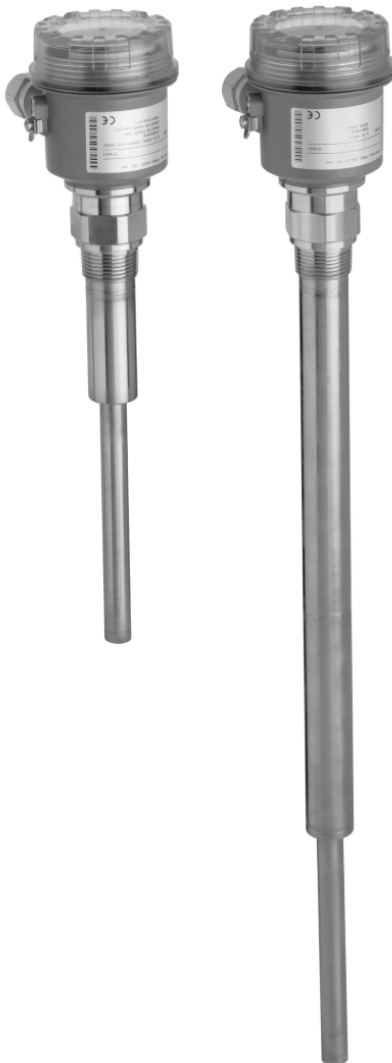


Technical Information

Soliphant T FTM20, FTM21

Vibronic



Robust point level switch for bulk solids,
also for dust incensive 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 incensive 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

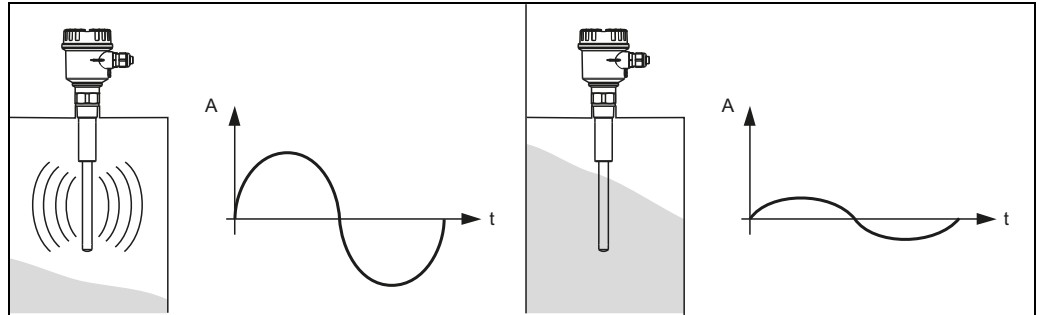
Table of contents

Function and system design	3	Lateral load	8
Measuring principle	3	Mechanical construction	9
Measuring system	3	Design, dimensions	9
Cable specifications	4	Weight	10
Temperature resistance	4	Material	10
Cable entries	4	Operability	10
Input	4	Display elements	10
Measured variable	4	Operating elements of electronic inserts FEM22 and FEM24 ...	11
Measuring range (application)	4	Sediment detection	11
Input signal	4	Certificates and approvals	12
Measuring frequency	4	CE mark, declaration of conformity	12
Output	4	Ex approval	12
Galvanic isolation	4	Type of protection	12
Switch behaviour	4	Other standards and guidelines	12
Power-on behaviour	4	Pressure Equipment Directive 2014/68/EU (PED)	12
Fail-safe mode	4	RCM-tick mark	12
Switching delay	4	EAC conformity	12
Ex specifications	4	RoHS	12
FEM22 electronic insert (DC PNP)	5	Ordering information	13
Power supply	5	Soliphant T FTM20	13
Electrical connection	5	Soliphant T FTM21	14
Output signal	5	Accessories	15
Signal on alarm	5	Sliding sleeve	15
Connectable load	5	Spare parts	15
FEM24 electronic insert (AC/DC with relay output) ..	6	Supplementary documentation	15
Power supply	6	Operating Instructions	15
Electrical connection	6	Certificates	15
Output signal	6		
Signal on alarm	6		
Connectable load	6		
Operating conditions	7		
Installation instructions	7		
Environment	7		
Ambient temperature range	7		
Storage temperature	7		
Climate class	7		
Degree of protection	7		
Vibration resistance	7		
Electrical safety	7		
Electromagnetic compatibility	7		
Installation height as per IEC61010-1 Ed.3	7		
Process	8		
Environment	8		
Thermal shock resistance	8		
Limiting medium pressure range	8		
State of aggregation	8		
Grain size	8		
Bulk density	8		

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.



