised as medium risk which could lead to death or serious injury if not averted.</p>

	DANGER
	<p>The word DANGER is used as an alert for immediate danger categorised as high risk which could lead to death or serious injury if not averted.</p>

Please note that we will not accept liability for damage caused by failure to follow these operating instructions.

1.5 Documentation

The product, as designed and built by IBS GmbH, is supplied with detailed and specific documentation.

The format of this documentation complies with the relevant standards and requirements. It is the responsibility of the user to distribute the relevant parts of the documentation to the right people. The user is required to ensure that at least one copy of the documentation is in the immediate vicinity of the product and is accessible to the relevant people.

The operating instructions constitute an integral part of the product and must be kept throughout its service life.

The operating instructions must be passed on to any subsequent owner or user of the product.



Any person assigned to work on the product must have read the relevant documentation before starting work, with particular reference to [Section 2 "Safety"](#). This applies most notably to persons who are instructed to work on the product only occasionally, e.g. maintenance personnel.

1.6 Copyright

The manufacturer holds the copyright to these operating instructions. These operating instructions are intended for the owner and the latter's personnel.

These operating instructions or any part thereof may not be duplicated, distributed, amended or processed electronically. They must not be made accessible to third parties. Any infringement or violation may lead to criminal prosecution.

1.7 Information on the briefing of operating personnel and the keeping of mandatory records

We recommend that the owners of our products make the operating instructions available to all persons who are instructed to operate, service and repair the products, especially [Section 2 "Safety"](#) so that they can acquire the relevant knowledge.

We also recommend that owners issue internal "**Operating procedures**", taking due account of the known skills and qualifications of the relevant personnel.

Written confirmation should be given to the owner to verify attendance at briefing sessions and training courses, etc., which cover the knowledge needed for the operation, maintenance and repair of the product.


2 Safety

2.1 Designated use

Our armatures are used in channels, raceways or basins of waste water treatment systems, reservoirs or similar installations. They are used to block, divert or control the flow of water. They can also be used as end fittings in pressure pipes. In all applications it is essential to heed the information relating specifically to the product in the relevant documentation, especially information on the maximum permissible operating pressure.

There are risks involved in using the product for any other purpose. The specified technical limits must not be exceeded.

The product may only be used as indicated in its technical specification. This includes adhering to the conditions prescribed by the manufacturer with reference to its start-up, assembly, operation, location and maintenance.

	WARNING
	<p>The safe operation of the product cannot be guaranteed if it is not used for its intended purpose. The owner of the product rather than the manufacturer shall be responsible for any injury and damage arising as a result of its improper use.</p>

Fundamental principles

The product, as built and placed into circulation by IBS GmbH, is designed for industrial use and meets the safety regulations applicable at the time of its delivery and set out in detail below. The product reflects the industry standard and conforms to the recognised codes of safe practice at the time of its delivery. Nevertheless, its use does entail the risk of injury or death of the user or third parties or the risk of damage to other assets.

Personal protective equipment

The required personal protective equipment is to be provided by the owner. You are required to wear the following personal protective equipment as a minimum:

- Hard hat
- Safety glasses
- Safety shoes

These symbols are used to remind you to wear your personal protective equipment.



Hard hat



Safety glasses



Safety shoes

Intended purpose

The product is designed to serve the purpose of use agreed in the contract between the manufacturer/supplier and user and to serve the purpose of use set out in the product specification and in line with its application as set out in the technical data.

The operational safety and reliability of the product is guaranteed if it is used as intended and with due regard for the relevant safety regulations, as far as can be foreseen.


Improper use of the product can entail the following risks:


- Risk of injury or death of the operator.
- Risk of damage to the product and to other valuable property

belonging to the operator or to third parties.

Improper use of the product might include the following:

- The product load limits are exceeded.
- Safety installations are bypassed.

	DANGER
	<p>Improper use of the product and disregard for the relevant safety standards and regulations can place the operator at risk of injury or death!</p>

	WARNING
	<p>Please ensure that adequate safety precautions are taken when transporting and manoeuvring the product.</p>

Technical condition:

The product must be in perfect working order when it is used and must be used as intended with due regard for the relevant regulations (cf. also section entitled ["Malfunctions" in chapter 2.2](#)).

The owner of the product rather than the manufacturer will be responsible for any injury and damage arising as a result of its improper use.

2.2 Organisational measures

Adherence to regulations

The owner must take appropriate organisational measures and hold the necessary briefings to ensure that the relevant safety regulations and codes of safe practice are observed by the personnel assigned to the operation, maintenance and repair of the product.

Monitoring of conduct

The owner is required to carry out at least occasional checks on personnel to ensure safe working practices and due awareness of hazards.

Hazard warnings

The owner is required to ensure that due account is being taken of safety advice and hazard warnings relating to the product and that the signs are clearly legible.

