Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Solicap M FTI55, FTI56

Level Limit Switch
Universal capacitive limit switch for bulk solids

Application

The compact transmitter is used for level limit detection in bulk solids and can be operated in minimum or maximum failsafe mode.

Due to its robust construction, it can also be used to provide accurate measurements in applications with very high tensile loads (up to 60 kN for rope version) or lateral loads (up to 300 Nm for rod version).

In combination with Fieldgate (for remote interrogation of measured values using internet technology), Solicap M represents an ideal solution for material provisioning and logistical optimization (inventory control).

Your benefits

- Extremely robust design for harsh process conditions
- Easy and fast commissioning as calibration is performed at the press of a button
- Universal application thanks to wide range of certificates and approvals
- Two-stage overvoltage protection against static discharges from the silo
- Active buildup compensation for bulk solids with caking tendency (under development)
- Use in safety systems requiring functional safety to SIL2/SIL3 in combination with electronic insert FEI55
- Increased safety due to permanent automatic monitoring of electronics
- Reduction in storage costs thanks to easy-to-shorten rod model (for partial insulation) and rope model (for partial and full insulation)
- Two-point control (e.g. for controlling a handling device)

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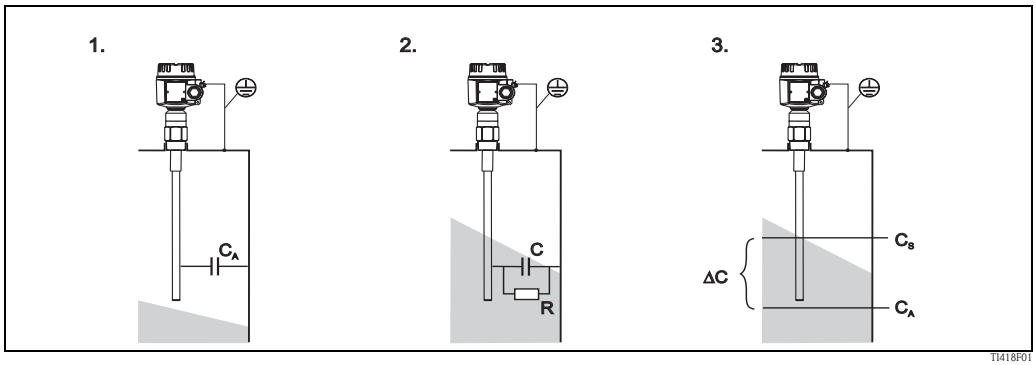
People for Process Automation

Table of contents

Function and system design

Measuring principle

The principle of capacitive level limit detection is based on the change in capacitance of a capacitor as a result of the probe being covered by bulk solids. The probe and container wall (conductive material) form an electric capacitor. When the probe is in air (1), a certain low initial capacitance is measured. If the container is being filled, the capacitance of the capacitor increases as more of the probe is covered (2), (3).
The limit switch switches when the capacitance C_S specified during calibration is reached.
In addition, a probe with inactive length ensures that the effects of medium buildup or condensate near the process connection are avoided. A probe with active buildup compensation compensates for the effects of buildup on the probe in the area of the process connection.



R: Conductivity of bulk solids
C: Capacitance of bulk solids
C_A: Initial capacitance (probe not covered)
C_S: Switching capacitance
ΔC: Change in capacitance

Function

The electronic insert selected for the probe determines the change in capacitance depending on how much of the probe is covered. This ensures accurate switching at the switchpoint (level) calibrated for this purpose.

Application examples

Sand, glass aggregate, gravel, molding sand, lime, ore (crushed), plaster, aluminum shavings, cement, grain, pumice, flour, dolomite, sugar beet, kaolin, fodder and similar bulk solids.

In general:
Bulk solids with a relative dielectric constant $\varepsilon_r \geq 2.5$.

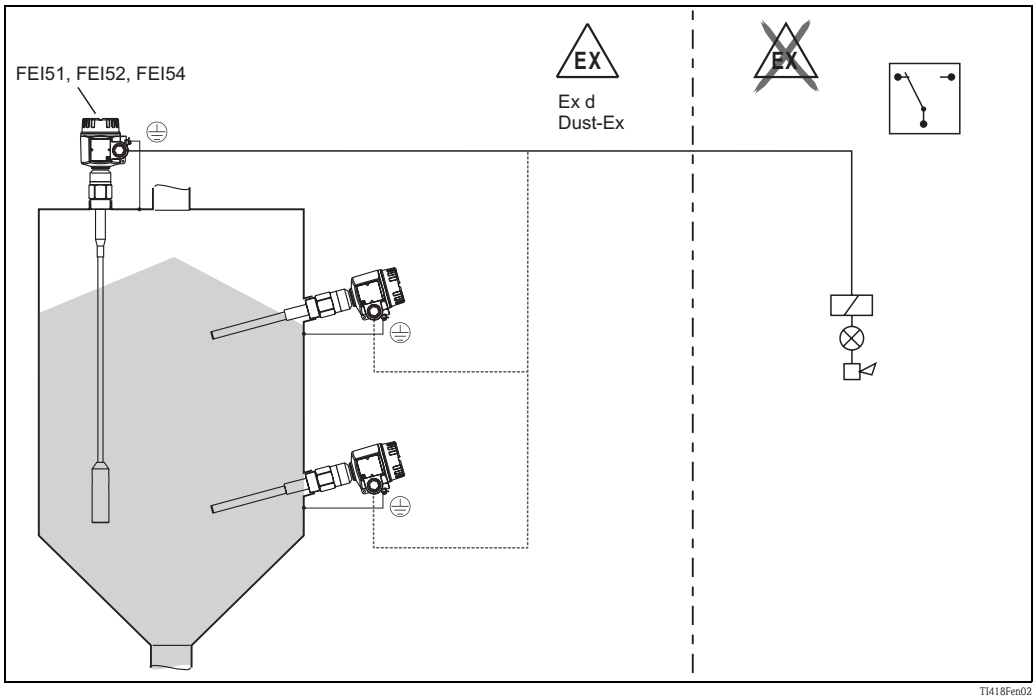
Measuring system

The make-up of the measuring system depends on the electronic insert selected.

Level limit switch

The complete measuring system consists of:

- The capacitive level limit probe, Solicap M FTI55 or FTI56
- An electronic insert FEI51, FEI52, FEI54



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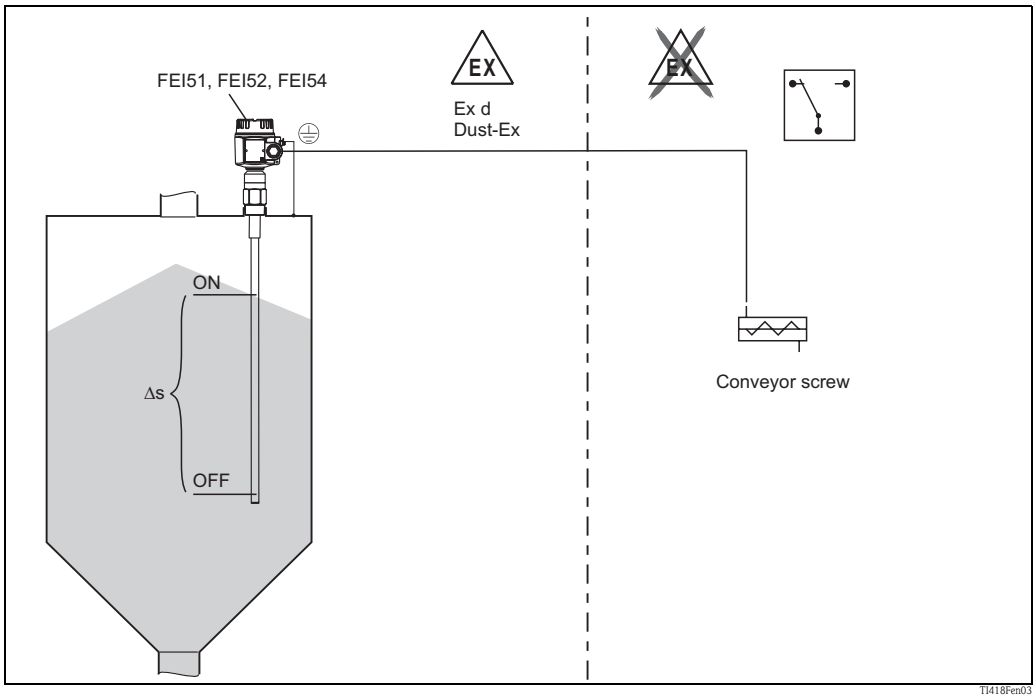
Two-point control (Δs function)

Note!
Partially insulated probes only in conjunction with nonconductive bulk solids.



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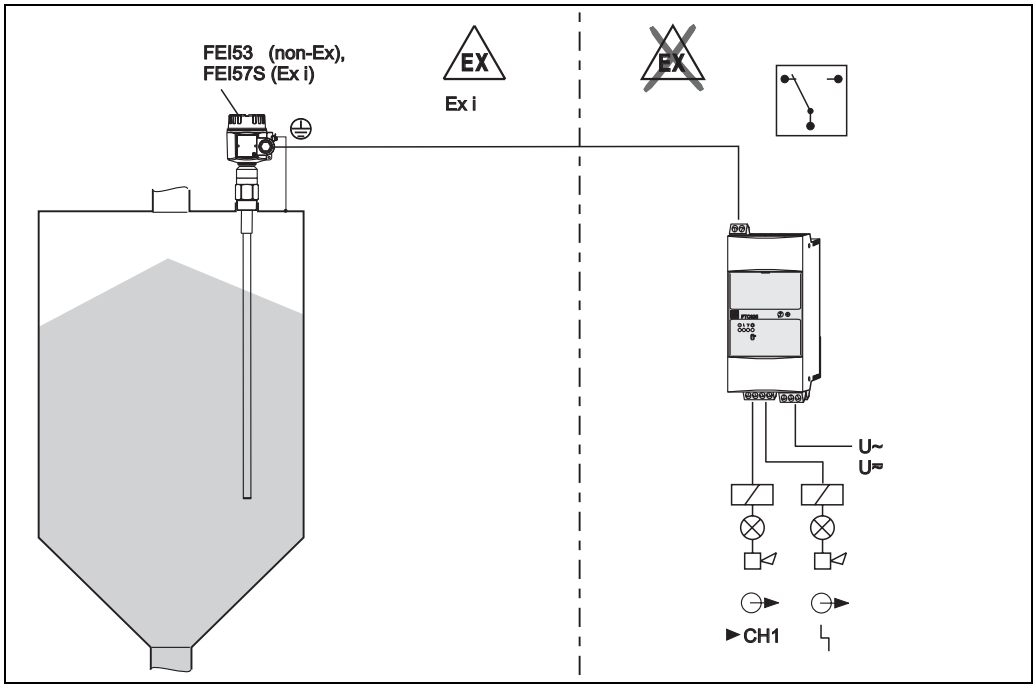
The level limit switch can also be used to control a screw conveyor, for example, where the on and off values can be freely defined.

