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Technical Information
Soliswitch FTE20

Rotary paddle level switch



Robust and cost-efficient rotary paddle level switch for bulk solids

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

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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.

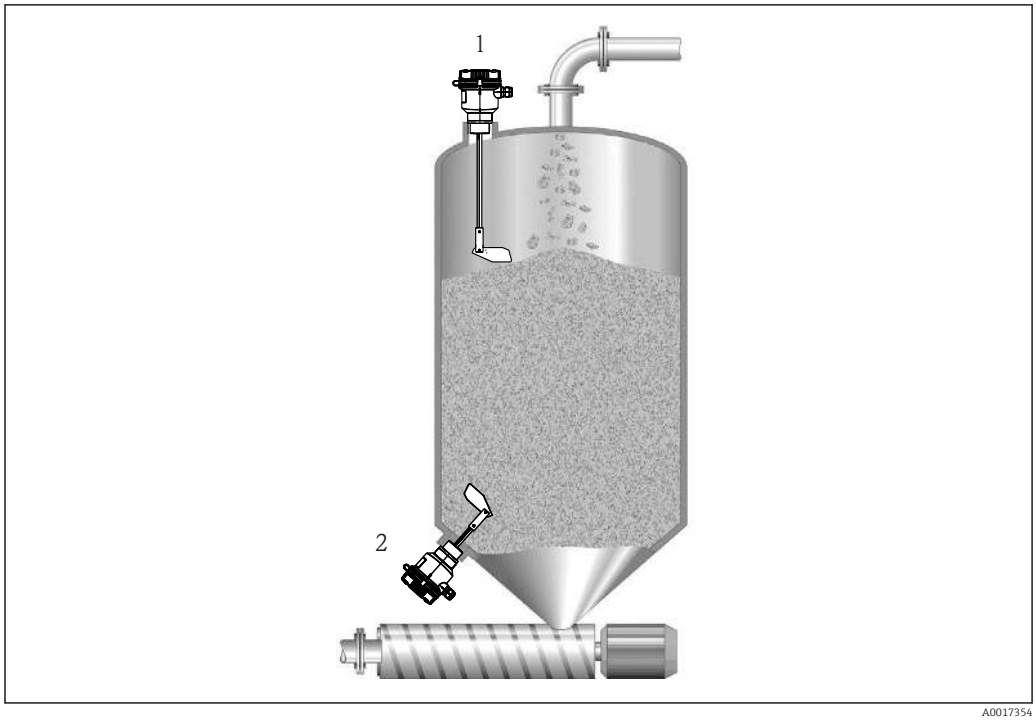
The shaft and rotary paddle are driven using a reduction gear and synchronous motor. If the rotary paddle is stopped by bulk material covering it, the pivot-mounted motor in the housing moves from the rest to the switch position. This movement operates two switch contacts; the first is for external level 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 level switch consisting of a shaft (optionally available with rope extension that can be shortened) with synchronous motor and slip clutch, and SPDT. Typical application areas are point level measurement in bulk solids, e.g. cereals, sugar, cacao, animal feeds, washing powders, chalk, dry plaster, cement, granulates and wood chips.



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 600 mm (2.95 to 23.62 in) or the rope extension up to max. 2 000 mm (6.56 ft).

Output

Output signal

Binary

Switch output

Function

Switch a floating change-over contact.

