

MODEL

MU

## GENERAL DESCRIPTION

The ORBINOX model MU is a 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 seal design that can achieve minimal equal seating and unseating (bidirectional) leakage rates. Sizes 1300 mm x 1300 mm up to 2000 mm x 2000 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, for more demanding service conditions.

For more information please contact an ORBINOX representative.



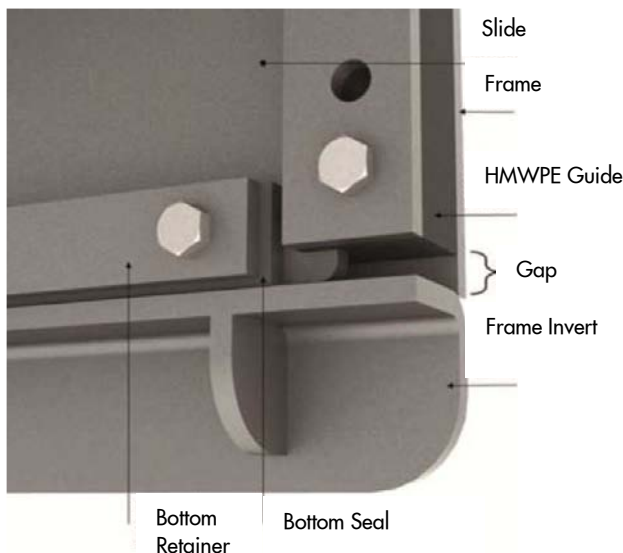
## CONSTRUCTION DESIGN

The MU penstock is manufactured in general accordance to DIN 19569. Other standards such as AWWA C561 and BS 7775 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
- Mounting configuration options:
  - Wall Mount (standard)
  - Curved Wall Mount
  - Embedded in concrete
- Option of Rising or Non-Rising stem configurations
- Design allows for elevated or flush bottom installation
- Suitable for actuation with manual, electric, pneumatic or hydraulic actuators
- HMWPE guides for seating and unseating heads, that reduce the friction coefficient during operation, minimizing therefore the actuation thrust and extending the seal life
- Self-cleaning HMWPE guides
- Machined slot for slide on guides to prevent “see-saw” effect when opening and closing the slide
- The unique seal design is self adjusting
- 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	Seating head pressure	Unseating head pressure
<b>BI-DIRECTIONAL</b>	10 meters of water column	10 meters of water column
150mm x 150mm – 1000mm x 1000mm		
<b>BI-DIRECTIONAL</b>	6 meters of water column	6 meters of water column
1100mm x 1100mm – 2000mm x 2000mm		
<b>UNI-DIRECTIONAL</b>	6 meters of water column	0 meters of water column
1300mm x 1300mm – 2000mm x 2000mm		

NOTE: For higher head pressures, please consult an ORBINOX representative

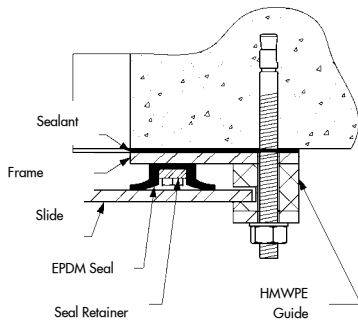
MODEL

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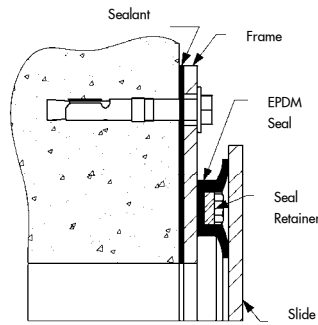
## BI-DIRECTIONAL