Level limit sensor

Solicap M FTI55, FTI56 with electronic versions FEI53, FEI57S for connecting to a separate switching unit.

The complete measuring system consists of:

- the capacitive level limit probe, Solicap M FTI55 or FTI56
- an FEI53, FEI57S electronic insert
- a transmitter power supply (e.g. FTC325, FTC625, FTC470Z, FTC471Z)



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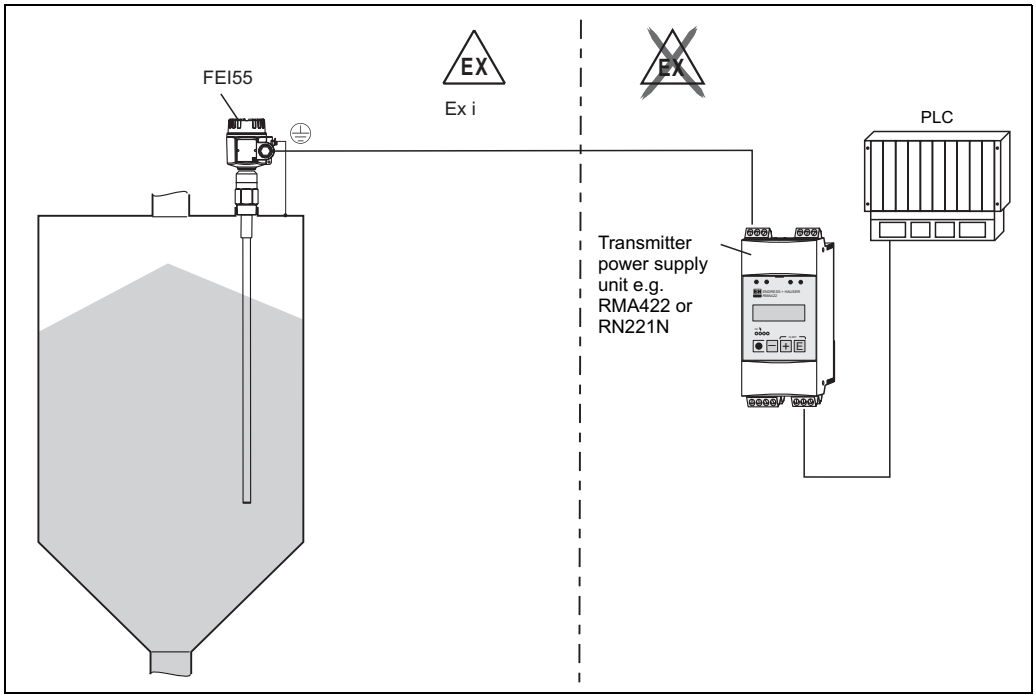
Level limit sensor 8/16 mA

The complete measuring system consists of:

- the capacitive level limit probe, Solicap M FTI55 or FTI56
- the FEI55 electronic insert
- a transmitter power supply unit (e.g. RN221N, RNS221, RMA421, RMA422)



Electronic versions

FEI51
Two-wire AC connection

- Load switched directly into the power supply circuit via the thyristor.
- Level limit adjustment directly at the level limit probe.

FEI52
3-wire direct current version:

- Switch the load via the transistor (PNP) and separate supply voltage connection.
- Level limit adjustment directly at the level limit probe.

FEI53
3-wire direct current version with 3 to 12 V signal output:

- For separate switching unit, Nivotester FTC325 3-WIRE.
- Level limit adjustment directly at the switching unit.

FEI54
Universal current version with relay output:

- Switch the loads via 2 floating changeover contacts (DPDT).
- Level limit adjustment directly at the level limit probe.

FEI55
Signal transmission 8/16 mA on two-wire cabling:

- SIL2 approval for the hardware
- SIL3 approval for the software
- For separate switching unit (e.g. RN221N, RNS221, RMA421, RMA422).
- Level limit adjustment directly at the level limit probe.

FEI57S
PFM signal transmission (current pulses are superimposed on the supply current):

- For separate switching unit with PFM signal transmission e.g. FTC325 PFM, FTC625 PFM and FTC470Z/471Z
- Self-test from the switching unit without changing levels.
- Level limit adjustment directly at the switching unit.
- Cyclical checking from the switching unit.

Note!
For additional information see Page 30 ff.

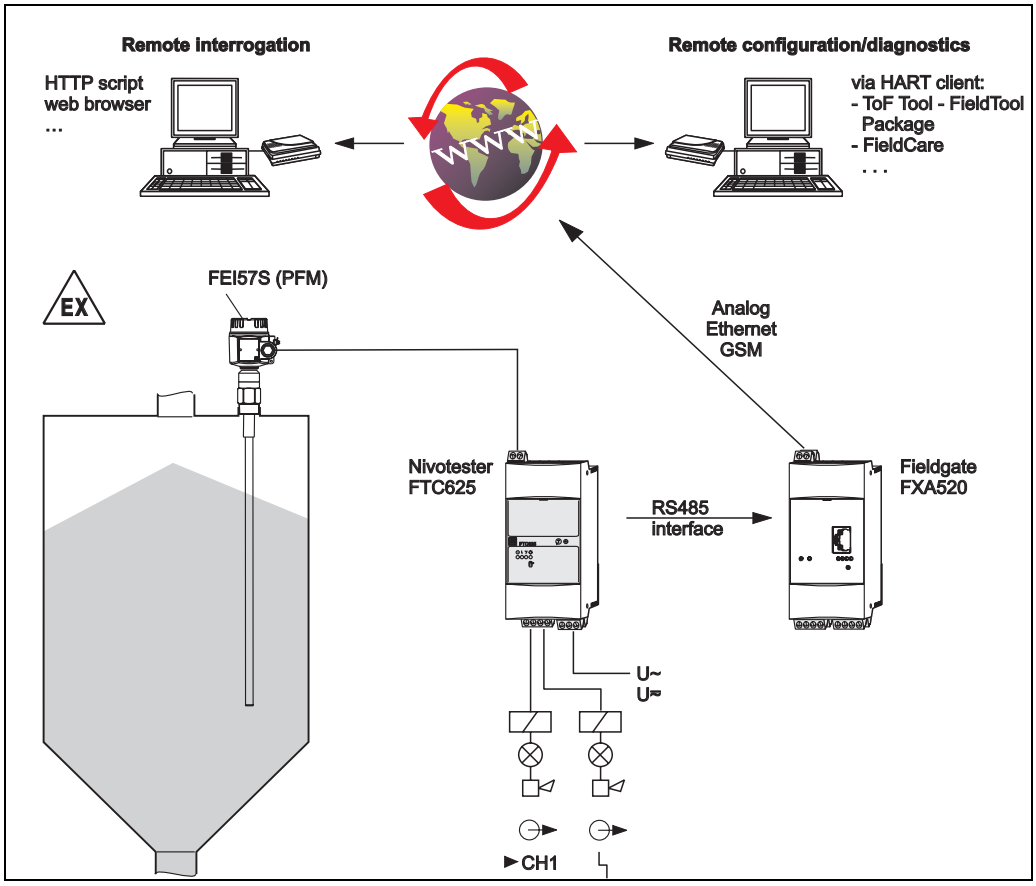
System integration via Fieldgate

Vendor managed inventory

The remote interrogation of tank or silo levels via Fieldgate enables suppliers of raw materials to gather information about the current inventories of their regular customers at any time and, for example, to take this into account in their own production planning. The Fieldgate monitors the configured level limits and automatically triggers the next order as required. Here, the range of possibilities ranges from simple requisitioning by e-mail through to fully automatic order processing by incorporating XML data into the planning systems on both sides.

Remote maintenance of measuring systems

Not only does Fieldgate transmit the current measured values, it also alerts the standby personnel responsible by e-mail or SMS as required. Fieldgate forwards the information transparently. In this way, all options of the operating software in question are available remotely. By using remote diagnosis and remote configuration some onsite service operations can be avoided and all others can at least be planned and prepared better.



Operating conditions: Installation

Note!
All dimensions in mm.

Installation

Installation instructions

The Solicap M FTI55 (rod probe) can be installed from above and from the side.
The Solicap M FTI56 (rope probe) can be installed vertically from above.

Note!
The probe may not come into contact with the container wall! Do not install probes in the area of the filling curtain!

General notes

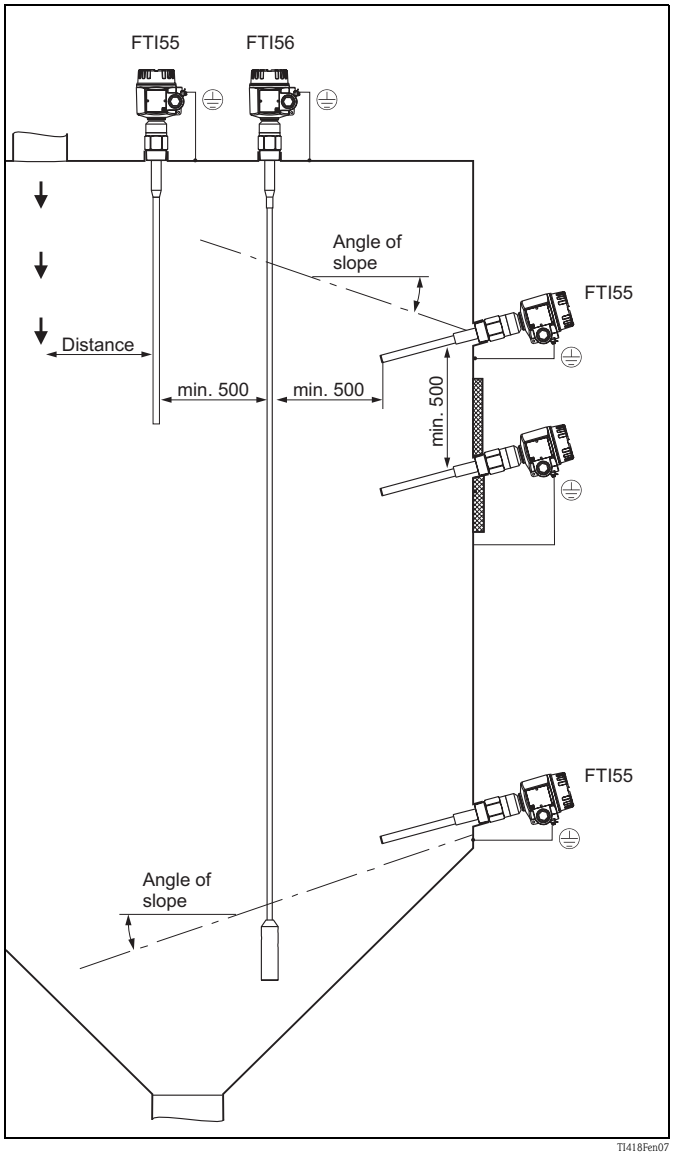
Filling the silo
The filling stream should not be directed onto the probe.

Angle of material flow
Note the expected angle of the material flow or of the outlet funnel when determining the mounting location or probe length.