Switching behavior

On/off

Switching time

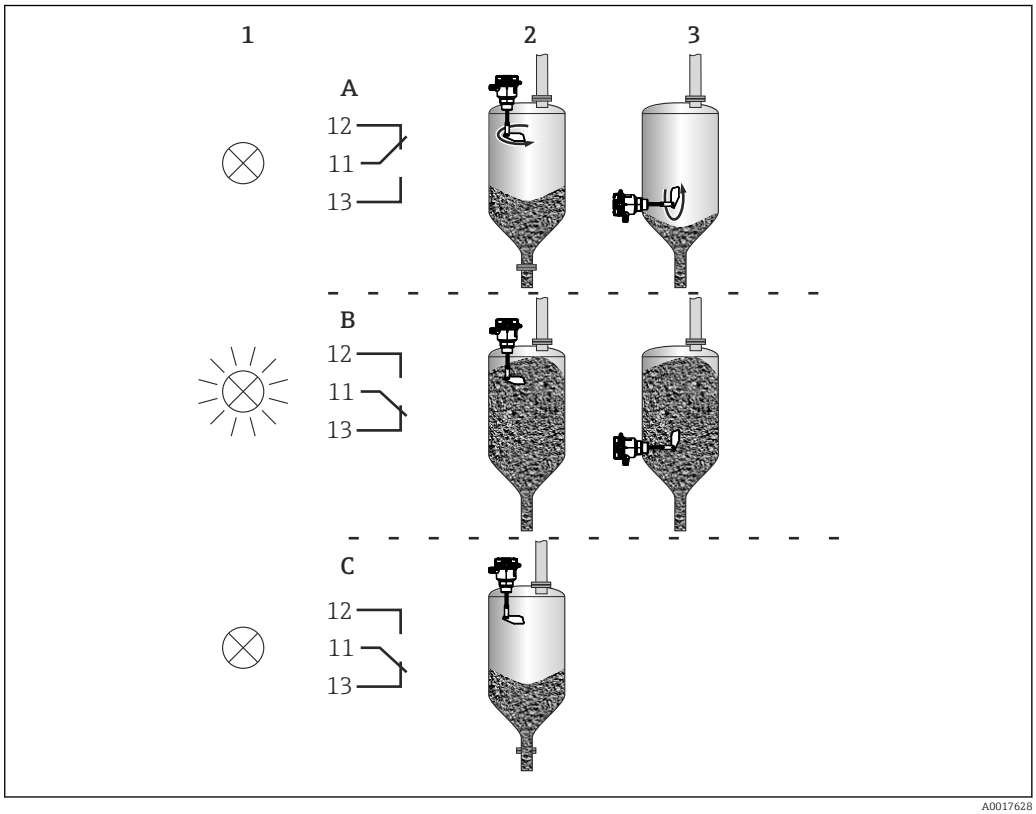
From rotary paddle standstill until output of the switch signal: 20°, corresponds to 3.5 s

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

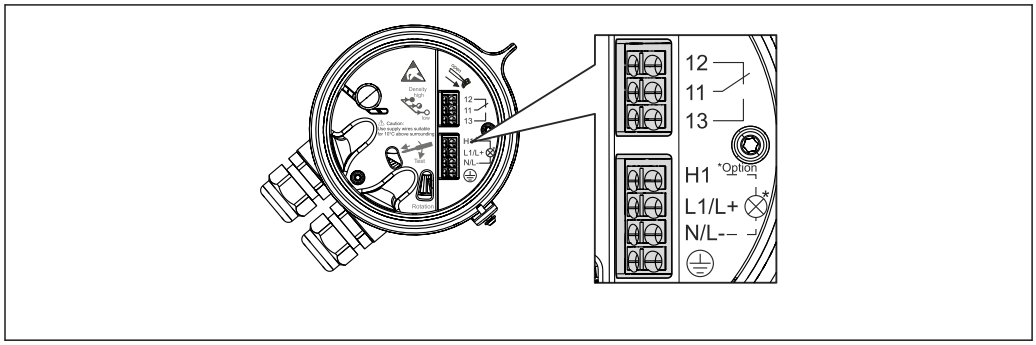


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	1 = Indicator light (optional, non-Ex only)	2 = Full signaling	3 = Refill signaling	Shaft rotation	Internal light
A	OFF	OFF	ON	YES	ON
B	ON	ON	OFF	NO	ON
C (only with optional rotation monitoring)	OFF	ON	OFF	NO	Flashes

Power supply

Terminal assignment



2 *Terminal assignment of the level switch*

Symbol	Description	Symbol	Description
⏚	Protective ground	H1	Connection for signaling empty/full status detection (optional)
N (AC), L- (DC)	Power supply	N/L-	
		11	Change-over contact
L1 (AC), L+ (DC)	Power supply	12	Normally closed contact
		13	Normally open contact

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

Rigid	0.2 to 2.5 mm² (24 to 14 AWG)
Flexible	0.2 to 2.5 mm² (24 to 14 AWG)
Flexible with wire end ferrule without plastic ferrule	0.5 to 2.5 mm² (22 to 14 AWG)
Flexible with wire end ferrule with plastic ferrule	0.5 to 1.5 mm² (22 to 16 AWG)
AWG as per UL/CUL/kcmil	

