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### 1 General

The technical data of the order are binding for the type of design. Modifications can only be considered if they are specified to us in time before starting production. Every ATEC PENSTOCK MULTITEC is checked for completeness, performance, and tightness before leaving the factory.

In case of non-compliance with these Operating Instructions, we cannot be made liable for any damages or troubles resulting thereof. We reserve the right to technical modifications as against the data and representations contained in these Operating Instructions in case this should be necessary for improving the ATEC PENSTOCK MULTITEC.

### 2 Safety Aspects

The ATEC PENSTOCK MULTITEC is reliable and designed to the state of the art. However, risks could be involved if the Penstock is handled in an inexperienced manner by untrained staff and not used in accordance with its duty and purpose. Whoever is engaged in mounting, operation and maintenance, inspection and repair of the ATEC PENSTOCK MULTITEC, is supposed to have read the complete Operating Instructions and to have understood them (VGB1 § 14 and following). The user is recommended to have the person involved confirm this fact in writing in each particular case (VGB1 § 7 Abs. 2).

Before removing safety devices and/or carrying out work on the ATEC PENSTOCK MULTITEC, the section, the pit or reservoir must be drained and dried eliminating any risk. Unauthorized, erroneous, and unexpected operation as well as dangerous movements by accumulated energy (compressed air, compressed water, weights, hydraulic energy) have to be excluded.

When using ATEC PENSTOCK MULTITEC the approved technical regulations have to be observed (DIN, DVGW, VDI, VDMA, etc.). For installations to be supervised the relevant rules and regulations have to be observed (GO, VBG, TRD, SR, TRG, TRbF, TRGL, TRAC, AD, etc.). Furthermore, the local safety regulations and rules for prevention of accidents are applicable.

If work is carried out in the vicinity of the ATEC PENSTOCK MULTITEC, which leads to soiling (concrete work, masonry, painting, shotblasting, welding, and grinding work, etc.).

### 3 Product Description and Range of Application

The MULTITEC PENSTOCK is a four-facing type penstock suitable for isolating, throttling, and regulating for installation at and into reservoir and pit inlets and outlets.

The standard MULTITEC PENSTOCK is applicable for the following operating pressures:

- 150 x 150 up to 2000 x 2000 / pressure up to 6mWc on both directions in standard design

### 4 Design Features

- Frame of rolled steel sections
- Door with suspension for stem nut or extension rod
- Slide rails, lip profile and invert seals
- For anchor-bolting or for grouting
- Pressure-tight on both sides (for on-seating and off-seating)
- Combinable with various types of drives

## 5 Operation

The ATEC PENSTOCK MULTITEC opens and closes channels and basin orifices. By mechanical movement of the door a defined orifice is released. The flow will get through this cross section only. The area which is still closed remains pressure-tight. Operation is performed via a manually or electrically operated drive thread or by a pneumatic or hydraulic actuator - **for this see Operating and Installation Instructions Operating Gears!**

## 6 Transport

Transport has to be carried out carefully. Inexpert handling may cause damages to the ATEC PENSTOCK MULTITEC. Such damages have to be reported immediately to ATEC. Prior to mounting, such damages have to be repaired in an appropriate manner.

If the ATEC PENSTOCK MULTITEC is too heavy to be handled manually it has to be transported by means of lifting gears which have to be attached at suitable places. For the standard design they have to be placed at the upper end of the vertical frame profile.

It is not allowed to attach the lifting gears to the handwheel, the stem, the gearbox casing or other sensitive components which would be contrary to the relevant safety regulations.

## 7 Storage

During the storage period, the ATEC PENSTOCK MULTITEC has to be protected against outside influences and impurities (e.g. by covering them with a tarpaulin). The ATEC PENSTOCK MULTITEC has to be stored flat on the frame with intermediate boards.

If long-time storage is required, the place of storage should be selected in such a way that the following conditions are met: frost-protected - cool - dry - dust-free. If it is impossible to comply with these conditions, the ATEC PENSTOCK MULTITEC must be packed to meet these requirements, e.g. it has to be welded in foil. For operating gears, the safety regulations of the corresponding manufacturer are applicable.

