

Operating Instructions

Soliswitch FTE20

Point level switch

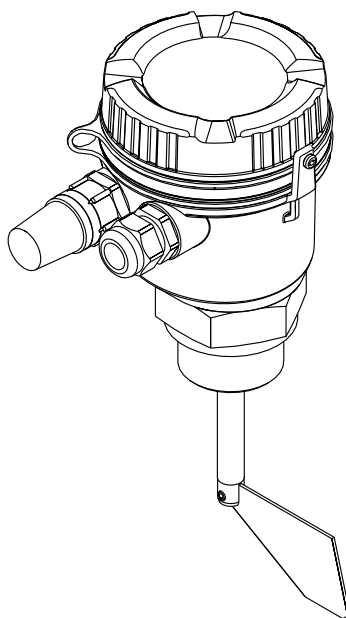


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1 Important document information

1.1 Document function







These 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.

1.2 Document conventions












1.2.1 Safety symbols

Symbol	Meaning
 A0011189-EN	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 A0011190-EN	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011191-EN	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 A0011192-EN	NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.


1.2.2 Electrical symbols



Symbol	Meaning
 A0011197	Direct current A terminal to which DC voltage is applied or through which direct current flows.
 A0011198	Alternating current A terminal to which alternating voltage is applied or through which alternating current flows.
 A0017381	Direct current and alternating current <ul style="list-style-type: none"> ▪ A terminal to which alternating voltage or DC voltage is applied. ▪ A terminal through which alternating current or direct current flows.
 A0011200	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
 A0011199	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.
 A0011201	Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

1.2.3 Symbols for certain types of information





Symbol	Meaning
 A0011182	Permitted Indicates procedures, processes or actions that are permitted.
 A0011183	Preferred Indicates procedures, processes or actions that are preferred.
 A0011184	Forbidden Indicates procedures, processes or actions that are forbidden.
 A0011193	Tip Indicates additional information.
 A0011194	Reference to documentation Refers to the corresponding device documentation.
 A0011195	Reference to page Refers to the corresponding page number.
 A0011196	Reference to graphic Refers to the corresponding graphic number and page number.
	Series of steps
	Result of a sequence of actions
 A0013562	Help in the event of a problem
 A0015502	Visual inspection

1.2.4 Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections

Symbol	Meaning
 A0011187	Hazardous area Indicates a hazardous area.
 A0011188	Safe area (non-hazardous area) Indicates the non-hazardous area.

1.2.5 Tool symbols

Symbol	Meaning
 A0011220	Flat blade screwdriver
 A0011221	Allen key
 A0011222	Open-ended wrench
 A0013442	Torx screwdriver

2 Safety instructions

2.1 Requirements for the personnel


The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- ▶ Trained, qualified specialists must have a relevant qualification for this specific function and task
- ▶ Are authorized by the plant owner/operator
- ▶ Are familiar with federal/national regulations
- ▶ Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- ▶ Following instructions and basic conditions

The operating personnel must fulfill the following requirements:

- ▶ Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- ▶ Following the instructions in these Operating Instructions

2.2 Designated use

The Soliswitch FTE20 must only be used as a point level switch for specific bulk solids (see Technical Data) (→  24).

- The device may only be operated when installed.
- The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated. It is not permitted to convert or modify the device in any way.

2.3 Workplace safety

For work on and with the device:

- ▶ Wear the required personal protective equipment according to federal/national regulations.

2.4 Operational safety

Risk of injury!

- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.

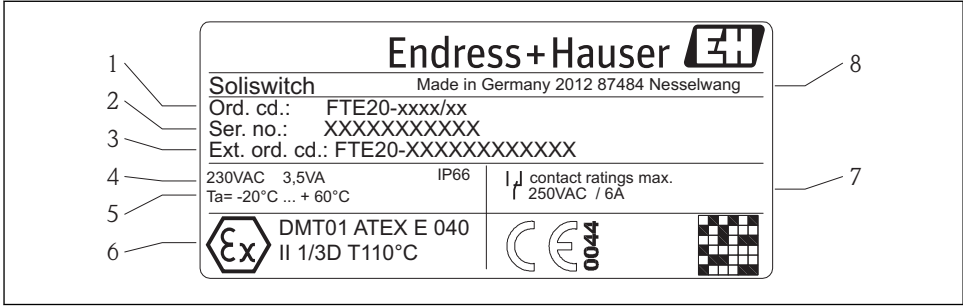
Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.

- ▶ If, despite this, modifications are required, consult with Endress+Hauser.

3 Identification

3.1 Nameplate



1 Nameplate of the Soliswitch FTE20 (example)

- 1 Order code
- 2 Serial number
- 3 Extended order code
- 4 Power supply and IP protection of the housing
- 5 Ambient temperature range
- 6 Approvals
- 7 Output
- 8 Year of manufacture and manufacturer's address

3.2 Certificates and approvals

An overview of all the approvals available is provided in the "Technical data" section (→ 27).


CE mark, Declaration of Conformity

The device is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations in accordance with EN 61010-1 "Safety requirements for electrical equipment for measurement, control and laboratory use".

The device described in these Operating Instructions therefore complies with the statutory requirements of the EU Directives. The manufacturer confirms that the device has been successfully tested by applying the CE mark.

4 Installation

4.1 Incoming acceptance, transport, storage

Compliance with the permitted environmental and storage conditions is mandatory. Precise specifications are provided in the "Technical data" section (→  21).

