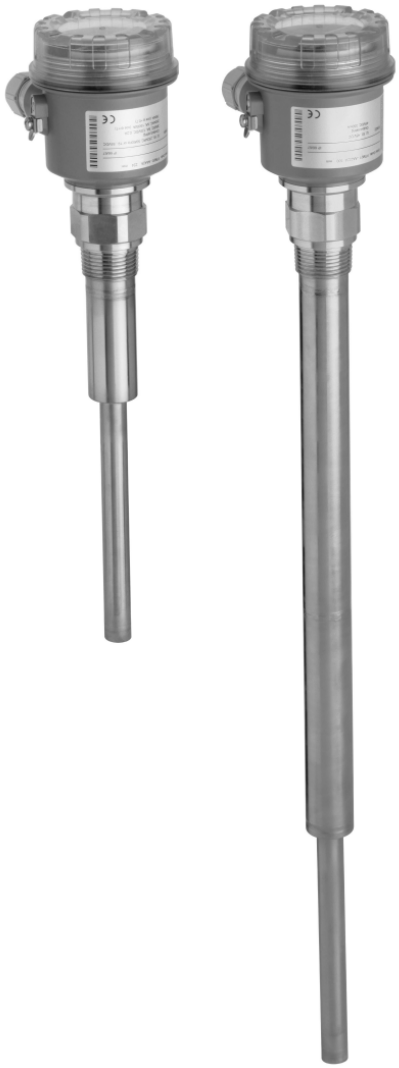
Technical Information

Soliphant T FTM20, FTM21

Vibronic



Robust point level switch for bulk solids, also for dust incendive hazard areas

Application

Soliphant T is a robust point level switch for silos with fine-grained or coarse-grained, non-fluidised bulk solids.
The various designs means the device has a wide range of applications. Certificates are also available for use in dust incendive hazard areas.

FTM20 compact design 250 mm (10 in) as vibrating rod for installation in any direction

FTM21 vibrating rod with extension pipe 500 mm, 1000 mm, 1500 mm (20 in, 40 in, 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 calibration: easy commissioning (plug and play)
- Insensitive to build-up: maintenance-free operation
- No mechanically moving parts: no wear, long operating life
- Sensor material 316L: hardly any abrasion even with building materials
- F16 plastic housing with cover with sight glass: switch status visible from outside
- F18 aluminium housing also available
- Insensitive to external vibration and flow noises
- Also available with explosion protection ATEX II 1/3 D, FM or CSA approval

Endress+Hauser
People for Process Automation

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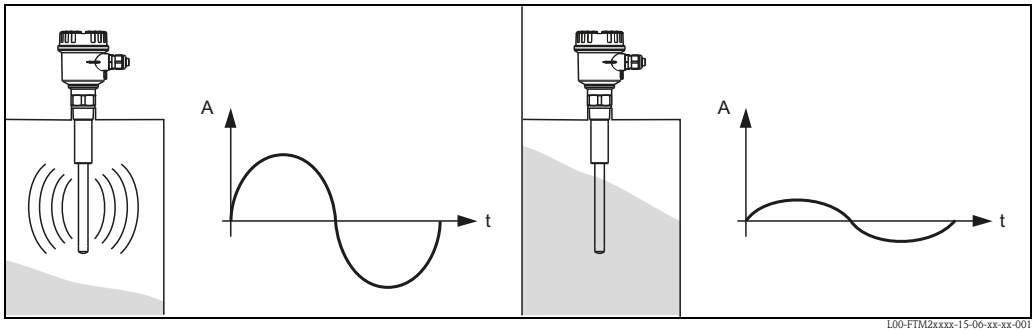
Function and system design

Measuring principle

A piezoelectric drive excites the vibrating rod of Soliphant T FTM20, FTM21 to its resonance frequency. If medium covers the vibrating rod, the rod's vibrating amplitude changes (the vibration is damped). Soliphant's electronics compare the actual amplitude with a target value and indicates whether the vibrating rod is vibrating freely or whether it is covered by medium.



