Safety comes first - with optical and optional automatic rotation monitoring

Applications
The economical Soliswitch FTE20 rotary paddle point level switch is ideal for use in bulk solids. Its polymer housing and compact design make it the ideal sensor for full, empty and refill requisitioning signalling in bulk solids silos. Due to its design and the materials used, the FTE20 is extremely robust and suitable for use in hazardous atmospheres formed by combustible dust.

- Full sensor
- Empty sensor
- Point level sensor

Your benefits
- Easy configuration and commissioning
- Optical rotation control for quick and easy checking, optionally with automatic rotation monitoring
- Line break and short-circuit monitoring optionally available as accessories
- Global explosion protection certifications for ATEX/IECEx, FM, NEPSI and UKCA
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.

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. 2000 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

![Switching States Diagram]

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A0017628
## Power supply

### Terminal assignment

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>@</td>
<td>Protective ground</td>
<td>H1</td>
<td>Connection for signaling empty/full status detection (optional)</td>
</tr>
<tr>
<td>N (AC), L- (DC)</td>
<td>Power supply</td>
<td>N/L-</td>
<td>Changeover contact</td>
</tr>
<tr>
<td>L1 (AC), L+ (DC)</td>
<td>Power supply</td>
<td>11</td>
<td>Normally closed contact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Normally open contact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

### Supply voltage
- 24 V DC ±15%
- 24 V AC ±10%, 50/60 Hz
- 115 V AC ±10%, 50/60 Hz
- 230 V AC ±10%, 50/60 Hz

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

### Power consumption
Max. 3.5 VA

### Terminals
Terminals with spring terminal design

**Permitted cable cross-sections**

<table>
<thead>
<tr>
<th>Type</th>
<th>Cross-section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid</td>
<td>0.2 to 2.5 mm² (24 to 14 AWG)</td>
</tr>
<tr>
<td>Flexible</td>
<td>0.2 to 2.5 mm² (24 to 14 AWG)</td>
</tr>
<tr>
<td>Flexible with wire end ferrule</td>
<td>0.5 to 2.5 mm² (22 to 14 AWG)</td>
</tr>
<tr>
<td>Flexible with plastic</td>
<td>0.5 to 1.5 mm² (22 to 16 AWG)</td>
</tr>
<tr>
<td>AWG as per UL/CUL/kcmil</td>
<td></td>
</tr>
</tbody>
</table>

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

**Shaft speed** | 1 min⁻¹
---|---

**Sensitivity** | Can be adjusted using an operating element accessible from the top →  § 9.
- Minimum: 80 g/l (4.99 lb/ft³)
- Depending on the density of the bulk solids adjustable in three stages: low, medium (default), high

**Mechanical operating life** | 500,000 switching operations

Mounting

**Mounting location**

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)
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

<table>
<thead>
<tr>
<th>Side load on the shaft</th>
<th>Max. 60 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load on the rope</td>
<td>Max. 1 500 N</td>
</tr>
<tr>
<td>Operating pressure (abs.)</td>
<td>0.5 to 2.5 bar (7.25 to 36.3 psi)</td>
</tr>
<tr>
<td>Housing can be rotated 360°</td>
<td>To adjust to the direction of the cable entries (pointing downwards)</td>
</tr>
<tr>
<td>Cable entries</td>
<td>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.</td>
</tr>
<tr>
<td>Mechanical load of optional signal lamp</td>
<td>The optional signal lamp must be protected against mechanical stress (impact energy &gt; 1 J).</td>
</tr>
<tr>
<td>Maximum flange depth of the connection</td>
<td>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 &gt; 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.</td>
</tr>
</tbody>
</table>

Environment

The device must be protected against direct sunshine.
A weather protection cover is available as an accessory, see the "Accessories" section → 11.
All values not indicated as per DIN EN 6054-1.