Malfunctions

Take the product out of operation immediately if it is not working properly and is unsafe to use, or if the way in which it is operating gives reason to suppose that it is unsafe to use, and do not reuse it until the problem has been diagnosed and rectified. Faults may only be rectified by trained and authorised personnel.

Modifications

The consent of the manufacturer/supplier must be obtained before making any modifications to the product, fitting anything on the product or making alterations to the product which may affect its safety. This also applies to the installation of safety devices.

Spare parts

The only spare parts which may be used are such as meet the specifications laid down by the manufacturer/supplier. This is always the case with original spare parts. Neither liability for the product nor warranty claims will be accepted if repairs are carried out improperly and if spare parts are used which are not approved.

Checks/inspections

It is essential to adhere to the prescribed intervals for regular checks and inspections as set out in the maintenance manual.

Staff selection and qualifications

- Work on/with the product may only be carried out by reliable personnel who are not below the minimum legal age.
- Personnel must be duly trained and briefed before working on the product, taking advantage of the training offered by the manufacturer, where necessary.
- Responsibility for operating, servicing and repairing must be clearly delineated so that staff are in no doubt as to their remit.
- Set out the responsibility of operators, including in respect of safe working practices, allowing the rejection of instructions from third parties which go against the codes of safety.

- Personnel who are being trained, briefed, instructed or familiarised with the product may only be allowed to work on/with the product under the constant supervision of an experienced person.

2.3 General safety information

Follow the instructions below in order to avoid accidents:

- Never work on your own.
- Wear protective clothing, belt, safety rope and fresh air helmet, if required.
- Make sure that there are no toxic gases in the working area. Use the correct equipment to carry out tests and measurements.
- Do not underestimate the risk of drowning and wear a life jacket or inflatable collar.
- Check if there is a risk of explosion before welding or using electric tools.
- Do not underestimate the health risk. Uphold high standards of cleanliness.
- Be aware of the risk of electric hazards.
- Check that lifting gear is in perfect condition.
- Cordon off the working area as appropriate, e.g. with grating panels.
- Keep exits and escape routes clear.
- Wear a hard hat, safety glasses, safety shoes, etc.
- All persons working at waste water treatment installations should be vaccinated against illnesses which might arise in such places.
- Keep a first aid kit to hand.

The health & safety provisions set out in the relevant national accident prevention regulations must be observed along with any internal operating instructions and occupational safety directions stipulated by the owner.

Master switch



If necessary, the owner must fit the product with a lockable master switch (conforming to EN60204) which prevents the product from being put into operation without authorisation. The owner is required to ensure that the key for this switch is kept in a suitably safe location and that responsible and authorised personnel only have access to this key.

Emergency Off switch

The owner must install "EMERGENCY OFF" switches so that the product can be brought to a standstill immediately in an emergency.

Safety during maintenance work

- Never engage in dangerous working practices.
- Check the product at least once a day for visible external signs of damage and defects.
- Report any changes and unusual behaviour immediately to the relevant body/supervisor; if necessary, shut the product down immediately and secure it if necessary.

Hazards in connection with using the product

- All the safety installations are to be checked regularly. Checks are to be logged by the owner.
- Any damage or faults which could put people at risk must be remedied immediately and correctly. The system is to be taken out of use until such time as faults have been rectified.
 - Disconnect the product from the power supply
 - Affix warning sign (out of order, do not use, etc.)
- Tests and inspections may only be carried out when the product is at a standstill.

Maintenance instructions

The reliable operation of the product can only be guaranteed in case of precise adherence to the maintenance procedures in the operating instructions (cf. [Section 9 "Maintenance and servicing"](#)).

Environmental protection regulations

The relevant environmental protection regulations must be adhered to when carrying out any servicing and repair work. The main German regulations and laws governing the use of cold cleaning solvents are as follows:

- Dangerous Chemicals Ordinance (GefStoffV)
- Water Resources Law (WHG)
- Waste Management Law (AbfG)
- Waste Documentation Ordinance (AbfNachwV)




Apply careful selection criteria even before buying lubricants and lubricating oils, researching their environmental impact, health risks, regulations for their disposal, and local facilities for approved disposal.


2.4 Safety precautions in normal operation


- Never operate the system unless all the safety devices are in working order.
- Before switching the system on, make sure that nobody can be put at risk by the system when it starts up.
- Check the system in due time before operation for external signs of damage and check that the safety installations are in working order. Checks are to be logged by the owner.
- When the gate is moving up or down, make sure that nobody is standing near or in the danger zone, especially with their hands or feet in the danger zone (e.g. sliding vane edges, guide rail, ground rail, brace, spindle, rotating axles...). Failure to heed this warning can lead to serious crushing injuries and even loss of limbs.


2.5 Electrical hazards


- The control cabinet must be kept closed at all times. It may only be opened and accessed by authorised personnel.
- If work is required on live parts, a second person must be present in order to press the Emergency Off switch in case of danger. The first basic requirement is to cut off the power supply and to take measures to prevent the system from being switched back on without authorisation. Only then may work begin on the system.

