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# Typical Specifications

## Stainless Steel Penstocks

**TESACO C20-series**

### 1. General Conditions

#### 1.1 Scope

This section applies to stainless steel Penstocks (Sluice Gates) and its appropriate operating equipment.

#### 1.2 Applicable standards

All Penstocks (Sluice Gates) and its appropriate operating equipment shall be conform to the requirements of DIN ISO 19569-4 and BS 7775 standard - latest edition, except as modfied or supplemented herein.

#### 1.3 General

All equipment provided under this section shall be produced, assembled and installed in proper operating condition in full conformity with the drawings, specifications, engineering data, installation, operating and maintenance instructions of the manufacturer unless exeptions are agreed.

Penstocks (Sluice Gates) and its appropriate operating equipment shall be supplied including all accessories indicated on the drawings and specifications or otherwise required for a complete, properly operating installation. It shall be the latest standard product of the manufacturer regularly engaged in the production of fabricated Penstocks (Sluice Gates).

Penstocks (Sluice Gates) supplied under this section shall be C20-series as manufactured by TESACO-TECHNIQUE GmbH, Germany.

#### 1.4 Submittals

The manufacturer shall submit to purchaser for approval the installation drawings indicating the main dimension and material specification used for the Penstocks (Sluice Gates).

#### 1.5 Quality Assurance

The manufacturer shall show evidence of experience for the production and installation of Penstocks (Sluice Gates) for at least 10 years.

All Penstocks (Sluice Gates) shall be inspected in the factory before shipping. The result shall be recorded in a Inspection Report (Certificate).

The manufacturers welders shall be

qualified and certified to meet the requirements of DIN EN 287-1 - latest edition.

## 2. Product

### 2.1 Penstocks (Sluice Gates)

#### 2.1.1 General Design

A Penstock (Sluice Gate) is a vertically sliding valve and used at the end of a pipe line or cover an aperture in a wall. It shall be either self-contained or non-selfcontained and raised and lowered by either rising spindle or non-rising spindle.

In the final CLOSED-Position the door should be pressed to the sealing inside the frame through a approved wedging system.

#### 2.1.2 Frame

The frame shall have a flat back suitable for wall fixing directly to the civil structure via anchor bolts and shall be of open top or closed top type. The frame shall be designed to cause no obstruction to the flow and shall have flush-bottom invert.

The replacement of the top-, bottom- and side seals shall be possible without removing the frame from the civil structure.

The frame shall be equipped with adjustable wedges and in case of control purposes shall have additional slide bars at each side.

#### 2.1.3 Door

The door shall consists of a flat plate reinforced with ribs, designed for high impact. The number of reinforcing ribs will vary according to the specific design head and size requirements.

The door shall be equipped with counter wedges.

#### 2.1.4 Sealing

The top- and side sealings shall be of resilient rubber in double-lip type to ensure self-adjustment under design water head.

The bottom sealing shall be of resilient rubber in flat type inside the frame bottom pocket to ensure the flush-bottom.

#### 2.1.5 Yoke

Closed top frames (self-contained penstocks) shall be equipped with a yoke made of structural formed plates and designed to withstand the lifting forces under max. design head.

### 2.2 Operating Equipment

#### 2.2.1 Spindle and Spindle Nut

The spindle shall be either rising or non-rising type in stainless steel and shall be of trapezoidal, machined cut thread.

Rising spindles shall be provided with a clear polycarbonate spindle cover including cap. If required a position indicating tape shall be applied at site, after the Penstock has been installed and Positioned.

The spindle nut shall be of bronze.

Penstocks (Sluice Gates) having a width bigger than 2000 mm or two times their heigth shall be equipped with a double spindle mechanisms connected by tandem shaft.

#### 2.2.2 Coupling

The couplings are connecting the spindle with the other sections of the operator and shall be of muff type. Depending upon the specific requirements it shall be a plain muff coupling or screwed muff coupling.