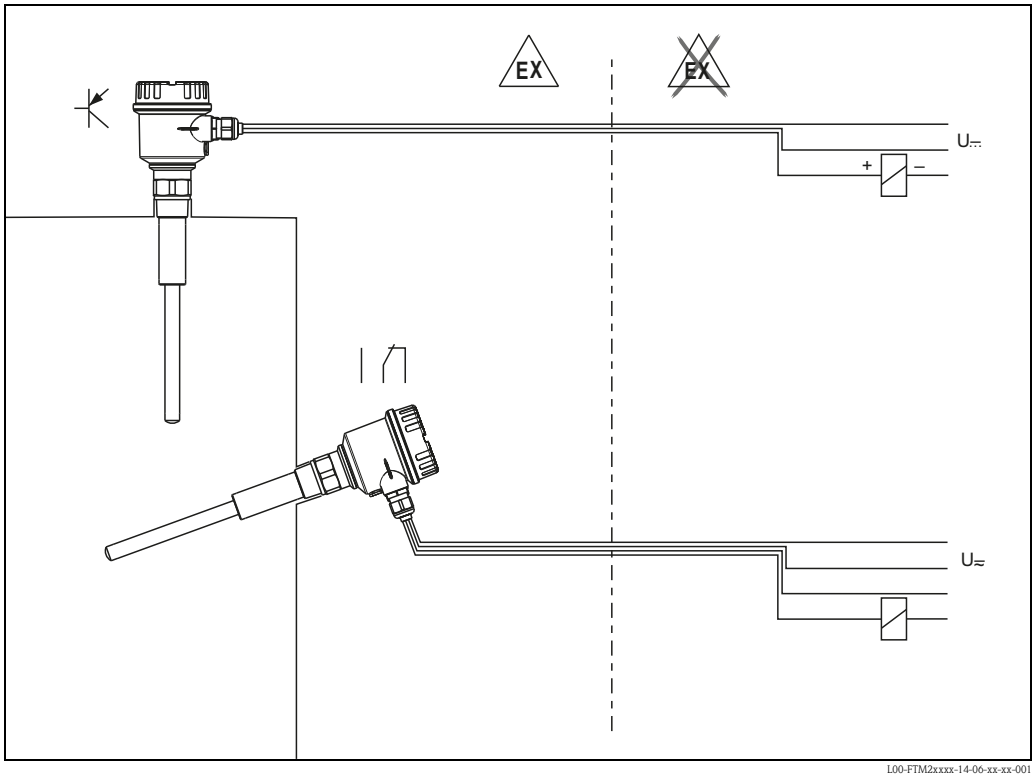
A = amplitude

Measuring system

Soliphant T is a compact electronic switch.

Thus, the entire measuring system only consists of:

- Soliphant T FTM20 or FTM21 with FEM22 or FEM24 electronic insert
- a supply point and
- the connected control systems, switching units, signalling systems (e.g. lamps, horns, PCS, PLC, etc.)



Cable specifications

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

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

Input

Measured variable	Level (according to the mounting location and the overall length)
Measuring range (application)	The measuring range depends on the mounting location of Soliphant T and the length of the pipe extension selected. The pipe extension is available in the following lengths: 500 mm, 1000 mm, 1500 mm (20 in, 40 in, 60 in).
Input signal	Probes covered => small amplitude Probe not covered => large amplitude
Measuring frequency	700...800 Hz

Output

Galvanic isolation	FEM22: Between sensor and power supply FEM24: Between sensor, power supply and load
Switch behaviour	Binary
Power-on behaviour	When switching on the power supply the output is set to "signal on alarm". After a maximum of 3 s it switches to the correct output signal.
Fail-safe mode	Minimum/maximum quiescent current safety can be switched at electronic insert MAX = maximum safety: When the vibrating rod is covered, the output switches in the direction of the signal on alarm Used for overfill protection for example MIN = minimum safety: When the vibrating rod becomes exposed, the output switches in the direction of the signal on alarm Used for empty running protection for example
Switching delay	0.5 s when the sensor is covered 1 s when the sensor is exposed
Ex specifications	FEM22, FEM24: – Explosion protection for explosive dust-air mixtures: Dust-Ex, DIP

FEM22 electronic insert (DC PNP)

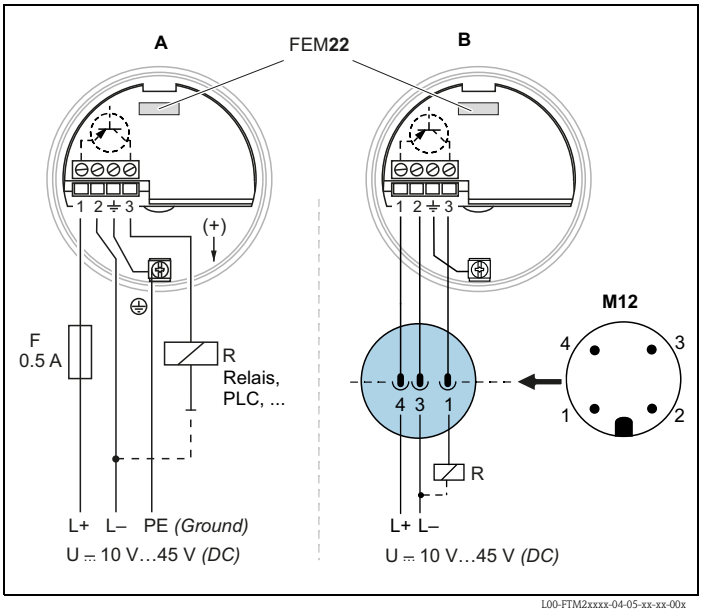
Power supply

Voltage DC: 10…45 V
Ripple max. 5 V, 0…400 Hz
Current consumption max. 18 mA
Power consumption max. 0.81 W
Reverse polarity protection
Separation voltage: 2.2 kV
FEM22 overvoltage protection: overvoltage category II

