

# Technical Information

## Soliswitch FTE20

Point level switch for granular solids



Safety comes first - with optical and optional automatic rotation monitoring

### Applications

The Soliswitch FTE20 is a paddle switch for bulk solids. Its robust and compact design makes the point level switch an ideal sensor for detecting the full, empty or refill status in applications with bulk solids, such as in silos containing solids.

- Full sensor
- Empty sensor
- Point level sensor

### Your benefits

- Safe operation
  - Automatic rotation monitoring (optional)
  - Optical rotation monitoring
  - Ex approvals
    - ATEX II 1/2D
    - FM DIP/ II, III/1/E-G
  - Switching threshold can be set even during operation
  - Robust plastic housing with cover with sight glass
- Fault detection without uninstalling the device by means of
  - Visualization of shaft rotation, visible when device is installed
  - Ability to test the switching function
- Easy installation thanks to
  - Screw-cover housing
  - Preformed cable entries
  - Push-in double-level terminals
  - Captive screw cap
- Weight of solids can be adjusted without the need for tools
- Housing can be rotated through 360° to enable optimal alignment following installation

## Function and system design

### Measuring principle

The paddle switch is primarily used to detect the full or refill status in silos containing solids. When used as a refill switch, it is typically mounted from below or at an angled position from below in the silo cone. When used as a full switch, it is fitted in the roof of the silo.

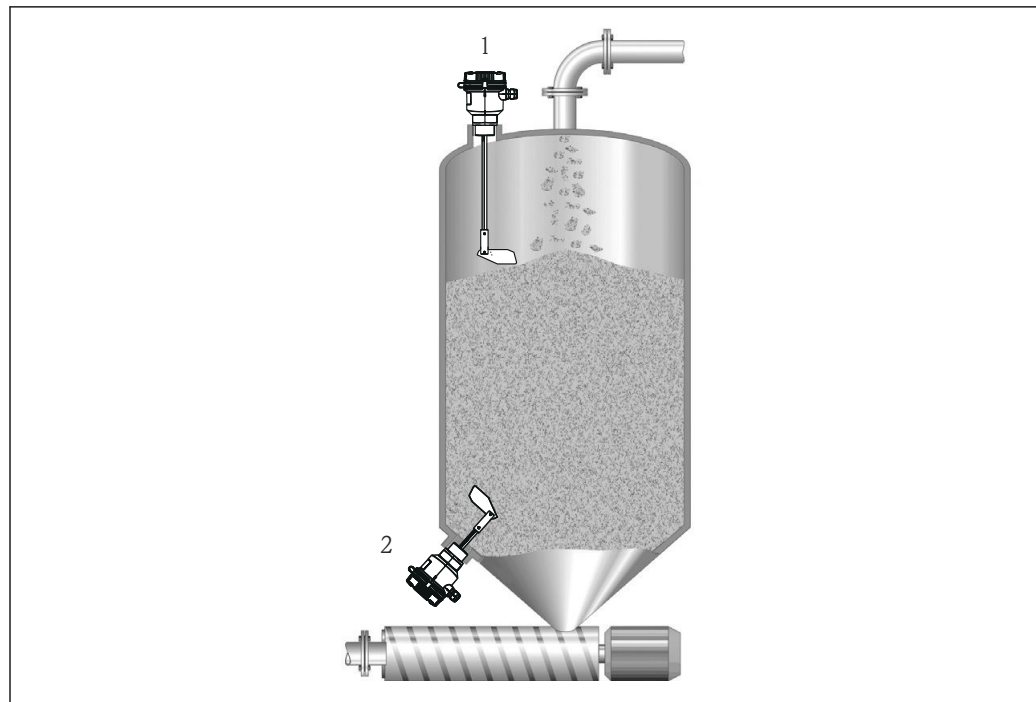
The shaft and rotary paddle are driven using a reduction gear and synchronous motor. If the rotary paddle is stopped by bulk material covering it, the pivot-mounted motor in the housing moves from the rest to the switch position. This movement operates two switch contacts; the first is for external level indication and the second switches off the power to the motor.