## 8 Installation

### 8.1 Principles

According to their design, the ATEC PENSTOCK MULTITEC is grouted, anchor-bolted or anchored into the structure by a combination of these two procedures. On principle, installation should be performed by the ATEC expert staff. In case installation is performed by a third party, an ATEC specialist can give the corresponding installation instructions and supervise the installation.

If the mounting work is done by a third party, the client or the mounting company is responsible for proper installation, testing, and commissioning.

For installation, the ATEC PENSTOCK MULTITEC has to be in perfect condition. All defects have to be reported immediately to ATEC and to be repaired before installation according to mutual agreement.

### 8.2 Requirements to the Structure

The structure has to be complete, i.e. the corresponding constructional section has to be complete with all surfaces and recesses necessary for installation of the ATEC PENSTOCK MULTITEC being geometrically available and plane-parallel and even.

The design of the interface between structure and ATEC PENSTOCK MULTITEC has to be carried out according to the relevant standards for structures (DIN 18202, DIN 19556, DIN 19569, etc.).

### 8.3 General Notes

Remove all packing material from the ATEC PENSTOCK MULTITEC. Prior to installation, check the mounting area for impurities and foreign bodies and clean it if necessary.

It is important that all around the ATEC PENSTOCK MULTITEC there is free access for operation and maintenance.

During the mounting process, corrosion protection and coatings must not be damaged. Particular attention has to be paid during welding or grinding works. If the surface is damaged, these defects have to be repaired in an expert manner.

Prior to mounting the supplied self-adhesive sealing tape has to be attached to the back of the Penstock.

### 8.4 Design for Grouting

Fix the self-adhesive sealing at the middle brace and at the upper cross profile. Then, insert the ATEC PENSTOCK MULTITEC into the provided recess and align. Please see to it that the upper edge of the invert seal is aligned with the invert. Moreover, the sealing tape has to be compressed to a final height of approx. 5 mm.

For the first adjustment the lateral and horizontal screwed in adjusting screws within the slidegate valve framework serve. Then, control once more the pre-stress of the sealing tape at the middle brace and adjust if necessary. For a ATEC PENSTOCK MULTITEC of large nominal size and/or high pressure rating the middle brace has to be provided with an additional fastening angle. Fixing has to be effected by compound anchor bolts.

As distortion affects functioning and tightness of the ATEC PENSTOCK MULTITEC, please take care during alignment that the ATEC PENSTOCK MULTITEC sits close without any distortion. Admissible structural tolerances to DIN 18202 will be compensated by the wall sealing. The mounting torque has to be applied crosswise by a wrench (see table, paragraph 8.8) in order to obtain final fastening force.

It is not possible to change the position of the frame after grouting. For that reason, **prior to grouting** the ATEC PENSTOCK MULTITEC has to be checked for perfect performance.



After shuttering up the structure recess, the ATEC PENSTOCK MULTITEC is grouted. When grouting, no mortar must touch the sealings or the frame profiles outside the shuttering. Possible impurities have to be removed immediately. For application of the grouting mortar, see paragraph 8.7.

### 8.5 Design for Anchor-bolting

Fix the self-adhesive sealing tape in an overlapping way to the back of the frame. Then, place the ATEC PENSTOCK MULTITEC at the determined position and align it.

The drilled holes of the penstock frame serve for preliminary fastening. Fixing has to be effected by compound anchor bolts.

As distortion affects functioning and tightness of the ATEC PENSTOCK MULTITEC, when presetting the fixing nuts take care that the ATEC PENSTOCK MULTITEC sits close without any distortion. Admissible structural tolerances to DIN 18202 will be compensated by the wall sealing. The mounting torque has to be applied crosswise by a wrench (see table, paragraph 8.8) in order to obtain final fastening force.

For application of the compound anchor bolts, see paragraph 8.8.

