

**MODEL**

**MU**

## GENERAL DESCRIPTION

The ORBINOX model MU is a flush bottom 4 sided sealing penstock. The gates are suitable for different types of applications with a highly versatile flow control for waste water treatment plants, irrigation, hydraulic works and hydro-electric power plants.

From sizes 150 mm x 150 mm to 1200 mm x 1200 mm, the MU model has a unique self adjusting seal design that can achieve minimal equal seating and unseating (bidirectional) leakage rates. Sizes 1300 mm x 1300 mm up to 4000 mm x 4000 mm are available in both uni-directional (only suitable for seating water heads) and bi-directional configurations. The maximum leakage rate is lower than the maximum allowable recommended by DIN 19569-4 (class 5) and AWWA C561 under normal conditions.

ORBINOX also designs and manufactures the MU model penstock in larger sizes and for more demanding service conditions.

For more information please contact an ORBINOX representative.



## DESIGN STANDARD

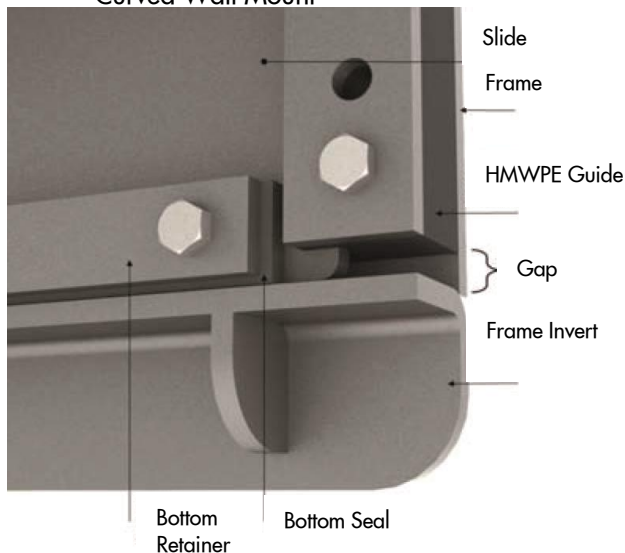
The MU penstock is manufactured in general accordance to DIN 19569-4. Other standards such as AWWA C561 and BS 7775 are also available.

The standard MU model is manufactured in stainless steel which has a higher corrosion resistance in many applications which results into a longer life cycle with little or no maintenance. Other materials of construction are available upon request, such as AISI 904L, Duplex stainless, etc.

**DESIGN FEATURES**

- Modular design allows for both Open Frame and Self-Contained configurations.
- Frame configuration options:
  - Square (standard)
  - Round & Rectangular opening
  - Round base
- Mounting configuration options:
  - Wall Mount (standard for sizes ≤ 1200 or unidirectional and sizes >1200)
  - Embedded in concrete (standard for bidirectional and sizes >1200)
  - Thimble Mount
  - Curved Wall Mount

- Option of Rising or Non-Rising stem configurations
- Flush bottom design allows for elevated or flush bottom installation
- Suitable for actuation with manual, electric, pneumatic or hydraulic actuators
- Self-cleaning HMWPE guides reduce the friction coefficient during operation, minimizing therefore the actuation thrust and extending the seal life
- Machined slot for slide on guides to prevent “seesaw” effect when opening and closing the slide
- Seal design is self adjusting (wedge-less design), thus reducing torque requirements
- Slide ribs are designed to avoid crevice corrosion
- Seal and guides bolting is completely separated from the frame anchoring
- ORBINOX penstocks are factory assembled and tested eliminating the need for on site adjustment
- All gate fasteners are stainless steel



**Self-cleaning guides**

**Leakage Allowance:**

The leakage rate on MU model is lower than the maximum allowable defined by different standards under normal conditions:

- DIN 19569-4 (class 5): 1,20 l/min per meter
- AWWA C-561: 1.24 l/min per meter

**Seating / Unseating Design Head:**

| Size                                    | UNI /BIDIRECTIONAL | Water Head  |                                      |
|---|--------------------|---|--------------------------------------|
|   |                    | Seating head pressure   | Unseating head pressure              |
| <b>Std. Range<br/>150x150-1200x1200</b> | BI-DIRECTIONAL     | 150-1000: 10 mWC<br>1100-1200: 6 mWC  | 150-1000: 10 mWC<br>1100-1200: 6 mWC |
| <b>1300x1300 - 4000x4000</b>            | BI-DIRECTIONAL     | Designed according to the project specification. Typically 6mWC of seating and unseating water head |                                      |
| <b>1300x1300 - 4000x4000</b>            | UNI-DIRECTIONAL    | Designed according to the project specification. Typically 6mWC of seating water head               | 0 meters of water column             |