4.1.1 Incoming acceptance

On receipt of the goods, check the following points:

- Is the packaging or the content damaged?
- Is the delivery complete? Compare the scope of delivery against the information on your order form.


4.1.2 Transport and storage



Please note the following:

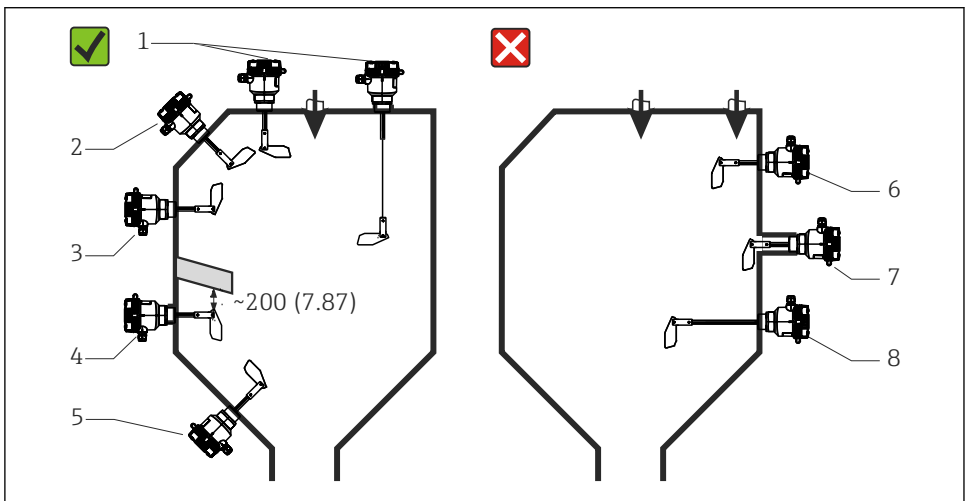
- Pack the device so that is protected against impact for storage and transport. The original packaging provides optimum protection.
- The permitted storage temperature is -20 to 60 °C (-4 to 140 °F).

4.2 Installation conditions

Correct and incorrect installation positions are indicated in (→  2,  9).

The device must be protected against direct sunshine. A weather protection cover is available as an accessory, see the "Accessories" section (→  28).

The dimensions of the device are provided in the "Technical data" section (→  16,  25).



 2 Orientations of the point level switch, dimensions in mm (in)

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Permitted orientations	Forbidden orientations
1: Vertical from the top	6: In direction of solids flow
2: Angled from the top	7: Installation coupling too long
3: From the side	8: Horizontal with shaft length >300 mm (11.8 in)
4: From the side with protective cover against falling solids	
5: From the bottom (device must be protected against shock-type loads)	

Ambient temperature range


-20 to 60 °C (-4 to 140 °F)

Medium temperature range

-20 to 80 °C (-4 to 176 °F)

Mechanical load of optional signal lamp

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

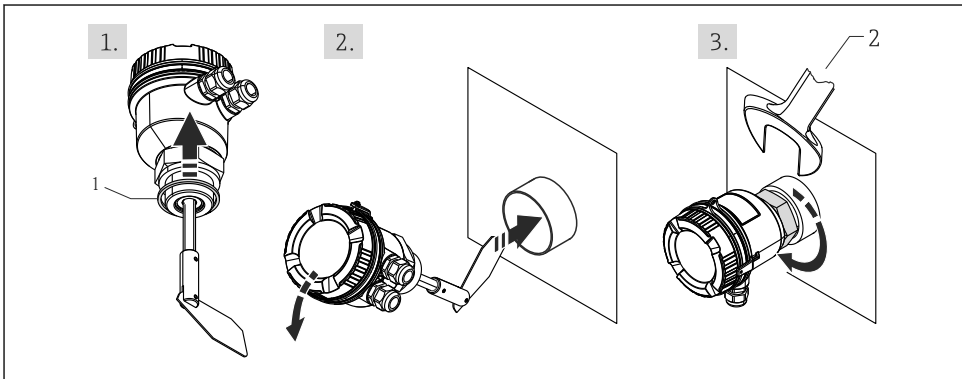
More information is provided in the "Technical data" section (→  23).

4.3 Installation instructions

NOTICE

The device can be damaged if handled incorrectly during installation

- ▶ Do not turn the housing to tighten the process connection. Once the process connection has been tightened, the housing can be aligned so that the cable entries point downwards.



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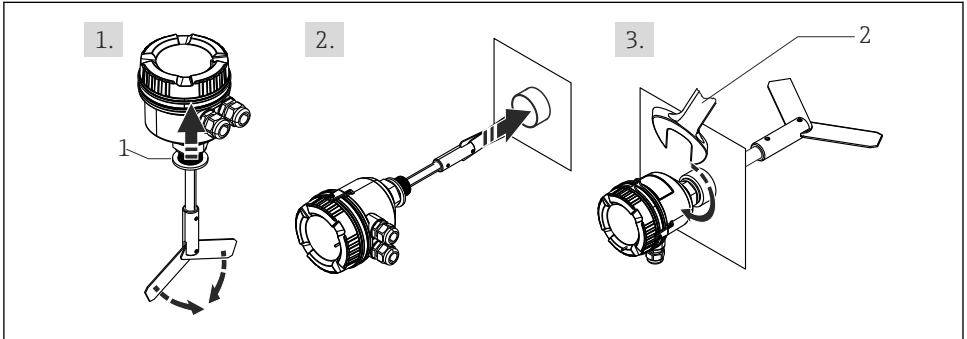
3 Installation of the standard version

- 1 Sealing ring 60x48x3 mm (2.36x1.89x0.12 in.)
- 2 Open-ended wrench AF 60

NOTICE

The device with hinged rotating paddle does not function correctly when the transport lock is secured.