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

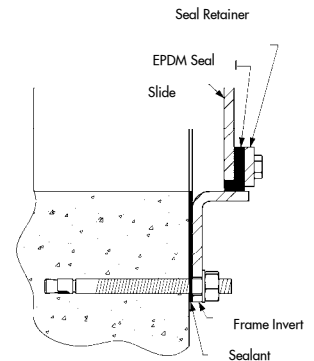
SIDE SEAL



TOP SEAL



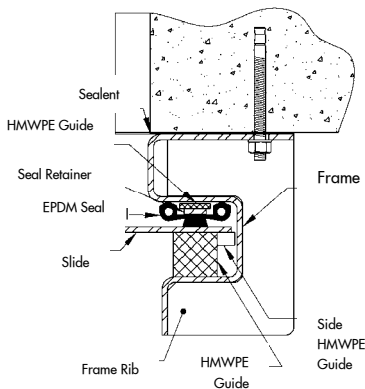
BOTTOM SEAL



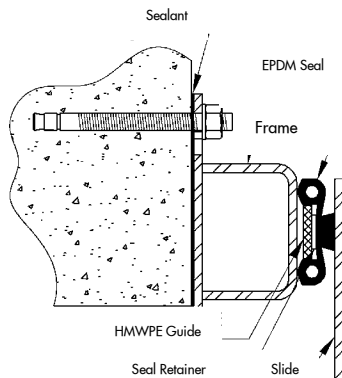
## BI-DIRECTIONAL

Seal Design: sizes 1300 mm x 1300 mm to 2000 mm x 2000 mm

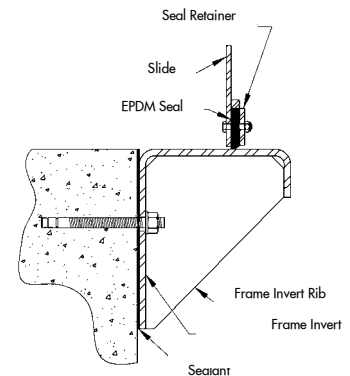
SIDE SEAL



TOP SEAL



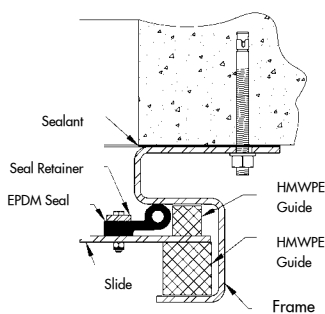
BOTTOM SEAL



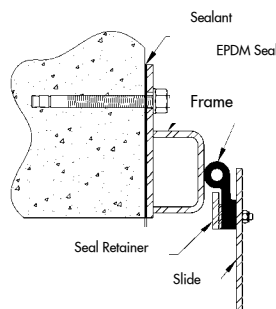
## UNI-DIRECTIONAL

Seal Design: sizes 1300 mm x 1300 mm to 2000 mm x 2000 mm

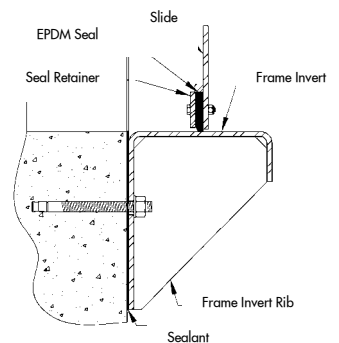
SIDE SEAL



TOP SEAL

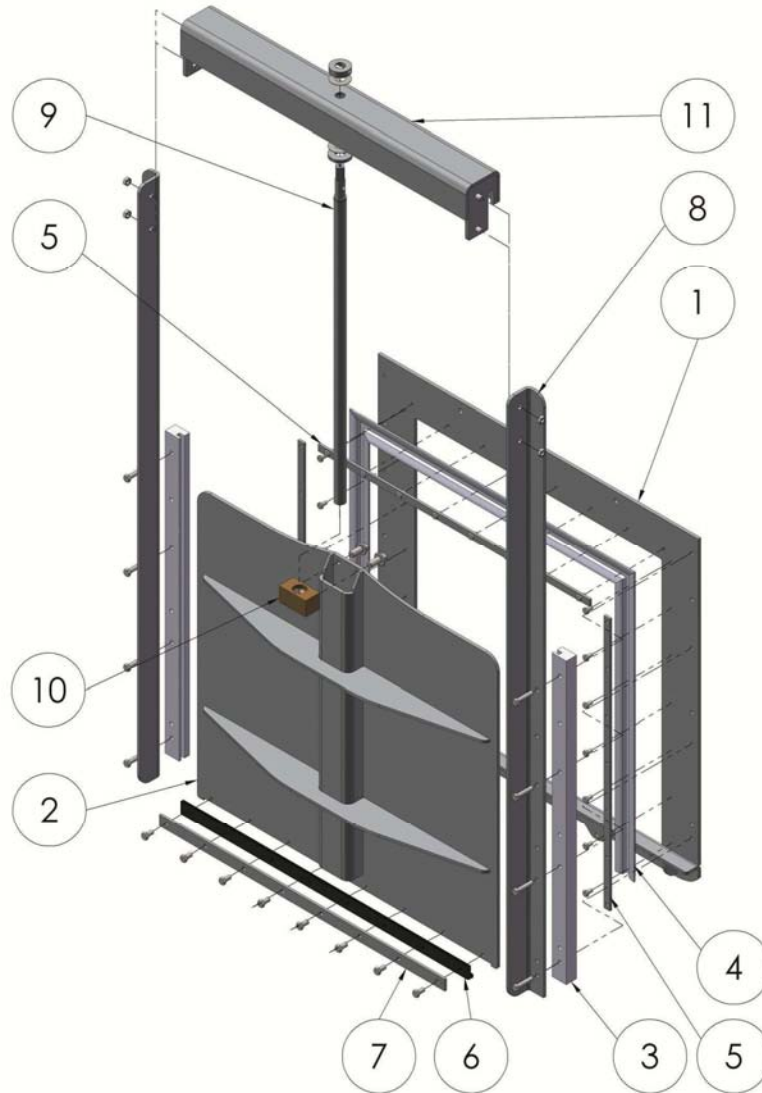


BOTTOM SEAL