	DANGER
	<p>Follow the instructions for switching the machine on and off. When the master switch is turned on, the electric components are connected to the power supply. Exposed components in the control cabinet may be live.</p>

	DANGER
	<p>Make sure that the machine is fully disconnected from the mains, and measures taken to prevent it from being switched back on, in order for work to proceed in the control cabinet or on electrical installations.</p>

	DANGER
	<p>Check the electrical parts of the machine regularly. Arrange for loose connections and scorched cables to be professionally repaired immediately.</p>

	DANGER
	<p>Live parts in the control cabinets and distribution boxes are safe to touch with fingers but if touched with tools there is a risk of contact with live parts.</p>

	DANGER
	<p>Work on electrical installations may only be carried out by qualified electricians, electricians qualified for specific electronic activities (FET) or persons trained in electrical engineering.</p>

2.6 Biohazards

Please note the importance of personal hygiene when working in the often hazardous environment of sewage treatment plants.

- Uphold high standards of cleanliness.
- Wash your hands before eating and drinking.
- Even smoking with dirty hands can entail a risk of viral and bacterial infections.

3 Product description

3.1 Design and function

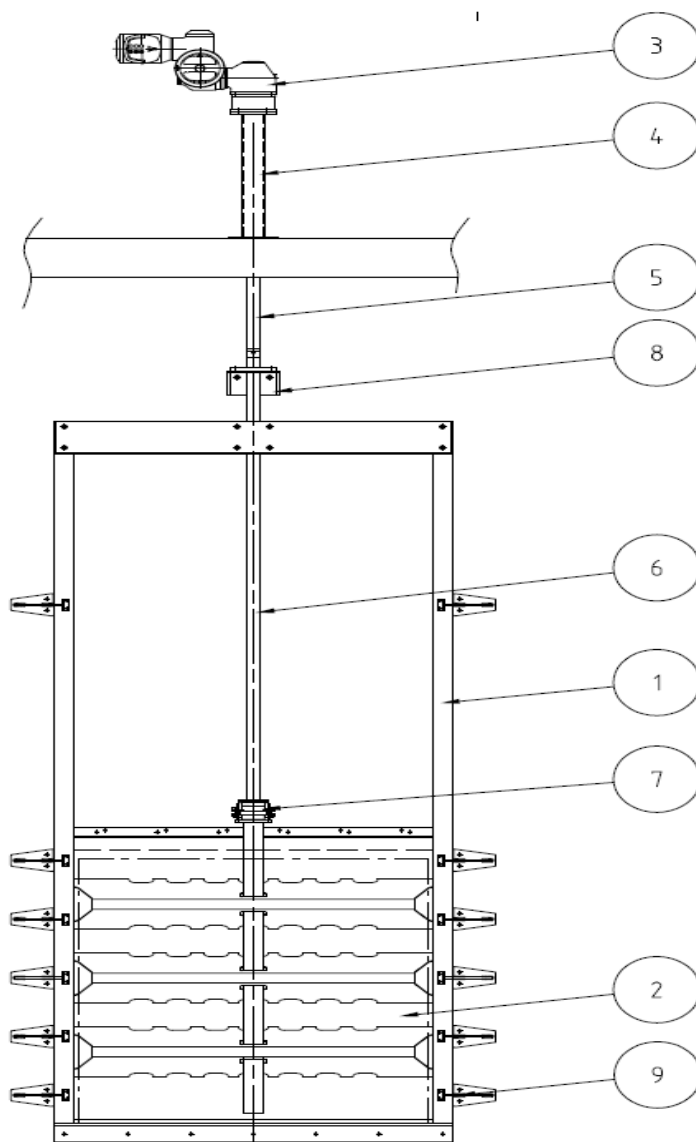
Armatures without housings generally consist of a frame which is attached to the building structure and a panel which is held in the frame. The seal between the panel and the frame is formed by profiled joints which can vary depending on the type of armature and what it is used for.

The seal is basically designed so as to allow pressure to be applied to the armature from both directions.

The armature is generally operated by an acme threaded spindle with a manual or electric drive. It is also possible for the drive to work with hydraulic or pneumatic systems as an alternative.

No other purpose of use is permitted.