- ▶ Remove the transport lock (plastic net around the rotating paddle) prior to installation.

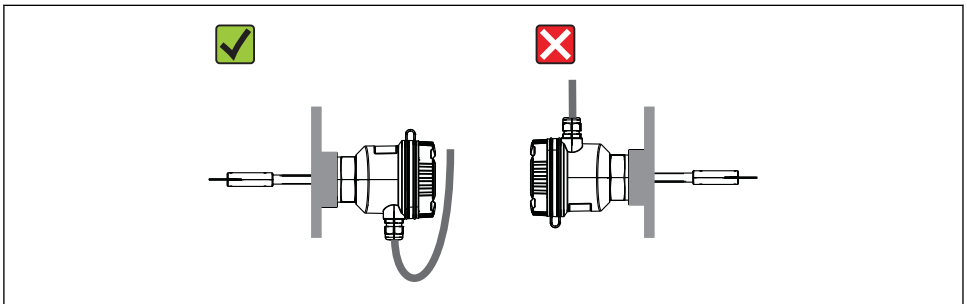


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4 Installation of the version with the hinged rotating paddle

- 1 Sealing ring
- 2 Open-ended wrench AF 60

4.3.1 Turning the housing to the right position

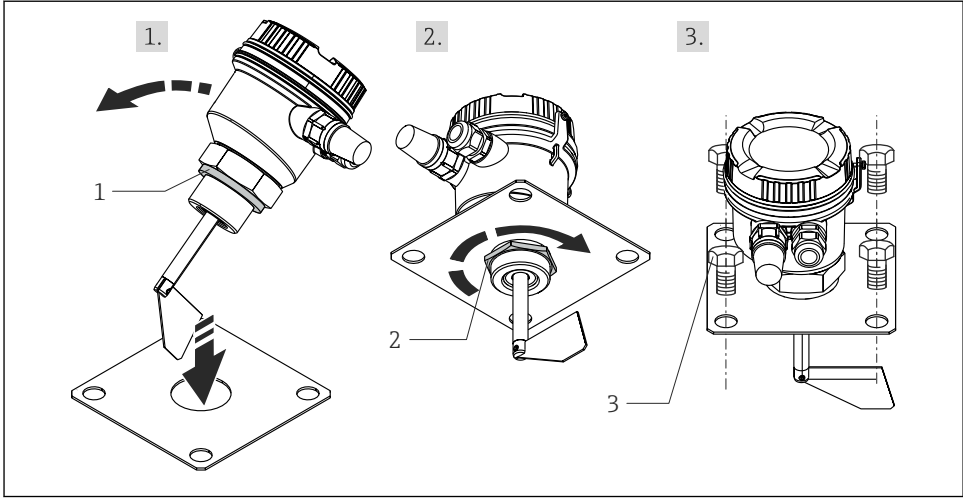


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5 Correct housing position

4.3.2 Installation of the flange version

The flange version is available as an accessory. The dimensions are provided in the "Technical data" section (→ 29).



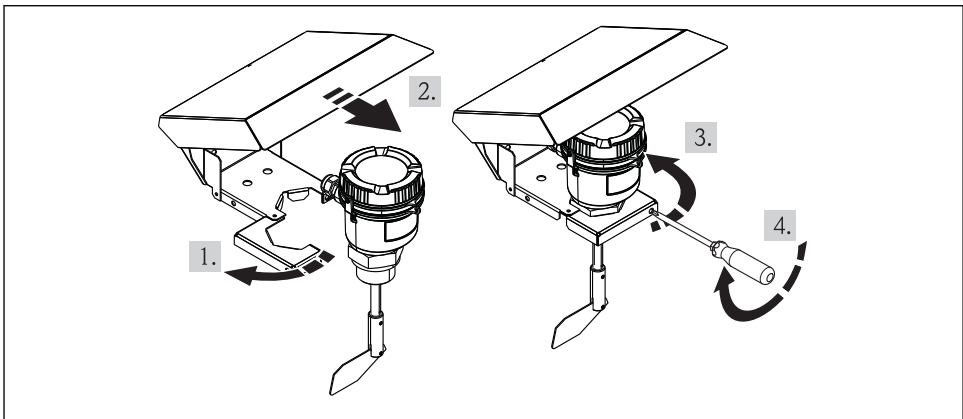
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6 Installation of the flange version

- 1 Process seal
- 2 Nut
- 3 Screws (not included in the delivery)

4.3.3 Mounting the weather protection cover

The weather protection cover is available as an accessory and can be installed without disassembling the point level switch. The dimensions are provided in the "Technical data" section (→ **19**, **29**).