L00-FTM2xxxx-15-06-xx-xx-001

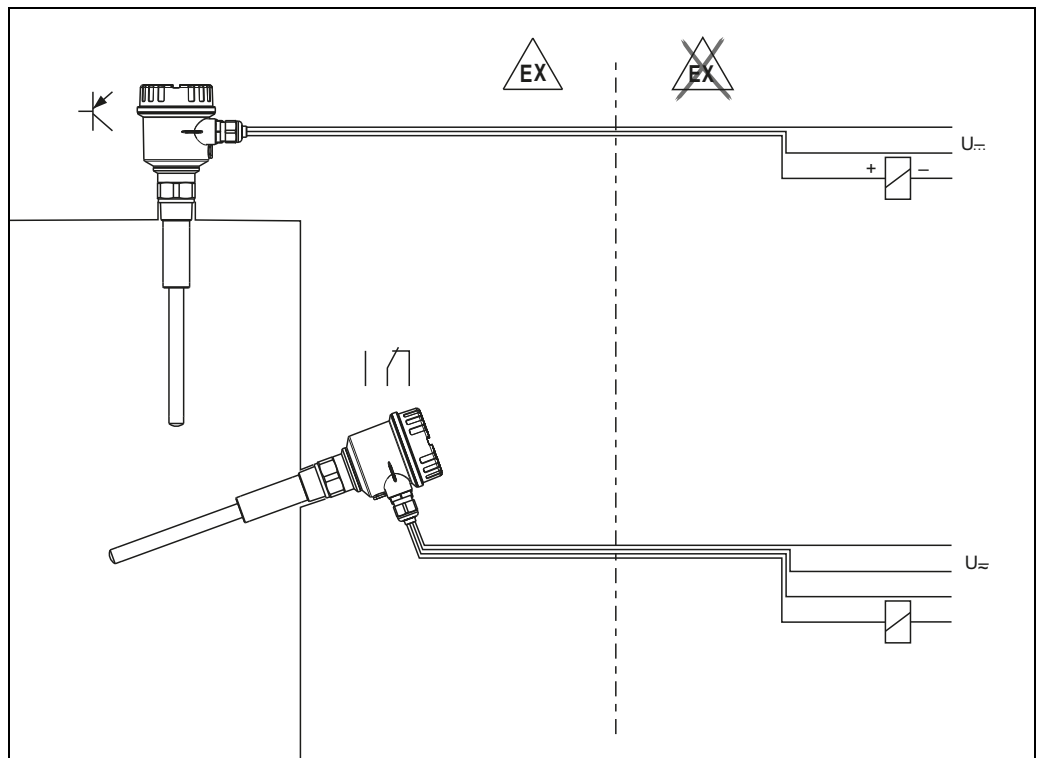
A = amplitude

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.)



L00-FTM2xxxx-14-06-xx-xx-001

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)

