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Technical Information
Soliphant T FTM21

Vibronic



Robust level switch for bulk solids, also for areas at risk of dust explosions

Field of application

The Soliphant is a robust level switch for silos with fine-grained or coarse-grained, non-fluidized bulk solids.

The various designs mean the device has a wide range of applications. Certificates are available for use in dust explosive areas.

Vibrating rod with extension pipe 500 mm (20 in), 1 000 mm (40 in) or 1 500 mm (60 in) for installation in any direction.

Typical applications: Cereals, coffee beans, sugar, animal feed, rice, detergents, dye powder, chalk, gypsum, cement, sand, plastic granules.

Your benefits

- No adjustment: Easy commissioning
- Resistant to buildup: Maintenance-free operation
- No mechanically moving parts: No wear, long operating life
- Sensor material 316L: Hardly any abrasion even with building materials
- Plastic housing with transparent cover: Switching status visible from outside
- Aluminum housing available
- Resistant to external vibrations and flow noises
- Approvals for use in hazardous areas such as ATEX, IEC Ex, FM or CSA

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About this document

Document conventions

Safety symbols

DANGER
This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

CAUTION
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Symbol	Meaning
⎓	Direct current
~	Alternating current
⎓ ~	Direct current and alternating current
⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⊜	**Protective earth (PE)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: ▪ Internal ground terminal: Protective earth is connected to the mains supply. ▪ External ground terminal: Device is connected to the plant grounding system.

Symbols for certain types of information

Symbol	Meaning
✓	**Permitted** Procedures, processes or actions that are permitted.
✗	**Forbidden** Procedures, processes or actions that are forbidden.
ℹ	**Tip** Indicates additional information.
📖	Reference to documentation
▶	Notice or individual step to be observed
1., 2., 3...	Series of steps

Symbols in graphics

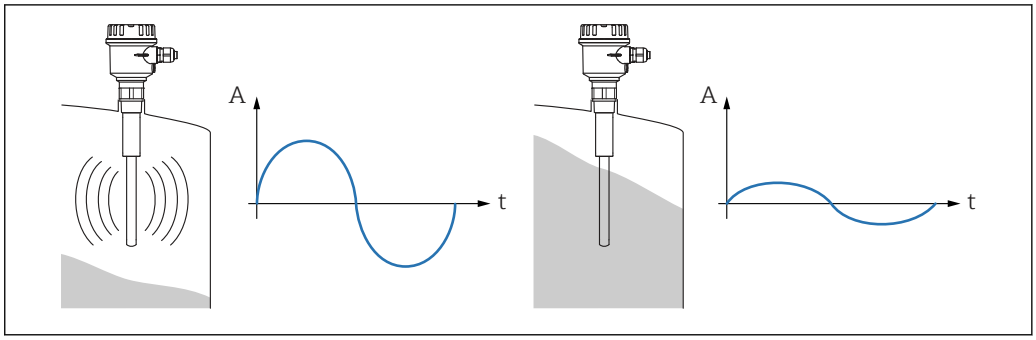
Symbol	Meaning
1, 2, 3 ...	Item numbers
1., 2., 3...	Series of steps
A, B, C, ...	Views

Symbol	Meaning
	**Hazardous area** Indicates the hazardous area.
	**Safe area (non-hazardous area)** Indicates the non-hazardous area.

Function and system design

Measuring principle

A piezoelectric drive excites the vibrating rod of Soliphant to its resonance frequency. If a medium covers the vibrating rod, the rod's vibrating amplitude changes (the oscillation is attenuated). The electronics of the Soliphant compares the actual amplitude with a target value and indicates whether the vibrating rod is vibrating freely or whether it is covered by the medium.