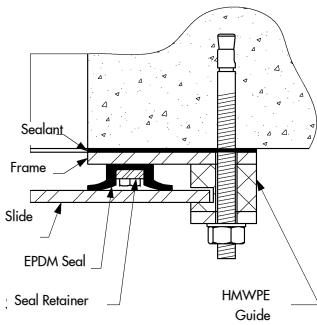
MODEL

MU

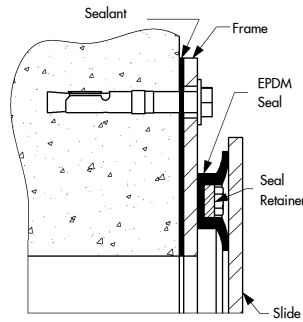
## BI-DIRECTIONAL

Seal Design: sizes 150 mm x 150 mm to 1200 mm x 1200 mm

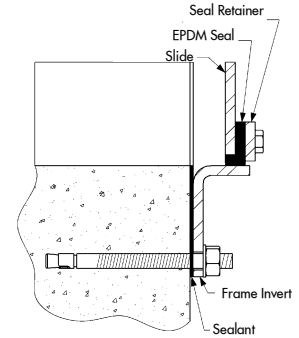
SIDE SEAL



TOP SEAL



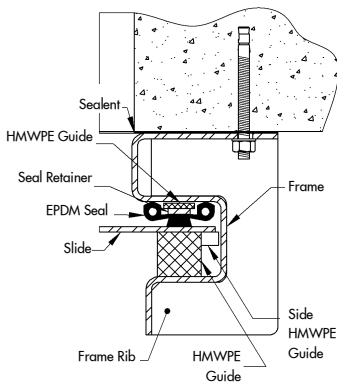
BOTTOM SEAL



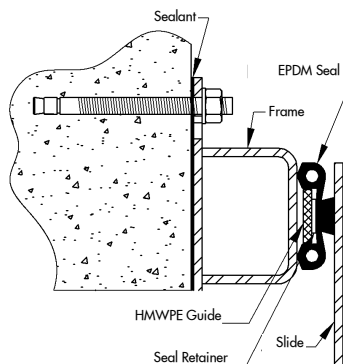
## BI-DIRECTIONAL

Seal Design: sizes 1300 mm x 1300 mm to 4000 mm x 4000 mm

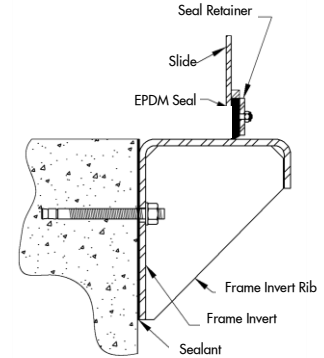
SIDE SEAL



TOP SEAL



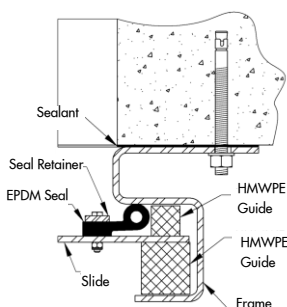
BOTTOM SEAL



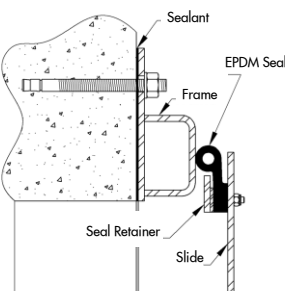
## UNI-DIRECTIONAL

Seal Design: sizes 1300 mm x 1300 mm to 4000 mm x 4000 mm

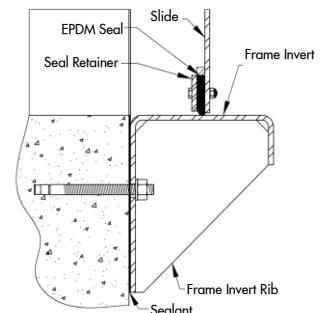
SIDE SEAL



TOP SEAL

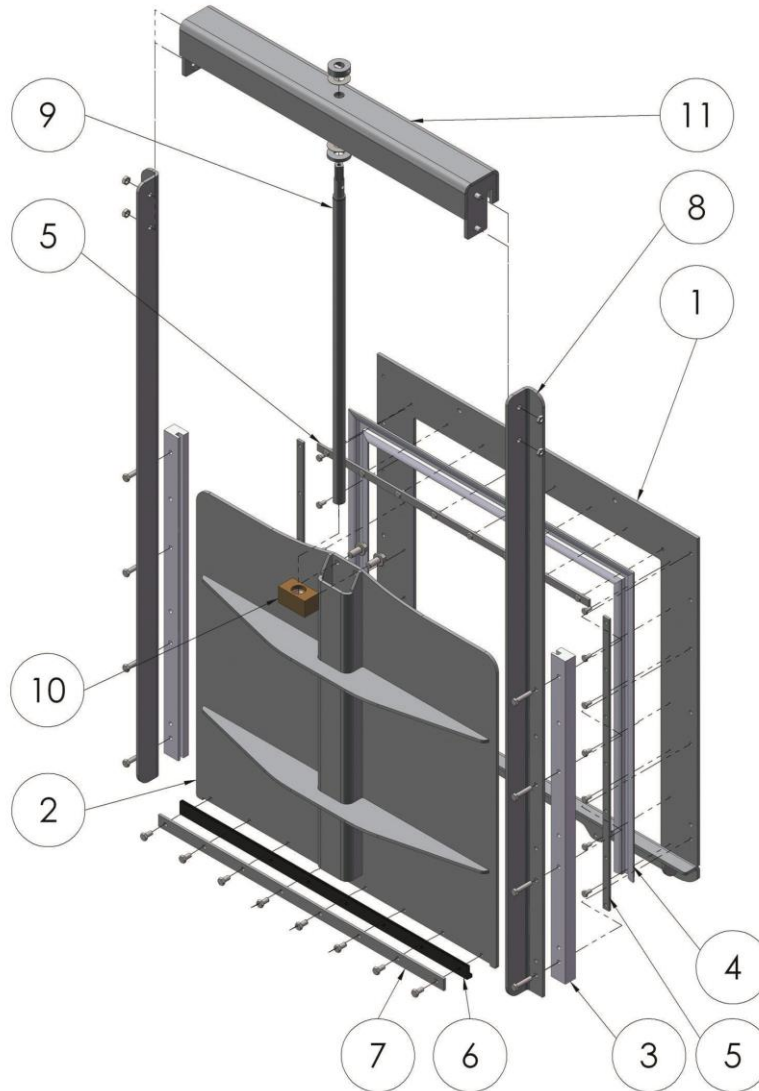


BOTTOM SEAL



**STANDARD MATERIALS OF CONSTRUCTION**

From 150 mm x 150 mm to 1200 mm x 1200 mm

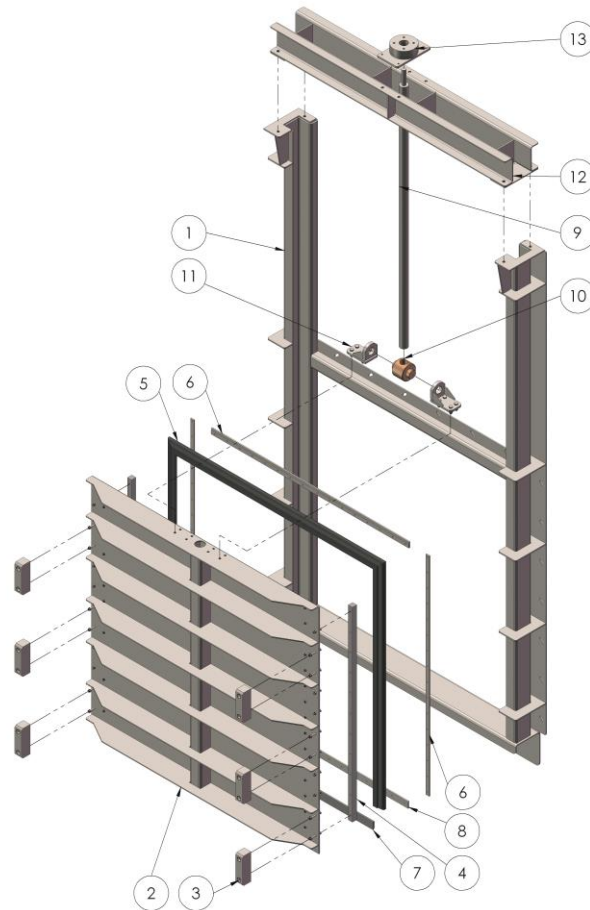


| ITEM | DESCRIPTION          | MATERIAL (standard)                        |
|------|----------------------|--|
| 1    | Frame                | Stainless Steel Type 304/304L or 316/316L  |
| 2    | Slide                | Stainless Steel Type 304/304L or 316/316L  |
| 3    | Guides               | High Molecular Weight Polyethylene (HMWPE) |
| 4    | Seal                 | EPDM                                       |
| 5    | Seal Retainer        | Stainless Steel Type 304/304L or 316/316L  |
| 6    | Bottom Seal          | EPDM                                       |
| 7    | Bottom Seal Retainer | Stainless Steel Type 304/304L or 316/316L  |
| 8    | Frame Guide          | Stainless Steel Type 304/304L or 316/316L  |