**STANDARD MATERIALS OF CONSTRUCTION**

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

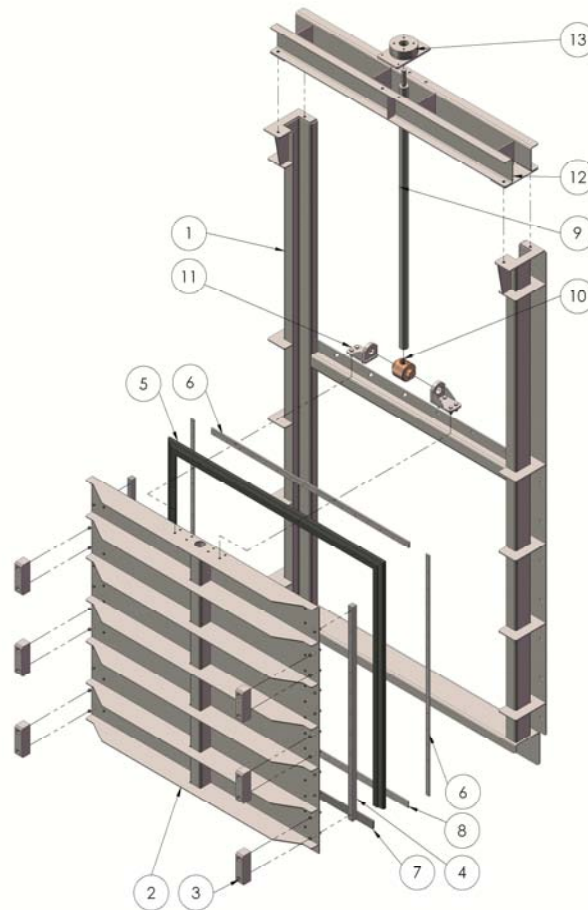


ITEM	DESCRIPTION	MATERIAL (standard)
1	Frame	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
2	Slide	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
3	Guides	High Molecular Weight Polyethylene (HMWPE)
4	Seal	EPDM
5	Seal Retainer	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
6	Bottom Seal	EPDM
7	Bottom Seal Retainer	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
8	Frame Guide	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
9	Stem	Stainless Steel Type 303 (1.4305), other on request
10	Stem Nut	Bronze
11	Yoke	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)