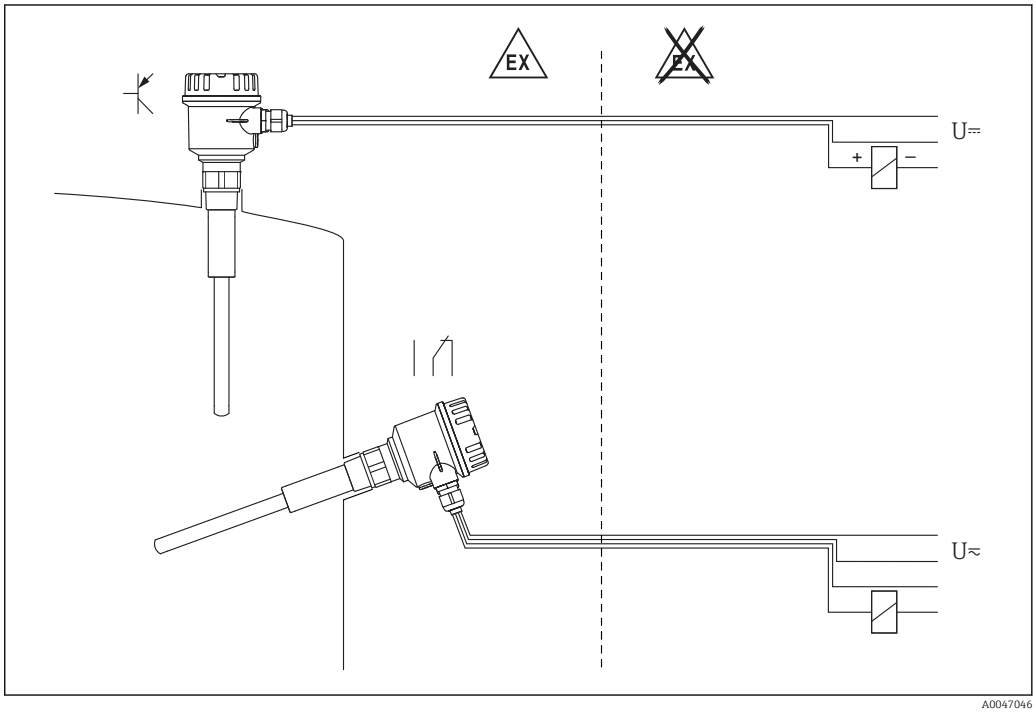
A0047042

A Amplitude

Measuring system

The Soliphant T is a compact electronic switch.

The entire measuring system consists of, e.g.:
- Soliphant T FTM21 with electronic insert FEM22 or FEM24
- a voltage source
- connected controllers, switching devices, signal transmitters (e.g. lamps, horns, PCS, PLC)



A0047046

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 length of the pipe extension selected. The pipe extension is available in the following lengths: 500 mm (20 in), 1 000 mm (40 in) or 1 500 mm (60 in).
Input signal	▪ Probe covered = small amplitude ▪ Probe not covered = large amplitude
Operating frequency	700 to 800 Hz

Output

Ex specification	FEM22, FEM24: Explosion protection for potentially explosive dust/air mixtures: Dust ignition-proof, DIP
Galvanic isolation	▪ FEM22: Between the sensor and the power supply ▪ FEM24: Between the sensor, power supply and load
Switching behavior	Binary
Switch-on behavior	When the power supply is switched on, the switching status of the outputs corresponds to the signal on alarm. The switching position is reached after a maximum of 3 seconds.
Safety mode	Minimum/maximum quiescent current safety can be switched at the electronic insert ▪ MAX = maximum safety When the vibrating rod is covered, the output switches in the direction of the failure signal Used, for example, for overflow protection systems ▪ MIN = minimum safety When the vibrating rod becomes exposed, the output switches in the direction of the failure signal. Used, for example, for dry running protection
Switching delay	▪ When the sensor is covered: 0.5 seconds ▪ When the sensor is exposed: 1 second

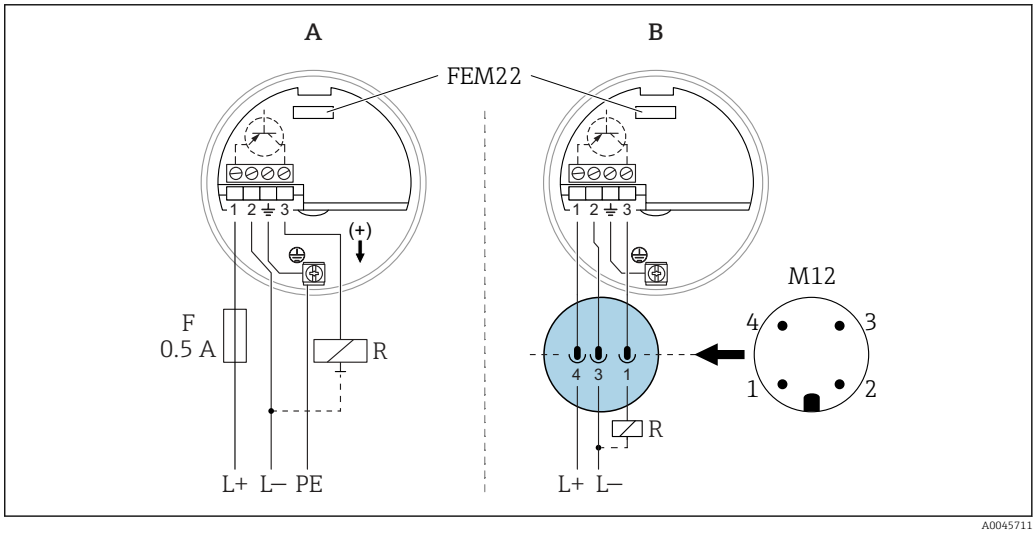
Electronic insert FEM22 (DC PNP)

Power supply

- DC voltage: 10 to 45 V
- Max ripple 5 V, 0 to 400 Hz
- Current consumption max. 18 mA
- Power consumption max. 0.81 W
- Reverse polarity protection
- Separation voltage: 2.2 kV
- Overvoltage protection: Overvoltage category OC II

Electrical connection

Three-wire DC connection with cable entry / M12 plug
- Preferably in conjunction with programmable logic controllers (PLC)
- DI modules as per EN 61131-2
- Positive signal at switching output of electronics module (PNP)
- Output blocked at point level