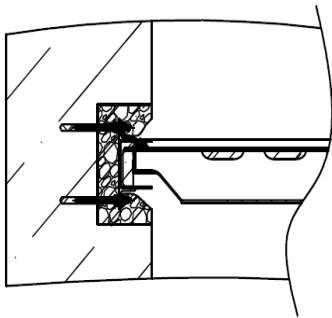
3.2 Design structure



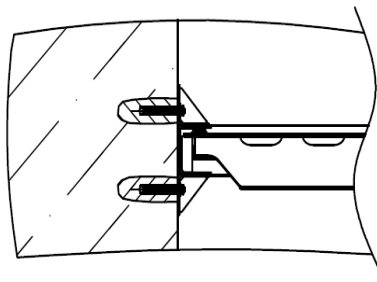
Legend:

1. Frame
2. Penstock gate
3. Drive (servomotor, hand wheel, stem square cap)
4. Column stand
5. Spindle extension
6. Threaded spindle
7. Spindle nut
8. Spindle guide
9. Fixing bracket

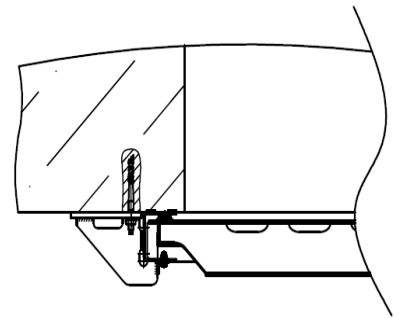
3.3 Installation positions



Recessed dowel fitting set in finishing concrete

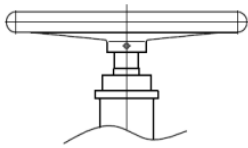


In raceway with angle bracket



In front of raceway (two-way pressure) for tensile loading

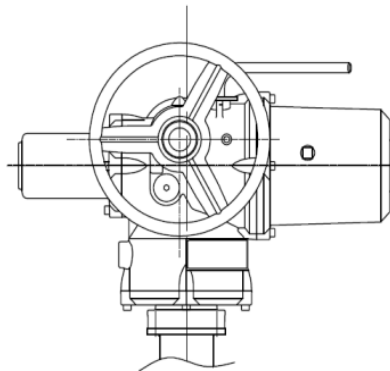
3.4 Operating modes



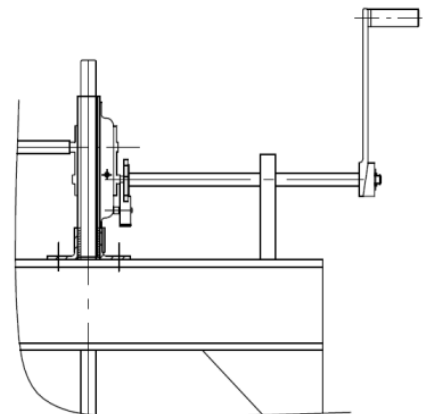
1. Hand wheel



2. Stem square cap



3. Electric drive




4. Crank handle with gear rack


4 Transportation


4.1 Transportation instructions

The safety precautions, safety advice and hazard warnings set out in [Section 1.2](#) and [Section 2.3](#) must be heeded and adhered to in respect of the transportation of the product.

- Exercise care when preparing the product for transportation.
 - Fasten moving parts.
 - Check that it is disconnected at all the relevant points before it is lifted up and carried away.
 - Otherwise hoses and cables may get damaged.
- Power terminals may only be disconnected by qualified professionals.
- Select appropriate wrapping for the product and take measures to prevent it from slipping out of place.
- Comply with the accident prevention regulations and local provisions.

	DANGER
	<p>When transporting penstocks, they may only be attached, lifted or fastened by their side frames or rested on their side frames. They must never be attached or fastened by other parts, e.g. spindle, spindle extension, brace, drive, ground rail, header rail, brackets, sliding vane, reinforcing ribs, etc. These parts are not designed for any such transport attachments.</p>

	DANGER
	<p>The correct lifting gear must be selected and used so that the penstock cannot accidentally break free or slip out of place.</p>

	DANGER
	<p>Both the lifting gear (belt, chain hoist, rope, etc.) and the transporting device (crane, forklift, truck, etc.) must be capable of taking the weight of the penstock and of safely withstanding the accelerating and braking forces which may be generated.</p>

4.2 Dimensions and weight

Please refer to the technical specifications supplied with the penstock.

4.3 Reliable transport aids and equipment

- The product may only be transported/handled by forklift truck or crane (capable of withstanding the load).
- Means of transport must be fit for purpose, in perfect condition, in full working order and must have sufficient loading capacity. Please refer to the data sheet for the relevant transport dimensions and weight (maximum installed weight).

5 Installation/assembly


5.1 Receiving inspection


- Check the goods and delivery note and make sure that the consignment is complete.
- Notify the forwarding agent and IBS of any missing parts or incorrect deliveries.
- Notify the forwarding agent and IBS of any damaged parts.
- If the goods have been damaged in transit, the consignee must give the forwarding agent verbal notice of the damage then note it down on the delivery slip and sign it.


5.2 Instructions for installation and assembly

The safety precautions, safety advice and hazard warnings set out in [Section 1.2](#) and [Section 2.3](#) must be heeded and adhered to in respect of the installation and assembly of the product.

- Follow the instructions of the relevant suppliers of any purchased parts which are used.
- If using parts from suppliers, check the CE mark and conformity declaration.
- Before fitting parts from suppliers, check that they are not damaged and that they are in working order.
- Any modifications require the written approval of the manufacturer.
- The universally applicable and the local regulations on accident prevention and environmental protection must be followed in addition to the operating instructions.
- Work on technical equipment may only be carried out by qualified professionals. Never engage in dangerous working practices.
- Follow the lubrication instructions for the product and for components.
- When assembling and installing the product, make sure that all power sources (electrics, pneumatics) are switched off and that there is no residual energy.