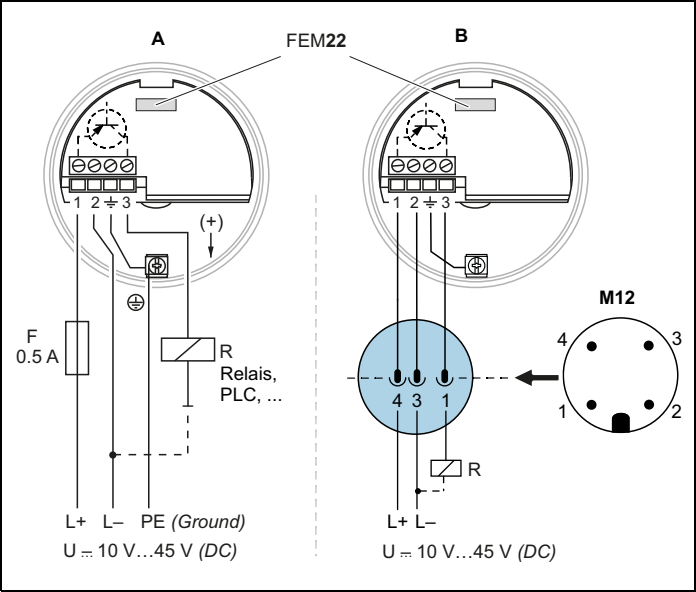
Power supply

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



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 μ A = Residual current (blocked)

 = Lit
 = Not lit

L00-FTL2xxxx-07-05-xx-xx-000

Fail-safe mode	Level	Output signal	LEDs green yellow
MAX		L+ 1 $\xrightarrow{I_L}$ 3	 
		1 $\xrightarrow{< 100 \mu A}$ 3	 
MIN		L+ 1 $\xrightarrow{I_L}$ 3	 
		1 $\xrightarrow{< 100 \mu A}$ 3	 

L00-FTM2xxxx-04-05-xx-xx-003

Signal on alarm

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

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 μ A (for blocked transistor)
- Capacitive load: max. 0.5 μ F for 45 V, max. 1.0 μ F 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.

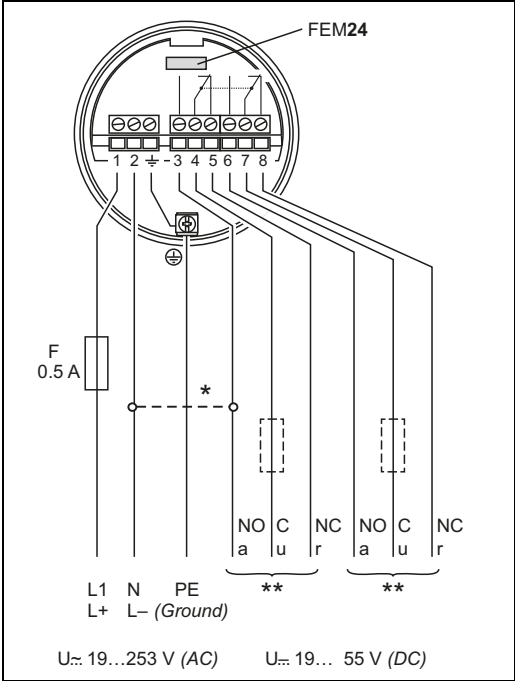
Output:
When connecting a device with
high inductance, provide a spark arrester
to protect the relay contact.
A fine-wire fuse (depending on the
load connected) protects the relay
contact in the event of a short-circuit.

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.