A0045711

A Wired with cable entry supplied by customer (order feature 40, options: 2, 3, 4, 5, 6, 7)
B Order feature 40, options: 1, 8

Output signal

Safety mode	Level	Output signal	LEDs	
			Green	Yellow
MAX		L+ 1 I_L + 3	 A0038205	 A0037697
		1 <100 µA 3	 A0038205	 A0037699
MIN		L+ 1 I_L + 3	 A0038205	 A0037697
		1 <100 µA 3	 A0038205	 A0037699

- IL = load current (switched through)
- <100 µA = residual current (blocked)

Failure signal

Output signal in the event of a power failure or device failure: < 100 µA

Connectable load

- Load switched via the transistor and separate PNP connection
- Load current: Max. 45 V (clocked overload and short-circuit protection), continuous max. 350 mA
- Residual current : <100 µA (with transistor blocked)
- Capacitive load: max. 0.5 µF at 45 V, max. 1.0 µF at 24 V
- Residual voltage : <3 V (with transistor switched through)

Cable specifications

Use a shielded cable in the event of strong electromagnetic radiation.

- Temperature resistance: The connecting cables must withstand the ambient temperature +20 K
- Cable entries: M20x1.5 (cable gland); NPT ½; G ½

Electronic insert FEM24 (AC/DC with relay output)

Power supply

- AC voltage: 19 to 253 V, 50/60 Hz or DC voltage: 19 to 55 V
- Power consumption max. 1.3 W
- Current consumption max. 18 mA
- Reverse polarity protection
- Separation voltage: 2.2 kV
- Overvoltage protection: Overvoltage category OC II

Electrical connection

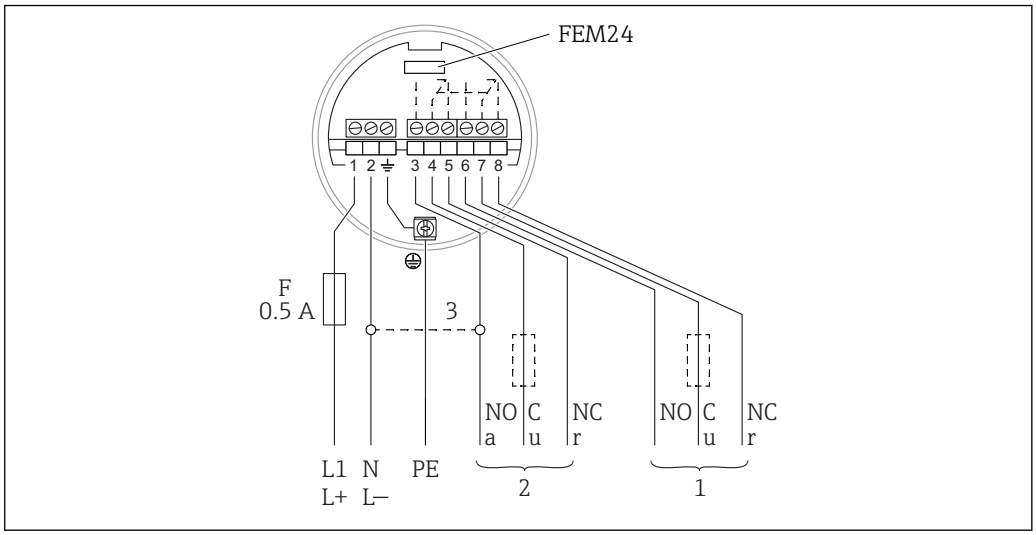
Power supply

Note the different voltage ranges for alternating current and direct current!

Output

When connecting a device with high inductance, fit a spark barrier to protect the relay contact. A fine-wire fuse (depending on the load connected) protects the relay contact on short-circuiting. Both relay contacts switch simultaneously. DPDT (double pole double throw)

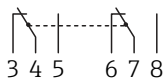
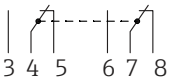
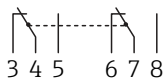
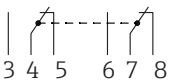
Note the different voltage ranges for alternating current and direct current!



A0045710

1, 2 Refer to "Connectable load"
3 When bridged, the relay output works with NPN logic

Output signal

Safety mode	Level	Output signal	LEDs	
			Green	Yellow
MAX		 3 4 5 6 7 8	 A0038205	 A0037697
		 3 4 5 6 7 8	 A0038205	 A0037699
MIN		 3 4 5 6 7 8	 A0038205	 A0037697
		 3 4 5 6 7 8	 A0038205	 A0037699

Failure signal

Output signal in event of power failure: Relay de-energized

Connectable load

- Loads switched via 2 potential-free change-over contacts
- I~ max. 6 A, U~ max. 253 V; P~ max. 1500 VA, cos φ = 1, P~ max. 750 VA, cos φ > 0.7
- I- max. 6 A to 30 V, I- max. 0.2 A to 125 V
- The following applies when connecting a functional low-voltage circuit with double insulation in accordance with IEC1010: Sum of the voltages of relay output and power supply max. 300 V

Cable specifications

Use a shielded cable in the event of strong electromagnetic radiation.