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

## STANDARD MATERIALS OF CONSTRUCTION

From 1300 mm x 1300 mm to 2000 mm x 2000 mm



ITEM	DESCRIPTION	MATERIAL (standard)
1	Frame	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
2	Slide	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
3	Front Guides	High Molecular Weight Polyethylene (HMWPE)
4	Guides	High Molecular Weight Polyethylene (HMWPE)
5	Seal	EPDM
6	Seal Retainer	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
7	Bottom Seal	EPDM
8	Bottom Seal Retainer	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
9	Stem	Stainless Steel Type 303 (1.4305), other on request
10	Stem Nut	Bronze
11	Stem Nut Bracket	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
12	Yoke	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)
13	Stem Coupling	Stainless Steel Type 304L or 316L (1.4306 or 1.4404)

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

MODEL

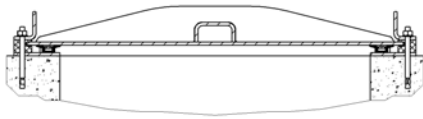
MU

## MOUNTING OPTIONS

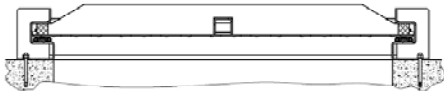
The following drawings show the most common mounting options for MU penstocks. For other types of mounts, please consult an ORBINOX representative

### WALL MOUNT (STANDARD)

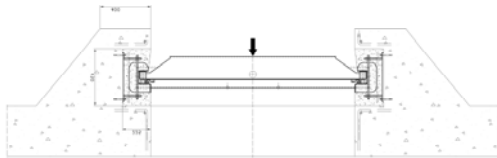
From 150 mm x 150 mm to 1200 mm x 1200 mm



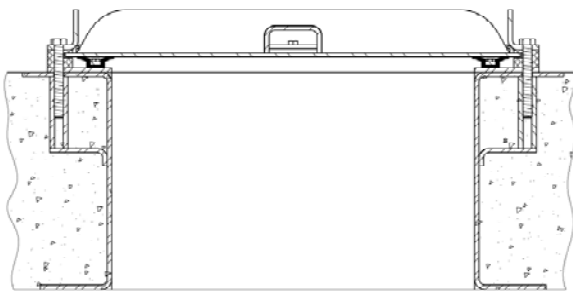
From 1300 mm x 1300 mm to 2000 mm x 2000 mm



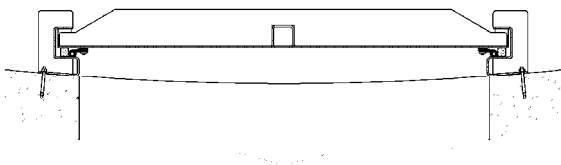
### EMBEDDED IN CONCRETE



### THIMBLE MOUNT

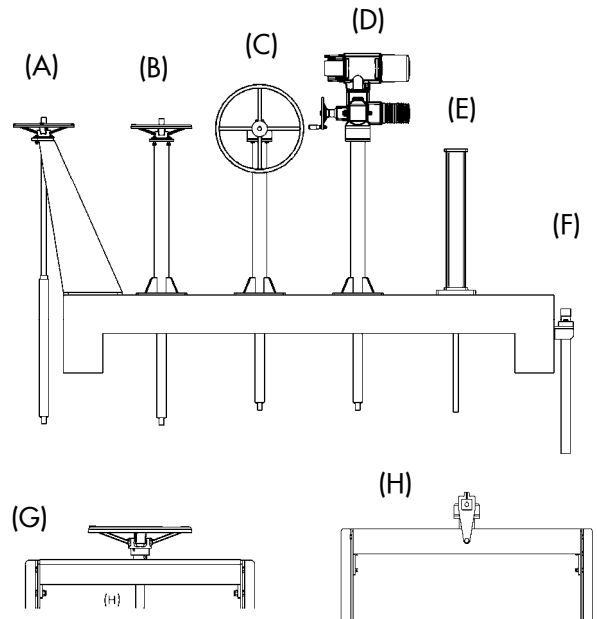


### CURVED WALL MOUNT



## 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) Gear operator on straight floor stand
- (D) Electric actuator on straight floor stand
- (E) Hydraulic or pneumatic actuator
- (F) Square nut (ISO 5211) (Non-Rising stem)
- (G) Yoke mounted handwheel
- (H) Yoke mounted gear and crank

### Accessories:

- Mechanical stops
- Actuator manual overrides
- Locking devices
- Solenoid valves
- Positioners
- Limit / Proximity switches

## STEM EXTENSIONS

In many 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.