### 8.6 Design for Anchor-bolting in Channel

The ATEC PENSTOCK MULTITEC is delivered with on one side welded attaching brackets and a threshold mounting manifold. The attaching brackets at the other side provided for adaptation in coagulate loosely. Fix the self-adhesive sealing tape in an overlapping way to the back of the frame. Then, place the ATEC PENSTOCK MULTITEC at the determined position and align it.

As distortion affects functioning and tightness of the ATEC PENSTOCK MULTITEC, when presetting the fixing nuts take care that the ATEC PENSTOCK MULTITEC sits close without any distortion. Admissible structural tolerances to DIN 18202 will be compensated by the wall sealing. The mounting torque has to be applied crosswise by a wrench (see table, paragraph 8.8) in order to obtain final fastening force.

For application of the compound anchor bolts, see paragraph 8.8.

### 8.7 Application of the Sealing Mortar

The grouting mortar has to have a low shrinkage and be very flowable with high early and final strength. The mortar must not develop corrosion and has to be water or medium resistant. Furthermore, firm adhesion has to be obtained between structure and penstock material.

We recommend to use a grouting mortar based on cement, e.g. Tricosal VGM Superfluid or Betec Rapid. The shuttering has to be provided with air outlet orifices.

During the grouting work the whole mounting area has to be free of grease, dirt and dust. Possibly, shuttering and structure recess have to be moistened, stagnant water has to be removed. The surfaces have to be as rough as possible, in case of need a coupling agent has to be applied. To avoid undesirable adhesion of the grouting mortar to components of the steel construction, we recommend to apply a separating agent.

The grouting mortar has to be produced and grouted continuously. To avoid air inclusions, grouting should be performed from one side only. Outside the normal range of ambient temperature (+5 °C to +30 °C), special procedures have to be followed (see manufacturer's specification).

Furthermore, appropriate measures have to be taken to avoid that after grouting the mortar dries too fast.

### 8.8 Use of the Compound Anchor Bolts

All fastening holes of ATEC PENSTOCK MULTITEC are double holes, diagonally displaced. Thus, you can always use alternative holes (e.g. if on drilling you come across a concrete reinforcing iron). Furthermore, the fastening bolt holes have a larger diameter than the required drill diameter. Thus it is possible to make the drill holes with the ATEC PENSTOCK MULTITEC aligned.

The compound anchor has to be chosen according to the respective range of application. Destruction by contact corrosion and by the medium have to be excluded. ATEC company recommends compound anchor bolts of the material "stainless steel" of type A4 (AISI-TP 316T);

e.g. Upat UKA 3.

The corresponding manufacturer's specification referring to handling and mounting procedure for anchor bolts has to be obeyed in any case. To avoid faulty mounting, it is necessary to proceed very carefully. Prior to the insertion of the compound anchor bolt cartridge the drill hole has to be cleaned by blowing-off. The threaded rod has to be fastened according to the manufacturer's indications and after the curing time only the nut must be tightened applying the specified tightening torque. It has to be considered that the curing time is considerably longer if there is a moist anchorage ground or lower ambient temperature.

The following tightening torques have to be applied according to manufacturer's indications (here: UPAT).

Thread	Tightening torque
M 10	20 Nm
M 12	30 Nm
M 14	45 Nm
M 16	60 Nm

## 9 Commissioning

Prior to commissioning, possible impurities have to be removed from the seal and the penstock surface. Prior to tightness test, the ATEC PENSTOCK MULTITEC has to be moved at least once over the entire stroke (OPEN-CLOSED).

When using electric, hydraulic or pneumatic actuators please obey the operating instructions of the relevant manufacturer.

On principle, for design with electric actuator the door has to be in an intermediate position for adjusting the direction of rotation (clockwise closing). Furthermore, manual movements to the positions OPEN and CLOSED have to be effected for adjustment of the travel and torque switches. The above-mentioned switches don't have any effect in case of wrong direction of rotation.