<table>
<thead>
<tr>
<th>Ambient temperature range</th>
<th>−20 to 60 °C (−4 to 140 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage temperature</td>
<td>−20 to 60 °C (−4 to 140 °F)</td>
</tr>
<tr>
<td>Climate class</td>
<td>EN60654-1, Class C2</td>
</tr>
</tbody>
</table>
Degree of protection | IP66
---|---
Shock resistance | As per EN 60068-2-27: 30g
Vibration resistance | As per EN 60068-2-64: 0.01g²/Hz
Electromagnetic compatibility | Electromagnetic compatibility in accordance with all the relevant requirements of the EN 61326 series. For details refer to the Declaration of Conformity.
  - Interference immunity: as per IEC 61326-1, industrial environment
  - Interference emission: as per IEC 61326-1, Class B
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/ft³)
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
### 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

<table>
<thead>
<tr>
<th>Version / part</th>
<th>Weight (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>With axis 100 mm (3.94 in), plastic process connection</td>
<td>800 g (1.76 lb)</td>
</tr>
<tr>
<td>With axis 100 mm (3.94 in), metal process connection</td>
<td>1,600 g (3.53 lb)</td>
</tr>
<tr>
<td>Hinged rotary paddle</td>
<td>110 g (0.24 lb)</td>
</tr>
<tr>
<td>Rope extension</td>
<td>755 g (1.66 lb)</td>
</tr>
</tbody>
</table>

### Materials

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

### Cable entries

2 x cable gland, M20 x 1.5  
(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.

![Image of Rotational movement display](image)

**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/ft³)
- Adjustable in 3 stages depending on the density of the bulk solids: low, medium (factory default), high

![Image of Setting the switching threshold](image)

Certificates and approvals

Current certificates and approvals for the product are available at [www.endress.com](http://www.endress.com) on the relevant product page.

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**.

**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

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flanged version, incl. seal and nut for the process connection</strong></td>
<td><img src="#" alt="Diagram 1" /></td>
</tr>
<tr>
<td><strong>Weather protection cover</strong></td>
<td><img src="#" alt="Diagram 2" /></td>
</tr>
</tbody>
</table>

#### 9 Dimensions of the flange connection, dimensions in mm (in)

Order as an accessory in the product structure.

#### 10 Dimensions of the protective cover, dimensions in mm (in)

Used to protect the measuring device from the adverse effect of the weather and sunlight when fitted in the roof of a silo.
### Accessory Description

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistive coupling element for line monitoring Order No. 71505353</td>
<td>Resistive coupling element 1K/10K Ohm (1 pc) for line monitoring; for installation in the terminal compartment of the FTE20;</td>
</tr>
</tbody>
</table>

Rs: 1 kΩ  
Rp: 10 kΩ

![Diagram](image)

RLN22 NAMUR isolating switch repeater for line monitoring  
Single-channel 24 V DC Namur isolating switch repeater with relay contact as signal output for switch cabinet installation on the DIN rail Input for proximity sensors, floating contacts or contacts with resistance circuit Monitors line faults such as line breaks or short-circuits of mechanical switching contacts The device is suitable for use in explosive atmospheres and safeguards up to SIL 2 according to IEC 61508.  
For details, see Technical Information RLN22: TI01560K

### 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) (depending on the selected device version):

<table>
<thead>
<tr>
<th>Document</th>
<th>Purpose and content of the document</th>
</tr>
</thead>
</table>
| Technical Information (TI) | Planning aid for your device  
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. |
| Brief Operating Instructions (KA) | Guide that takes you quickly to the 1st measured value  
The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning. |
| Operating Instructions (BA) | Your reference document  
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. |
| Description of Device Parameters (GP) | Reference for your parameters  
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. |
| Safety Instructions (XA) | Depending on the approval, Safety Instructions (XA) are supplied with the device. The Safety Instructions are an integral part of the Operating Instructions.  
Information on the Safety Instructions (XA) that are relevant for the device is provided on the nameplate. |
| Supplementary device-dependent documentation (SD/FY) | Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the device documentation. |