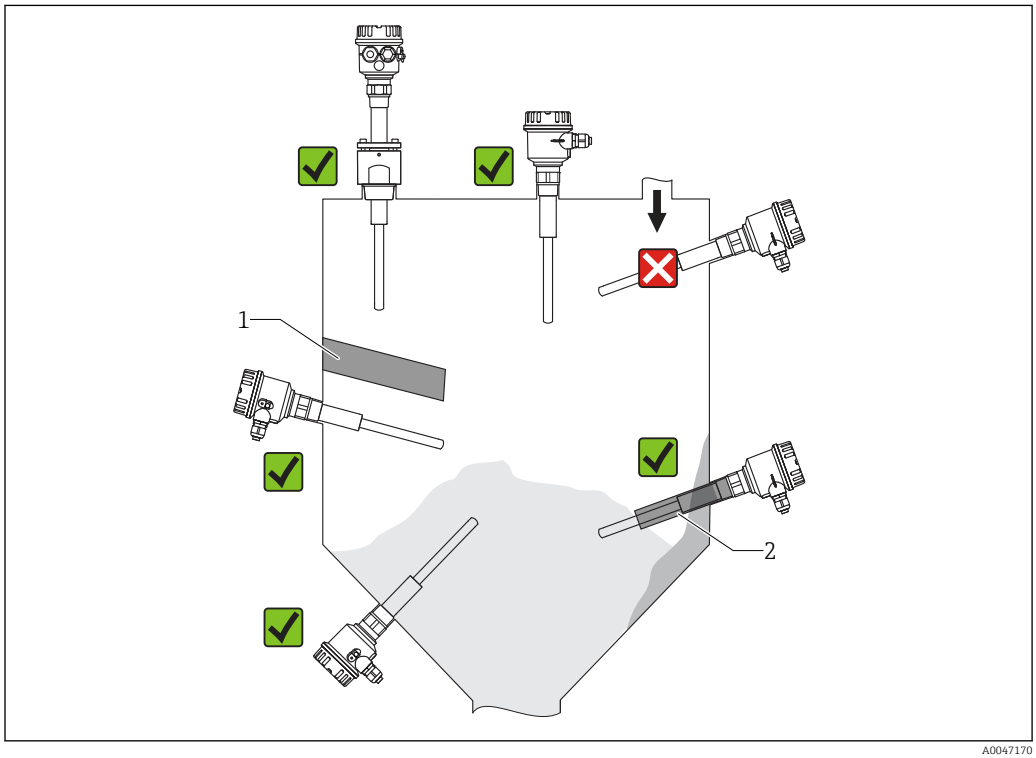
- Temperature resistance: The connecting cables must withstand the ambient temperature +20 K
- Cable entries: M20x1.5 (cable gland); NPT ½; G ½

Installation

Installation location

E.g. in storage or a buffer container.

Orientation



1 Vertical installation

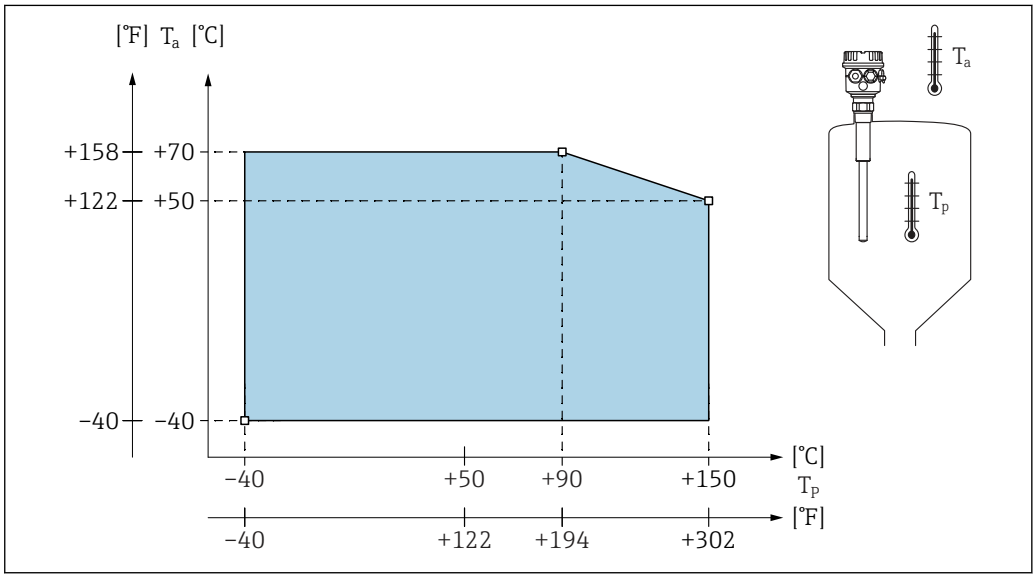
1 With protective cover (to be installed by the customer)
2 With protection pipe (to be installed by the customer)