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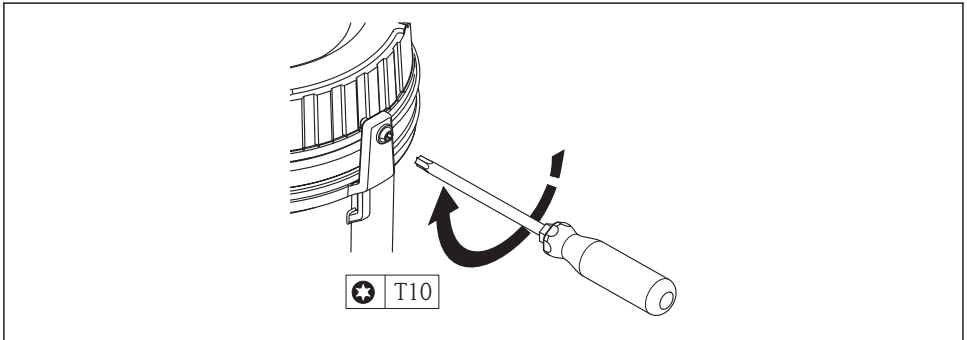
7 Mounting the weather protection cover

- i** To protect the device from sunlight, arrange the weather protection cover in such a way that provides optimum shade for the device.

4.3.4 Installation in hazardous areas

When installing the point level switch in a hazardous area, the securing screw must be tightened to prevent the cover from opening.

Additional installation instructions for the hazardous area are provided in the separate Ex documentation for the device (optional).



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- 8** *Tightening the cover securing screw. This is a combined screw; a flat-blade screwdriver can be used as an alternative to a T10 Torx screwdriver.*

4.4 Post-installation check

- Are the seals undamaged?
- Is the process connection securely tightened?
- Do the cable entries point downwards and are they tightened?
- Is the cover securely closed and the securing screw securely tightened?

5 Wiring

5.1 Connection instructions

⚠ WARNING

Danger! Electric voltage!

- ▶ The entire connection of the device must take place while the device is de-energized.

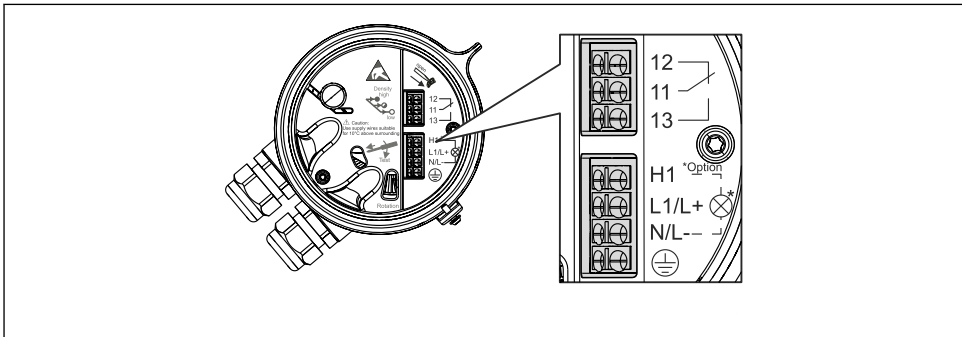
CAUTION**Pay attention to additional information provided**

- ▶ The protective ground conductor must be connected before any other connection is established.
- ▶ Before commissioning the device, make sure that the supply voltage matches the voltage specifications on the nameplate.
- ▶ Provide a suitable switch or power-circuit breaker in the building installation. This switch must be provided close to the device (within easy reach) and marked as a circuit breaker.
- ▶ An overload protection element (rated current ≤ 10 A) is required for the power cable.

NOTICE**High temperatures can damage the cables and the device.**

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

i If replacing an older Soliswitch FTE3x with a new FTE20-type device, note that the free ends of the cable to the terminal are longer than in the older version (approx. 5 to 6 cm (1.97 to 2.36 in)).

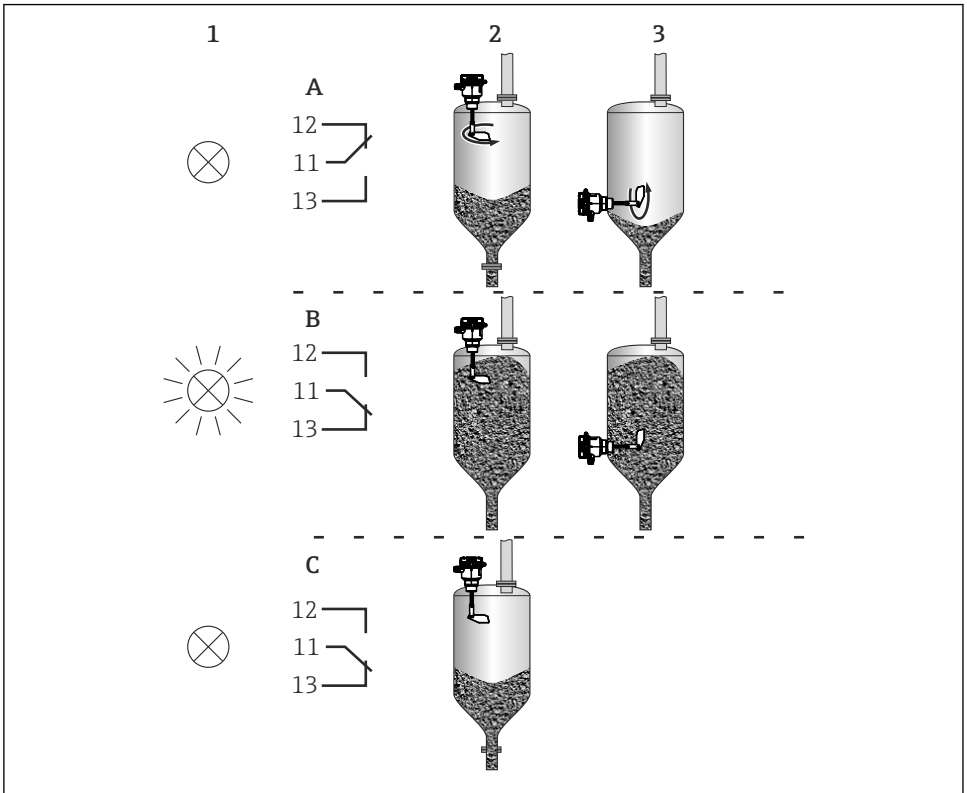
5.2 Quick wiring guide

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9 Terminal assignment of the point level switch