If the bulk material releases the rotary paddle again, the motor returns to its rest position. The two contacts switch back to rest position and the rotary paddle continues to turn. Intermittent loads on the rotary paddle that work in the same or opposite direction of rotation are absorbed by a slip clutch.

The rotational movement of the shaft can be observed from the outside when the cover is closed. Optional automatic rotation monitoring detects a blockage or the failure of the drive unit.

### Measuring system

Complete point level switch consisting of a shaft (optionally available with shortenable rope extension) with synchronous motor and slip clutch, and single pole changeover contact. Typical application areas are point level detection in bulk solids, e.g. cereals, sugar, cacao, animal feeds, washing powders, chalk, dry plaster, cement, granulates and wood chips.



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1 Measuring system with Soliswitch FTE20

1 Functioning as full sensor

2 Functioning as refill sensor

## Input

### Measured variable

Level (in line with the orientation and length)

### Measuring range

The measuring range depends on the installation location of the device and the selected length of the shaft 75 to 300 mm (2.95 to 11.81 in) or the rope extension up to max. 2 000 mm (6.56 ft).

## Output

Output signal

Binary

Switch output

**Function**

Switch a floating changeover contact.

**Switching behavior**


On/off

**Switching time**

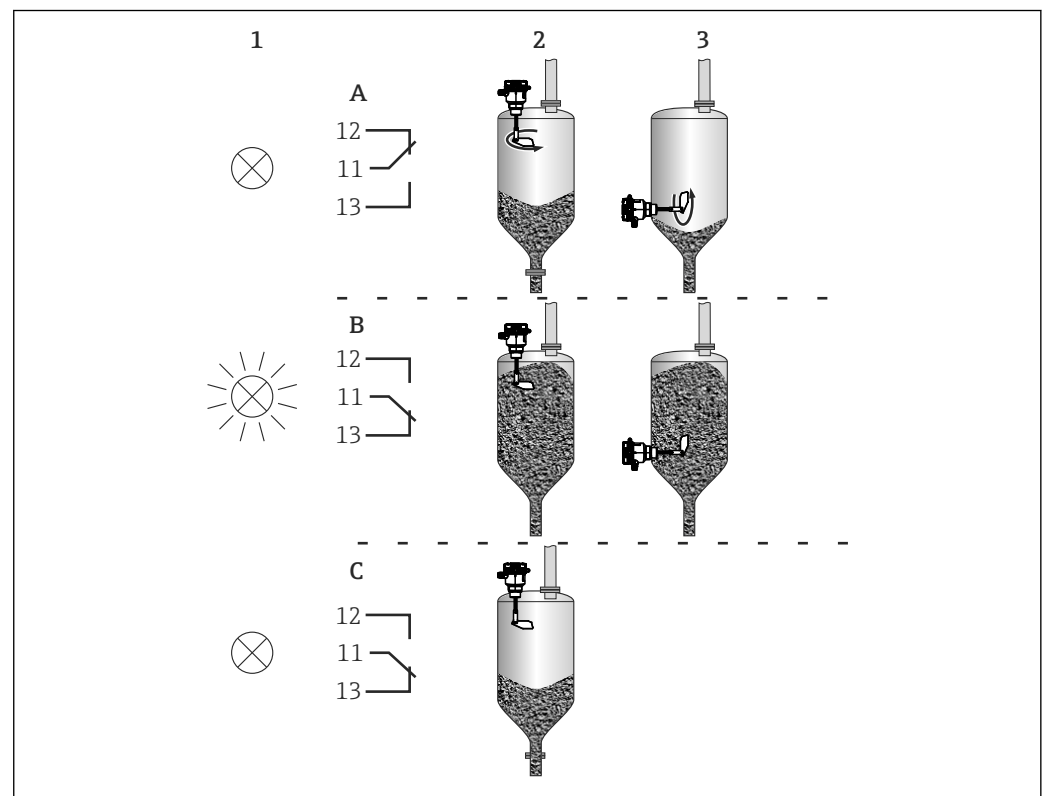
From rotary paddle standstill until output of the switch signal: 20°, corresponds to 3.5 s

**Switching capacity**

- According to EN 61058: 250 V AC 5E4, 6(2) A
- According to UL 1054: 125 to 250 V AC, 5 A
- 24 V DC, 3 A
- Min. switching load 300 mW (5 V/5 mA)

 After a current >100 mA is actuated, it is no longer possible to guarantee the switching function with a switching current  $I < 100$  mA.