Output signal

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

L00-FTL2xxxx-07-05-
xx-xx-001

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

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

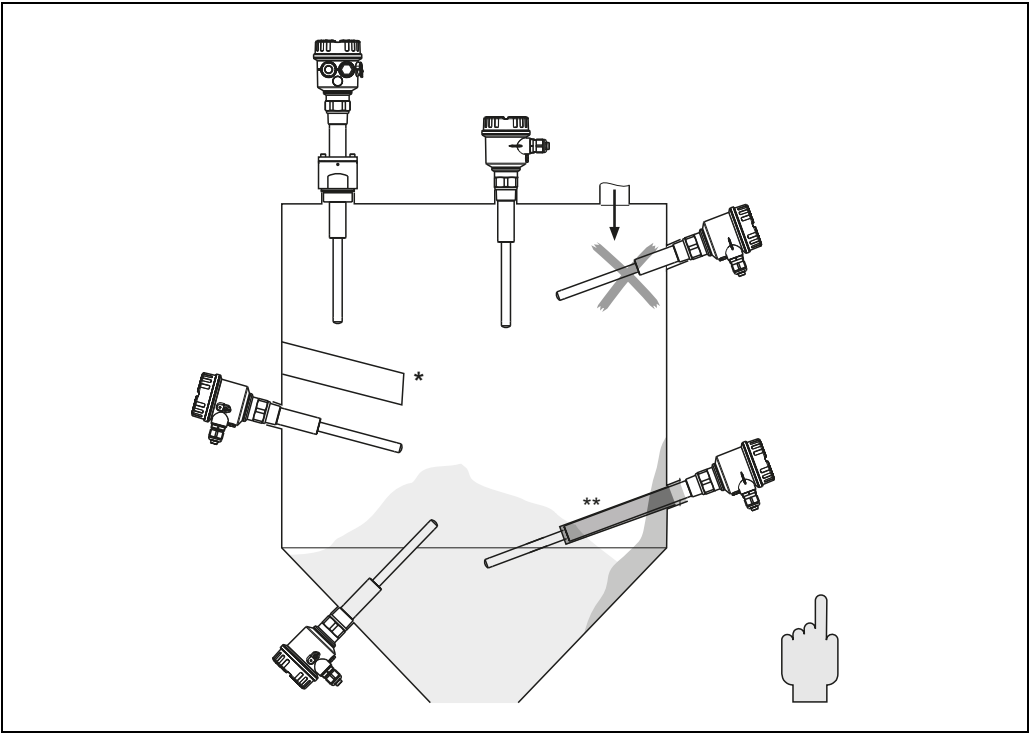
Mounting location

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

Note!

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

Orientation



L00-FTM20xxx-11-05-xx-xx-000

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 g²/Hz

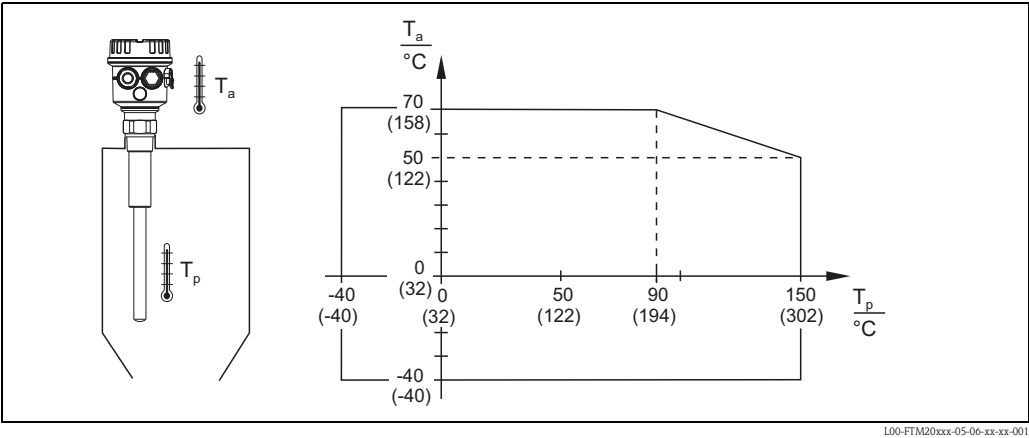
Electrical safety IEC 61010, CSA 1010.1-92, FM3600

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:



Thermal shock resistance Maximum 120 K

Limiting medium pressure range -1...25 bar (-14.5...362.5 psi)