Environment

Ambient temperature range

−40 to 70 °C (−40 to 158 °F)

Permitted ambient temperature T_a at the housing as a function of the medium temperature T_p in the vessel:



A0045704

Storage temperature

−40 to 85 °C (−40 to 185 °F)

Climate class

Climate protection as per DIN IEC 68 Part 2-38, Fig. 2a

Degree of protection

IP66/IP67, NEMA4X

Vibration resistance

DIN 60068-2-27/IEC 68-2-27
- Shock: 30 g
- Vibration: 0.01 g^2/Hz

Electrical safety

IEC 61010, CSA 1010.1-92, FM3600

Electromagnetic compatibility

- Interference emission according to EN 61326, electrical equipment Class B
- Interference resistance according to EN 61326, Annex A (Industrial)

Installation height as per IEC61010-1 Ed.3

Up to 2 000 m (6 600 ft) above sea level.

Process

Medium pressure range

−1 to 25 bar (−14.5 to 362.5 psi)

Max. working pressure (MWP)

25 bar (362.5 psi)

Burst pressure

100 bar (1 450 psi)

State of matter

Solids

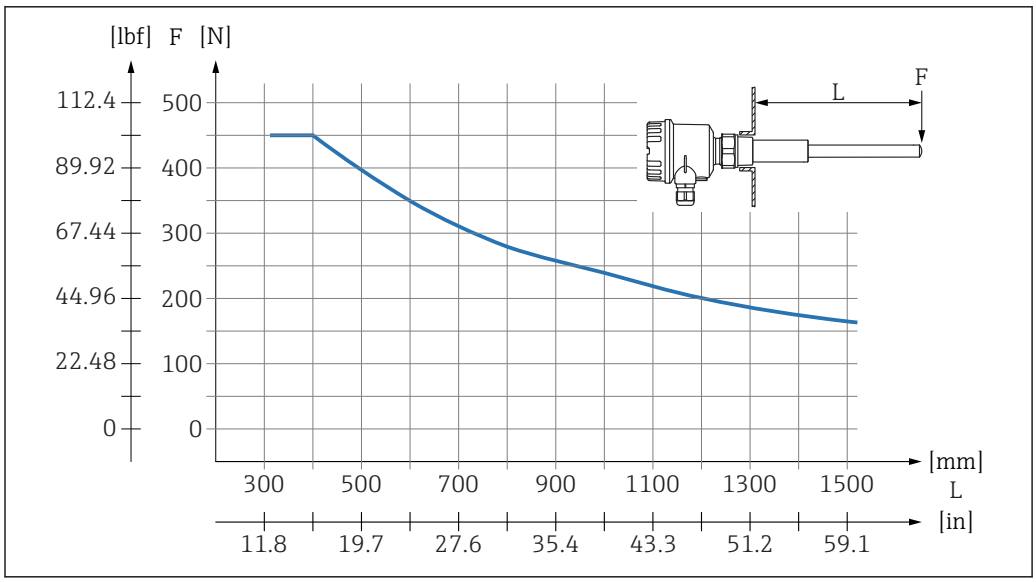
Grain size

≤25 mm (0.98 in)

Bulk density

≥200 g/l (26.7 oz/gal US), not fluidized

Side load



A0045700

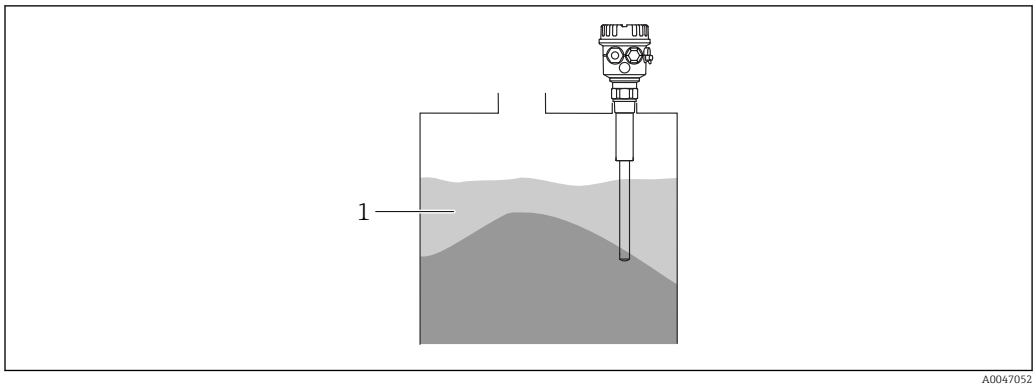
F Maximum permitted side load in N (lbf)
L Length in mm (in)

Thermal shock

Maximum 120 K

Sediment detection

Detection of solids under water: Coverage is not detected by water-like liquids.