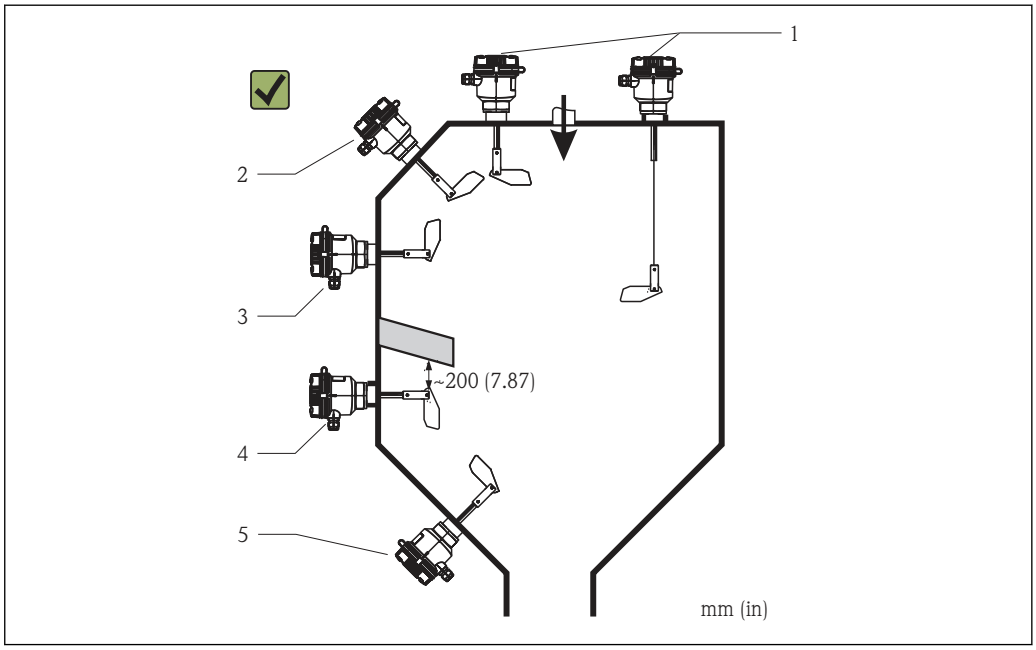
Use wires that are suitable for temperatures 10 °C (18 °F) above the ambient temperature.

Performance characteristics

Shaft speed	1 min^{-1}
Sensitivity	Can be adjusted using an operating element accessible from the top → 🖹 10. ▪ Minimum: 80 g/l (4.99 lb/ft^3) ▪ Depending on the density of the bulk solids adjustable in three stages: low, medium (default), high
Mechanical operating life	500 000 switching operations