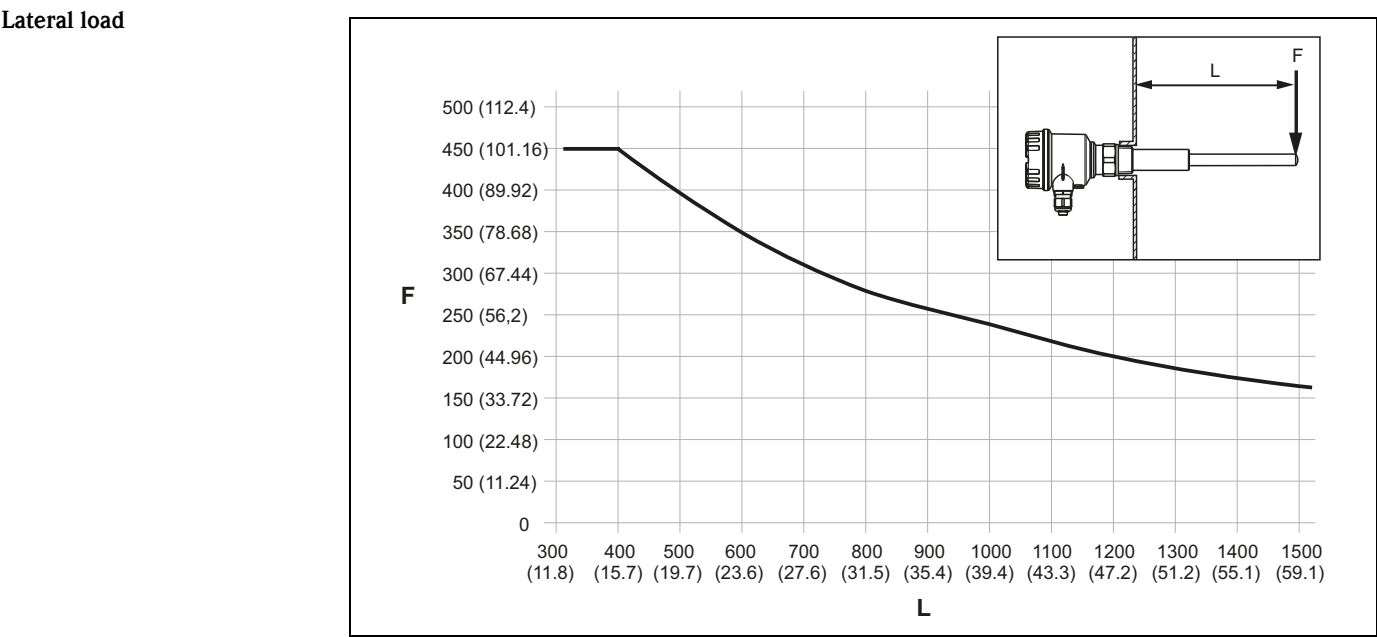
Maximum Working Pressure (MWP)
25 bar (362.5 psi)

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



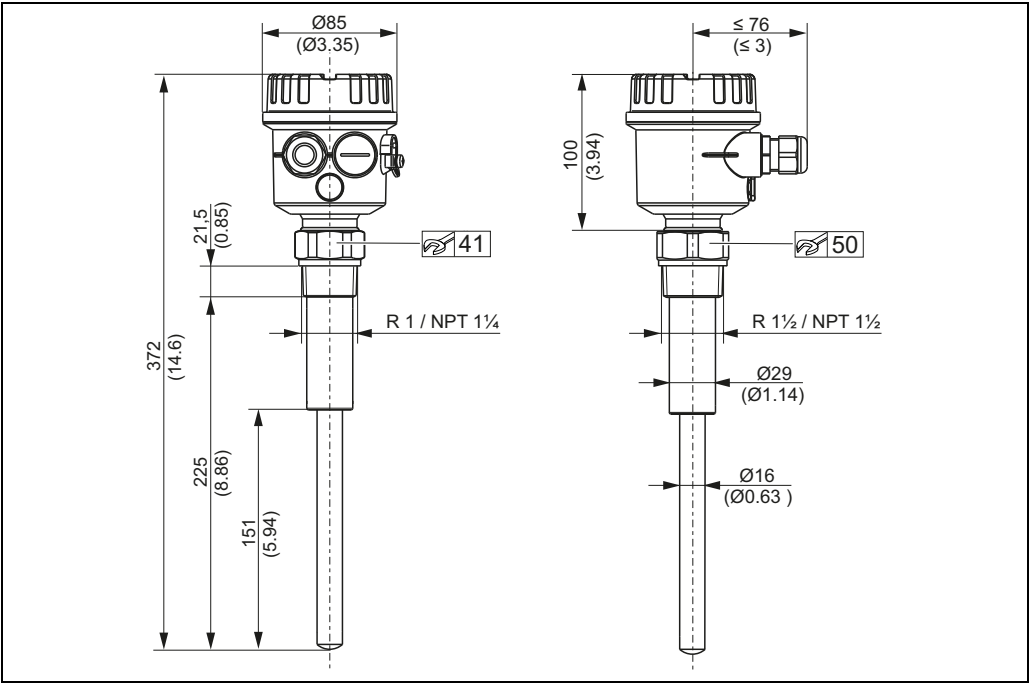
F : Maximum permissible lateral load in Nm (lbf)
 L : Length in mm (in)