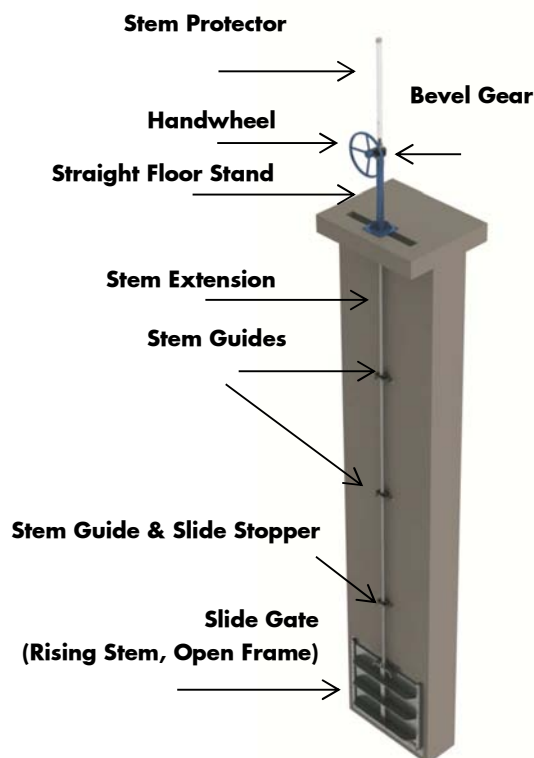
The stem guide has a HWMPE guide to reduce friction between the guide and the extension

### 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 (flatness, levelness and plumbness) 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