**Switching states**

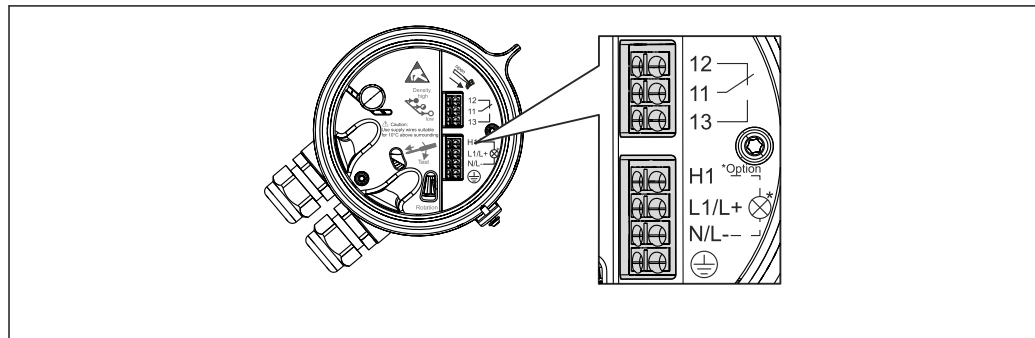


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|  | 1 = Indicator light (optional, non-Ex only) | 2 = Full signaling | 3 = Refill signalling | Shaft rotation | Internal light |
|--|---|--------------------|-----------------------|----------------|----------------|
| A  | OFF   | OFF                | ON                    | YES            | ON             |
| B  | ON  | ON                 | OFF                   | NO             | ON             |
| C (only with optional rotation monitoring) | OFF   | ON                 | OFF                   | NO             | Flashes        |

## Power supply

### Terminal assignment



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 2 Terminal assignment of the point level switch

| Symbol              | Description       | Symbol | Description   |
|---------------------|-------------------|--------|---|
| ⊕                   | Protective ground | H1     | Connection for signaling empty/full status detection (optional) |
| N (AC),<br>L- (DC)  | Power supply      | N/L-   |   |
| L1 (AC),<br>L+ (DC) | Power supply      | 11     | Changeover contact  |
|                     |                   | 12     | Normally closed contact   |
|                     |                   | 13     | Normally open contact   |

### Supply voltage

- 24 V DC  $\pm 15\%$
- 24 V AC  $\pm 10\%$ , 50/60 Hz
- 115 V AC  $\pm 10\%$ , 50/60 Hz
- 230 V AC  $\pm 10\%$ , 50/60 Hz

 An overload protection element (rated current  $\leq 10$  A) is required for the power cable.

### Power consumption


Max. 3.5 VA

### Terminals

Terminals with spring terminal design

#### Permitted cable cross-sections

|  |   |
|--|---|
| Rigid  | 0.2 to 2.5 mm <sup>2</sup> (24 to 14 AWG) |
| Flexible   | 0.2 to 2.5 mm <sup>2</sup> (24 to 14 AWG) |
| Flexible with wire end ferrule without plastic ferrule | 0.5 to 2.5 mm <sup>2</sup> (22 to 14 AWG) |
| Flexible with wire end ferrule with plastic ferrule    | 0.5 to 1.5 mm <sup>2</sup> (22 to 16 AWG) |
| AWG as per UL/CUL/kcmil                                |   |