Electrical connection

Three-wire DC connection with cable entry / M12 plug

- Preferred in conjunction with programmable logic controllers (PLC), DI modules as per EN 61131-2
- Positive signal at electronics switch output (PNP)
- Output blocked at point level



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A: With cable entry wired by customer (Ordering feature 40, options 2, 3, 4, 5, 6, 7)
B: With M12 plug wired at the factory (Ordering feature 40, options 1, 8)

Output signal

IL = Load current (switched through)

< 100 µA = Residual current (blocked)

☼ = Lit

● = Not lit

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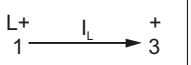
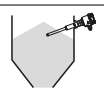
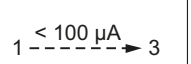
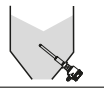
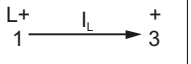
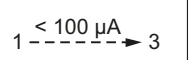
Fail-safe mode	Level	Output signal	LEDs green	LEDs yellow
MAX			☼	☼
			☼	●
MIN			☼	☼
			☼	●

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Signal on alarm

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

Connectable load

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

FEM24 electronic insert (AC/DC with relay output)

Power supply

Alternating voltage AC: 19…253 V, 50/60 Hz or DC voltage 19…55 V
Power consumption max. 1.3 W
Reverse polarity protection
Separation voltage: 2.2 kV
FEM24 overvoltage protection: overvoltage category II

Electrical connection

Universal current connection with relay output

Power supply:
Please note the different voltage ranges for AC and DC.

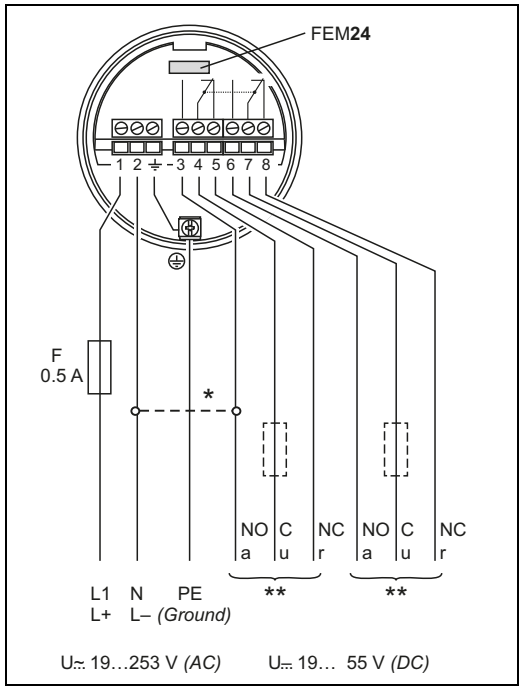
Output:
When connecting a device with high inductance, provide a spark arrester to protect the relay contact.
A fine-wire fuse (depending on the load connected) protects the relay contact in the event of a short-circuit.

Both relay contacts switch simultaneously.
DPDT (double pole double throw)

* When jumpered, the relay output works with NPN logic.

** See below "Connectable load"

Note!
Please note the different voltage ranges for direct and alternating current.



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Output signal

= Relay energised
= Relay de-energised
= Lit
= Not lit

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Fail-safe mode	Level	Output signal	LEDs green	LEDs yellow
MAX		3 4 5 6 7 8	☼	☼
		3 4 5 6 7 8	☼	●
MIN		3 4 5 6 7 8	☼	☼
		3 4 5 6 7 8	☼	●

L00-FTM2xxxx-04-05-xx-xx-005

Signal on alarm

Output signal in event of power failure: relay de-energised

Connectable load

- Loads switched via 2 floating 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 extra-low voltage circuit with double insulation as per IEC 1010: Sum of voltages of relay output and power supply max. 300 V