	DANGER
	<p>Instructions on the attachment of loads and the briefing of crane operators must be provided by qualified professionals. The instructor must be in the range of vision of the operator or be speaking directly to the operator.</p>

	DANGER
	<p>Use suitable lifting gear only with sufficient carrying capacity. Do not walk under suspended loads.</p>

	DANGER
	<p>Work on electrical installations may only be carried out by qualified electricians, electricians qualified for specific electronic activities (FET) or persons trained in electrical engineering.</p>

5.3 Assembly

Checks should be made before assembly that all the bearing surfaces provided for the penstock on site are at a level of 5mm in total and adjustments made if necessary. The penstock must be closed when mounted. Please note section 4 Transportation.

Alignment of drive and spindle can be staggered by max. +/- 3° in order to avoid wedging of the moving parts, e.g. penstock gate.

If fixing brackets are not already mounted on the frame, e.g. for transportation, screw them in at the points shown on the installation drawing.


Drill all the dowel holes (using the gate as a template). After drilling the holes, clean the dust off the side and the back of the gate. Fit the dowels correctly, as directed by the dowel manufacturer, and in a plumb line.

Fit a double Compriband sealing strip on the back of the frame on all four sides. Do not leave any gaps at the corners. Even out any irregularities with additional sealant. Bring the frame on to the dowels using an assembling aid (mandrel). Tighten the screws evenly without distorting or warping the frame. Do not exceed the maximum torque specified by the dowel manufacturer when tightening the screws (see dowel data sheet). Form a seal (material and location as specified on installation drawing) on the inside and outside edge of the frame (frame, header rail and ground rail).

If the construction schedule dictates that the frame must be assembled first and the panel including acme threaded spindle at a later date, then the pin connections shown in the drawing must be drilled and dowelled together during the assembly process.

If the electric drive is not already fitted, it should now be mounted on the drive flange. Apply silicone or a similar product to the contact surfaces between the drive and bracket before fitting the drive in order to repel water from the contact surfaces. Do not apply force when fitting the threaded spindle and bearings. Depending on the design, the threaded spindle/spindle extension may need to be bolted to the motor collar bush or connection flange.

Once the installation process is complete, check the torque switches and limit switches of the electric drives and make any necessary adjustments.

	CAUTION
	<p>Check the size and alignment of the penstock carefully with reference to the installation drawing and data sheets. Excessive tightening of the nuts, screws and anchor bolts can cause distortion of the frame and ultimately result in major leaks.</p>

5.4 Manual drives

If a central column stand is provided, make sure that the base plate is aligned vertically flush over the actuator stem on the top plate. If the drive is installed in front of the raceway, possible with a projecting column stand on a wall bracket, make sure that it is aligned centrally flush over the actuator stem. Use appropriate dowels for fixing in position.

Check the alignment of the drive once it is in place and tighten all the nuts. Fit the protective tube (in the case of rising spindles only) and apply sealant.

Alignment of drive and spindle can be staggered by up to $\pm 3^\circ$ as otherwise the penstock will be wedged in the end position, i.e. moved sideways.

5.5 Electric drives


Follow the installation instructions for manual drives. Open and close the penstock manually for testing purposes before using the electric drive for the first time. Follow the specific instructions of the electric drive manufacturer. Electrical installations and power supply connection (cf. Section 6).

5.6 Pneumatic and hydraulic drives

Follow the installation instructions for manual drives. Store and handle cylinders with great care. Make sure that the piston rod does not get damaged/nicked during the installation process. Follow the specific instructions of the cylinder manufacturer.

6 Start of operation

6.1 General information


	DANGER
	<p>Always arrange for power supplies (electrics, pneumatics, hydraulics) to be connected by qualified professionals.</p>

The initial commissioning of the system is only to check that the mechanical and electrical systems are working correctly. The system should only be started up by qualified and trained professionals.

- All the sealing faces must be cleaned and sprayed with silicone before start of operation.
- All the metallic bearing surfaces must be relubricated with biodegradable machine grease.
- When positioning and fixing the system in place, remember to allow enough space for moving parts, operation, servicing and repair work.
- Check the lubrication of the armature and spindles and apply more grease if necessary.
- Check the rotational direction of the drives.

The power connection is established by the customer according to the terminal diagram supplied. Consult the rotary drive operating instructions to check that the direction of rotation is correct.

- All safety installations and connections must be correctly fitted.
- Nobody is allowed to stand in the danger zone.

	DANGER
	<p>Connect an Emergency Off switch and a lockable switch on the line side of the system in order to prevent it from being operated by unauthorised persons (protection from unauthorised switching on).</p>

6.2 Before start of operation

Read the operating instructions carefully before putting the system into operation.