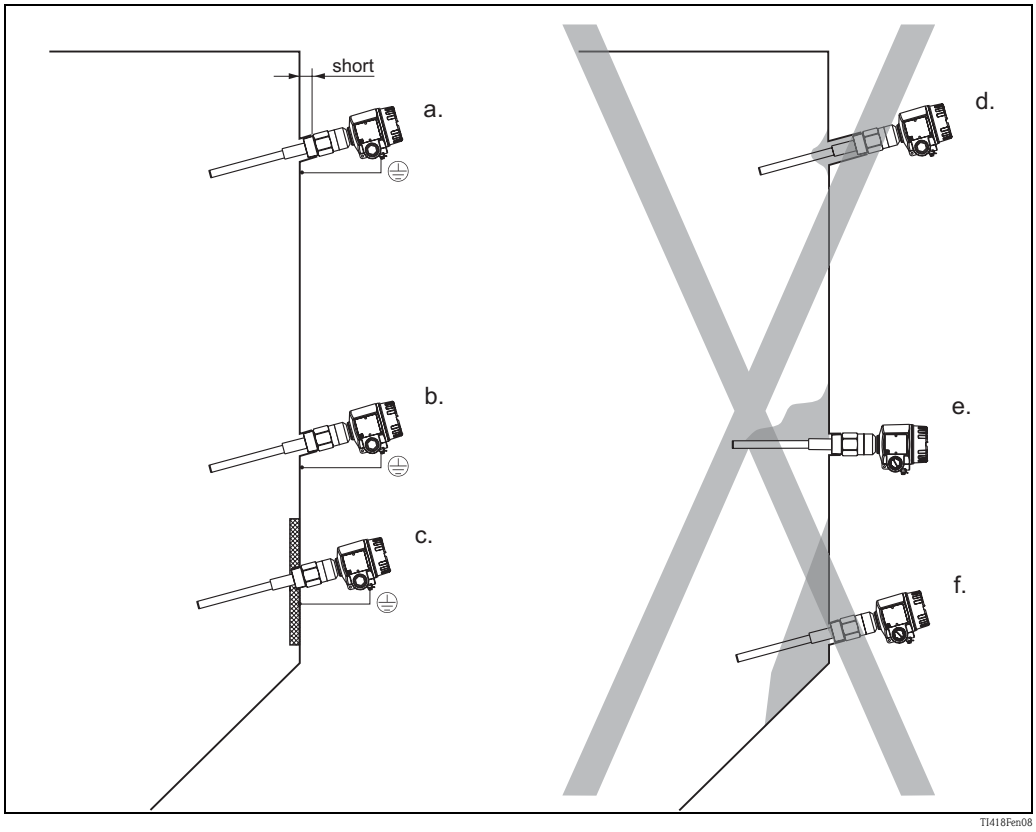
Distance between probes
When installing several probes in a silo, a minimum distance of 0.5 m between the probes must be observed.

Threaded coupling for mounting
When installing the Solicap M FTI55, FTI56, the threaded coupling should be as short as possible.
Condensation or product residue may occur in a long threaded coupling and interfere with the correct operation of the probe.

Heat insulation
In the event of high temperatures in the silo:
Insulate the external silo wall to avoid exceeding the permitted temperature of the Solicap M housing.
Heat insulation also prevents condensation from forming near the threaded boss in the silo.
This reduces buildup and the risk of error switching.



Preparing to install rod probes FTI55



Correct installation

a. For maximum level limit detection, a short threaded coupling is used.

b. For minimum level limit detection, a short threaded coupling is used.

c. In the event of light buildup on the silo wall, the threaded coupling is welded internally. The probe tip points slightly downwards so that bulk solids slide off more easily.

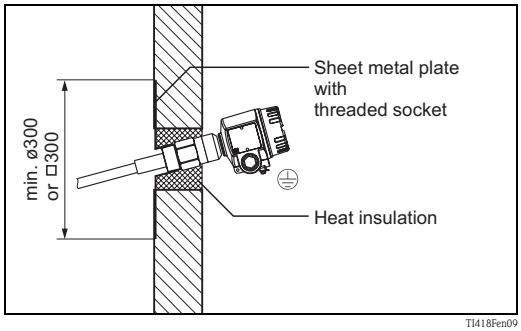
Incorrect installation

d. The threaded coupling is too long. This may cause material to settle inside and result in error switching.

e. Horizontal mounting means a risk of error switching in the event of heavy buildup on the silo wall. In this case, the Solicap M FTI55 (rod probe) with inactive length is recommended.

f. In areas where product buildup occurs, the device cannot detect if the silo is "empty". In this case, the FTI56 (rope probe) should be installed from above.

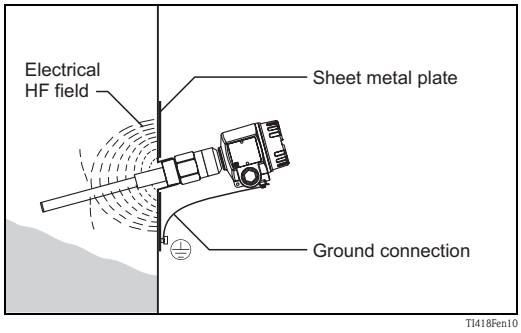
In this example, the grounded steel plate forms the counter electrode.
Heat insulation prevents condensation and therefore buildup on the steel plate.



In a silo with concrete walls

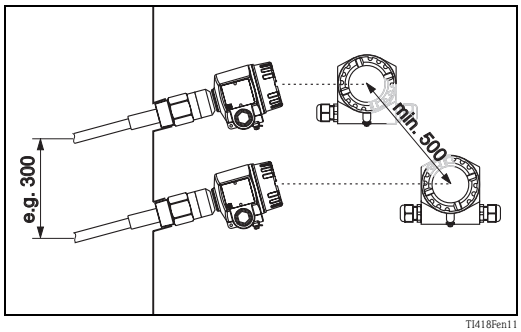
When installing in a silo made of plastic, a sheet metal plate must be attached to the exterior of the silo as a counter electrode.
This plate can be either square or round.

– Dimensions in the case of a thin silo wall with a low dielectric constant:
  approx. 0.5 m along each side or ø0.5 m;
– Dimensions in the case of a thicker silo wall or wall with a higher dielectric constant:
  approx. 0.7 m along each side or ø0.7 m.



In a silo with plastic walls

The required minimum distances can be observed by installing in a staggered manner.

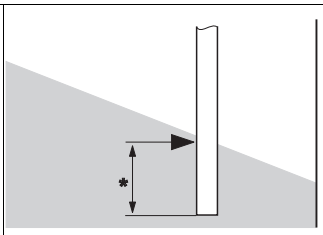


For small differences in level

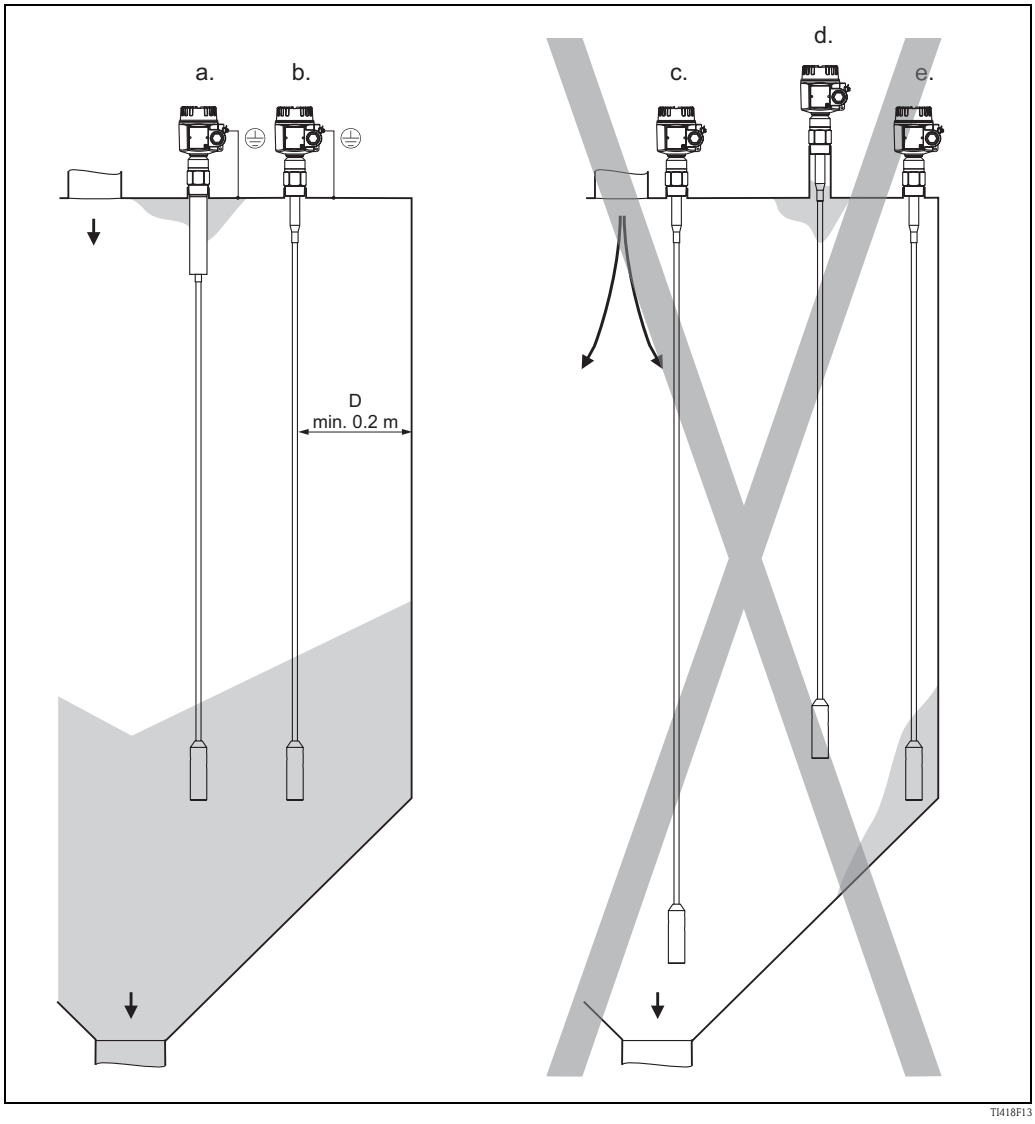
Probe length and minimum coverage

Note!

- When selecting the probe length, pay attention to the dependency between the relative dielectric constant ε_r and the minimum amount the probe rod needs to be covered (see Table).
- For probe length tolerances see Page 27 ff.
- To ensure problem-free operation, it is important that the difference in capacitance between the covered and uncovered parts of the probe is at least 5 pF.
- If you do not know the dielectric constant of the material, contact us for advice.