| 9    | Stem                 | Stainless Steel                            |
| 10   | Stem Nut             | Bronze                                     |
| 11   | Yoke                 | Stainless Steel Type 304/304L or 316/316L  |

NOTE: For materials other than the above, please consult an ORBINOX representative

**STANDARD MATERIALS OF CONSTRUCTION**

**From 1300 mm x 1300 mm to 4000 mm x 4000 mm**



| ITEM | DESCRIPTION          | MATERIAL (standard)                        |
|------|----------------------|--|
| 1    | Frame                | Stainless Steel Type 304/304L or 316/316L  |
| 2    | Slide                | Stainless Steel Type 304/304L or 316/316L  |
| 3    | Front Guides         | High Molecular Weight Polyethylene (HMWPE) |
| 4    | Guides               | High Molecular Weight Polyethylene (HMWPE) |
| 5    | Seal                 | EPDM                                       |
| 6    | Seal Retainer        | Stainless Steel Type 304/304L or 316/316L  |
| 7    | Bottom Seal          | EPDM                                       |
| 8    | Bottom Seal Retainer | Stainless Steel Type 304/304L or 316/316L  |
| 9    | Stem                 | Stainless Steel                            |
| 10   | Stem Nut             | Bronze                                     |
| 11   | Stem Nut Bracket     | Stainless Steel Type 304/304L or 316/316L  |
| 12   | Yoke                 | Stainless Steel Type 304/304L or 316/316L  |
| 13   | Stem Coupling        | Stainless Steel Type 304/304L or 316/316L  |

NOTE: For materials other than the above, please consult an ORBINOX representative