The following points are important in order to avoid problems with initial operation:

- Check that the product is safe to use before starting work.
- Check that all the screws and bolts are securely fitted.
- Do not start up the system until you are sure that nobody is still working on the system.
- Check that the system is stable and that all the parts are correctly fitted (especially the safety installations).
- Check that the direction of rotation is correct on electric penstocks.

7 Operation


7.1 Safety information

The safety precautions, safety advice and hazard warnings set out in [Section 1.2](#) and [Section 2.3](#) must be heeded and adhered to in respect of the usage of the product.

Stop work as follows in case of irregularities or malfunctions:

- Shut off energy supply.
- Wait for system to come to a standstill.
- Affix warning signs (e.g. out of order).
- Rectify problem.
- Notify company manager / customer service / service engineer if necessary.

Any damage or faults which could put people at risk must be remedied immediately and correctly. The system is to be taken out of use until such time as faults have been rectified.

	DANGER
	<p>When the gate is moving up or down, make sure that nobody is standing near or in the danger zone, especially with their hands or feet in the danger zone (e.g. sliding vane edges, guide rail, ground rail, brace, spindle, rotating axles...). Failure to heed this warning can lead to serious crushing injuries and even loss of limbs.</p>

7.2 Information with regard to operation

The torque switches and limit switches of the electric drives are preset by the manufacturer and need to be checked, and adjusted if necessary, after installation. In the event of a power failure, the drives can be moved manually with the hand wheels. The hand wheels are dismounted by some manufacturers in order to prevent their unauthorised use. They must be kept in the immediate vicinity, however, where they will be readily accessible in an emergency.

The arrows on the hand wheel indicate the direction of rotation. Further information about the operation of the electric drive can be found in the operating instructions for the electric drive.




Wear personal protective equipment!

8 Help in the event of problems

It is essential to heed the following points in order to avoid damage or life-threatening injuries when rectifying faults on the product:

- Do not attempt to rectify a fault unless you have the necessary skills and training to do so.
- Cordon off access to the working range of the moving machine parts.
- Read [Section 2.3 "General safety information"](#).
- Wear personal protective equipment.
- Be aware of the risk of residual energy.

	WARNING
	<p>Do not rectify faults caused by jammed machine parts and/or trapped workpieces until the power has been disconnected (electrics, pneumatics) and any residual energy has dissipated.</p>



Wear personal protective equipment!

Fault	Possible cause	Possible remedy
Leakage at the base	There is concrete, grouting or sediment on the sealing at the base	Remove sediment and clean the sealing at the base
	Frame is not vertical and/or is distorted	Check the fitting
Leakage at the sides	There is concrete, grouting or sediment on the sealing at the side	Remove sediment and clean the sealing
Leakage at the head sealing	Structural precision	Underlay the frame (levelling of building structure)
Excessive force exerted on opening/closing of gate	Frame distorted on installation	Check fitting and realign if necessary
	Frame not fitted vertically or straight	Check fitting and realign if necessary
	Dry (unlubricated) spindle	Lubricate spindle as necessary


9 Maintenance and servicing

Regular servicing and careful monitoring and maintenance are essential for the operational reliability and longevity of the product.

Carry out adjustments, servicing and inspection work within the prescribed time limits.

The main servicing jobs are listed below although additional reference must always be made to the operating and maintenance instructions supplied by the manufacturers.

9.1 Safety information

	WARNING
	<p>The safety precautions, safety advice and hazard warnings set out in section 1.2 and section 2 must be heeded and adhered to in respect of the maintenance of the product.</p>

Ensure **compliance with the accident prevention regulations!**

Repairs are to be carried out by **authorised and skilled professionals** only.

Inform operating staff before the start of servicing and maintenance work (release ticket).

Measures should generally be taken before starting work to prevent moving parts from slipping, tilting, twisting, etc. in order to prevent injuries caused by crushing or cutting.

Work on electrical installations may only be carried out by qualified electricians, electricians qualified for specific electronic activities (FET) or persons trained in electrical engineering. Live parts in the control cabinets and distribution boxes are safe to touch with fingers but if touched with tools there is a risk of contact with live parts.

During servicing, inspection and repair work on the product, **safety measures must be taken to prevent it from being switched back on** (lock) and warning signs must be displayed (out of order - repairs in progress).

Do not embark on maintenance and servicing work **until the power has been disconnected** (electrics, pneumatics) and any residual energy has dissipated (e.g. accumulator).

Exercise care when replacing relatively large assemblies and when attaching and securing them to hoisting gear.

Tests and inspections may only be carried out when the product is at a standstill.

Parts from suppliers are to be serviced **as specified by the manufacturer** in any given case.

Keep transportation routes clear.

On completion of all servicing and repair work, check that the product is in **perfect working order** and check all the **safety installations**.

The product must be in perfect condition before it can be put back into operation.