Product properties, relative dielectric constant ε_r	 ** Minimum coverage*
Electrically conductive	25 mm
Nonconductive	
$\varepsilon_r > 10$	100 mm
$\varepsilon_r > 5$ to 10	200 mm
$\varepsilon_r > 2$ to 5	500 mm

Preparing to install rope probes FTI56



In a silo with metal walls
Distance D between the probe and the wall approx. 10 to 25 % of the silo diameter

Correct installation

a. Solicap M FTI55, FTI56 with inactive length in the event of condensation and material buildup on the silo roof.

b. At the correct distance from the silo wall, the material inlet and the material outlet.
Close to the wall, for reliable switching in the case of a low dielectric constant (not for pneumatic filling).
For pneumatic filling, the distance from the probe to the wall should not be too short, as the probe may swing.

Incorrect installation

c. If too close to the material inlet, inflowing bulk solids may damage the sensor.
If close to the center of the material outflow, high tensile forces at this point may cause the probe to break off or subject the silo roof to excessive strain.

d. The threaded coupling is too long. This may cause condensation and dust to settle inside which may result in error switching.

e. If too close to the silo wall, the probe may swing slightly against the wall or come in contact with buildup. This can result in error switching.

Silo roof

Ensure that the silo roof is of a sufficiently stable construction.
High tensile forces may occur when material is being extracted, particularly in the case of heavy and powdery bulk solids which have a tendency to form buildup.

Coarse-grained bulk solids

In silos with extremely coarse-grained or extremely abrasive bulk solids, the use of a Solicap M FTI55 or FTI56 is recommended only for maximum detection.

Distance between the rope probes

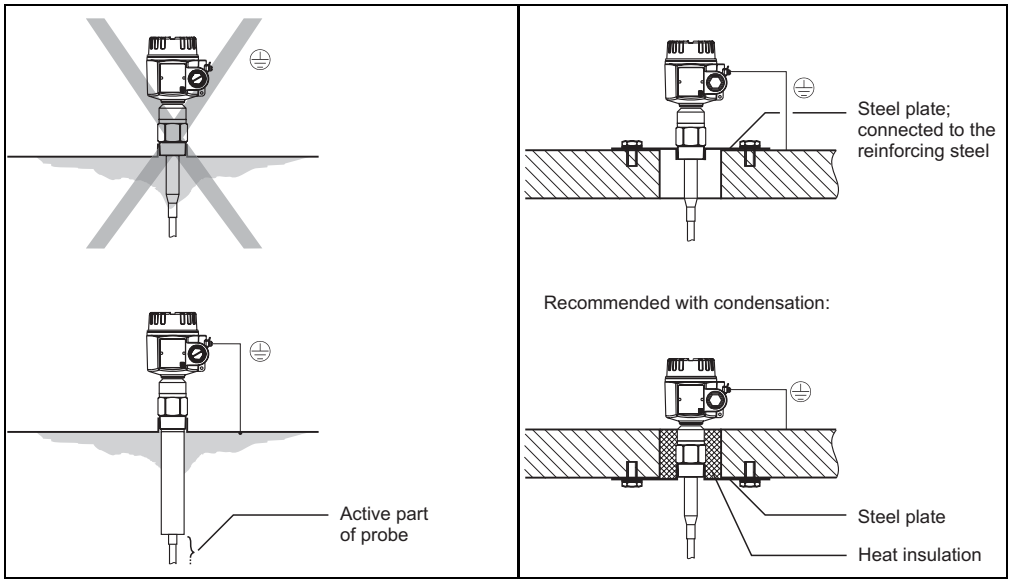
To rule out mutual probe interference, you must maintain a minimum distance of 0.5 m between the rope probes. This also applies if you are installing several Solicap M units in adjacent silos with nonconductive walls.

In the event of condensation:

Use the FTI56 with inactive length.
The inactive length (**A**) prevents moisture and buildup forming between the active part of the probe and the silo roof.

Or:
To reduce the effects of condensation (**B**) and buildup, the threaded coupling (length: max. 25 mm) must project into the silo.
Heat insulation reduces condensation and therefore buildup on the steel plate.

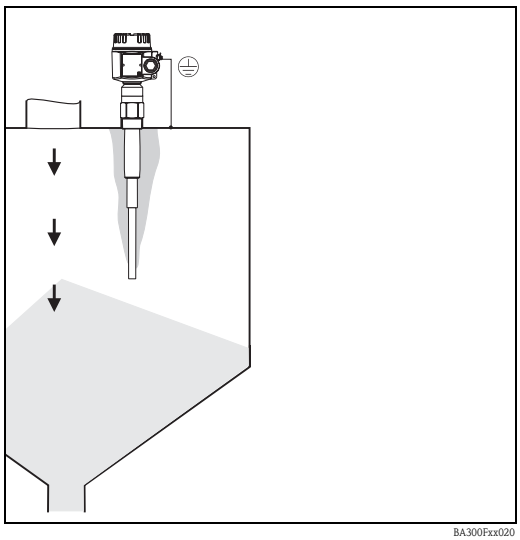
A **B**



Silo with walls that conduct electricity *Silo with concrete walls*

In the event of buildup:

If buildup on the probe rod can be expected when operating the measuring system, the active buildup compensation function prevents the measurement result from becoming distorted. No cleaning work has to be performed on the probe rod.



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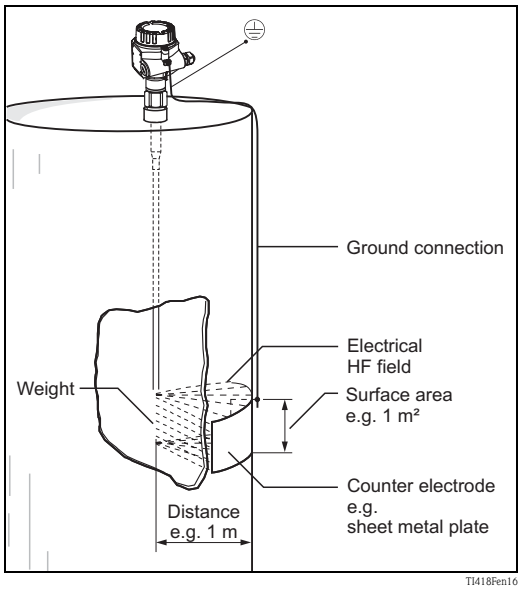
Installation in plastic tanks

When installing in a silo made of plastic, a counter electrode must be mounted on the silo exterior at the same height as the tensioning weight.
The length of the edge of the counter electrode should be approximately the same length as the distance between the tensioning weight and the silo wall.



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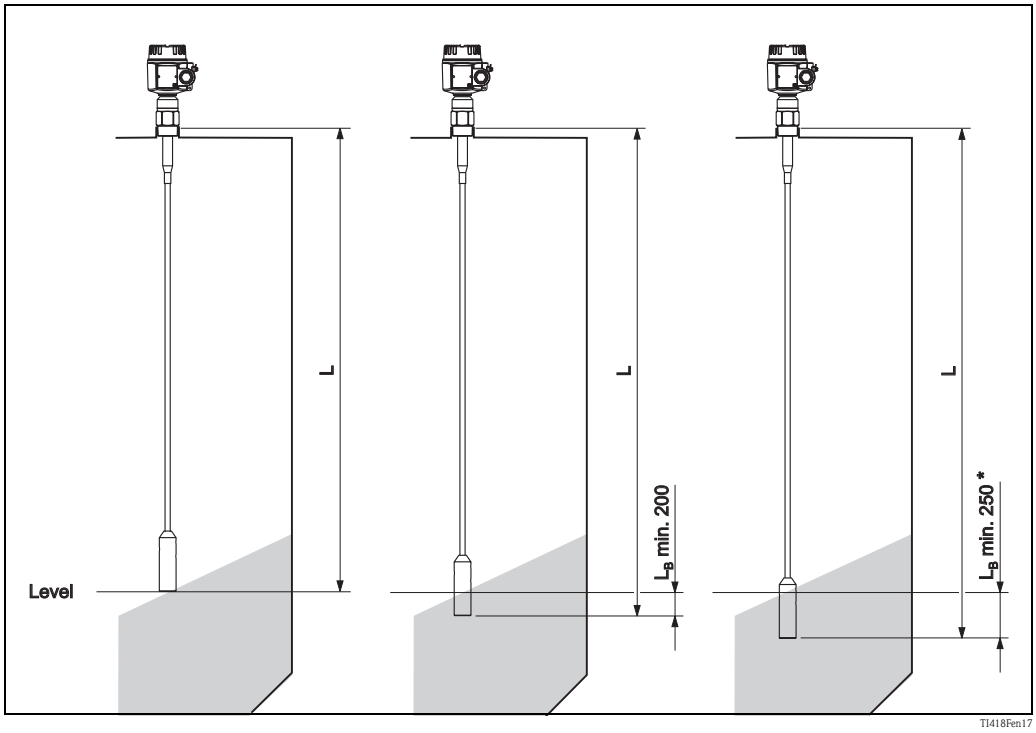
In a silo with plastic walls

Range of sensor lengths

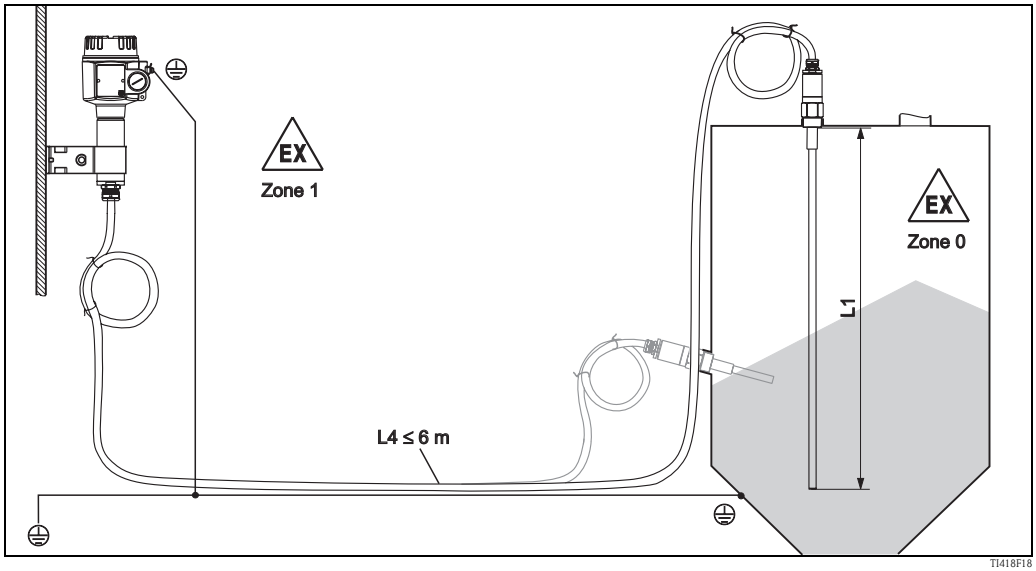


Electrically conductive bulk solids (e.g. coal)	Bulk solids with high dielectric constant (e.g. rock salt)	Bulk solids with low dielectric constant (e.g. dried grain)

* L_B (covered length):
For nonconductive bulk solids with a low dielectric constant, the rope probe must be approx. 5 % (but no less than 250 mm) longer than the distance between the tank roof and the required level limit.