Operating conditions

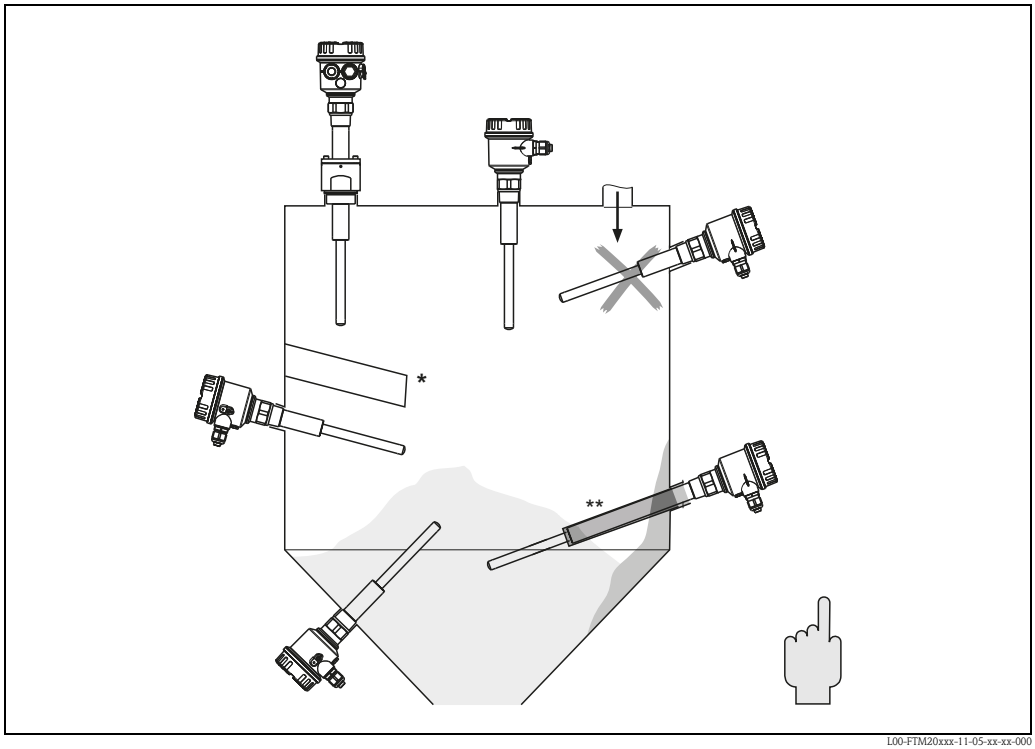
Installation instructions

Mounting location

e.g. vessels, silos, storage or buffer container

Note!
Installation must ensure friction-locked mechanical connection between sensor and vessel/silo.

Orientation



Horizontal installation/vertical installation
** With protective cover (to be provided by customer)*
*** With protecting tube (to be provided by customer)*

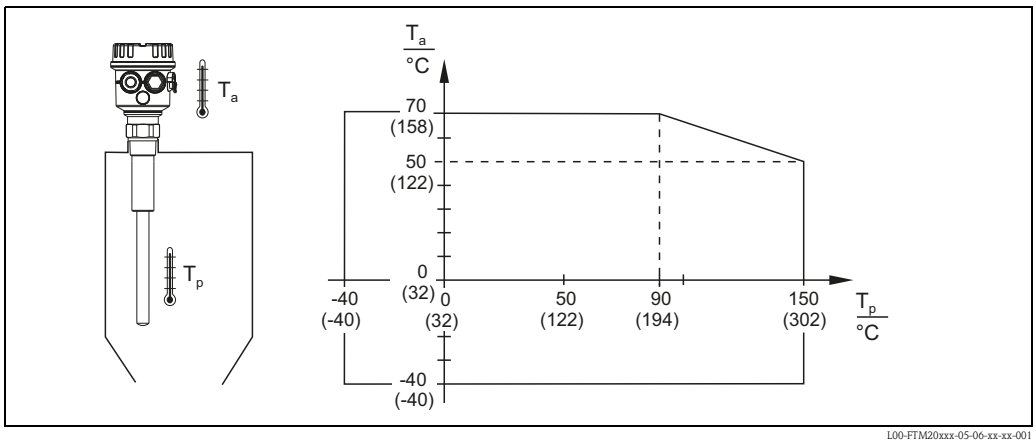
Environment

Ambient temperature range	–40...70 °C (-40...158 °F)
Storage temperature	–40...85 °C (-40...185 °F)
Climate class	Climatic 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 to EN 61326, Electrical Equipment Class B Interference immunity to EN 61326, Annex A (Industrial)
Installation height as per IEC61010-1 Ed.3	Up to 2000 m (6600 ft) above sea level.

Process

Environment

Permitted ambient temperature T_a at housing depending on the medium temperature T_p in the container:



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Thermal shock resistance

Maximum 120 K

Limiting medium pressure range

–1...25 bar (-14.5...362.5 psi)

Maximum Working Pressure (MWP)
25 bar (362.5 psi)

Burst pressure
100 bar (1450 psi)