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

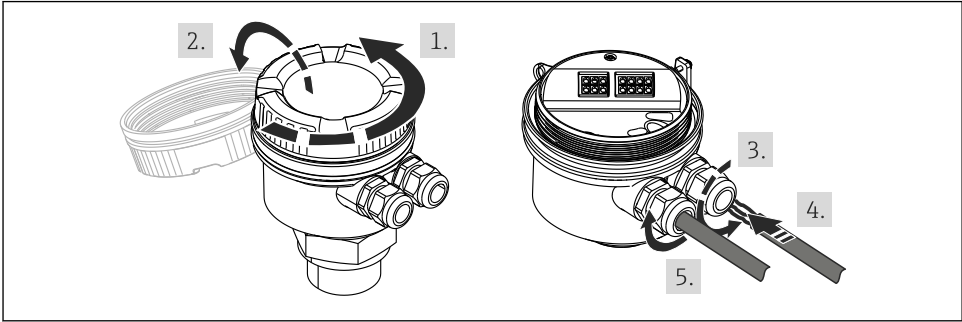
5.2.1 Switching states



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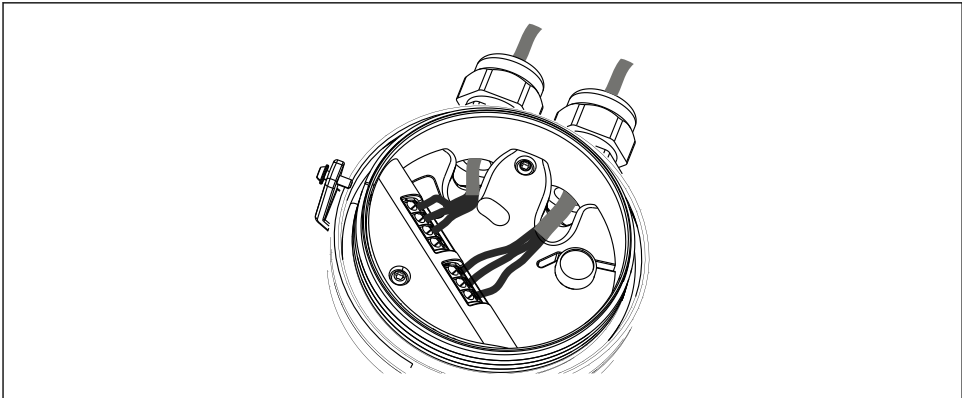
	1 = signal lamp (optional, only non-Ex)	2 = full sensor	3 = demand sensor	axle rotation	internal lighting
A	OFF	OFF	ON	YES	ON
B	ON	ON	OFF	NO	ON
C (only with optional rotation monitoring)	OFF	ON	OFF	NO	Blinking

5.2.2 Inserting the cable



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10 Removing the housing cover and inserting the cables



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11 Connect the cable to the terminals

5.3 Post-connection check

Device condition and specifications	Notes
Are cables or the device damaged?	Visual inspection
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	(→ 1, 8) <ul style="list-style-type: none"> ▪ 20 to 28 V DC ▪ 24 V AC ▪ 115 V AC ▪ 230 V AC

Are the mounted cables connected correctly and strain-relieved?	-
Are the cable glands securely tightened?	-

6 Operation

⚠ WARNING

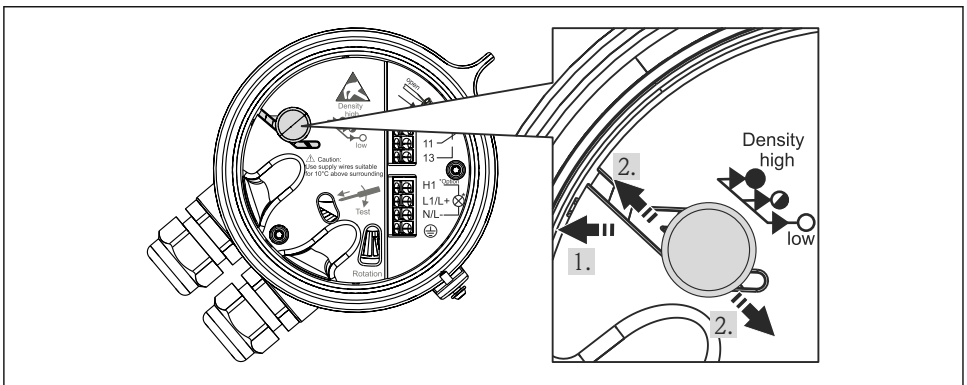
The device is not explosion-protected if the housing is open.

- ▶ The device may only be opened in the hazardous area if no supply voltage is applied. Therefore the device may only be operated in a de-energized state or outside the hazardous area.