With separate housing

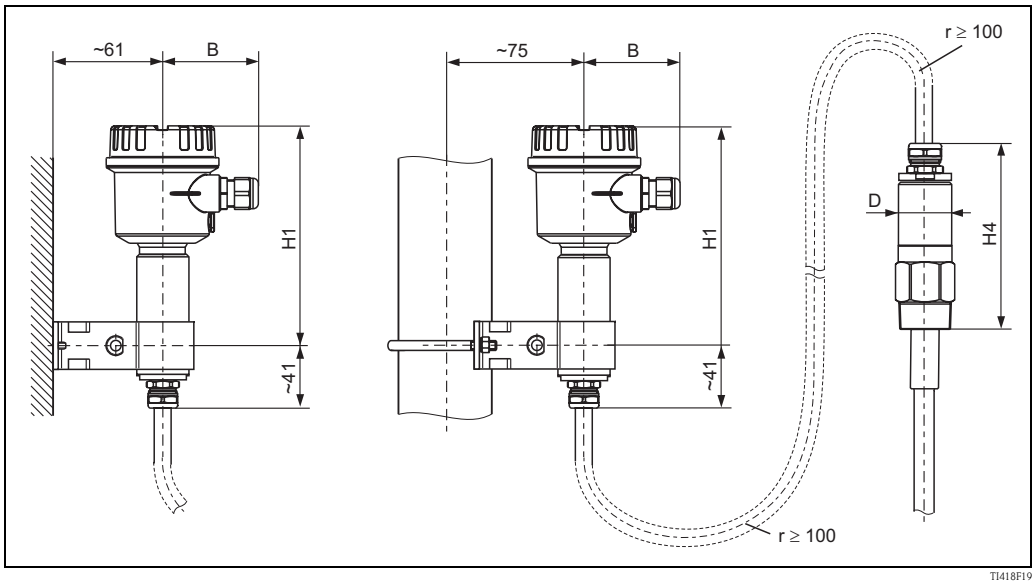
Note!
- For information on how to order, see also "Ordering information" from Page 41 under "Probe design".
- The maximum connection length between the probe and the separate housing is 6 m (L4). When ordering a Solicap M with a separate housing, the desired length must be specified.
- If the connecting cable is to be shortened or passed through a wall, it must be separated from the process connection.
- The cable has a bending radius of r ≥ 100. This must be observed as a minimum.



Rod length L1 max. 4 m
Rope length L1 max. 19.7 m (the maximum total length of L1 + L4 should not exceed 20 m.)

Extension heights

Housing side: wall mounting | Housing side: pipe mounting | Sensor side

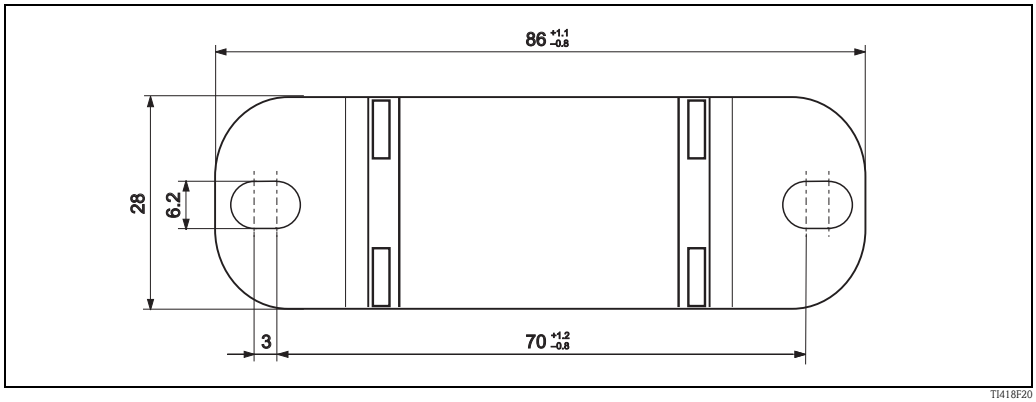


	R 1½, NPT 1½	Polyester housing F16	Stainless steel housing F15	Aluminum housing F17
B	-	76	64	65
H1	-	172	166	177
D	50	-	-	-
H4	130	-	-	-

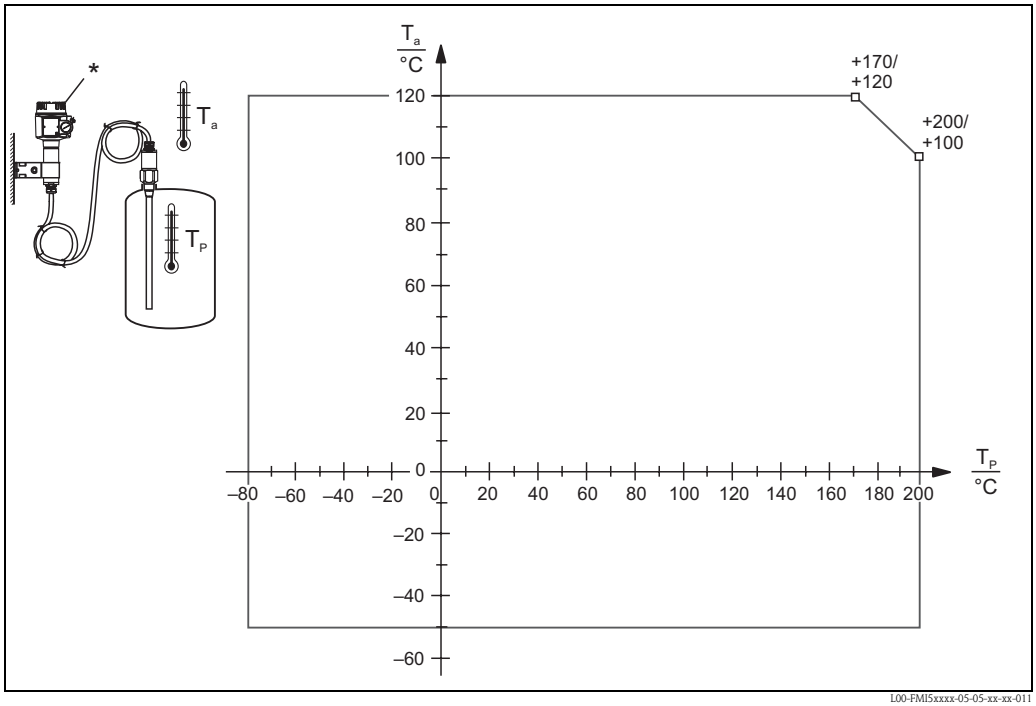
Note!
- Connecting cable: ø10.5 mm
- Outer jacket: silicone, notch-resistant

Wall holder unit

Note!
The wall holder unit first has to be screwed to the separate housing before you can use it as a drilling template. The distance between the holes is reduced by screwing it to the separate housing.



Temperature-derating separate housing



T_a: ambient temperature
T_P: process temperature
** temperature at separate housing ≤ 70 °C*

Note!
The maximum connection length between the probe and the separate housing is 6 m (L4). When ordering a Liquicap M with a separate housing, the desired length must be specified.
If the connecting cable is to be shortened or passed through a wall, it must be separated from the process connection. See "Documentation" => "Operating Instructions" on Page 46.

Operating conditions: Environment

Ambient temperature range

- Ambient temperature of the transmitter (note derating, see Page 20 ff.):
  - ❑ –50 to +70 °C
  - ❑ –40 to +70 °C (with F16 housing)
- A weather protection cover should be used when operating outdoors in strong sunlight. For further information on the weather protection cover, see Page 45.

Storage temperature

–50 to +85 °C

Climate class

DIN EN 60068-2-38/IEC 68-2-38: test Z/AD

Degree of protection

In accordance with EN 60529

	IP66	IP67	IP68	NEMA4X
Polyester housing F16	X	X	–	X
Stainless steel housing F15	X	X	–	X
Aluminum housing F17	X	X	–	X
Aluminum housing F13 with gas-tight process seal	X	–	X	X
Aluminum housing T13 with gas-tight process seal and separate connection compartment (EEx d)	X	–	X	X
Separate housing	X	–	X	X

Vibration resistance

DIN EN 60068-2-64/IEC 68-2-64: 20 Hz– 2000 Hz; 0.01 g^2/Hz

Cleaning

Housing:
When cleaning, make sure that the cleaning agent used does not corrode the housing surface or the seals.

Probe:
Depending on the application, buildup (contamination and soiling) can form on the probe rod. A high degree of material buildup can affect the measurement result. If the medium tends to create a high degree of buildup, regular cleaning is recommended. When cleaning, it is important to make sure that the insulation of the probe rod is not damaged. If cleaning agents are used make sure the material is resistant to them!

Electromagnetic compatibility (EMC)

- Interference emission to EN 61326, Electrical Equipment Class B
  Interference immunity in accordance with EN 61326, Appendix A (Industrial) and NAMUR Recommendation NE 21 (EMC)
- A usual commercial instrument cable can be used.