A0047052

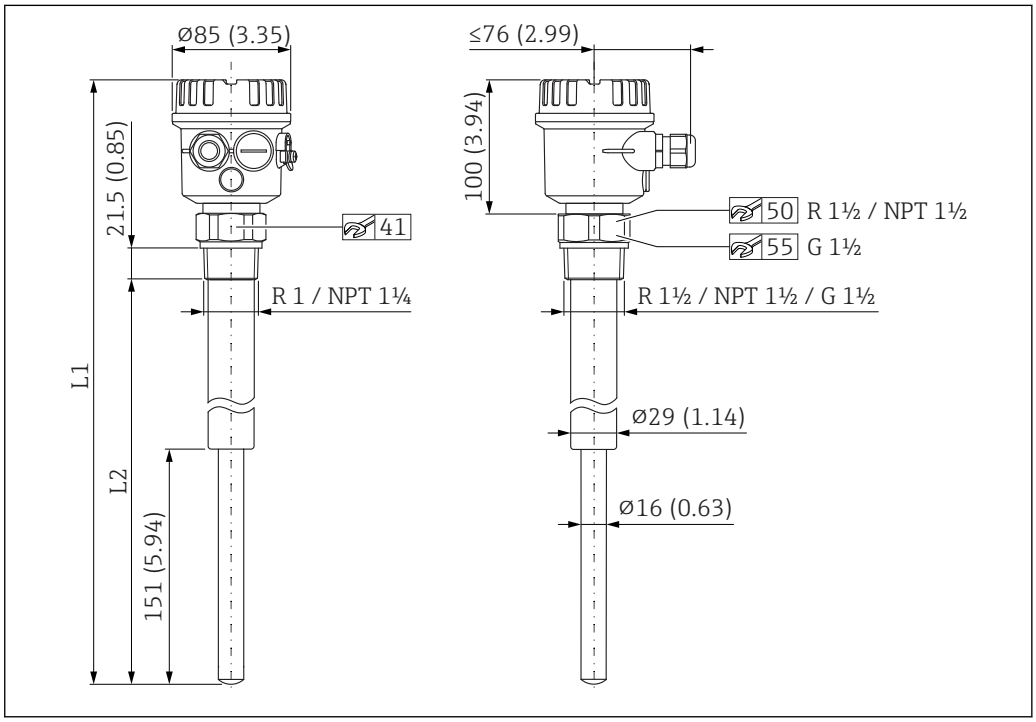
Mechanical construction

The following dimensions are rounded values. As a result, there may be deviations from the specifications in the Product Configurator at www.endress.com.

Design, dimensions

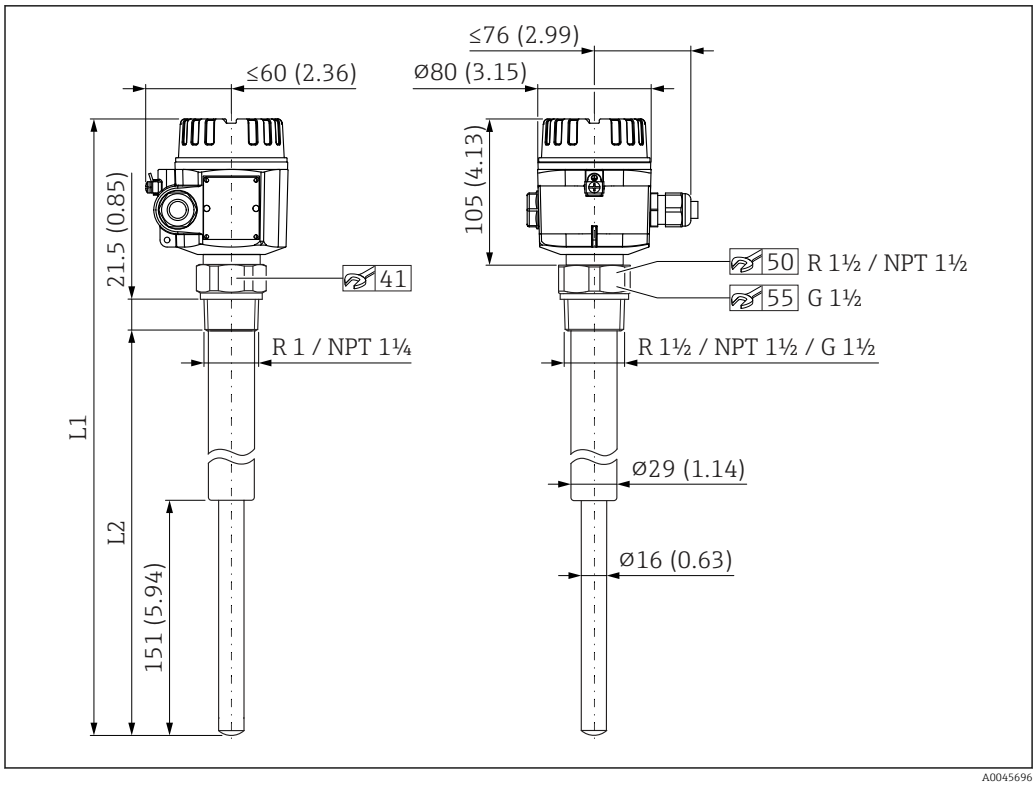
The following figures show one possible configuration. The individual process connections can be combined with different housing versions.