MODEL

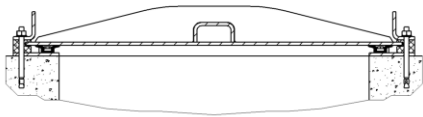
MU

## MOUNTING OPTIONS

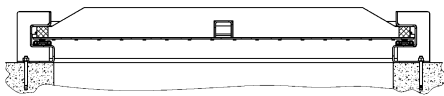
The following drawings show the most common mounting options for MU penstocks. For other types of mounts, please consult an ORBINOX representative

### WALL MOUNT (STANDARD)

From 150 mm x 150 mm to 1200 mm x 1200 mm

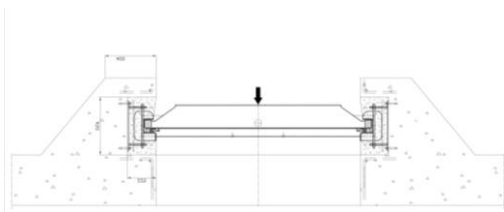


From 1300 mm x 1300 mm to 4000 mm x 4000 mm

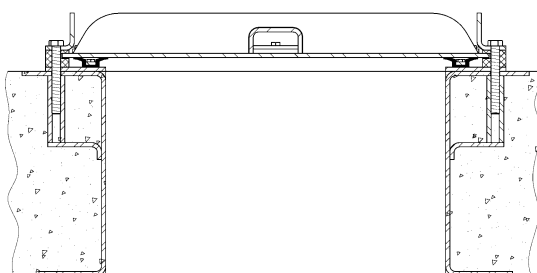


### EMBEDDED IN CONCRETE

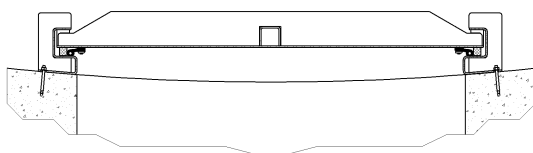
(Standard for bidirectional and >1200)



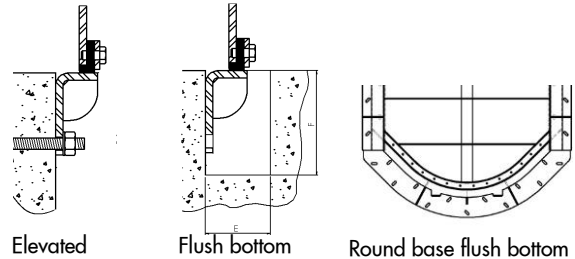
### THIMBLE MOUNT



### CURVED WALL MOUNT

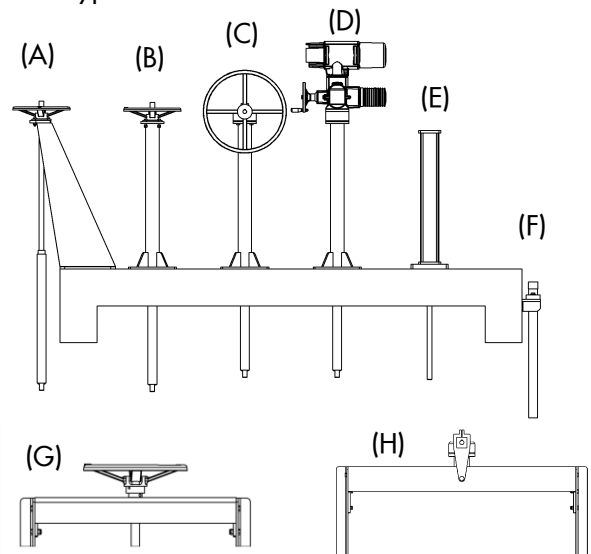


## FRAME INVERT MOUNTING OPTIONS



## ACTUATORS

All ORBINOX actuators can be yoke or pedestal mounted, below are some examples of the most common types



**Various types of actuators as shown above:**

- (A) Handwheel on inclined floor stand
- (B) Handwheel on straight floor stand
- (C) Bevel Gear operator on straight floor stand
- (D) Electric actuator on straight floor stand
- (E) Hydraulic or pneumatic actuator
- (F) Square nut (BS 5163-2, DIN 3223 or 2" sqr)  
(Only for Non-Rising stem)
- (G) Yoke mounted handwheel
- (H) Yoke mounted gear and crank

**Accessories:**

- Mechanical stops (for the completely closed position and manual actuator)
- Actuator manual overrides
- Positioners
- Limit / Proximity switches

## STEM EXTENSIONS

In most cases, the operating floor level is located substantially higher than the opening. In order to be able to operate the gate, stem extensions are necessary. Stem guides are used to limit the “unsupported” length of the stem extension in order to avoid any buckling failure.