Shock resistance

DIN EN 60068-2-27/IEC 68-2-27: 30g acceleration

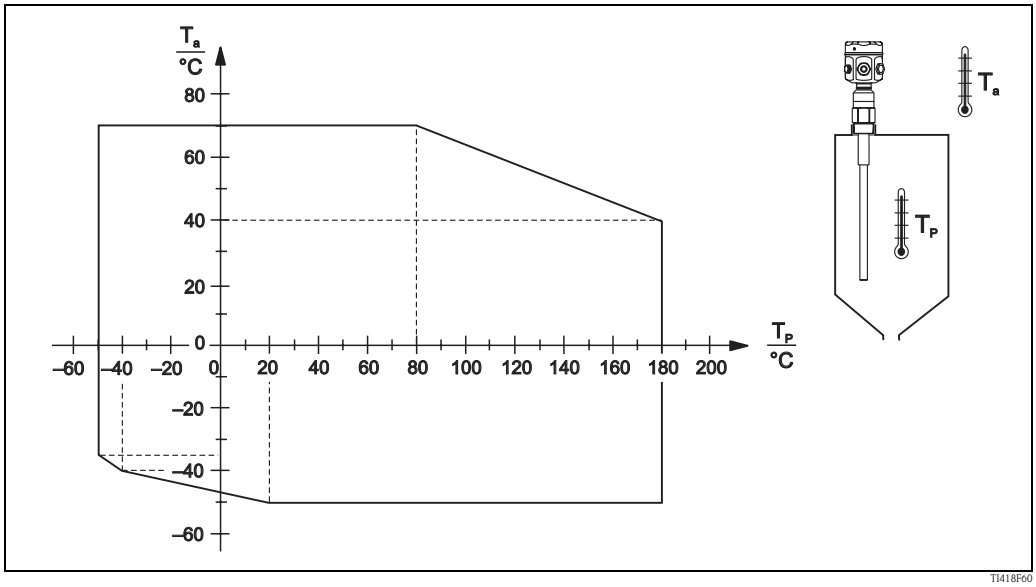
Operating conditions: Process

Process temperature range

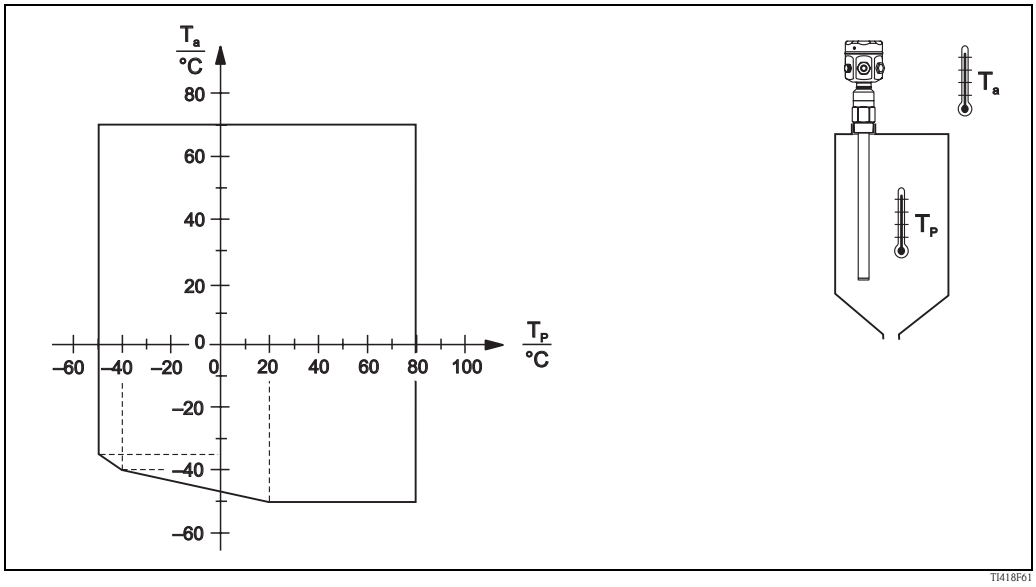
Note!
- The following process temperature ranges only apply for standard applications outside hazardous areas.
- Regulations for use in hazardous areas are provided in the Supplementary Documentation XA389F/00.

Permitted ambient temperature T_a at the housing depending on the process temperature T_p in the tank.

Rod probe FTI55



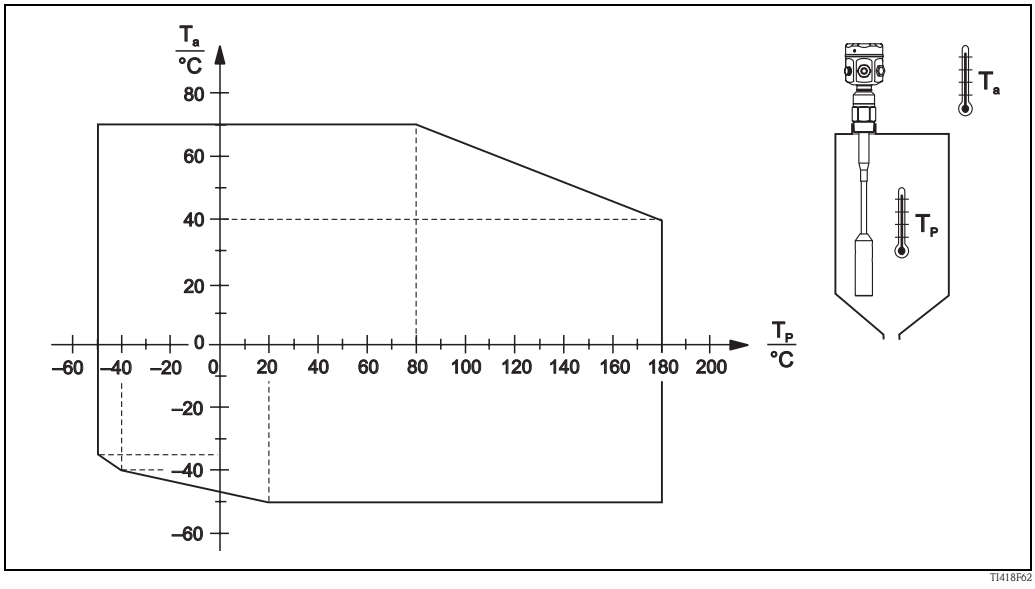
Partially insulated (PPS)



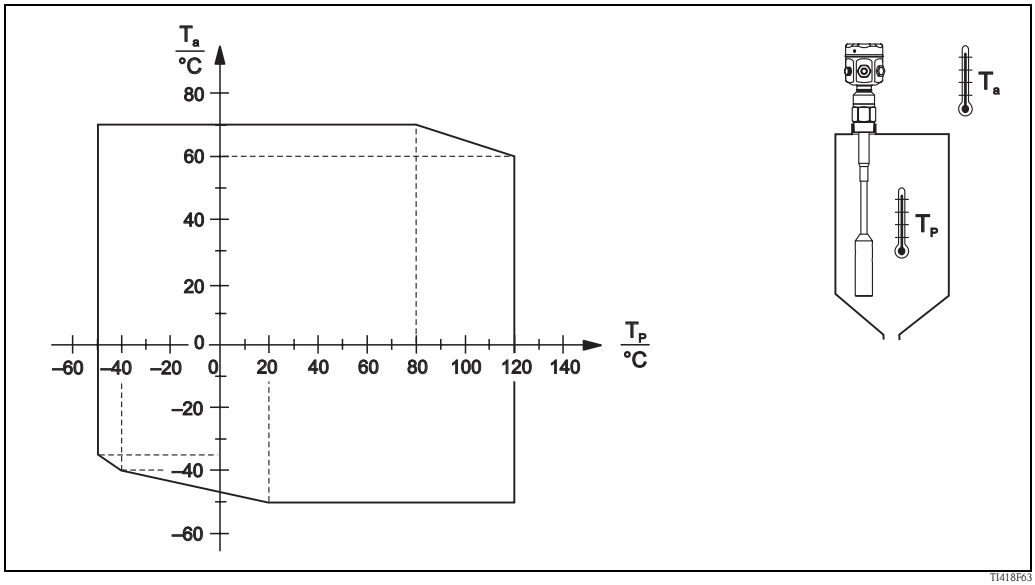
Fully insulated (PE)

Note!
- Restriction to T_a –40 °C for polyester housing F16.

Rope probe FTI56



Partially insulated (PTFE)

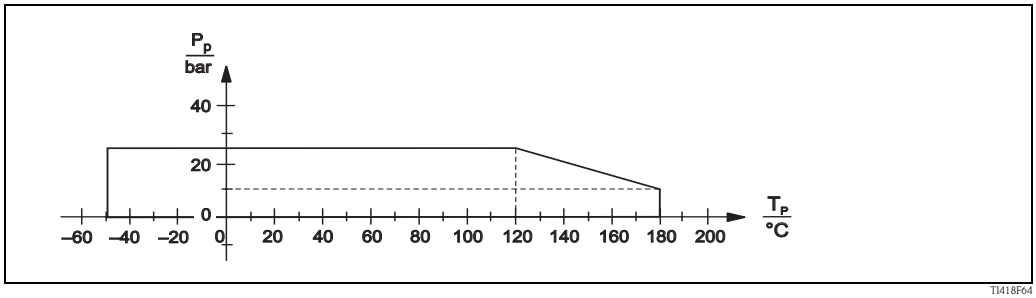


Fully insulated (PA)

Process pressure and temperature derating

Note!
- The lowest value from the derating curves of the device and the selected flange applies.
- In the case of flange process connections, the maximum pressure is limited by the nominal pressure of the flange.
- See also "Process connections" on Page 26 ff.

Rod probe FTI55



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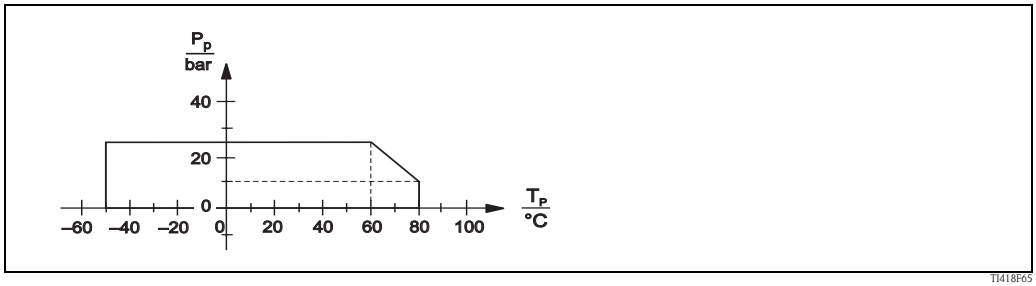
Partially insulated (PPS)



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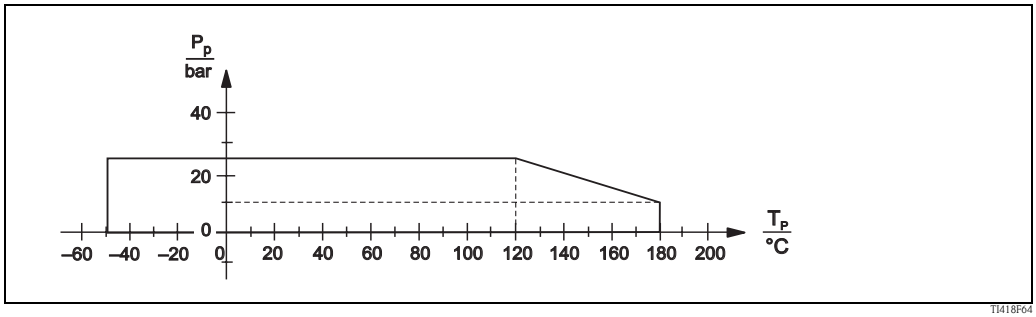
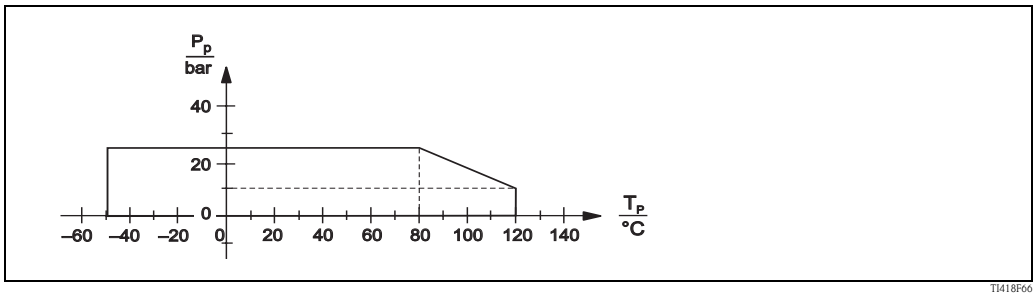
Fully insulated (PE)

Rope probe FTI56



TI418F64

Partially insulated (PTFE)



TI418F66

Fully insulated (PA)

Process pressure limits

–1 to 25 bar (observe dependencies: process temperature and process connection from Page 20 and Page 26 ff.)