#### 2.2.3 Spindle Guide

Spindle guides shall be manufactured in stainless steel including an UHMWPE bushing. They shall be a wall fixing type and adjustable and spaced in line with the manufacturers recommendation.

When considering the vertical spacing of the guide, the L/r (length/radius) should not exceed 200 mm.

#### 2.2.4 Drive

Any Drive (Operator) shall be provided by the Penstock (Sluice Gate) manufacturer and shall be in accordance the individual requirements.

Each Drive (Operator) shall be designed to operate the Penstock (Sluice Gate) under the maximum design on- and/or offseating head. The max. manual opening effort should not exeed temporarily (lifting the door out of the wedges) 400 N and in the long run

(remaining full stroke) 100 N at the Tee Key or handwheel.
All gears and bearings shall be totally enclosed according IP 67 and the pinion shaft of the handwheel shall be of stainless steel, supported by roller or needle bearings. The handwheel shall be of removable type.

## 3. Performance

### 3.1 Design Head

The Penstocks (Sluice Gates) shall be designed to withstand the design head specified in the Penstock Identification.

### 3.2 Wedging system

The Penstocks (Sluice Gates) shall be equipped with a wedging system which shall ensure a proper contact pressure of the Penstock Door to the Door Sealing in the final CLOSED position of the Penstocks (Sluice Gates). The contact pressure shall be all round equal.

### 3.3 Allowable Leakage Rates

Penstocks shall be virtually drop-tight at their working pressure if installation has been carried out correctly at least shall has a maximum leakage of **5% as specified in BS 7775:2005** stipulated as follows:

Subject to on- or off seating heads up to and including six meters the leakage rate shall not exceed 0,5 l/(min * m) of seal perimeter. For on- or off-seating heads above six meters the maximum leakage rate, $R_{lm}$ (in l/(min * m)), shall conform to:

$R_{lm} = 0,1 + 0,067\ H_{OS}$ where $H_{os}$ is the on- or off seating head, in meters.

## 4. Materials

| | |
|---|---|
| Frame: | Stainless steel acc. BS EN 10088, grade 1.4301 (304) or 1.4571 (316Ti) |
| Door: | Stainless steel acc. BS EN 10088, grade 1.4301 (304) or 1.4571 (316Ti) |
| Sealing: | Neoprene acc. BS 2752 |
| Wedge components: | UHMWPE |
| Spindle: | Stainless steel acc. BS EN 10088, grade 1.4301 (304) or 1.4571 (316Ti) |
| Spindle nut: | Bronze acc. EN 12164 |
| Spindle guide: | Stainless steel acc. BS EN 10088, grade 1.4301 (304) or 1.4571 (316Ti) with bushing of UHMWPE |
| Headstock: | Stainless steel acc. BS EN 10088, grade 1.4301 (304) or 1.4571 (316Ti) |
| Spindle cover: | Galvanized steel or clear Polycarbonate |
| Fastening elements: | Stainless steel acc. BS EN 10088, grade 1.4301 (304) or 1.4571 (316Ti) |

All stainless steel parts shall be pickled and passivated.

## 5. Penstock (Sluice Gate) Identification

| | |
|---|---|
| Aperture: | Round Ø mm<br>Square mm |
| Sealing: | 4-face or 3-face |
| Max. Head: | mWC static<br>mWC operat. |
| Direction of pressure: | on- or off-seating |
| Channel depth: | mm |
| Type of installation: | |
| Operation: | manual or electric |
| Material: | SS304 or SS 316Ti |

## 6. Execution

### 6.1 Installation

The manufacturers Installation,- Operating- and Maintenance Instructions shall be observed in order to get the full performance of the Penstock (Sluice Gate).

### 6.2 Field Test

Before a site leakage test is undertaken the installer shall ensure that the penstock and it operating equipment have been correctly installed and not damaged during transportation and installation.