- Check that the screw fittings have been tightened back up.
- Check that all the safety installations are working when the maintenance work has been completed.



Wear personal protective equipment!

9.2 Penstock gate


If out of service for an extended period of time, the panel should be raised and any debris carefully removed from the surfaces, grooves and base area. Bearing surfaces and threaded spindles should be given only a light coating of waterproof, biodegradable machine grease. If operated normally, the product will only need relubricating about every **three months**. If subject to heavier duty (e.g. regular operation), the penstock gate should be lubricated once a month (refer to data sheet of grease manufacturer).

The gate should be inspected regularly to avoid malfunctions. Remove lumps of debris and coarse deposits. These can be hosed off with water. If necessary, silicone can be sprayed onto sealing surfaces which have dried out. With regard to the electric drive, please refer to the enclosed documents supplied by the manufacturer.

In case of infrequent use, it is necessary to do a **test run at least every six months** in order to verify that the gate is ready for operation at any time.

Any damage which is discovered during the test must be rectified immediately or steps must be taken to have it rectified immediately. The drives may need to be taken out of operation until the problem has been remedied and the armature is fit to resume safe operation.

9.3 Electric drive

	DANGER
	<p>Before opening the drive, switch it off and disconnect it from the electric circuit. Take measures to prevent it from being switched back on.</p>

Changing the gear lubricant:

- After 10-12 years if rarely used (see specifications of manufacturer).
- After 6-8 years if used frequently (see specifications of manufacturer).


9.4 Seals

Elastomer seals are subject to ageing and must therefore be checked regularly and replaced if necessary.

9.5 Fastening bolts

Check the fastening bolts between the rotary drive and the armature/gear unit **six months after start of operation** and then annually, and tighten them with a torque spanner if necessary.

9.6 Connection flange (output drive unit) on the gear units

	NOTE
	<p>A pressure washer or pump with an operating pressure of max. 80 bar can be used for cleaning.</p> <p>Care should be taken to avoid damage.</p>

9.7 Cleaning and lubrication

Always handle substances and materials carefully, especially when working on lubricating systems and lubrication facilities and when using solvents for cleaning, and dispose of them correctly.

Only use industrial water for cleaning. **Do not add any cleaning agents** or chemicals.

Clean stubborn dirt by hand. **Do not use wire brushes** to clean stainless steel parts.

Proceed with care when taking the cover off the drive motor, terminal box, control cabinet, Emergency Off switch, etc. Do not spray with pressure jets. These components should only be cleaned with a soft hand brush or cloth.

Inspect protective coatings on components like the drive motor, bearings, etc. and touch up, if necessary.

Stainless steel surfaces must be bright after the above cleaning process. Deposits of rust film, mud, sludge, chemicals, waste water residues and other similar debris can even lead to signs of corrosion on high-quality stainless steel.

Always read the safety advice and descriptions of the care products given by the manufacturers with the instructions for their application, disposal, safe use, first aid, etc.

9.8 Servicing intervals

What:	When:
General visual inspection and cleaning if required	Weekly
Check drives are working	Weekly
Visual inspection of spindle / spindle nut	Monthly
Regrease spindle / spindle nut	Quarterly
Lubricate connection flange / output drive unit	Biannually
Run through the entire lifting cycle (if used infrequently)	Biannually
Check condition and wear of seals	Biannually

Servicing instructions for purchased parts are set out in detail in the latest versions of the operating instructions of the manufacturer in any given case.


These documents are appended.

Always follow the instructions of the suppliers of spare parts.

Permanent lubrication:

Applications: Used for the lubrication and maintenance of machines, friction bearings, roller bearings, and for long-term lubrication in wet areas and in critical areas in the food industry, pharmaceuticals sector, printing industry and paper industry.

10 Removal from service / recommissioning

	WARNING
	<p>The safety precautions, safety advice and hazard warnings set out in section 1.2 and section 2 must be heeded and adhered to in respect of the removal from service / recommissioning of the product.</p>

10.1 Storage


When in storage, the penstock must be protected from the elements and kept clean (e.g. covered with a tarpaulin). Store the penstock flat and straight on timber planks. If it will need to be stored for a relatively long period of time, the storage location must meet the following criteria: **frost-free - cool - dry - dust-free**. If no such location can be provided, the penstock must be packed in such a way as to meet the above criteria (e.g. in film wrap). The instructions of the relevant manufacturer apply to drives.

Read the section on "Start of operation" when putting the product back into operation after a long period out of use.

The following steps must be taken for the recommissioning process:

- Check that the product is safe to use.
- Clean the product carefully to remove dirt and deposits.

10.2 Disposal

	NOTE
	<p>Follow the instructions under "Waste disposal" in the operating instructions!</p>

Always handle substances and materials carefully and dispose of them correctly, especially in the following cases:

- When working on lubricating systems and lubrication facilities.
- When using solvents for cleaning.