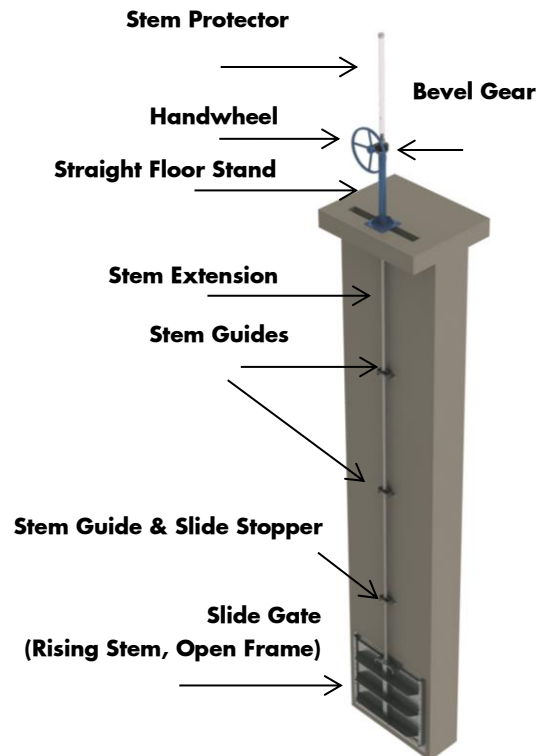
The stem guide has a HWMPE guide to reduce friction between the guide and the extension

### Non-Rising Stem Configuration

As standard, non-rising stem gate configurations are used with self-contained frame designs. Therefore, the stem extension does not support the axial load (only torque) and less wall brackets are required. As a general rule, a stem guide should be installed every 3 meters of unsupported stem extension

### Rising Stem Configuration

As standard, rising stem gate configurations are used with open-frame designs. Therefore, the stem extension has to support the axial load when the gate is operated to avoid any buckling failure. As a general rule, a stem guide should be installed every 2 meters of unsupported stem extension



## INSTALLATION, OPERATION AND MAINTENANCE

This section briefly describes the installation, operation and maintenance of MU penstocks. For more detailed information please refer to the “MU IOM Manual”

### Installation:

MU penstocks are installed by means of Anchor Bolts. Depending on the size and working conditions they shall be either of the mechanical or chemical type (see table below). In order to avoid leakage between the concrete wall and the frame, ORBINOX recommends the use of construction sealant equivalent to Sikaflex 11FC sealant (200ml per meter of opening perimeter)

The minimum concrete strength shall be 20.7 MPa. The tolerance of the concrete construction shall be in accordance to DIN 18202. For detailed information about type, size and quantity of the required anchor bolts at the installation, please refer to the notes on the “General Arrangement Drawing”.

### Maintenance and Operation:

The MU penstocks need practically no maintenance. The stem shall be kept lubricated and seals shall be replaced if damaged. The MU penstock is closed by applying a clockwise rotation. Applying too much force when closing the gate may cause damage to the stem

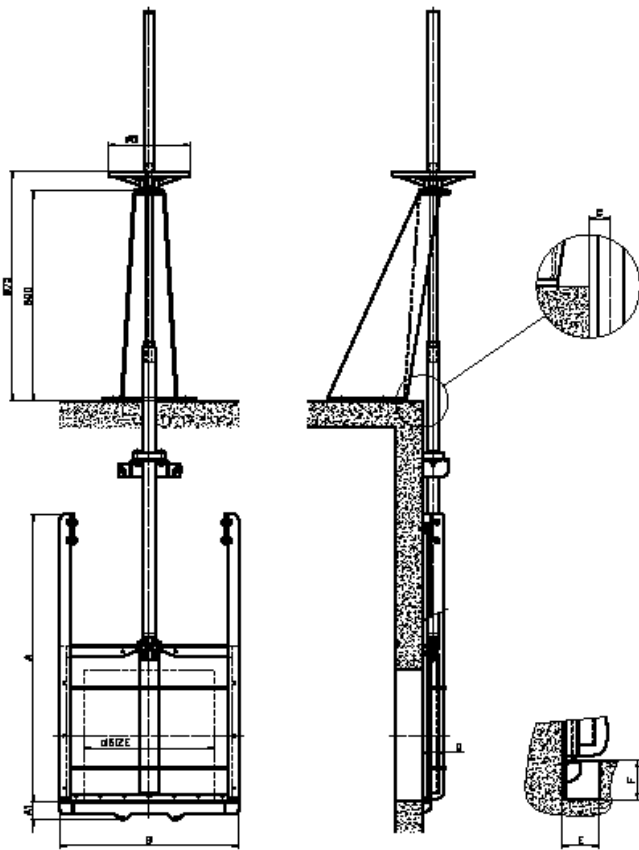
| Size  | Water Pressure                             | Standard Mounting Type  |
|---|--|---|
| <b>BI-DIRECTIONAL STANDARD RANGE</b><br>150mm x 150mm -1200 mm x 1200mm | Seating and Un-Seating<br>(Bi-Directional) | Wall mount:<br>• Stud Type Mechanical Anchor Bolts                  |
| <b>BI-DIRECTIONAL</b><br>1300mm x 1300mm -4000 mm x 4000mm              | Seating and Un-Seating<br>(Bi-Directional) | Embedded in concrete<br>Optional wall mount + chemical anchor bolts |
| <b>UNI-DIRECTIONAL</b><br>1300mm x 1300mm -4000 mm x 4000mm             | Seating (Uni-Directional)                  | Wall mount:<br>• Stud Type Mechanical Anchor Bolts                  |

The following drawings show the most common frame and stem configurations and their dimensional charts. Note that any frame (open and self-contained), stem (rising and non-rising) and actuator combination can be manufactured for MU penstocks.