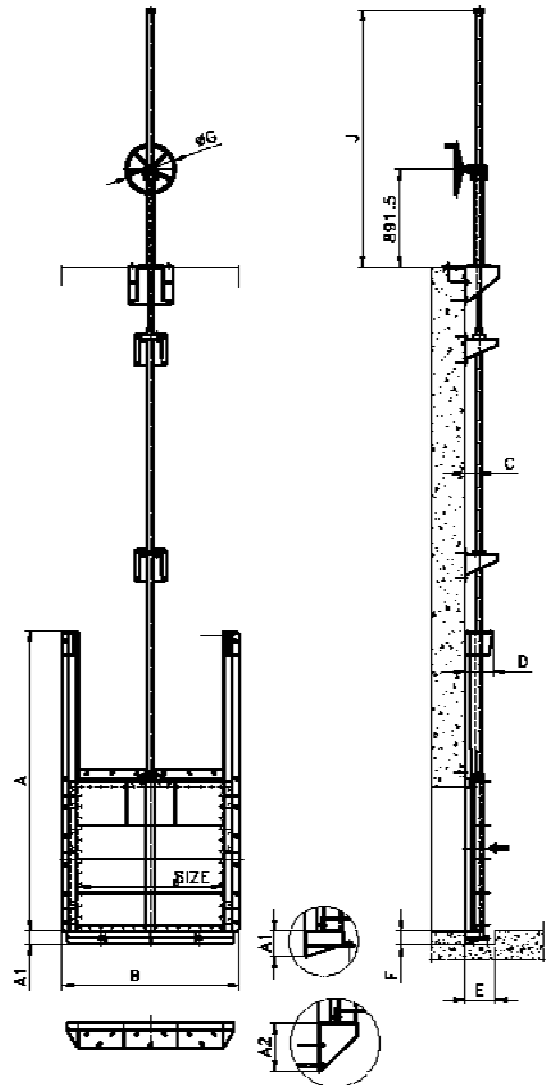
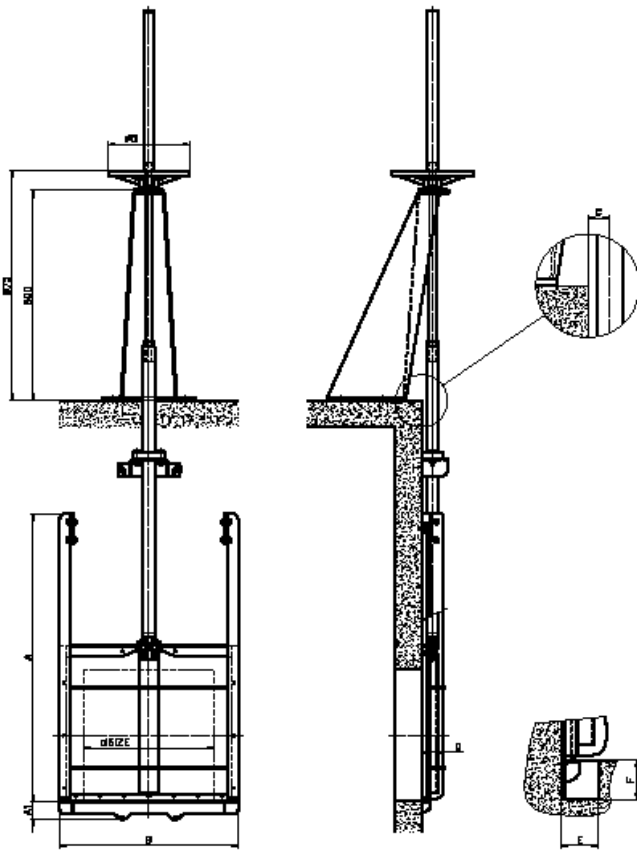
Size	Water Pressure	Standard Mounting Type
<b>BI-DIRECTIONAL</b> 150mm x 150mm -1200 mm x 1200mm	Seating and Un-Seating (Bi-Directional)	Wall mount: • Stud Type Mechanical Anchor Bolts
<b>BI-DIRECTIONAL</b> 1300mm x 1300mm -2000 mm x 2000mm	Seating and Un-Seating (Bi-Directional)	Embedded in concrete
<b>UNI-DIRECTIONAL</b> 1300mm x 1300mm -2000 mm x 2000mm	Seating (Uni-Directional)	Wall mount: • 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**

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

From 1300 mm x 1300 mm to 2000 mm x 2000 mm





## OPEN FRAME - RISING STEM - DIMENSION

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

SIZE (mm) 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	410	70 x 85
1000 x 1000	2185	1200	82	56	136	410	70 x 85
1100 x 1100	2385	1300	82	56	136	410	70 x 85
1200 x 1200	2585	1400	82	56	136	410	70 x 85

**From 1300 mm x 1300 mm to 2000 mm x 2000 mm**

### BI-DIRECTIONAL

SIZE (mm) opening	A	B	A1	A2	C	D	J	ØG	E x F
1300 x 1300	2725	1650	115	220	145	275	2350	450	280 x 150
1400 x 1400	2925	1750	115	220	145	275	2450	450	280 x 150
1500 x 1500	3125	1850	115	220	145	275	2550	450	280 x 150
1600 x 1600	3325	1950	115	220	145	275	2650	650	280 x 150
1700 x 1700	3525	2050	115	220	145	275	2750	650	280 x 150
1800 x 1800	3725	2150	115	250	145	275	2850	650	280 x 150
1900 x 1900	3925	2250	115	250	145	275	2950	650	280 x 150
2000 x 2000	4125	2350	115	250	145	275	3050	650	280 x 150