State of aggregation

Solids

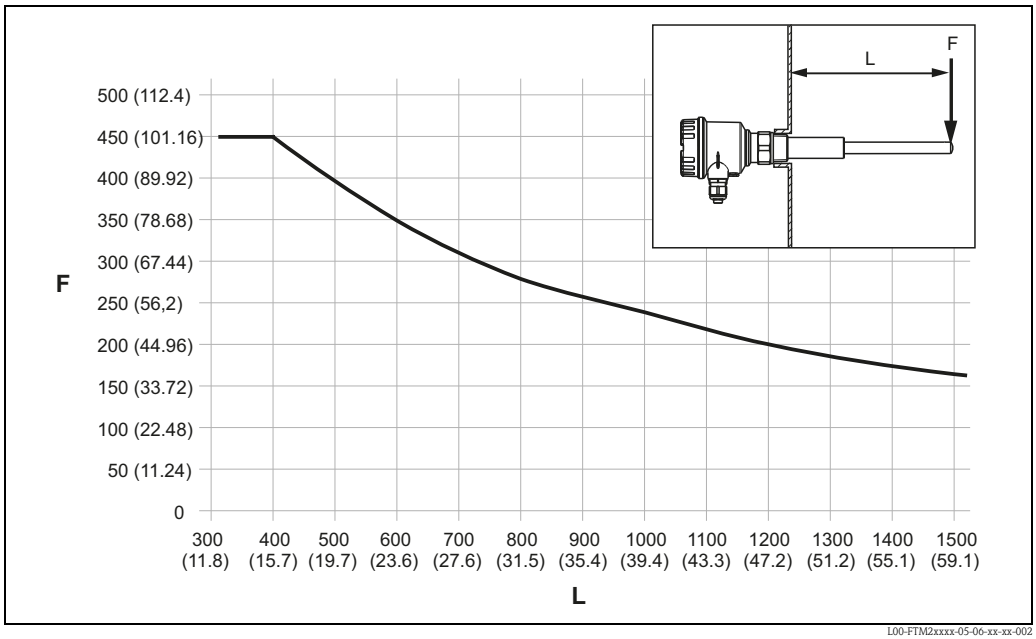
Grain size

≤ 25 mm (< 0,98 in)

Bulk density

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

Lateral load



L00-FTM2xxxx-05-06-xx-xx-002

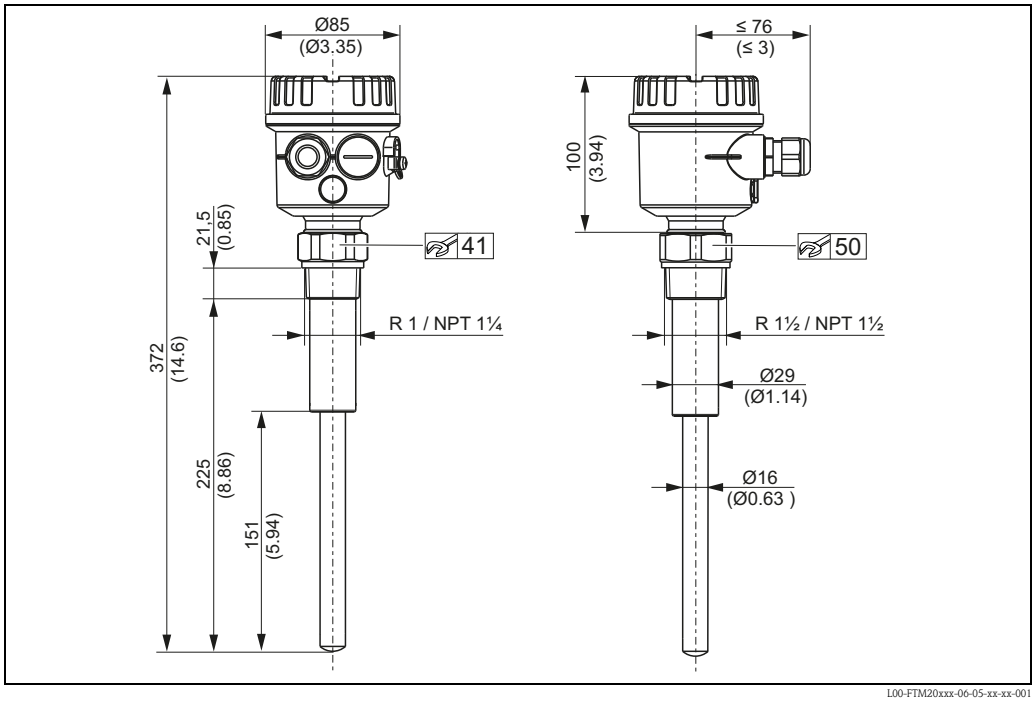
F: Maximum permissible lateral load in Nm (lbf)
L: Length in mm (in)

Mechanical construction

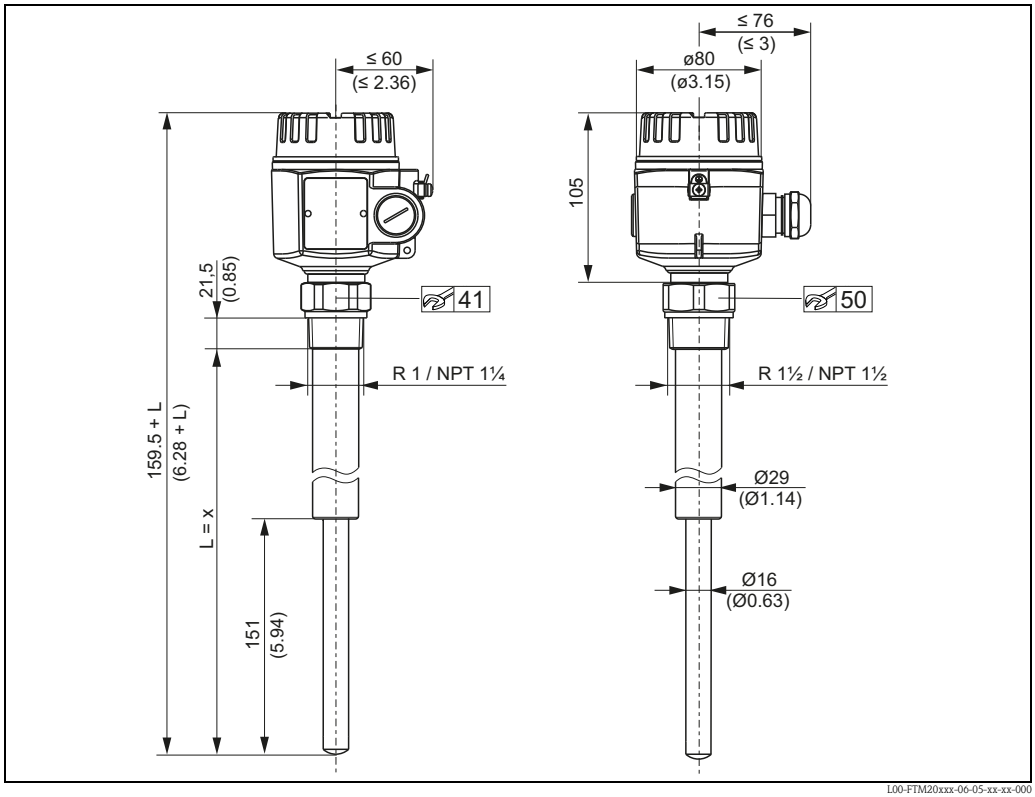
Note!
All dimensions in mm!