The lowest value from the derating curves of the device and the selected flange applies.
Please refer to the following standards for the pressure values permitted at higher temperatures:

- pR EN 1092-1: 2005 Table, Appendix G2
  With regard to its resistance/temperature property, the material 1.4435 is identical to 1.4404 (AISI 316L) which is grouped under 13E0 in EN 1092-1 Tab. 18. The chemical makeup of the two materials can be identical.
- ASME B 16.5a - 1998 Tab. 2-2.2 F316
- ASME B 16.5a - 1998 Tab. 2.3.8 N10276
- JIS B 2220

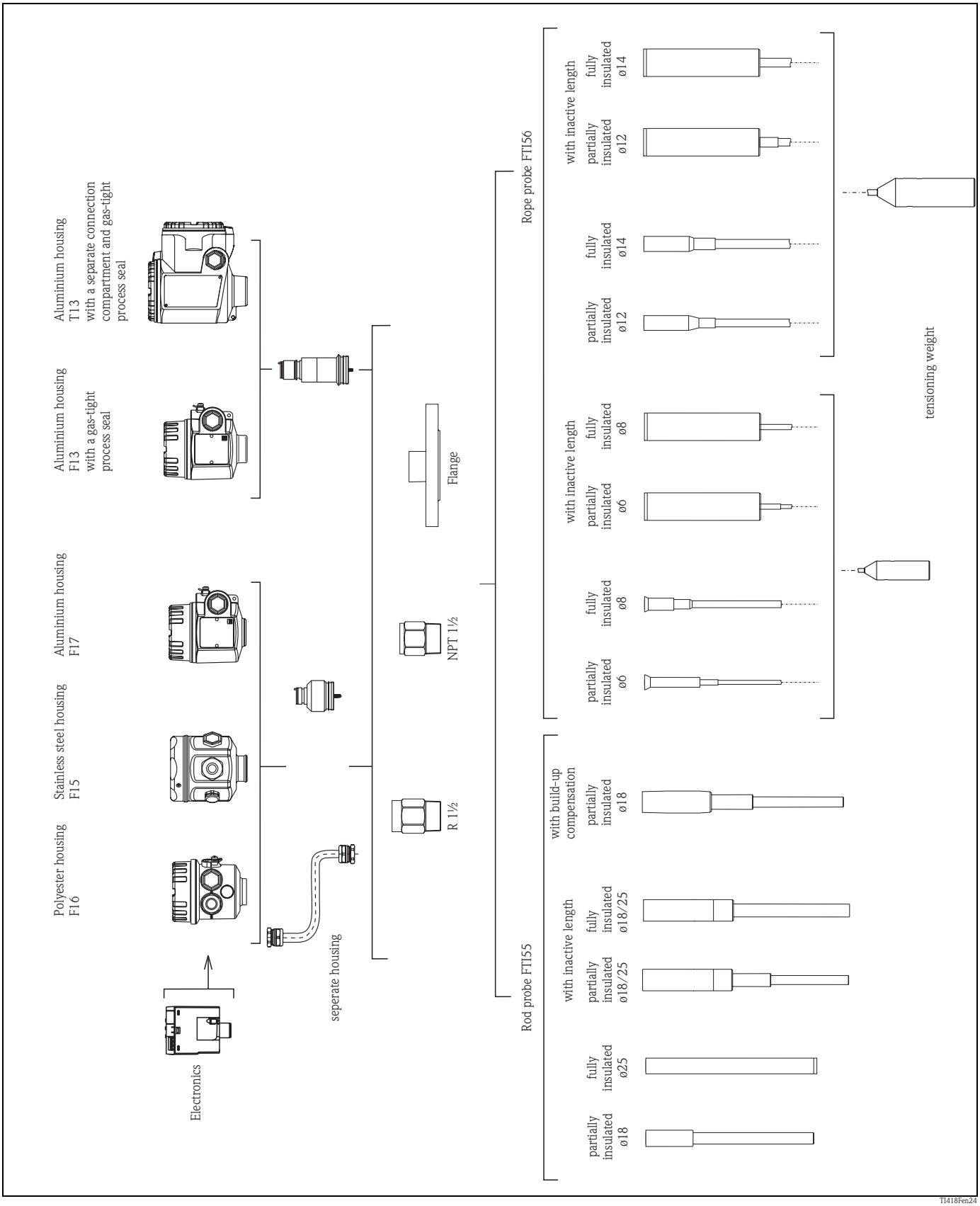
State of aggregation

See Page 4, "Application examples"

Mechanical construction

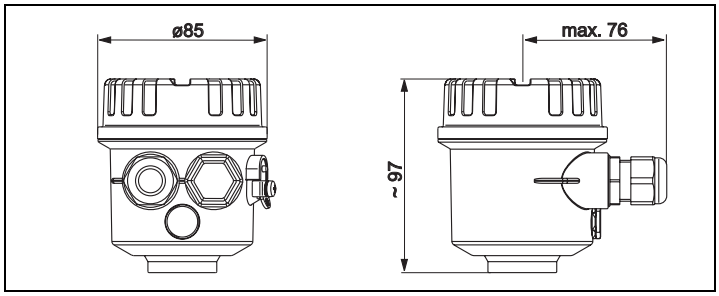
Note!
All dimensions in mm.

Overview

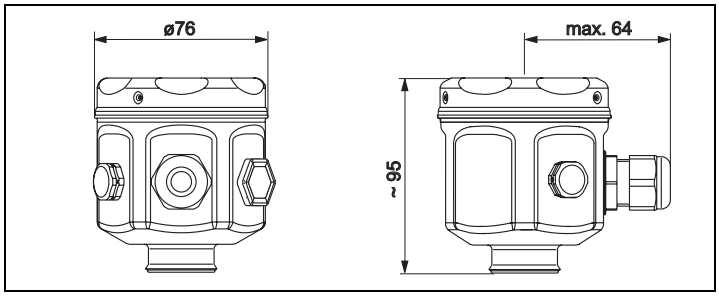


Housing

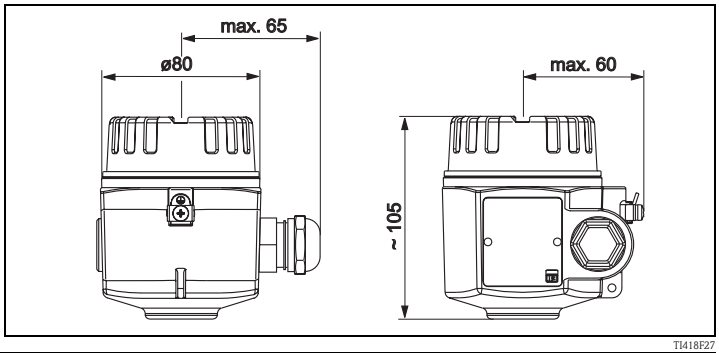
Polyester housing F16



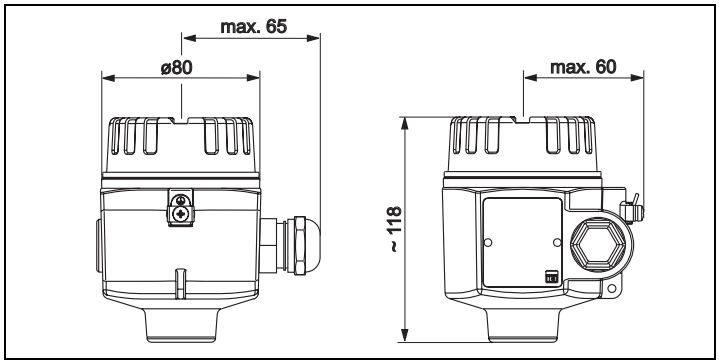
Stainless steel housing F15



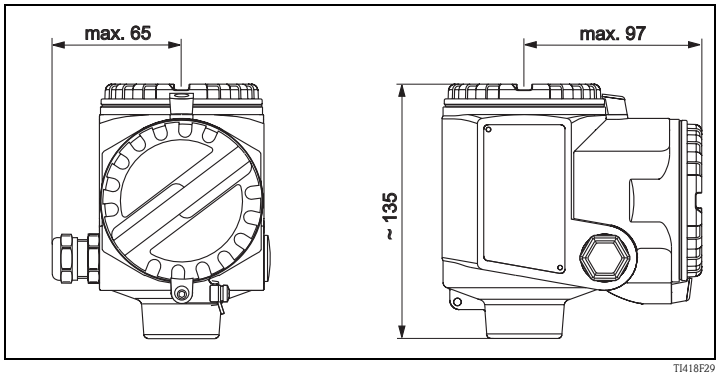
Aluminum housing F17



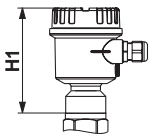
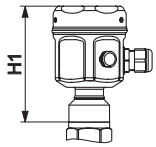
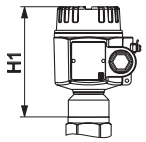
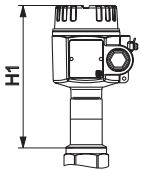
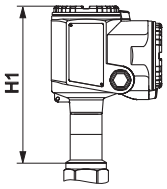
Aluminum housing F13
with gas-tight process seal



Aluminum housing T13
with separate connection compartment and gas-tight process seal

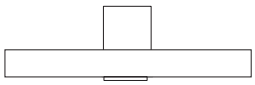


Housing heights with adapter

	Polyester housing F16	Stainless steel housing F15	Aluminum housing F17	Aluminum housing F13*	Aluminum housing with separate connection compartment T13*
	 TI418F30	 TI418F31	 TI418F32	 TI418F33	 TI418F34
Order code	2	1	3	4	5
FTI55, FTI56					
H1	125	121	131	177	194