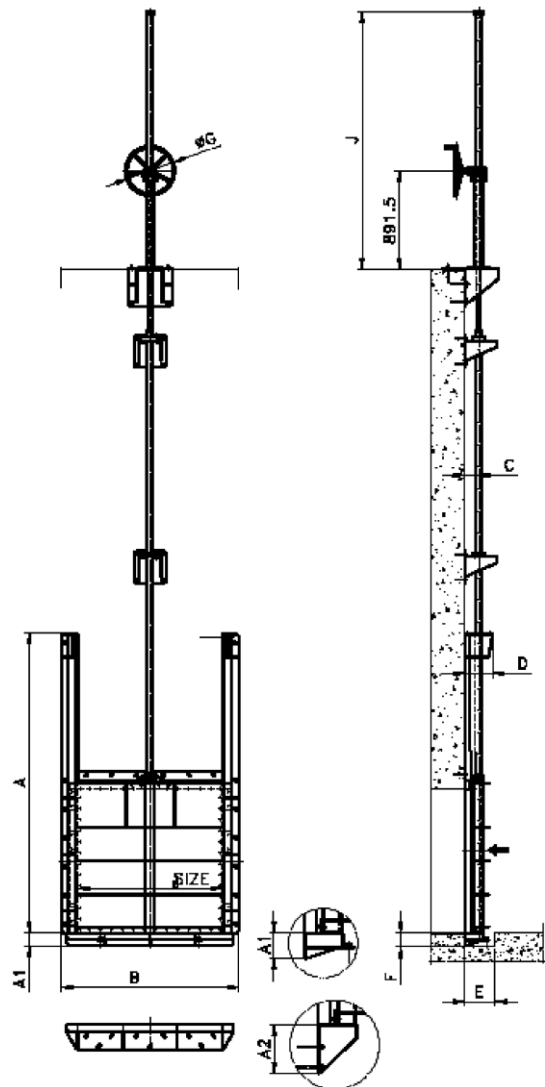
**OPEN FRAME - RISING STEM - DIMENSION**

**STANDARD RANGE**

From 150 mm x 150 mm to 1200 mm x 1200 mm



From 1300 mm x 1300 mm to 4000 mm x 4000 mm





## OPEN FRAME - RISING STEM - DIMENSION

### STANDARD RANGE From 150 mm x 150 mm to 1200 mm x 1200 mm

| SIZE (mm)<br>opening | A    | B    | A1 | C  | D   | ØG   | E x F   |
|----------------------|------|------|----|----|-----|------|---------|
| 200 x 200            | 504  | 380  | 70 | 41 | 82  | 225  | 70 x 75 |
| 300 x 300            | 704  | 480  | 70 | 41 | 82  | 225  | 70 x 75 |
| 400 x 400            | 905  | 580  | 70 | 42 | 85  | 310  | 70 x 75 |
| 500 x 500            | 1105 | 680  | 70 | 42 | 85  | 310  | 70 x 75 |
| 600 x 600            | 1307 | 780  | 70 | 42 | 115 | 310  | 70 x 75 |
| 700 x 700            | 1510 | 880  | 70 | 42 | 115 | 310  | 70 x 75 |
| 800 x 800            | 1710 | 980  | 70 | 42 | 125 | 310  | 70 x 75 |
| 900 x 900            | 1985 | 1100 | 82 | 56 | 136 | 350* | 70 x 85 |
| 1000 x 1000          | 2185 | 1200 | 82 | 56 | 136 | 350* | 70 x 85 |
| 1100 x 1100          | 2385 | 1300 | 82 | 56 | 136 | 350* | 70 x 85 |
| 1200 x 1200          | 2585 | 1400 | 82 | 56 | 136 | 350* | 70 x 85 |

\* Actuator with Bevel Gear- Handwheel

### From 1300 mm x 1300 mm to 4000 mm x 4000 mm

#### BI-DIRECTIONAL

| SIZE (mm)<br>opening | A    | B    | A1  | A2  | C   | D   | J    | ØG  | E x F     |
|----------------------|------|------|-----|-----|-----|-----|------|-----|-----------|
| 1300 x 1300          | 2816 | 1644 | 115 | 220 | 151 | 295 | 2450 | 450 | 280 x 150 |
| 1500 x 1500          | 3216 | 1844 | 115 | 220 | 151 | 295 | 2650 | 450 | 280 x 150 |
| 1600 x 1600          | 3416 | 1944 | 115 | 220 | 151 | 295 | 2750 | 650 | 280 x 150 |
| 1800 x 1800          | 3816 | 2144 | 115 | 250 | 151 | 295 | 2950 | 650 | 280 x 150 |
| 2000 x 2000          | 4216 | 2344 | 115 | 250 | 151 | 295 | 3150 | 650 | 280 x 150 |
| 2500 x 2500          | 5216 | 2844 | 115 | 250 | 151 | 295 | 3650 | 650 | 280 x 150 |
| 3000 x 3000          | 6216 | 3344 | 115 | 250 | 151 | 295 | 4150 | 650 | 280 x 150 |
| 4000 x 4000          | 8216 | 4344 | 115 | 250 | 151 | 295 | 5150 | 650 | 280 x 150 |