Design, dimensions

Compact version



Pipe extension



x = 500 mm, 1000 mm, 1500 mm (20 in, 40 in, 60 in)

Weight

FTM20/FTM21 with F16 housing, FEM24 and R 1 thread:

Compact	=	approx. 1.0 kg (2.21 lbs)
500 mm (20 in)	=	approx. 1.3 kg (2.87 lbs)
1000 mm (40 in)	=	approx. 2.0 kg (4.41 lbs)
1500 mm (60 in)	=	approx. 2.6 kg (5.73 lbs)

Material

F16 housing:

PTB-FR, cover with sight glass made of PA12, EPDM cover seal

F18 housing:

Aluminium EN-AC-AlSi10Mg, plastic-coated
EPDM cover seal

Process connections:

- R1; R1½ (316L, DIN 2999)
- NPT 1¼ – 11½; NPT 1½ – 11½ (316L, ANSI B 1.20.1)

Sensor:

316L

Operability

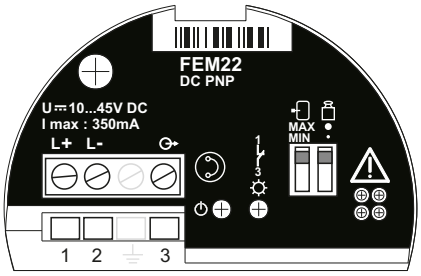
Display elements

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

FEM22

One green LED: operation

One yellow LED: electronic switch closed

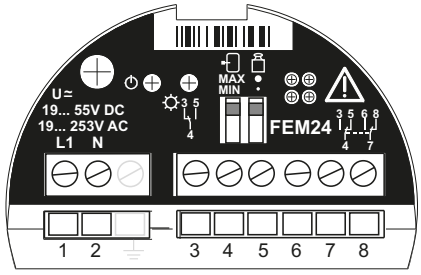


L00-FEM22xxx-07-05-xx-xx-001

FEM24

One green LED: operation

One yellow LED: contact closed
(relay energised or fed with current)



L00-FEM24xxx-07-05-xx-xx-002

Operating elements of electronic inserts FEM22 and FEM24

(factory setting)

L00-FTM2xxxx-19-05-xx-xx-002

One switch for safety mode

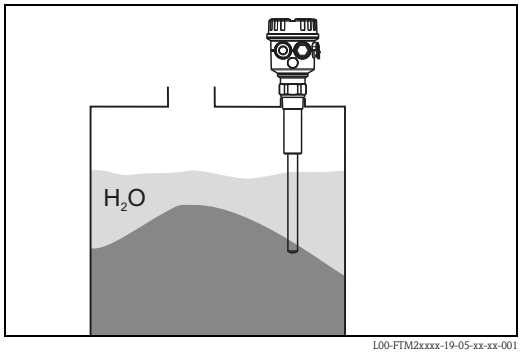
MAX Overfill protection
MIN Dry running protection

One switch for bulk density/density setting

- ● 400 g/l (high bulk density)
- • 200 g/l (low bulk density)

Sediment detection

Detection of solids under water



L00-FTM2xxxx-19-05-xx-xx-001

The system does not detect coverage by liquids similar to water.

Certificates and approvals

CE mark, declaration of conformity

The measuring system meets the legal requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied.
Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

Ex approval

Your Endress+Hauser sales centre can provide you with information on the Ex versions which can currently be delivered.
All explosion protection data are given in a separate documentation (see "Supplementary Documentation") which is available upon request.
Copies of certificates available upon request.

Type of protection

See "Ordering information" as of Page 13 and "Supplementary documentation" on Page 15.