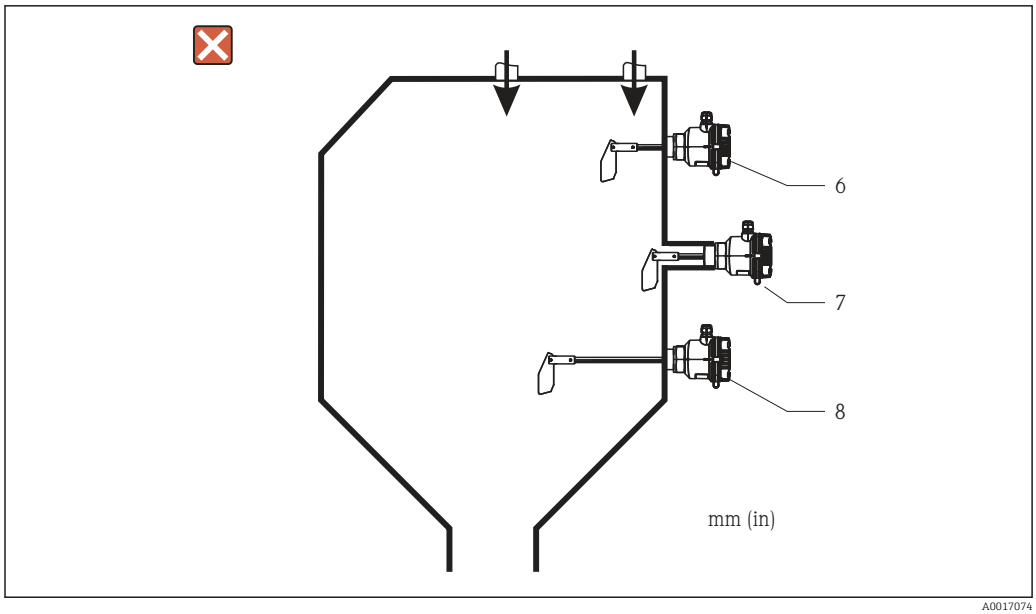
Installation

Installation location



🖹 3 *Permitted 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 orientations of the device*

6: In direction of solids flow
7: Installation coupling too long
8: Horizontal with shaft length > 300 mm (11.8 in)
(In version with reinforced shaft: horizontal with shaft length > 600 mm (23.6 in))

Special installation instructions

Side load on the shaft
- Max. 60 N
- Max. 1 500 N for version with reinforced shaft

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

Maximum flange depth of the connection
With the standard rotary paddle, installation in flange connections is permitted up to a sleeve length ≤ 40 mm (1.57 in). For sleeve lengths > 40 mm (1.57 in) only the version with hinged rotary paddle can be used. 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 → 11.

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

Ambient temperature range

−20 to 60 °C (−4 to 140 °F)

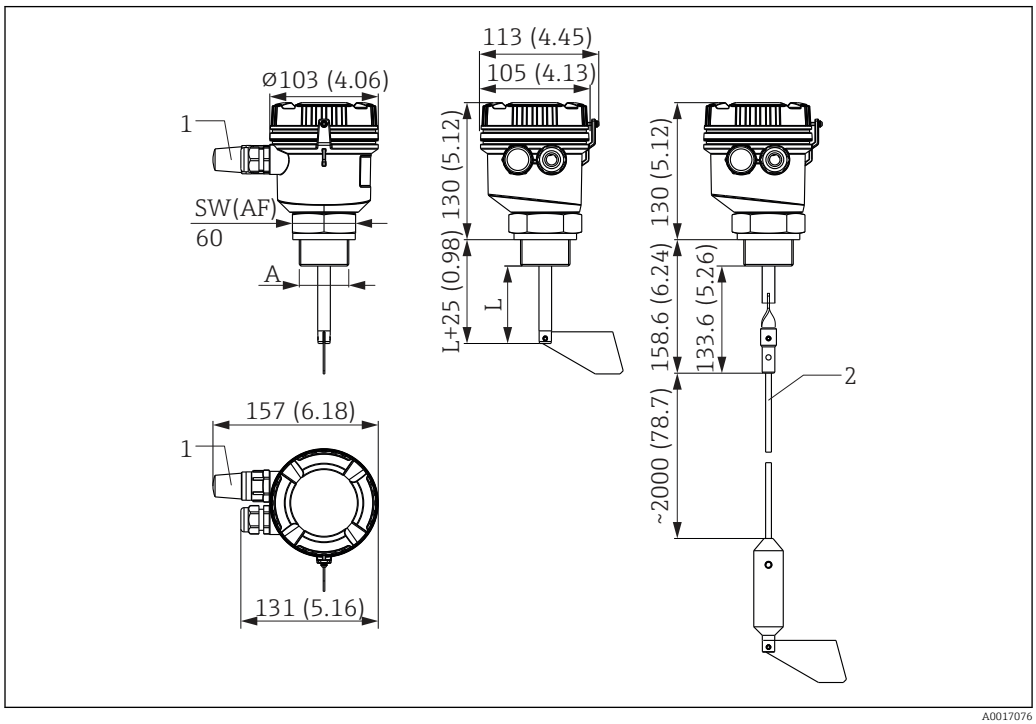
Storage temperature	−20 to 60 °C (−4 to 140 °F)
Climate class	EN60654-1, Class C2
Degree of protection	IP66
Shock resistance	As per EN 60068-2-27: 30g
Vibration resistance	As per EN 60068-2-64: 0.01g²/Hz
Electromagnetic compatibility	Electromagnetic compatibility in accordance with all the relevant requirements 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)