See the Product Configurator for additional configuration options: www.endress.com



2 *Threaded process connection with F16 polyester housing*

L1 654.5 mm (25.77 in), 1 154.5 mm (45.46 in), or 1 654.5 mm (65.14 in)
L2 500 mm (20 in), 1 000 mm (40 in), or 1 500 mm (60 in)



3 Threaded process connection with F18 aluminum housing

L1 659.5 mm (26 in), 1 159.5 mm (45.65 in), or 1 659.5 mm (65.34 in)
L2 500 mm (20 in), 1 000 mm (40 in), or 1 500 mm (60 in)

Weight

Device with plastic housing, FEM24 and R 1 thread:

- 500 mm (20 in): approx. 1.3 kg (2.87 lb)
- 1 000 mm (40 in): approx. 2 kg (4.41 lb)
- 1 500 mm (60 in): approx. 2.6 kg (5.73 lb)

Materials

Materials in contact with process

- Process connections
  - R 1, R 1½: 316L, DIN 2999
  - NPT 1¼ , NPT 1½: 316L, ANSI B 1.20.1
  - G 1½: 316L
- Sensor
  316L

Materials not in contact with process

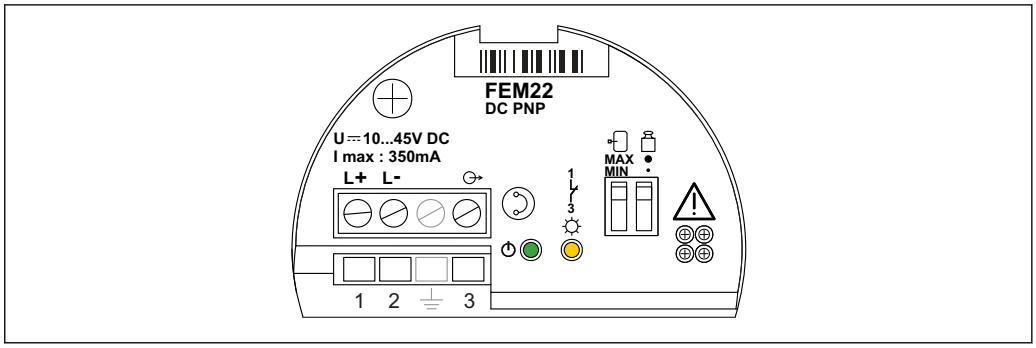
- Plastic housing F16:
  - Housing: PTB-FR
  - Transparent cover: PA12
  - Cover seal: EPDM
- Aluminum housing F18
  - Housing: EN-AC-AlSi10Mg aluminum, plastic-coated
  - Cover seal: EPDM

Operability

Local operation

The switch settings in the following graphics are in the as-delivered state.

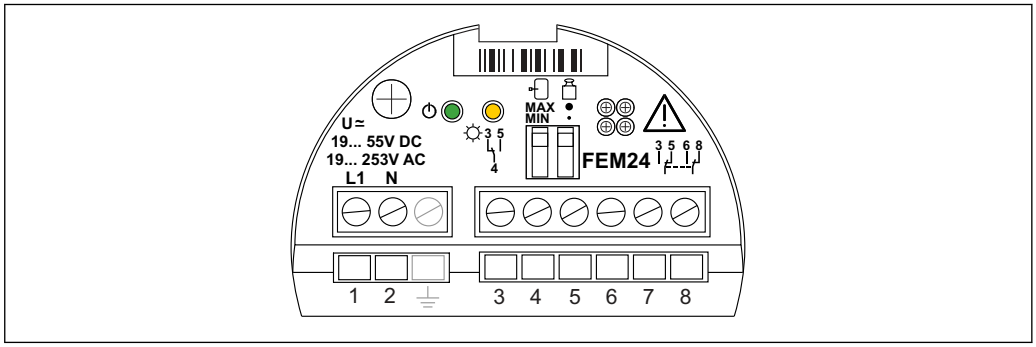
FEM22



A0045694

- A green LED: Operation
- A yellow LED: Electronic switch closed

FEM24



A0045693

- A green LED: Operation
- A yellow LED: Contact closed (relay energized or fed with current)

Controls

As-delivered state	 A0047050	
Switch for safety mode	 A0047051	MAX = overfill protection system MIN = dry running protection
Switch for bulk density/density setting	 A0025607	● = 400 g/l (high bulk density) · = 200 g/l (low bulk density)

Certificates and approvals

Current certificates and approvals for the product are available via the Product Configurator at www.endress.com.

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

The **Configuration** button opens the Product Configurator.

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. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button to the right of the product image opens the Product Configurator.