Other standards and guidelines

Other standards and guidelines that were taken into consideration in designing and developing Soliphant T FTM20, FTM21:

- Low Voltage Directive (73/23/EEC)
- DIN EN 61010 Part 1, 2001
  Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures
  Part 1: General requirements
- EN 61326
  Electrical Equipment for Measurement, Control and Laboratory Use
  EMC requirements

Pressure Equipment Directive 2014/68/EU (PED)

Pressure instruments with permitted pressure ≤ 200 bar (2 900 psi)

Pressure instruments with permitted pressure ≤ 200 bar (2 900 psi) Pressure instruments with a flange and threaded boss that do not have a pressure-bearing housing do not fall within the scope of the Pressure Equipment Directive, irrespective of the maximum permitted pressure.

Reason:

According to Article 2, point 5 of EU Directive 2014/68/EU, pressure accessories are defined as "devices with an operational function and having pressure-bearing housings".
If a pressure instrument does not have a pressure-bearing housing (no identifiable pressure chamber of its own), there is no pressure accessory present within the meaning of the Directive.

Note:

A separate analysis must be performed for pressure instruments that are part of safety equipment designed to protect a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

RCM-tick mark

The product or measuring system supplied complies with the regulations of the Australian Communications and Media Authority (ACMA) for network integrity, performance characteristics and health and safety requirements. The specifications for electromagnetic compatibility, in particular, are observed. The products bear the RCM-tick mark on their nameplate.

A0029561

EAC conformity

The measuring system meets the legal requirements of the applicable EAC Directives.
These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

RoHS

The measuring system complies with the substance restrictions of the EU Directive on the restriction of the use of certain hazardous substances 2011/65/EU (RoHS 2).

Ordering information

Soliphant T FTM20

10	Approval
A	Non-hazardous area
C	CSA General Purpose, CSA C US
D	CSA DIP+FM DIP
G	IEC Ex t IIIC
N	NEPSI DIP A20/A22
V	EAC Ex t IIIC
Y	Special version
4	ATEX II 1/3 D

20		Process connection		
A	Thread, DIN2999	R1,	316L
G	Thread, DIN2999	R1½,	316L
M	Thread, ANSI	NPT1¼,	316L
N	Thread, ANSI	NPT1½,	316L
Y	Special version		

30		Electronics; output		
2	FEM22:	3-wire PNP,	10...45 V DC
4	FEM24:	Relay DPDT,	19...253 V AC / 55 V DC
8	FEM20B	ASI Bus	
9	Special version		

40			Housing; cable entry		
1	F16	Polyester	IP66/IP67,	NEMA4X	M12 plug
2	F16	Polyester	IP66/IP67,	NEMA4X	M20 gland
3	F16	Polyester	IP66/IP67,	NEMA4X	Thread, NPT½
4	F16	Polyester	IP66/IP67,	NEMA4X	Thread, G½
5	F18	Aluminium	IP66/IP67,	NEMA4X	M20 gland
6	F18	Aluminium	IP66/IP67,	NEMA4X	Thread, NPT¾
7	F18	Aluminium	IP66/IP67,	NEMA4X	Thread, G½
8	F18	Aluminium	IP66/IP67,	NEMA4X	M12 plug
9	Special version				

50		Additional fittings
A	Basic version
Y	Special version

FTM20						Complete product designation

Soliphant T FTM21

10	Approval
A	Non-hazardous area
C	CSA General Purpose, CSA C US
D	CSA DIP+FM DIP
G	IEC Ex t IIIC
N	NEPSI DIP A20/A22
V	EAC Ex t IIIC
Y	Special version
4	ATEX II 1/3 D

20		Process connection		
A	Thread, DIN2999	R1,	316L
G	Thread, DIN2999	R1½,	316L
M	Thread, ANSI	NPT1¼,	316L
N	Thread, ANSI	NPT1½,	316L
Y	Special version		

25		Sensor length
2	500 mm
3	1000 mm
4	1500 mm
6	20 inch
7	40 inch
8	60 inch
9	Special version

30			Electronics; output	
2	FEM22:	3-wire PNP,	10...45 V DC
4	FEM24:	Relay DPDT,	19...253 V AC / 55 V DC
8	FEM20 B	ASI Bus	
9	Special version		

40						Housing; cable entry
1	F16	Polyester	IP66/IP67,	NEMA4X	M12 plug
2	F16	Polyester	IP66/IP67,	NEMA4X	M20 gland
3	F16	Polyester	IP66/IP67,	NEMA4X	Thread, NPT½
4	F16	Polyester	IP66/IP67,	NEMA4X	Thread, G½
5	F18	Aluminium	IP66/IP67,	NEMA4X	M20 gland
6	F18	Aluminium	IP66/IP67,	NEMA4X	Thread, NPT¾
7	F18	Aluminium	IP66/IP67,	NEMA4X	Thread, G½
8	F18	Aluminium	IP66/IP67,	NEMA4X	M12 plug
9	Special version				