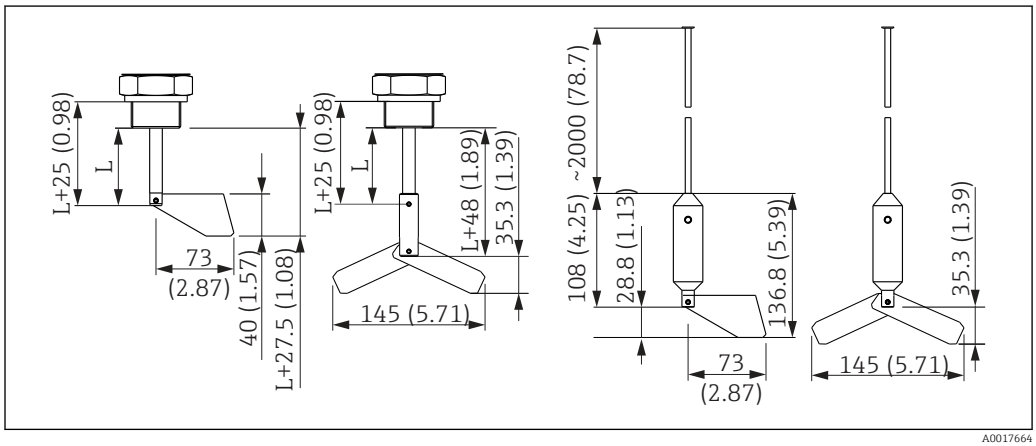
Mechanical construction

Design, dimensions



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

1 Signal lamp (optional)
2 Version with rope extension, can be shortened



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 600 mm (2.95 to 23.62 in) 300 to 600 mm (11.81 to 23.62 in) for version with reinforced shaft

Weight

Version / part	Weight (approx.)
With 100 mm (3.94 in) axis, plastic process connection	800 g (1.76 lb)
With 100 mm (3.94 in) axis, metal process connection	1 600 g (3.53 lb)
Reinforced shaft, with 300 mm (11.81 in) axis, metal process connection	4 100 g (9.04 lb)

Version / part	Weight (approx.)
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) 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)

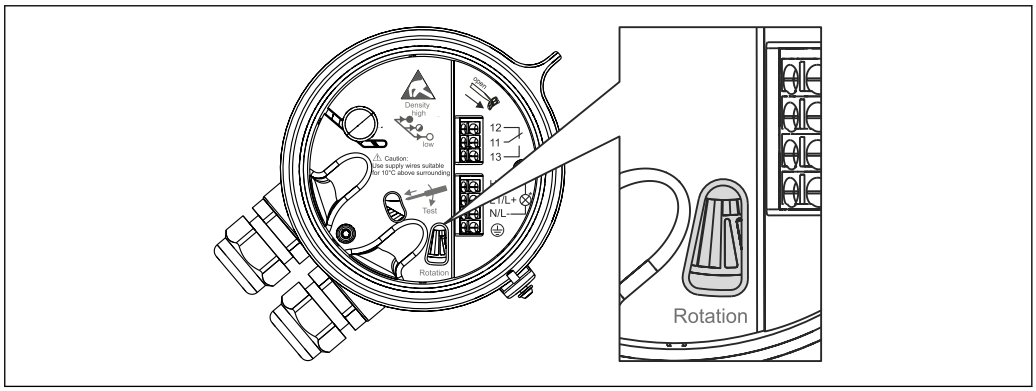
Operability

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 a fault, the LED flashes.

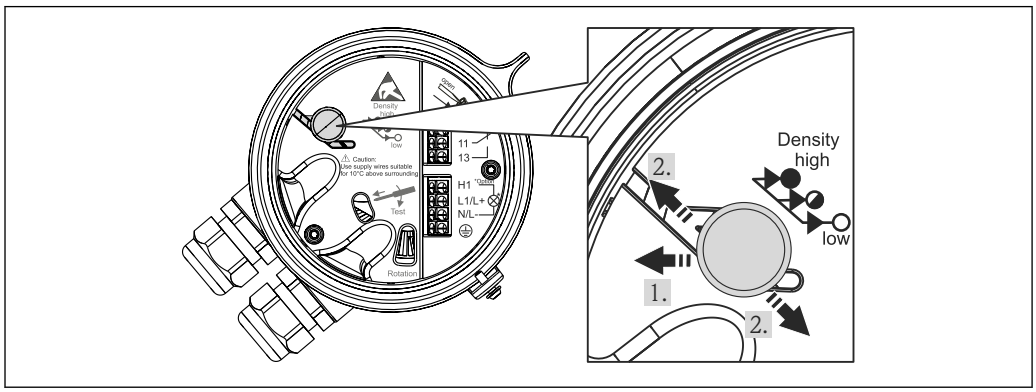


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7 *Inspection glass to observe rotational movement*