#### UNI-DIRECTIONAL

| SIZE (mm)<br>opening | A    | B    | A1  | A2  | C   | D   | J    | ØG  | E x F     |
|----------------------|------|------|-----|-----|-----|-----|------|-----|-----------|
| 1300 x 1300          | 2906 | 1644 | 115 | 220 | 151 | 295 | 2450 | 450 | 280 x 150 |
| 1500 x 1500          | 3306 | 1844 | 115 | 220 | 151 | 295 | 2650 | 450 | 280 x 150 |
| 1600 x 1600          | 3546 | 1944 | 115 | 220 | 151 | 295 | 2750 | 650 | 280 x 150 |
| 1800 x 1800          | 3956 | 2144 | 115 | 250 | 151 | 295 | 2950 | 650 | 280 x 150 |
| 2000 x 2000          | 4378 | 2344 | 115 | 250 | 151 | 295 | 3150 | 650 | 280 x 150 |
| 2500 x 2500          | 5418 | 2844 | 115 | 250 | 151 | 295 | 3650 | 650 | 280 x 150 |
| 3000 x 3000          | 6500 | 3344 | 115 | 250 | 151 | 295 | 4150 | 650 | 280 x 150 |
| 4000 x 4000          | 8500 | 4344 | 115 | 250 | 151 | 295 | 5150 | 650 | 280 x 150 |

NOTE: For dimensions other than above, please contact an ORBINOX representative

These dimensions are for information only. Do not use for installation or submittal purposes

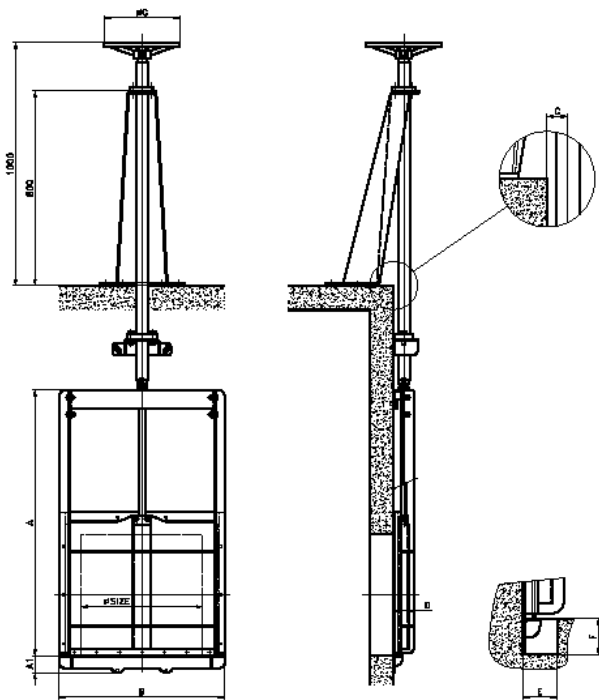
MODEL

MU

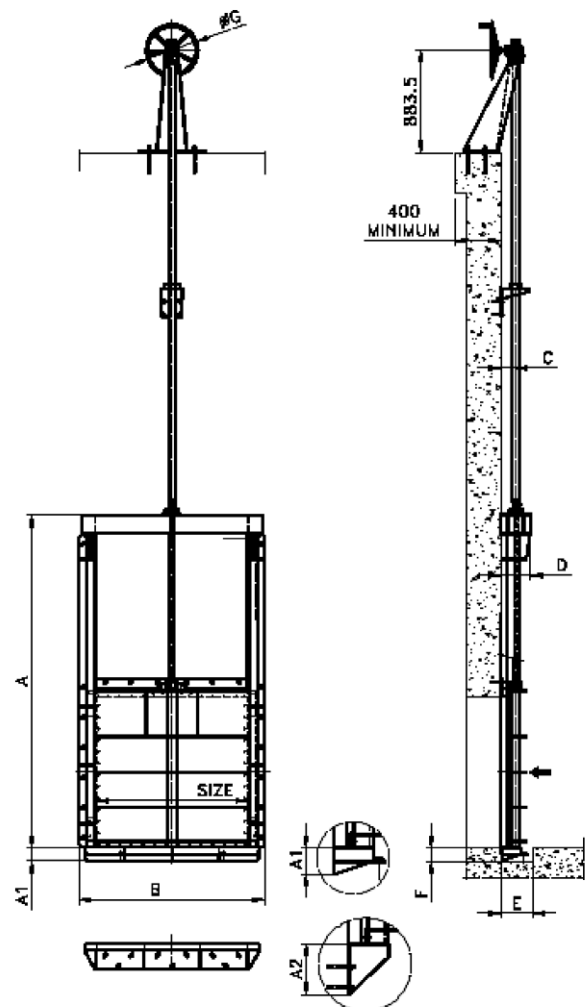
**CLOSED FRAME - NON RISING STEM - DIMENSION**

**STANDARD RANGE**

From 150 mm x 150 mm to 1200 mm x 1200 mm



From 1300 mm x 1300 mm to 4000 mm x 4000 mm



## CLOSED FRAME - NON RISING STEM - DIMENSION

**STANDARD RANGE From 150 mm x 150 mm to 1200 mm x 1200 mm**

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| 1200 x 1200          | 2585 | 1400 | 82 | 56 | 136 | 350* | 70 x 85 |

\* Actuator with Bevel Gear- Handwheel

**From 1300 mm x 1300 mm to 4000 mm x 4000 mm**

### BI-DIRECTIONAL

| SIZE (mm)<br>opening | A    | B    | A1  | A2  | C   | D   | J    | ØG  | E x F     |
|----------------------|------|------|-----|-----|-----|-----|------|-----|-----------|
| 1300 x 1300          | 2816 | 1644 | 115 | 220 | 151 | 295 | 2450 | 450 | 280 x 150 |
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| 3000 x 3000          | 6216 | 3344 | 115 | 220 | 151 | 295 | 4150 | 650 | 280 x 150 |
| 4000 x 4000          | 8216 | 4344 | 115 | 220 | 151 | 295 | 5150 | 650 | 280 x 150 |