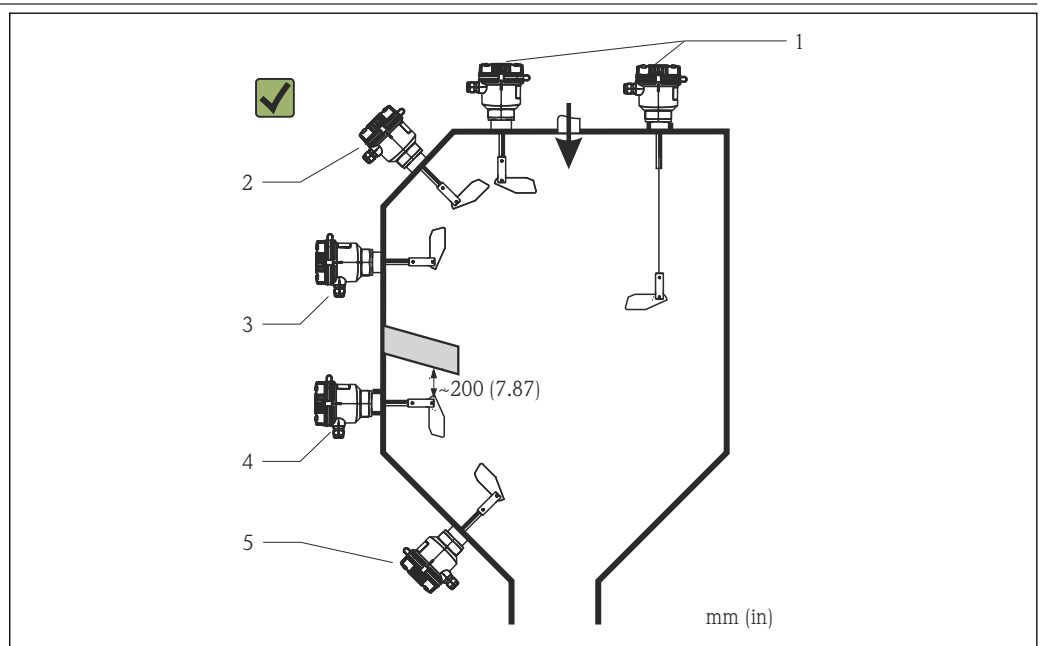
 Use supply wires suitable for 10 °C (18 °F) above surrounding.

## Performance characteristics

|                                  |   |
|----------------------------------|---|
| <b>Shaft speed</b>               | 1 min <sup>-1</sup>   |
| <b>Sensitivity</b>               | Can be adjusted using an operating element accessible from the top → 9. <ul style="list-style-type: none"> <li>■ Minimum: 80 g/l (4.99 lb/ft<sup>3</sup>)</li> <li>■ Depending on the density of the bulk solids adjustable in three stages: low, medium (default), high</li> </ul> |
| <b>Mechanical operating life</b> | 500 000 switching operations  |