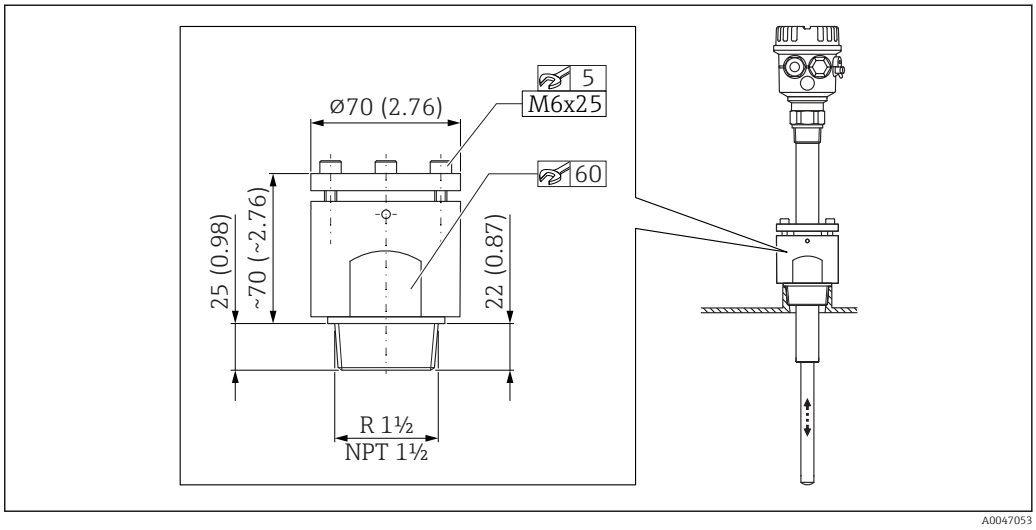
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic 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

Device-specific accessories

Sliding sleeve for pressurized vessels

Suitable for setting multiple switch points

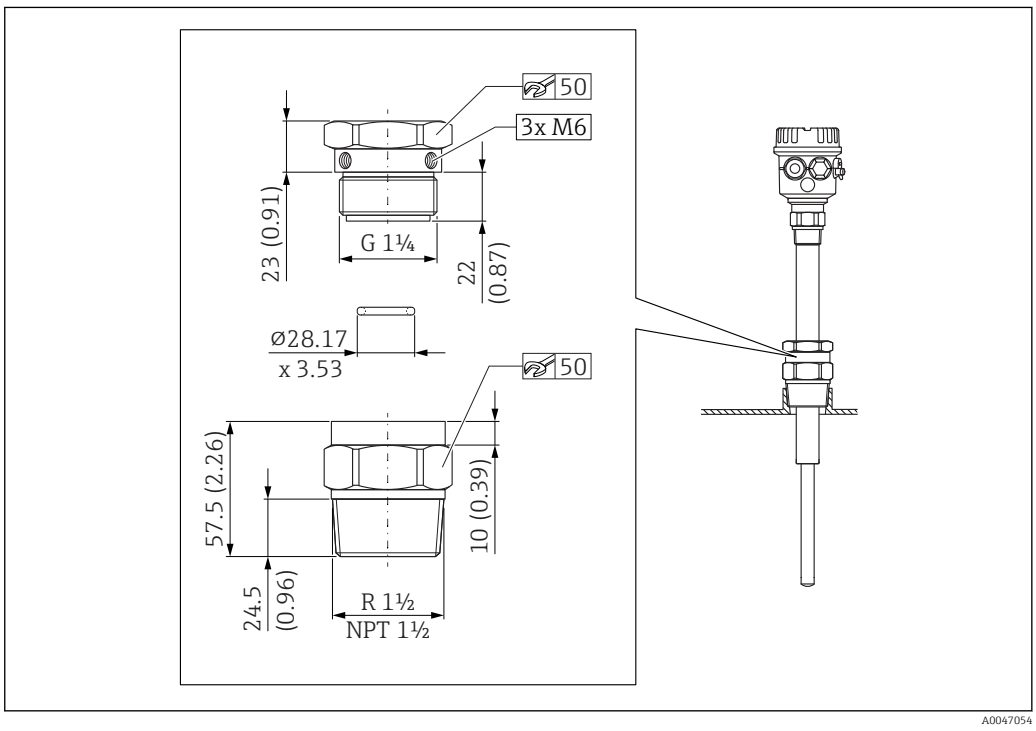


Unit of measurement mm (in)

- MWP = 25 bar (360 psi)
- Ta = maximum : 150 °C (300 °F)
- R 1½, DIN 2999, order number 52023312
- NPT 1½, ANSI B 1.20.1, order number 52025090

Sliding sleeve for unpressurized operation, IP65

Suitable for one-time switch point adjustment only



Unit of measurement mm (in)

- MWP = 0 bar (0 psi)
- Ta = maximum : 150 °C (300 °F)
- R 1½, DIN 2999, order number 52023313
- NPT 1½, ANSI B 1.20.1, order number 52024578

Supplementary documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the matrix code on the nameplate

Standard documentation

- Technical Information: Planning guide
  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
- Operating Instructions: reference manual
  The Operating Instructions contain all the information that is required in the 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

Supplementary device-dependent documentation

Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.



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