### UNI-DIRECTIONAL

| SIZE (mm)<br>opening | A    | B    | A1  | A2  | C   | D   | J    | ØG  | E x F     |
|----------------------|------|------|-----|-----|-----|-----|------|-----|-----------|
| 1300 x 1300          | 2906 | 1644 | 115 | 220 | 151 | 295 | 2450 | 450 | 280 x 150 |
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| 3000 x 3000          | 6500 | 3344 | 115 | 220 | 151 | 295 | 4150 | 650 | 280 x 150 |
| 4000 x 4000          | 8500 | 4344 | 115 | 220 | 151 | 295 | 5150 | 650 | 280 x 150 |

NOTE: For dimensions other than above, please contact an ORBINOX representative

These dimensions are for information only. Do not use for installation or submittal purposes

**MU PENSTOCK SELECTION FORM**

Customer: \_\_\_\_\_ Tag No.: \_\_\_\_\_ Date: \_\_\_\_\_  
 Order Number: \_\_\_\_\_ Qty.: \_\_\_\_\_

**DESIGN**

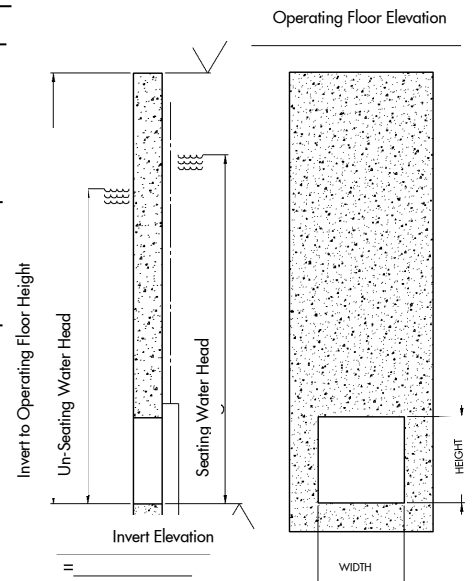
Units: mm  Size | Wall Opening Width: \_\_\_\_\_  
 inch  | Wall Opening Height: \_\_\_\_\_

Seating Water Head: \_\_\_\_\_

Unseating Water Head: \_\_\_\_\_

Invert to Operating Floor height: \_\_\_\_\_

- Non Rising Stem (NRS)  UNI-DIRECTIONAL  Closed Frame  
 Rising Stem (RS)  BI-DIRECTIONAL  Open Frame

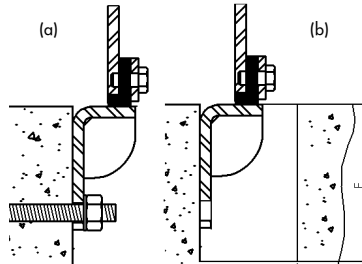


**PENSTOCK MOUNTING**

- Concrete Wall Mount  
 Wall thimble Mount  
 Embedded In Concrete

**Frame Invert Mounting:**

- Standard Wall Mount (a)  
 Flush Bottom Mount (b)



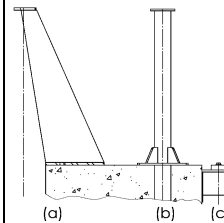
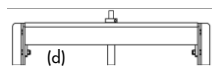
↳ E= \_\_\_\_\_ F= \_\_\_\_\_

**ACTUATORS**

- Handwheel  
 Crank (w/ B.Gear and Sqr. Nut)  
 Square Nut (NRS Only)  
 Bevel Gear  
 Electric Motor  
 Pneumatic Cylinder  
 Hydraulic Cylinder

**Actuator Mounting:**

- Inclined Floor Stand (a)  
 Straight Floor Stand (b)  
 Wall Bracket (for Sqr.Nut) (c)  
 Frame Mounted (d)



**Position Indicator:  
(For RS Only)**

- Position Label  
 Limit Switch  
 Proximity Switch

**MATERIALS**

- |  |                                       |                                  |              |
|--|---------------------------------------|----------------------------------|--------------|
| <input type="checkbox"/> Frame & Slide | <input type="checkbox"/> 304L SS      | <input type="checkbox"/> 316L SS | Other: _____ |
| <input type="checkbox"/> Stem          | <input type="checkbox"/> 303 SS       | <input type="checkbox"/> 316 SS  | Other: _____ |
| <input type="checkbox"/> Extension     | <input type="checkbox"/> 304L SS      | <input type="checkbox"/> 316L SS | Other: _____ |
| <input type="checkbox"/> Floor Stand   | <input type="checkbox"/> Carbon Steel | <input type="checkbox"/> 304L SS | Other: _____ |
| <input type="checkbox"/> Seal          | <input type="checkbox"/> EPDM         |                                  | Other: _____ |
| <input type="checkbox"/> Stem Cover    | <input type="checkbox"/> Carbon Steel | <input type="checkbox"/> PVC     | Other: _____ |

**REMARKS**

Name: \_\_\_\_\_ Signature: \_\_\_\_\_