### UNI-DIRECTIONAL

SIZE (mm) opening	A	B	A1	A2	C	D	J	ØG	E x F
1300 x 1300	2725	1650	115	220	145	275	2350	450	280 x 150
1400 x 1400	2925	1750	115	220	145	275	2450	450	280 x 150
1500 x 1500	3125	1850	115	220	145	275	2550	450	280 x 150
1600 x 1600	3325	1950	115	220	145	275	2650	650	280 x 150
1700 x 1700	3525	2050	115	220	145	275	2750	650	280 x 150
1800 x 1800	3725	2150	115	250	145	275	2850	650	280 x 150
1900 x 1900	3925	2250	115	250	145	275	2950	650	280 x 150
2000 x 2000	4125	2350	115	250	145	275	3050	650	280 x 150

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

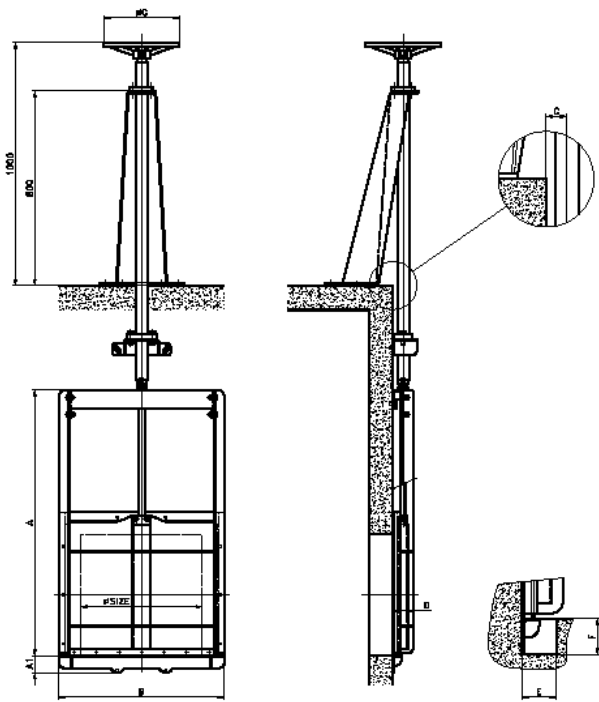
These dimensions are for information only. Do not use for installation or submittal purposes

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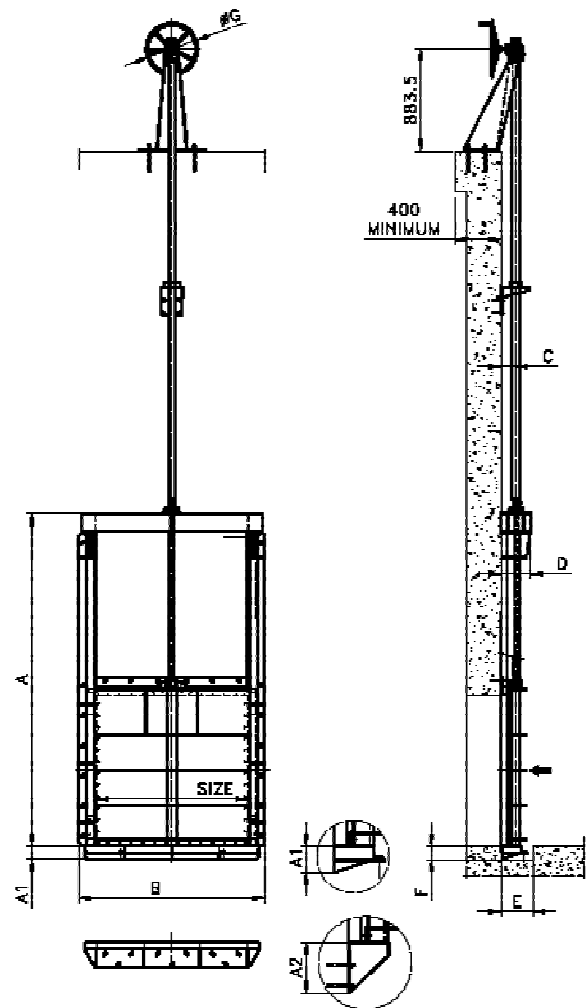
MU