50		Additional fittings
A	Basic version
Y	Special version

FTM21							Complete product designation

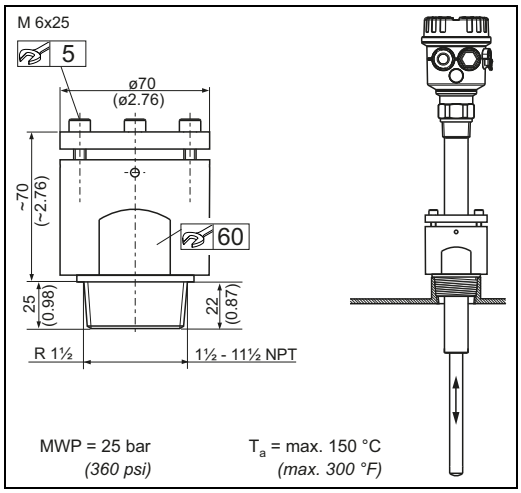
Accessories

Sliding sleeve

For pressurised container

- R 1½
  DIN 2999
  Material number: 52023312
- NPT 1½ - 11½
  ANSI B 1.20.1
  Material number: 52025090

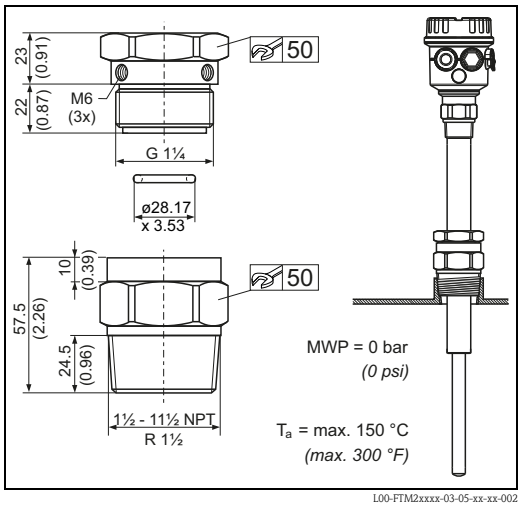
Note!
Suitable for multiple switch-point configurations!



For unpressurised container, IP65

- R 1½
  DIN 2999
  Material number: 52023313
- NPT 1½ - 11½
  ANSI B 1.20.1
  Material number: 52024578

Note!
Only suitable for one-time switch-point configuration!



Spare parts

- FEM22 electronic insert: 52025688
- FEM24 electronic insert: 52025691
- Cover for polyester housing (F16), transparent plastic with seal: 52025790
- Cover for aluminium housing (F18), aluminium with seal: 52005910
- Cover for aluminium housing (F18), aluminium with glass insert and seal (not for EEx d): 52027693

Supplementary documentation

Operating Instructions

- Soliphant T FTM20, FTM21
  KA00227F

Certificates

■ ATEX II	Ex t	1/3D	XA00300F
■ IECEx	Ex t	Ga/Gc	XA00424F
■ NEPSI	Ex t	ta/tb	XA00434F

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FTM20-AA21A FTM20-AN42A FTM21-AN643A FTM21-DN246A FTM21-AN626A FTM21-DN646A FTM20-AG42A FTM20-AM26A FTM21-CM646A FTM21-DM646A FTM20-CG46A FTM20-CN25A FTM21-AN346A FTM20-AA22A FTM20-AA23A FTM20-AN28A FTM20-CA26A FTM20-CA46A FTM21-AN726A FTM21-DN626A FTM20-AK42A FTM20-DG47A FTM21-CM746A FTM20-4N46A FTM20-AA43A FTM21-DM346A FTM20-4K45A FTM20-MG25A FTM21-AM643A FTM21-DN846A FTM20-AN45A FTM21-4A445A FTM21-AG225A FTM21-DN326A FTM20-AM23A FTM20-AN22A FTM21-CA225A FTM21-CM626A FTM20-AA42A FTM21-AN843A FTM20-AG22A FTM20-DN26A FTM21-AG245A FTM21-DM746A FTM20-CG45A FTM21-AM226A FTM20-MN45A FTM20-MN46A FTM21-AN646A FTM20-AG43A FTM20-DM26A FTM21-AM843A FTM21-AN243A FTM21-CN225A FTM20-4A25A FTM20-CN26A FTM21-CN746A FTM20-4K25A FTM20-MN25A FTM21-AN343A FTM21-DN746A FTM20-4N25A FTM20-AM22A FTM20-CM26A FTM21-AM646A FTM21-MN245A FTM20-AA46A FTM21-CG245A FTM21-AN246A FTM20-GN45A FTM21-AG242A FTM21-AN446A FTM21-CN846A FTM21-DN226A FTM20-4G45A FTM20-AG44A FTM20-DM46A FTM21-AN226A FTM21-CN626A FTM20-4G47A FTM20-AK22A FTM20-4N45A FTM21-4G245A FTM20-AK45A FTM20-DG26A FTM21-AG345A FTM21-4G345A FTM20-NN45A FTM20-4N27A FTM20-AN25A FTM20-GG25A