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/ft³)
- 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

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

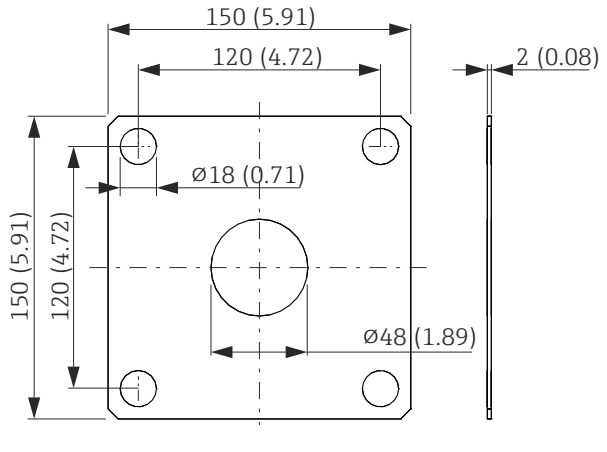
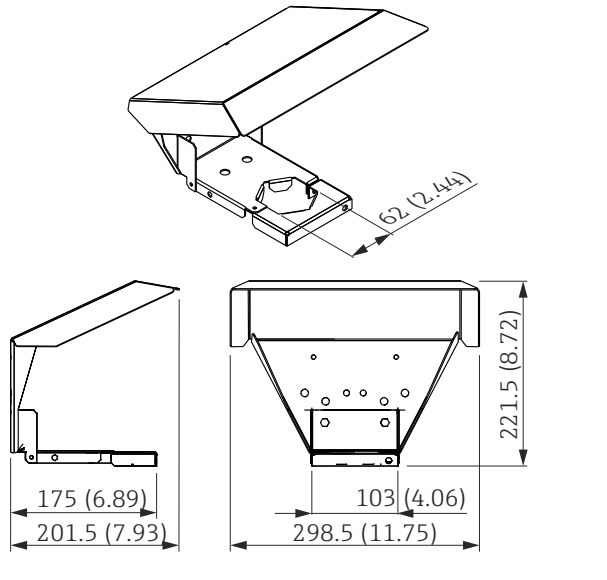
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic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

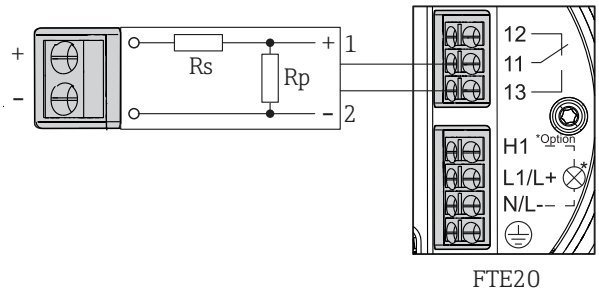
Accessories

The accessories currently available for the product can be selected at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

Device-specific accessories

Accessory	Description
Flanged version, incl. seal and nut for the process connection	 9 Dimensions of the flange connection, dimensions in mm (in) Order as an accessory in the product structure
Weather protection cover	Used to protect the measuring instrument from the adverse effect of the weather and sunlight when fitted in the roof of a silo.  10 Dimensions of the protective cover, dimensions in mm (in)

Accessory	Description
Resistive coupling element for line monitoring Order No. 71505353	Resistive coupling element 1K/10K Ohm (1 pc) for line monitoring; for installation in the terminal compartment of the FTE20;  *Rs: 1 kΩ* *Rp: 10 kΩ*
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

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):

Document	Purpose and content of the document
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** These Operating Instructions contain all the information that is required in the various life cycle phases 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)	Safety Instructions (XA) are supplied with the device, depending on the approval. These are an integral part of the Operating Instructions. The nameplate indicates which Safety Instructions (XA) apply to the device.
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.



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