## 10 Operation and Application

### 10.1 General

The ATEC PENSTOCK MULTITEC is produced for the ranges raw water, drinking water, and sewage. For special requirements as sea water, aggressive media or other environmental influences, special materials are necessary which have to be considered when designing the Penstock.

### 10.2 Admissible Mode of Operation

The ATEC PENSTOCK MULTITEC may be exposed only to stresses for which it is designed in terms of pressure and materials (see paragraph 10.1).

It can be used as isolating, throttling and regulating valve. The door has to be moved only by the operating gear provided for this purpose.

### 10.3 Admissible leakage

Leakage according to DIN 19569-4 Tab. 1 Class 4  
0,02-0,05L per second, per meter of seal perimeter of pure water.

### 10.4 Inadmissible Modes of Operation

Too high operating forces and use of electric actuators without travel switch are inadmissible. In case a foreign body is in the orifice, the former has to be removed by opening the ATEC PENSTOCK MULTITEC once more or by other suitable measures before final closing is performed. Violent movement leads to failure.

Movement of the door without using the provided operating gear can lead to the destruction of the Penstock. Furthermore, it is possible that hydraulic vibrations and water hammers are produced when the Penstock is operated in a wrong way which can lead to damages of the structure.

Table of max. permissible actuation moments and the resulting hand forces at the control key and/or handwheel (provided lever length 0,2 m) without transmissions. With use of reduction gears the strength and the relationship of the translation of the drive become smaller. At higher penstock dimensions we provide information on request or see contract documents.

max. operating pressure	PN 0,6*											
Penstock size BxH	150	200	300	400	500	600	700	800	900	1000	1100	1200
Open	Anti-clockwise turn to the stem/handwheel/control key											
MD max. permissible Nm	40	40	45	45	50	50	80	90	100	110	120	130
Hand strength at the control key or handwheel max. permissible N	200	200	225	225	250	250	400	450	500	550	600	650
Close	Clockwise rotation at the stem/handwheel/control key											
MD max. permissible Nm	20	20	25	25	30	30	50	60	65	70	75	80
Hand strength at the control key or handwheel max. permissible N	100	100	125	125	150	150	250	300	325	350	375	400

\*At lower loads, the operating forces must be reduced accordingly

## 11 Maintenance

### Inspection and Maintenance

On principle, the ATEC PENSTOCK MULTITEC has to be inspected once every month. The door should be moved at least once over the entire stroke (OPEN-CLOSED), the stem has to be greased and the seal has to be checked for perfect fit.

During this procedure, wear and tear at stem, stem nut, and seals has to be checked. Worn components have to be replaced immediately. Special conditions of application as aggressive media, the application as regulating valve with high duty period and regulating frequency or the intense use of a short portion of the entire stroke require shorter inspection intervals according to the load. Frequency and scope of inspection have to be agreed with ATEC Company. Furthermore, it is possible to conclude a maintenance contract for ATEC PENSTOCK MULTITEC.

For inspection and maintenance please see the notes in paragraph 2 (Safety Aspects).

### 11.1 Servicing:

<b>Activity</b>	<b>Interval</b>	<b>Part</b>	<b>Works to be carried out</b>
Function test	At least every three month or after needs as a function of the stress	Door Frame	Move door over the entire stroke (OPEN-CLOSE). Check parts for state and wear. If necessary clean and grease.
Wear check	At least every year or after needs as a function of the stress	Door Frame Seal	Move door over the entire stroke (OPEN-CLOSE). Check parts for state and wear. If necessary replace.

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The servicing data must be documented according the details in table (maintenance journal, in case of damages with pictures) otherwise the warranty goes out.

### 11.2 Repair

We recommend having the ATEC PENSTOCK MULTITEC repaired by the ATEC Service Department. In case the repair is done by a third party, an ATEC specialist can give the corresponding installation instructions and supervise the repair. Only original ATEC spare parts shall be used. The use of foreign components is a risk for safety and operation. For the repair, the notes under paragraph 2 (Safety Aspects) and in paragraph 9 (Commissioning) are applicable.