## Mounting

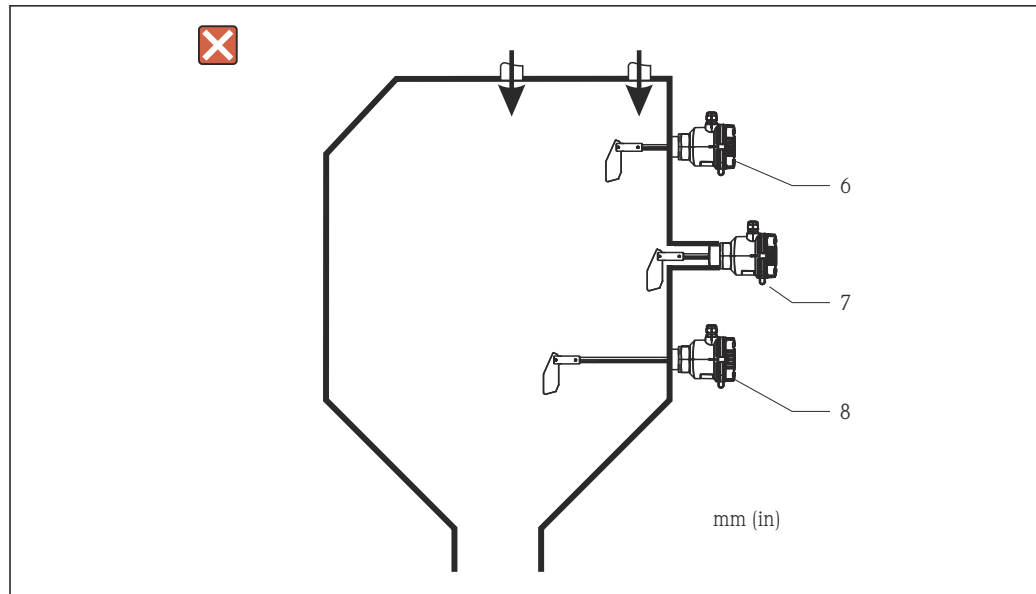
### Mounting location



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3 Correct installation positions of the device

- 1: Vertical from the top
- 2: Angled from the top
- 3: From the side
- 4: From the side with protective cover against falling solids
- 5: From the bottom (device must be protected against shock-type loads)



4 Incorrect installation positions of the device

- 6: In direction of solids flow
- 7: Installation coupling too long
- 8: Horizontal with shaft length >300 mm (11.8 in)

### Special mounting instructions

#### Side load on the shaft

Max. 60 N

#### Load on the rope

Max. 1 500 N

#### Operating pressure (abs.)

0.5 to 2.5 bar (7.25 to 36.3 psi)

#### Housing can be rotated 360 °

To adjust to the direction of the cable entries (pointing downwards)

#### Cable entries

The dust protection caps which are delivered with the device are only for protection during transport and storage. Close an unused cable entry with a blind plug (IP65) when commissioning the device.

#### Mechanical load of optional signal lamp

The optional signal lamp must be protected against mechanical stress (impact energy > 1 J).

#### Maximum flange depth of the connection

In the case of the standard rotary paddle, installation in flange connections is permitted up to a sleeve length of ≤ 40 mm (1.57 in), for lengths > 40 mm (1.57 in) this installation is only permitted in the version with the hinged rotary paddle. The insertion of the rotary paddle must be performed without the use of force and must be possible.

## Environment

The device must be protected against direct sunshine.

A weather protection cover is available as an accessory, see the "Accessories" section → 10.

All values not indicated as per DIN EN 6054-1.

Ambient temperature range -20 to 60 °C (-4 to 140 °F)

Storage temperature -20 to 60 °C (-4 to 140 °F)

Climate class EN60654-1, Class C2

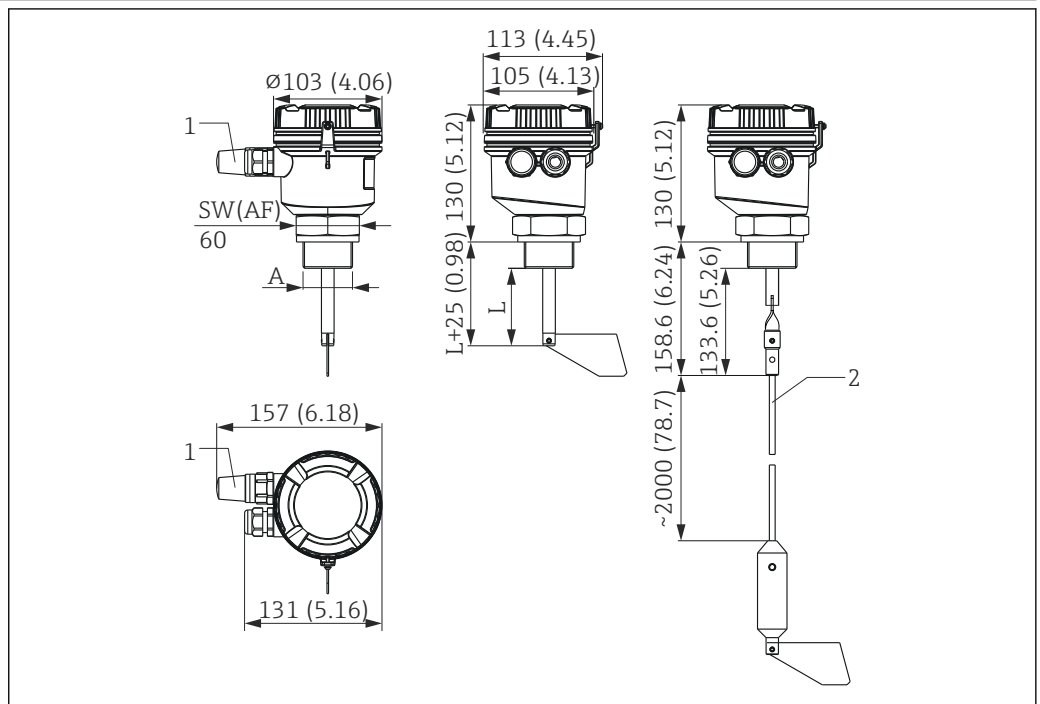
|                               |   |
|-------------------------------|---|
| Degree of protection          | IP66  |
| Shock resistance              | As per EN 60068-2-27: 30g   |
| Vibration resistance          | As per EN 60068-2-64: 0.01g <sup>2</sup> /Hz  |
| Electromagnetic compatibility | <p>Electromagnetic compatibility in accordance with all the relevant requirements of the EN 61326 series. For details refer to the Declaration of Conformity.</p> <ul style="list-style-type: none"> <li>■ Interference immunity: as per IEC 61326-1, industrial environment</li> <li>■ Interference emission: as per IEC 61326-1, Class B</li> </ul> |
| Electrical safety             | Class I equipment, overvoltage category II, pollution degree 2  |
| Altitude                      | < 2 000 m (6 560 ft) over MSL   |