Mechanical construction

Note!
All dimensions in mm!

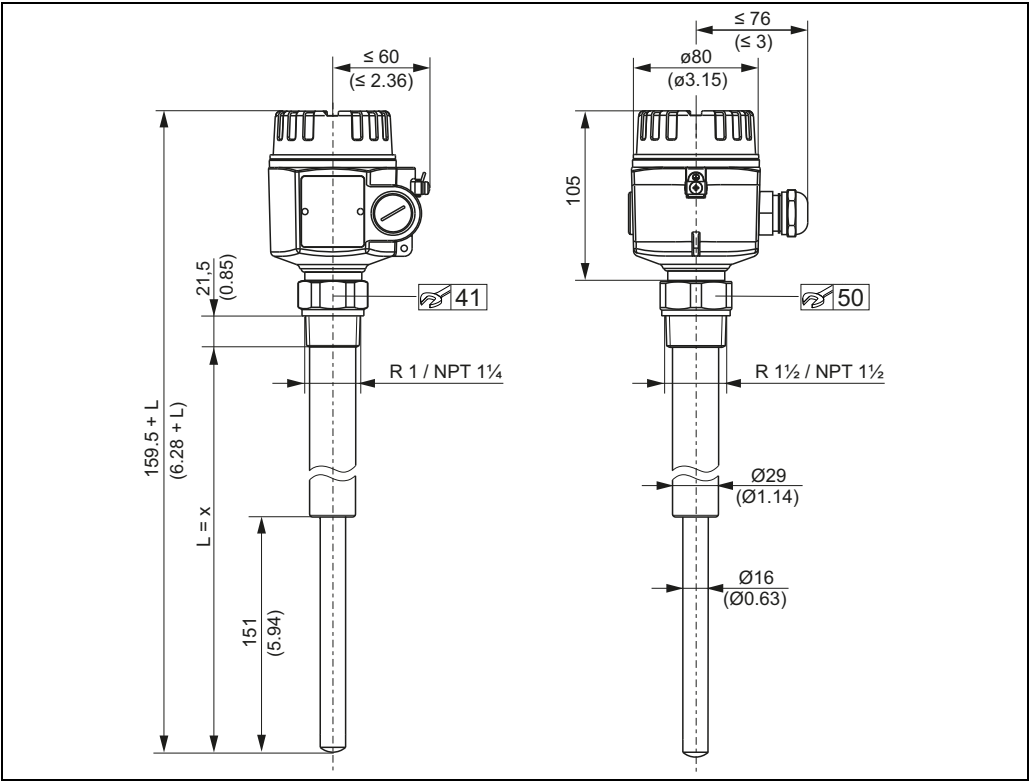
Design, dimensions

Compact version



L00-FTM20xxx-06-05-xx-xx-001

Pipe extension



L00-FTM20xxx-06-05-xx-xx-000

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

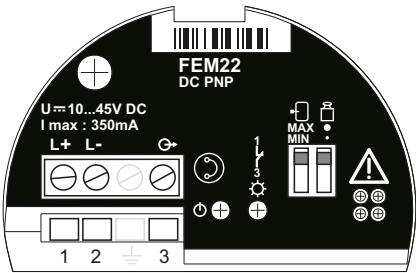
Weight	FTM20/FTM21 with F16 housing, FEM24 and R 1 thread:	
	Compact	= approx. 1.0 kg (2.21 lbs)
	500 mm (20 in)	= approx. 1.3 kg (2.87 lbs)
	1000 mm (40 in)	= approx. 2.0 kg (4.41 lbs)
	1500 mm (60 in)	= approx. 2.6 kg (5.73 lbs)
Material	F16 housing:	
	PTB-FR, cover with sight glass made of PA12, EPDM cover seal	
	F18 housing:	
	Aluminium EN-AC-AISi10Mg, 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