6.1 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. The threshold can also be set during operation (in the non-hazardous area):

- Minimum: 80 g/l (4.99 lb/ft³)
- Depending on the density of the bulk solids adjustable in three stages: low, medium (default), high



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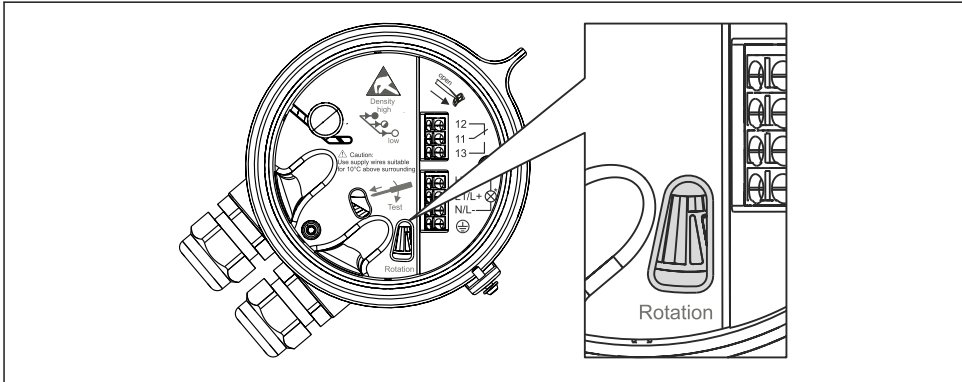
12 Setting the switching threshold

Setting the switching pressure


1. Move the operating element counterclockwise as illustrated in the graphic.
2. Move the operating element to the desired position and let it click into place.

6.2 Rotational movement display

The shaft's rotational movement is displayed by a ratchet disk fitted on the drive axle of the paddle. The viewing area is lit up by an LED to make it easier to see. The rotational movement of the disk, and therefore also the shaft, can be checked through an inspection opening in the cover of the internal compartment when the cover is closed.



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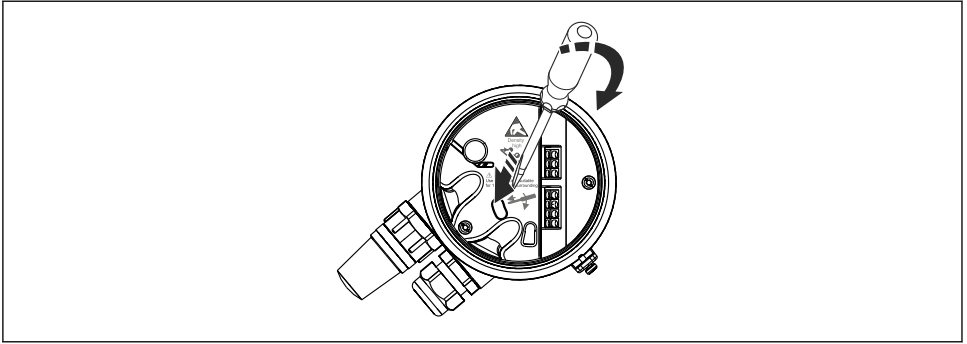
 13 Inspection glass to observe rotational movement

6.3 Indicator light (optional)


The point level switch is optionally fitted with an indicator light that lights up when the rotating paddle stops.

6.4 Testing the internal switch

When the housing cover is open, the function of the internal switch to switch off the motor can be checked by inserting a screwdriver into the opening provided in the electronics cover and by moving the handle in the direction of the arrow.





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 14 *Testing the internal switch*

7 Commissioning

7.1 Post-installation and post-connection check

Checklists:

- Post-installation check(→  13)
- Post-connection check(→  16)

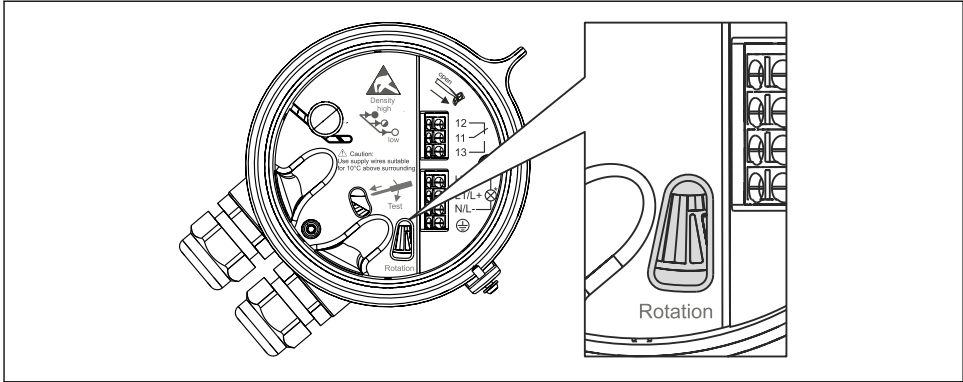
7.2 Setting the switching pressure

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)
- Depending on the density of the bulk solids adjustable in three stages: low, medium (default), high

7.3 Switching on the device

The shaft starts to turn as soon as the supply voltage is switched on. The rotational movement can be observed from the outside.



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15 Window to observe rotational movement

8 Troubleshooting

Functional testing of the point level switch by testing the internal switch (→ 14, 19)

8.1 Point level switch with rotation monitoring

The table below shows the output signal of the point level switch with rotation monitoring for overflow protection.