## Process

|                          |  |
|--------------------------|--|
| Medium temperature range | -20 to 80 °C (-4 to 176 °F)                                  |
| Process pressure range   | ≤ 1.5 bar (21.8 psi) overpressure (e.g. when silo is filled) |
| Solids weight            | ≥ 80 g/l (4.99 lb/ft <sup>3</sup> )                          |
| Grain size               | ≤ 50 mm (1.97 in)  |

## Mechanical construction

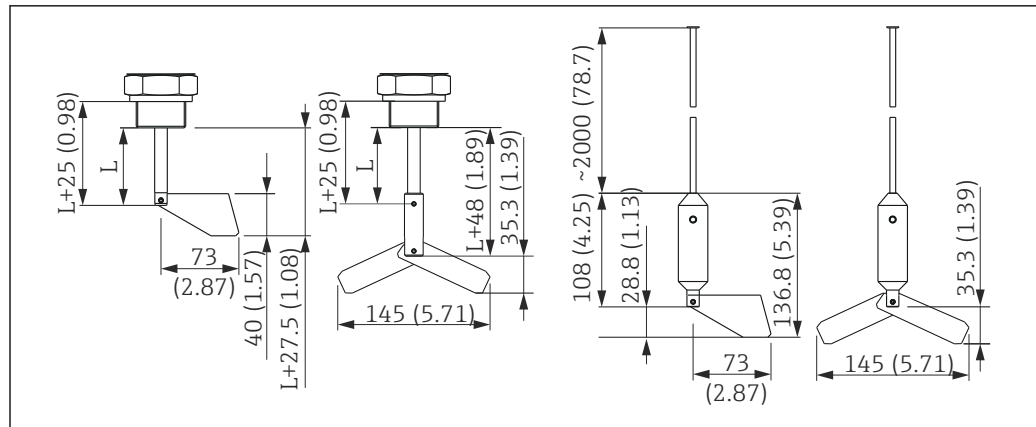
### Design, dimensions



5 Dimensions of the point level switch, dimensions in mm (in)

1 Indicator light (optional)

2 Version with rope extension, can be shortened



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6 Dimensions of the rotary paddle - standard and hinged, for shaft and rope extension, dimensions in mm (in)

| Dimensions depending on the version |                    |                                 |
|-------------------------------------|--------------------|---------------------------------|
| A                                   | Process connection | NPT 1¼", NPT 1½", G 1½"         |
| L                                   | Length of shaft    | 75 to 300 mm (2.95 to 11.81 in) |