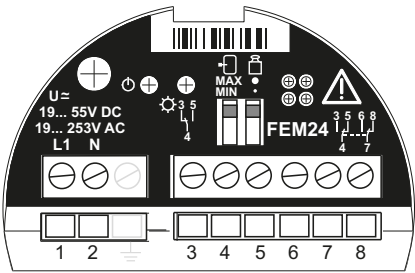
- One green LED: operation
- One yellow LED: electronic switch closed



L00-FEM22xxxx-07-05-xx-xx-001

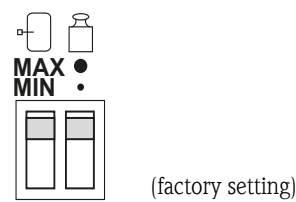
FEM24

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



L00-FEM24xxxx-07-05-xx-xx-002

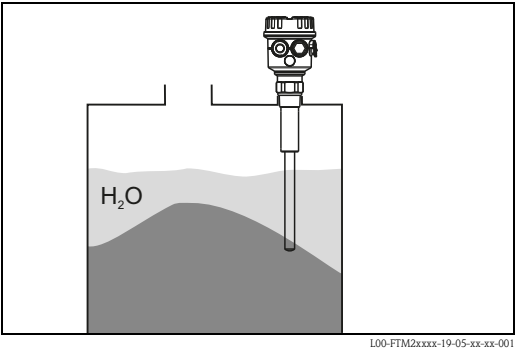
Operating elements of
electronic inserts
FEM22 and FEM24



- 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



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.
	
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).

A0029561

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	ASI Bus		
		B				
		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

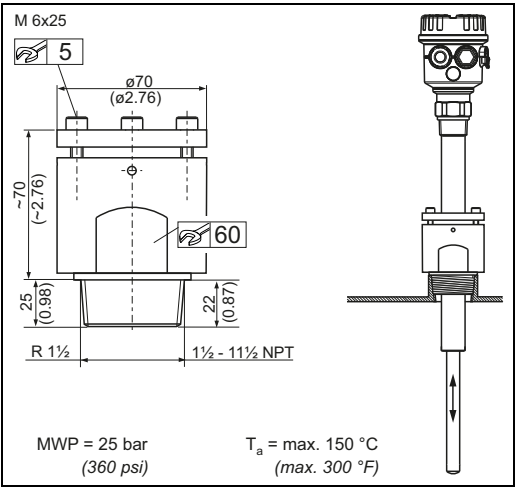
Accessories

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!

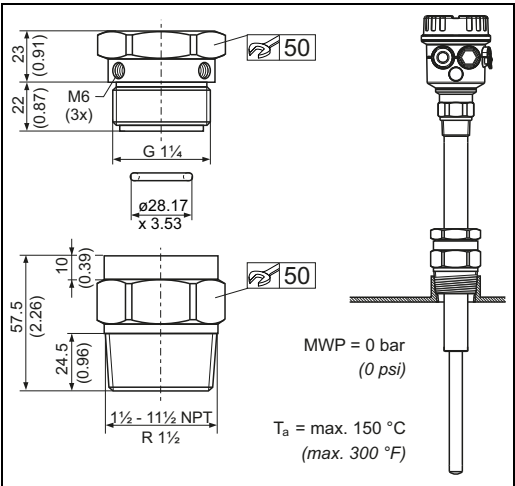


L00-FTM2xxxx-03-05-xx-xx-001

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!



L00-FTM2xxxx-03-05-xx-xx-002

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

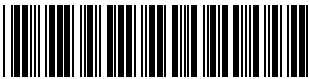
Supplementary documentation

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 |



71415262

www.addresses.endress.com