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

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



From 1300 mm x 1300 mm to 2000 mm x 2000 mm



## CLOSED FRAME - NON RISING STEM - DIMENSION

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

SIZE (mm) 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	410	70 x 85
1000 x 1000	2185	1200	82	56	136	410	70 x 85
1100 x 1100	2385	1300	82	56	136	410	70 x 85
1200 x 1200	2585	1400	82	56	136	410	70 x 85

**From 1300 mm x 1300 mm to 2000 mm x 2000 mm**

### BI-DIRECTIONAL

SIZE (mm) opening	A	B	A1	A2	C	D	J	ØG	E x F
1300 x 1300	2916	1650	115	220	145	275	2350	450	280 x 150
1400 x 1400	3116	1750	115	220	145	275	2450	450	280 x 150
1500 x 1500	3316	1850	115	220	145	275	2550	450	280 x 150
1600 x 1600	3528	1950	115	220	145	275	2650	650	280 x 150
1700 x 1700	3728	2050	115	220	145	275	2750	650	280 x 150
1800 x 1800	3988	2150	115	250	145	275	2850	650	280 x 150
1900 x 1900	4188	2250	115	250	145	275	2950	650	280 x 150
2000 x 2000	4458	2350	115	250	145	275	3050	650	280 x 150

### UNI-DIRECTIONAL

SIZE (mm) opening	A	B	A1	A2	C	D	J	ØG	E x F
1300 x 1300	2871	1610	115	220	145	275	2350	450	280 x 150
1400 x 1400	3071	1710	115	220	145	275	2450	450	280 x 150
1500 x 1500	3271	1810	115	220	145	275	2550	450	280 x 150
1600 x 1600	3483	1910	115	220	145	275	2650	650	280 x 150
1700 x 1700	3683	2010	115	220	145	275	2750	650	280 x 150
1800 x 1800	3943	2110	115	250	145	275	2850	650	280 x 150
1900 x 1900	4143	2210	115	250	145	275	2950	650	280 x 150
2000 x 2000	4413	2310	115	250	145	275	3050	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**

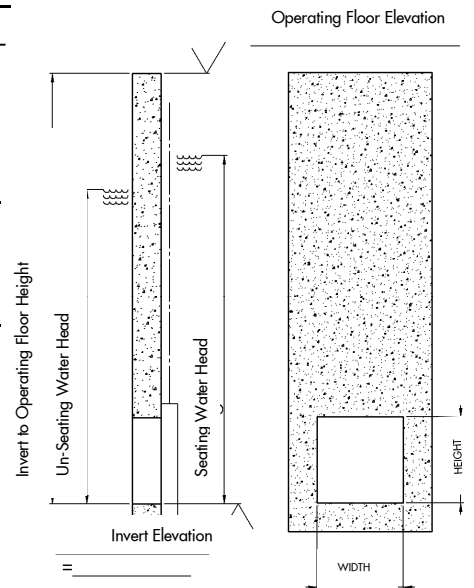
Customer: \_\_\_\_\_ Tag No.: \_\_\_\_\_ Date: \_\_\_\_\_  
 Order Number: \_\_\_\_\_ Qty.: \_\_\_\_\_

**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

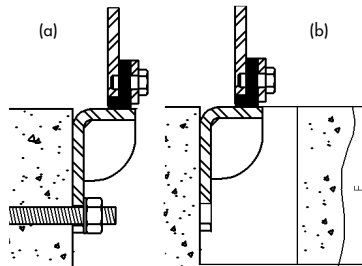


**PENSTOCK MOUNTING**

- Concrete Wall Mount  
 Wall thimble Mount  
 Embedded In Concrete

**Frame Invert Mounting:**

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



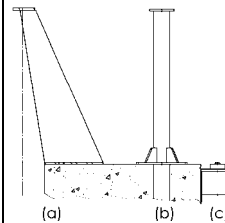
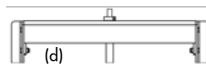
↳ E= \_\_\_\_\_ F= \_\_\_\_\_

**ACTUATORS**

- Handwheel  
 Crank (w/ B.Gear and Sqr. Nut)  
 Square Nut - ISO 5211(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: \_\_\_\_\_