Rotation monitoring of the FTE20 (optional)

	Power supply	Motor	Output signal of "full" sensor	Internal light
Normal operation	On	Shaft turns	-	On
	On	Shaft does not turn, rotating paddle is covered	Full	On
Event of fault	On	Shaft does not turn, rotating paddle is not covered	Full	Flashes
	Off		Full	Off

If the rotation monitoring system detects an error, a "full" alarm is signaled and the light in the electronics housing flashes.

Function testing of the point level switch

Operate the internal switch

1. Insert a screwdriver or another suitable tool in the opening provided in the electronics cover and move it in the direction indicated, see testing the internal switch (→  14,  19).
 - ↳ The switch is operated and the empty/full alarm is reset.
2. Wait for the error detection time to elapse (approx. 25 s).
 - ↳ If no rotational movement is detected during the error detection time, the device signals the full or empty alarm again and the light in the electronics housing flashes.

9 Technical data

9.1 Input

9.1.1 Measured variable

Level (in line with the orientation and length)

9.1.2 Measuring range

The measuring range depends on the installation location of the Soliswitch FTE20 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).

9.2 Output

9.2.1 Output signal

Binary

9.2.2 Switching output

Function

Switch a floating changeover contact.

Switching behavior

On/off

Switching capacity

- EN 61058: 250 V AC 5E4, 6(2) A
- UL 1054: 125 to 250 V AC, 5 A
- 30 V DC, 8 A
- Min. switching load 300 mW (5 V/5 mA)



After actuating of a current >100 mA the switching function with a switching current I <100 mA cannot be guaranteed.

9.3 Power supply

9.3.1 Terminal assignment

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

9.3.2 Supply voltage

- 20 to 28 V DC
- 24 V AC 50/60 Hz
- 115 V AC 50/60 Hz
- 230 V AC 50/60 Hz



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

9.3.3 Power consumption

Max. 3.5 VA

9.3.4 Terminals

Terminals with spring terminal design

Permitted cable cross-sections

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



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

9.4 Performance characteristics

9.4.1 Shaft speed

1 min⁻¹



9.4.2 Sensitivity

Can be adjusted using an operating element accessible from the top (→ 27).

- Minimum: 80 g/l (4.99 lb/ft³)
- Depending on the density of the bulk solids adjustable in three stages: low, medium (default), high

9.5 Installation

9.5.1 Mounting location

Orientation(→  2,  9)

Permitted	Not permitted	Comments
Vertical from the top		
Angled from the top		Cable entry must point downwards
From the side		Cable entry must point downwards; with protective cover against falling solids depending on the installation position
From the bottom (device must be protected against shock-type loads)		Cable entry must point downwards
	In direction of solids flow	
	Installation socket too long	
	Horizontal with shaft length >300 mm (11.8 in)	

9.5.2 Special mounting instructions

Side load on the shaft

Max. 60 N

Load on the rope

Max. 1500 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)

Mechanical load of optional signal lamp

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

9.6 Environment

The device must be protected against direct sunshine.

A weather protection cover is available as an accessory, see the "Accessories" section (→  28).

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

9.6.1 Ambient temperature range

-20 to 60 °C (-4 to 140 °F)

9.6.2 Storage temperature

-20 to 60 °C (-4 to 140 °F)

9.6.3 Climate class

EN60654-1, Class C2

9.6.4 Degree of protection

IP66

9.6.5 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

9.6.6 Electrical safety

As per IEC 61010-1

Class I equipment, overvoltage category II, pollution degree 2

9.6.7 Altitude

< 2 000 m (6 560 ft) over MSL

9.7 Process**9.7.1 Medium temperature range**

-20 to 80 °C (-4 to 176 °F)

9.7.2 Process pressure range

≤ 1.5 bar (21.8 psi) overpressure (e.g. when silo is filled)

9.7.3 Solids weight

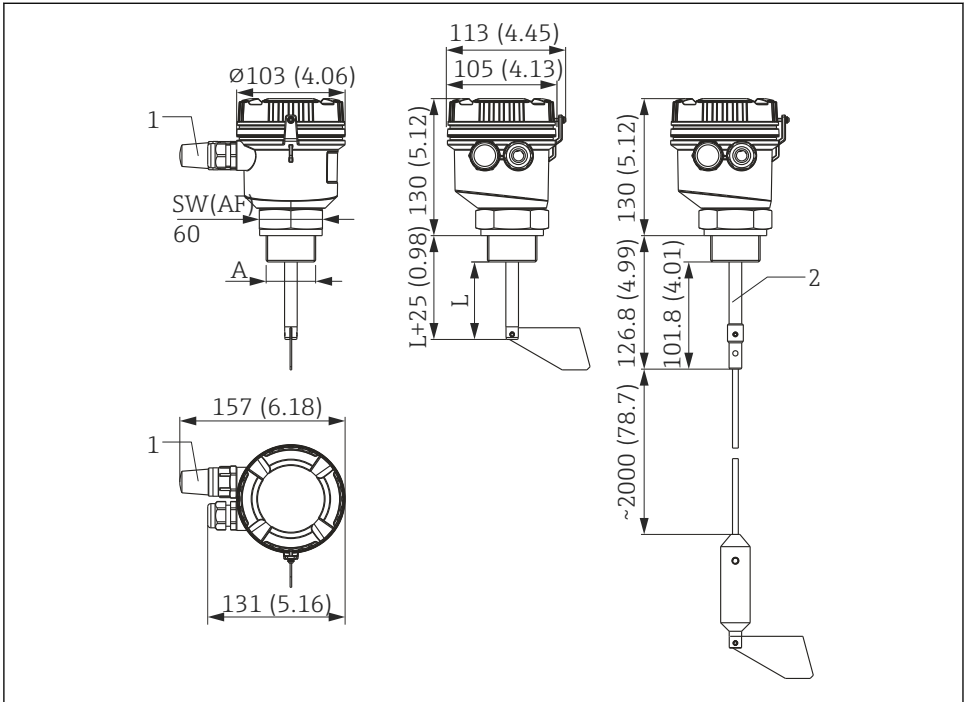
≥80 g/l (4.99 lb/ft³)