| Weight   | Version / part   | Weight (approx.) |
|--|--|------------------|
|  | With axis 100 mm (3.94 in), plastic process connection | 800 g (1.76 lb)  |
| With axis 100 mm (3.94 in), metal process connection | 1600 g (3.53 lb)                                       |                  |
| Hinged rotary paddle                                 | 110 g (0.24 lb)  |                  |
| Rope extension                                       | 755 g (1.66 lb)  |                  |

| Materials                         | Designation   | Material      |
|-----------------------------------|---|---------------|
|                                   | Housing   | Polycarbonate |
| Captive screw cap                 | Polyamide   |               |
| Cover seal                        | Silicone  |               |
| Housing/process connection seal   | Viton   |               |
| Process seal                      | Synthetic/organic fiber elastomer seal (asbestos-free)<br>NPT versions do not have a process seal and the thread must be sealed by the customer onsite, e.g. using a Teflon tape. |               |
| Shaft                             | 1.4305 / 303  |               |
| Rope extension                    | 1.4401 / 316  |               |
| Rotary paddle (standard / hinged) | 1.4301 / 304  |               |
| Shaft seal                        | NBR   |               |
| Process connections               | In stainless steel 1.4305 / 303 or PBT  |               |

**Cable entries** 2 x cable gland, M20 x1.5  
(optionally 1 x cable gland M20 x 1.5 and indicator lamp)  
Permitted cable diameter  
5 to 9 mm (0.2 to 0.35 in)



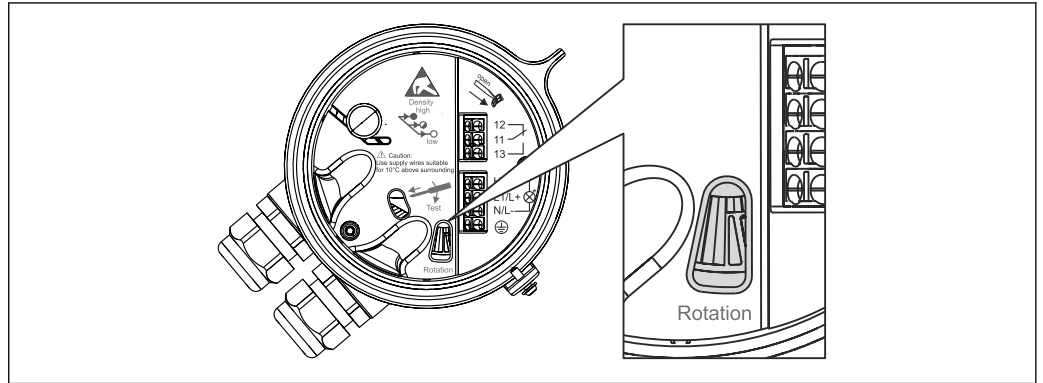
## Operability

### Local operation


#### Rotational movement display

The shaft's rotational movement is indicated by a reflector disk fitted on drive shaft of the rotary paddle and can be monitored through a sight opening in the drive/terminal cover. The disk's viewing area is lit up by an LED to make it easier to see.

If rotation monitoring (optional) detects an error, the LED flashes.



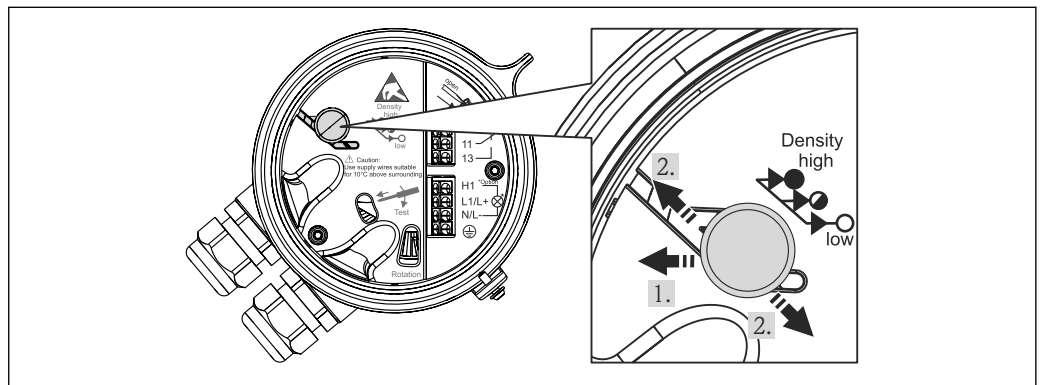
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 7 Inspection glass to observe rotational movement