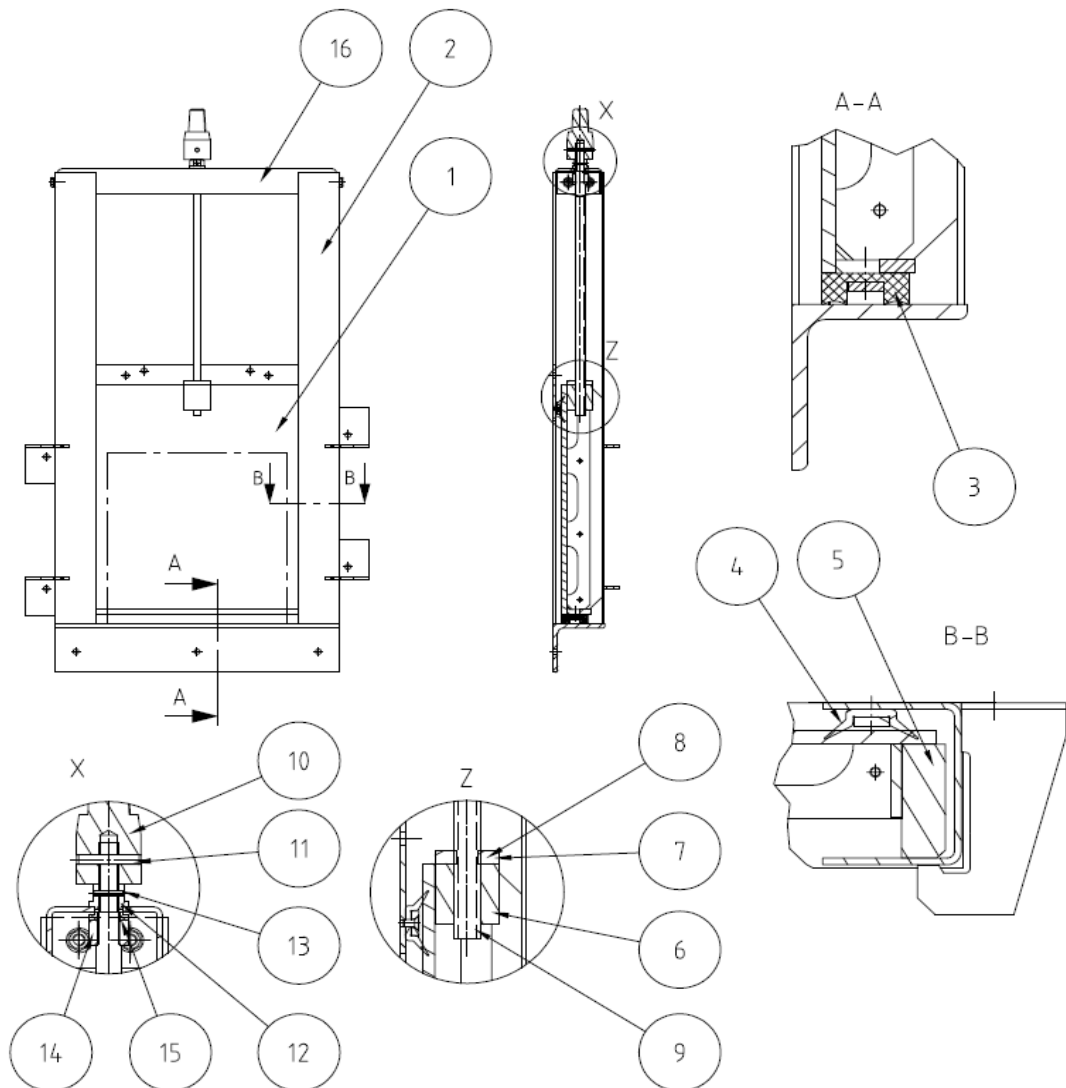
Follow the statutory waste disposal regulations which apply at the place of installation.

The following substances will need to be disposed of from our point of view:

- Waste materials: Aluminium, steel, plastics
- Special waste: e.g. lubricating grease, oils,

11 Spare parts

Our penstocks will work smoothly for many years under normal operating conditions. We therefore advise against the storage of spare parts. Should spare parts be required in future, they can be ordered by stating the order number. Wearing parts (spindle, spindle nut, double lip seal and base seal) can be delivered at short notice if needed.



Legend for spare parts

- | | |
|--|-------------------------------|
| 1. Penstock gate | 10. Stem square cap |
| 2. Frame | 11. Stem square cap dowel pin |
| 3. Base seal | 12. Threaded collar bush |
| 4. Double lip seal | 13. Collar bush dowel pin |
| 5. POM strip | 14. Spacer bushing |
| 6. Spindle nut | 15. Collar bush |
| 7. Spindle nut protector | 16. Cross-brace |
| 8. Spindle nut protector grooved taper pin | |
| 9. Trapezoidal spindle | |

12 Additional information

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12.1 Service centre address

Do you have any further questions or requests? Please do not hesitate to contact us.

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