9.7.4 Grain size

≤50 mm (1.97 in)

9.8 Mechanical construction

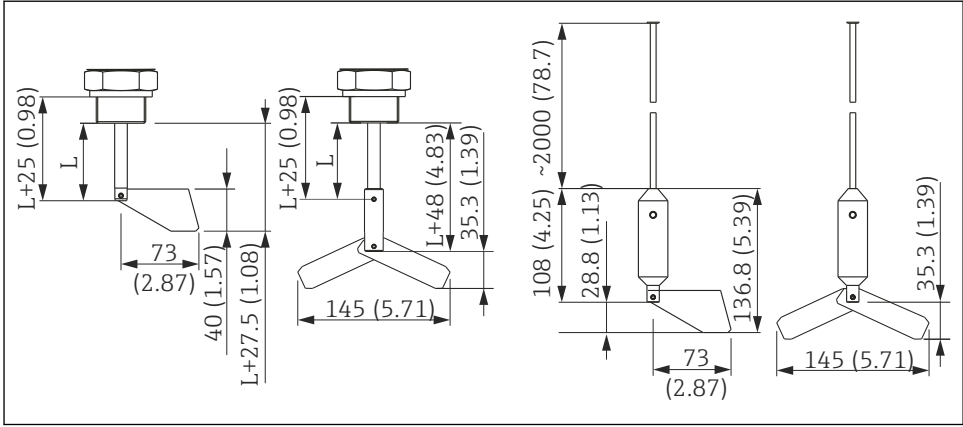
9.8.1 Design, dimensions



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

- 1 Indicator light (optional)
- 2 Version with rope extension



17 Dimensions of the rotating paddle - standard and foldable versions, for shaft and rope, 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)

9.8.2 Weight

Version / part	Weight (approx.)
FTE20 with shaft 100 mm (3.94 in), plastic process connection	800 g (1.76 lb)
FTE20 with shaft 100 mm (3.94 in), metal process connection	1600 g (3.53 lb)
Hinged paddle	110 g (0.24 lb)
Rope extension	755 g (1.66 lb)

9.8.3 Materials

- 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 seal:
NBR
- Process connections:
G3/4": Stainless steel 303
Other versions: Stainless steel 303 version or PBT version

9.8.4 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)

9.9 Operability

9.9.1 Local operation

Rotational movement display

The shaft's rotational movement is displayed by a reflector disk fitted on drive shaft of the 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.

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)
- Depending on the density of the bulk solids adjustable in three stages: low, medium (default), high

9.10 Certificates and approvals

9.10.1 CE mark

The measuring system meets the legal requirements of the EU Directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

9.10.2 Ex approval

Information about currently available Ex versions (ATEX, FM, CSA, etc.) can be supplied by your E+H Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.

9.10.3 Other standards and guidelines

- IEC 60529:
Degrees of protection provided by enclosures (IP code)
- IEC 61010-1: 2001 cor 2003
Safety requirements for electrical equipment for measurement, control and laboratory use
- IEC 61326 series:
Electromagnetic compatibility (EMC requirements)
- Climate class as per EN60654-1, Class C2

9.11 Accessories

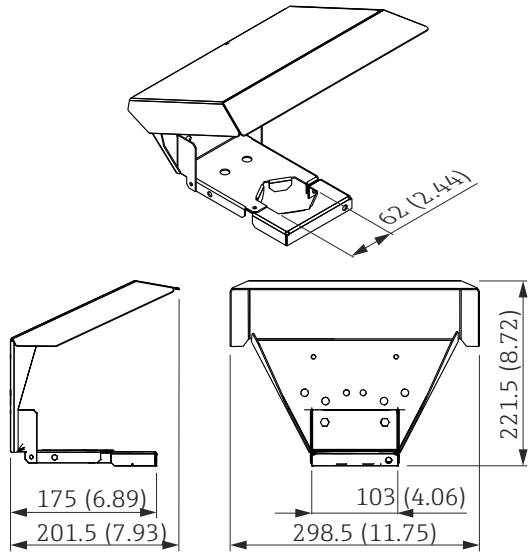
Various accessories, which can be ordered with the device or subsequently from Endress +Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress +Hauser website: www.endress.com.

9.11.1 Device-specific accessories

Accessories	Description
Flanged version, incl. seal and nut for the process connection	<p style="text-align: right;">A0018A72</p> <p> ☐ 18 <i>Dimensions of the flange connection, dimensions in mm (in)</i> </p> <p style="text-align: center;">Order as an accessory in the product structure</p>

Protective cover

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



A0017694

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

Order as an accessory in the product structure

www.addresses.endress.com