#### Setting the switching threshold (sensitivity)

The switching threshold can be adapted to the weight of the bulk solids in 3 stages via an operating element that is accessible from above (also possible during operation):

- Minimum: 80 g/l (4.99 lb/ft<sup>3</sup>)
- Adjustable in 3 stages depending on the density of the bulk solids: low, medium (factory default), high



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 8 Setting the switching threshold

## Certificates and approvals

 For the approvals available, see the Configurator on the specific product page: [www.endress.com](http://www.endress.com) → (search for device name)

## Ordering information

Detailed ordering information is available from your nearest sales organization [www.addresses.endress.com](http://www.addresses.endress.com) or in the Product Configurator at [www.endress.com](http://www.endress.com):

1. Select the product using the filters and search field.

2. Open the product page.
3. Select **Configuration**.

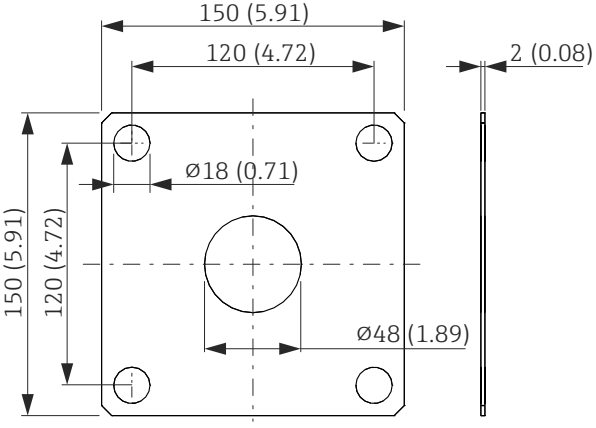
**i** **Product Configurator - the tool for individual product configuration**

- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

## Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: [www.endress.com](http://www.endress.com).


### Device-specific accessories

| Accessories  | Description  |
|--|--|
| Flanged version, incl. seal and nut for the process connection | <div style="text-align: center;">  </div> <p style="text-align: right; font-size: small;">A0018472</p> <p>9 <i>Dimensions of the flange connection, dimensions in mm (in)</i></p> <p>Order as an accessory in the product structure</p> |

|                         |  |
|-------------------------|--|
| <p>Protective cover</p> | <p>Used to protect the measuring device from the adverse effect of the weather and sunlight when fitted in the roof of a silo.</p> <p>10 <i>Dimensions of the protective cover, dimensions in mm (in)</i></p> <p>Order as an accessory in the product structure</p> <p style="text-align: right;">A0017694</p> |
|-------------------------|--|

## Supplementary documentation

The following types of documentation are available on the product pages and in the Download Area of the Endress+Hauser website ([www.endress.com/downloads](http://www.endress.com/downloads)) (depending on the selected device version):

| Document   | Purpose and content of the document  |
|--|--|
| Technical Information (TI)                           | <p><b>Planning aid for your device</b></p> <p>The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.</p>  |
| Brief Operating Instructions (KA)                    | <p><b>Guide that takes you quickly to the 1st measured value</b></p> <p>The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.</p>  |
| Operating Instructions (BA)                          | <p><b>Your reference document</b></p> <p>The Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.</p>                           |
| Description of Device Parameters (GP)                | <p><b>Reference for your parameters</b></p> <p>The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.</p>   |
| Safety Instructions (XA)                             | <p>Depending on the approval, Safety Instructions (XA) are supplied with the device. The Safety Instructions are an integral part of the Operating Instructions.</p> <p> Information on the Safety Instructions (XA) that are relevant for the device is provided on the nameplate.</p> |
| Supplementary device-dependent documentation (SD/FY) | <p>Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the device documentation.</p>  |



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