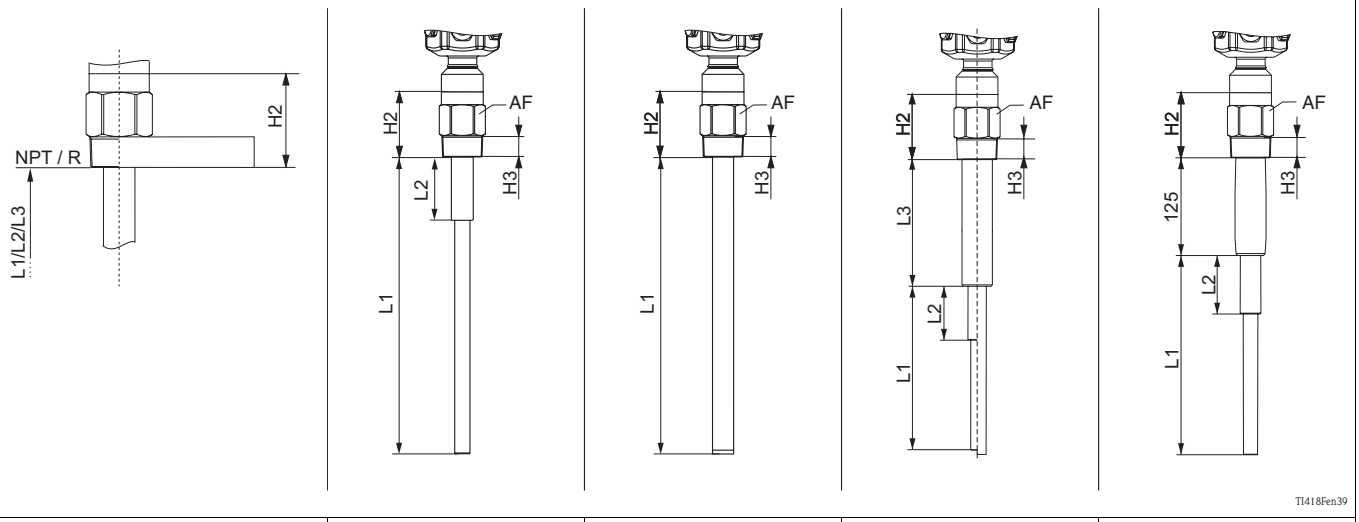
* Housing with gas-tight process seal

Process connections and flanges

	Thread: R 1½	Thread: NPT 1½	Flanges
	 TI418Fen35	 TI418Fen36	 TI418F37
	(DIN EN 10226-1)	(ANSI B 1.20.1)	(EN1092-1) (ANSI B 16.5) (JIS B2220)
Order code/material	RVJ / 316L RV1 / steel	RGJ / 316L RG1 / steel	
Pressures up to	25 bars	25 bars	Depends on flange max. 25 bar

Rod probes FTI55

Note!
Total length of the probe from the start of the thread: L = L1 + L3
(+ 125 mm with active buildup compensation)

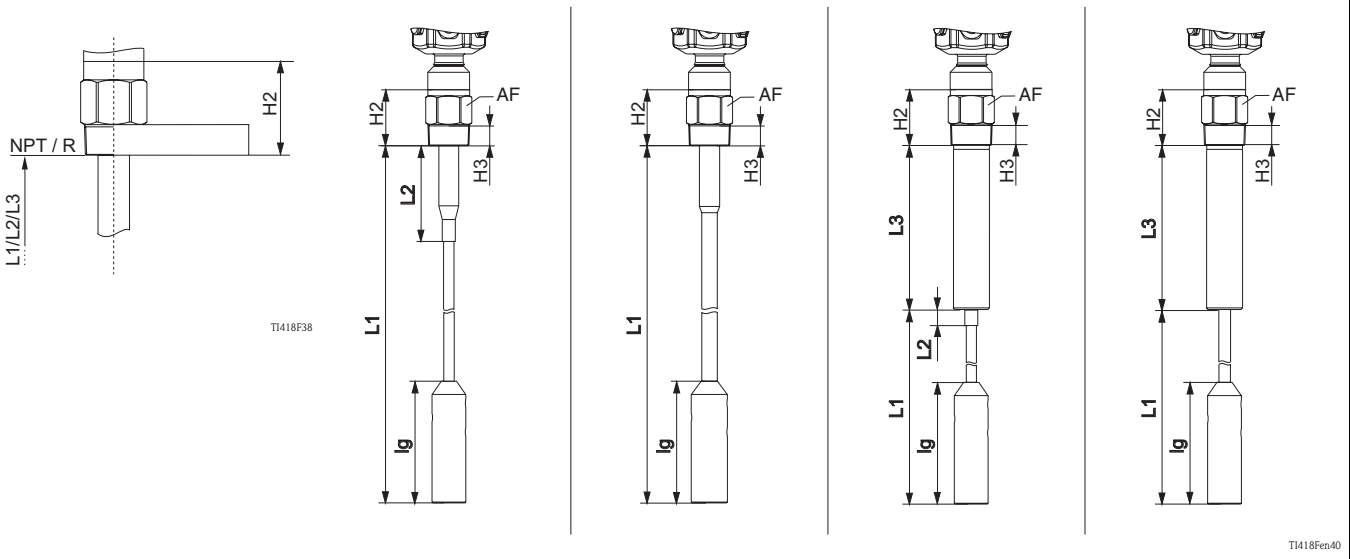
	Rod probe partially insulated	Rod probe fully insulated	Rod probe with inactive length partially/fully insulated	Rod probe with active buildup compensation partially insulated
				
H2	77	77	66	92
H3	25	25	25	25
Across flats (AF)	50	50	50	50
Total length (L)	200 to 4000	200 to 4000	300 to 6000	225 to 4000
Active rod length (L1)	200 to 4000	200 to 4000	100 to 4000	100 to 4000
Inactive rod length (L3)	-	-	200 to 2000	-
Length of partial insulation (L2)	75	-	75 / -	75
Probe rod diameter + insulation thickness (mm)	18 3.5	18 3.5	18 3.5	18 3.5
ø Active buildup compensation Length (mm)	– / –	– / –	– / –	36 125
Lateral loading capacity (Nm) at 20 °C	300	300	300	200
Maximum process temperature (°C)	180	80	180/80	180
For use in mounting nozzles	-	-	X	-
In the event of condensate on tank ceiling	-	-	X	X

X = recommended

Length tolerance up to 1 m: 0 to –5 mm > 1 m to 3 m: 0 to –10 mm > 3 m to 6 m: 0 to –20 mm

Rope probes FTI56

Note!
Total length of probe from start of thread: L = L1 + L3

	Rod probe Partially insulated rope		Rod probe Fully insulated rope		Rope probe with inactive length Partially insulated rope		Rope probe with inactive length Fully insulated rope	
								
H2	66		66		66		66	
H3	25		25		25		25	
Across flats (AF)	50		50		50		50	
Total length (L)	500 to 20000		500 to 20000		700 to 20000		700 to 20000	
Active rope length (L1)	500 to 20000		500 to 20000		500 to 19800		500 to 19800	
Length of partial insulation (L2)*	500		-		500		-	
Inactive length (L3)	-		-		200 to 2000		200 to 2000	
Probe rope diameter + insulation thickness (mm)	6 1	12 2	6 1	12 1	6 1	12 2	6 1	12 1
ø Tensioning weight (mm)**	30	40	30	40	30	40	30	40
Length of tensioning weight (lg)	150	250	150	250	150	250	150	250
Tensile loading capacity (kN) of probe rope at 20 °C	30	60	30	60	30	60	30	60
Maximum process temperature (°C)	180		120		180		120	
For use in mounting nozzles	-		-		X		X	
In the event of condensate on tank ceiling	-		-		X		X	

X = recommended
* The length of the partial insulation extends, at maximum, to the tensioning weight.
** The tensioning weight is always uninsulated.

Length tolerance up to 1 m: 0 to –10 mm > 1 m to 3 m: 0 to –20 mm > 3 m to 6 m: 0 to –30 mm > 6 m to 20 m: 0 to –40 mm

Technical data (probe)

Probe capacitance

Mount the probe at a minimum distance of 500 mm from a conductive container wall:
- Probe rod: approx. 1.3 pF/100 mm in air
- Probe rope: approx. 1.0 pF/100 mm in air

Material

Housing

- Aluminum housing F17, F13, T13: GD–Al Si 10 Mg, DIN 1725, with plastic coating (blue/gray)
- Polyester housing F16: PBT–FR fiberglass reinforced polyester (blue/gray)
- Stainless steel housing F15: corrosion-resistant steel 316L (14404), uninsulated

Housing cover and seals

- Aluminum housing F17, F13, T13: EN-AC-AlSi10Mg, plastic-coated
  Cover seal: EPDM
- Polyester housing F16: Cover made of PBT-FR or cover with sight glass made of PA12
  Cover seal: EPDM
- Stainless steel housing F15: AISI 316L
  Cover seal: silicone

Probe material

- Process connection, tensioning weight for rope probe: 1.4404 (316L) or steel
- Inactive length: 1.4404 (316L)
- Probe rope partially insulated: PTFE, 1.4401 (AISI 316)
- Probe rope fully insulated: PA, galvanized steel
- Probe rod partially insulated: PPS, 1.4404 (316L)
- Probe rod fully insulated: PE, galvanized steel

Weight

- with F15, F16, F17 or F13 housing approx. 4.0 kg
  + flange weight or process connection
  + probe rod 2.0 kg/m (for ø18 mm probe rod) or
  + probe rope 0.180 kg/m (for ø6 mm rope probes) or
  + probe rope 0.550 kg/m (for ø12 mm rope probes)
- with T13 housing approx. 4.5 kg
  + flange weight or process connection
  + probe rod 2.0 kg/m (for ø18 mm probe rod) or
  + probe rope 0.180 kg/m (for ø6 mm rope probes) or
  + probe rope 0.550 kg/m (for ø12 mm rope probes)

Input

Measured variable

Detection of the change in capacitance between the probe rod and the tank wall, depending on the level of the bulk solids.

Measuring range (valid for all FEI5x)

- Measuring frequency:
  500 kHz
- Span:
  ΔC = 0 to 1600 pF
- Final capacitance:
  C_E = max. 1600 pF
- Adjustable initial capacitance:
  C_A = 0 to 500 pF (range 1 = factory setting)
  C_A = 0 to 1600 pF (range 2)

Input signal

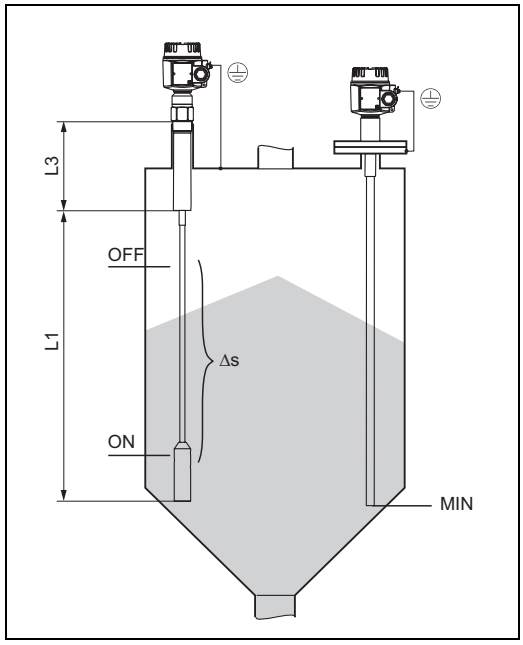
Probe covered => high capacitance
Probe not covered => low capacitance

Measuring conditions

Note!
- When installing in a nozzle, use inactive length (L3).
- To control a screw conveyor (Δs mode), rod probes and rope probes can be used. The on-value and off-value are determined by the empty and full calibration;
  – Partially insulated probes are only suitable for nonconductive bulk solids.

DK > 10	Measuring range up to 4 m
5 < DK < 10	Measuring range up to 12 m
2 < DK < 5	Measuring range up to 20 m

- The minimum capacitance change for level limit detection must be ≥ 5 pF.



TI418F41

Minimum probe length for nonconductive media (<1µs/cm)

$l_{min} = \Delta C_{min} / (C_s * [\varepsilon r - 1])$

l_{min}	=	Minimum probe length
ΔC_{min}	=	5 pF
C_s	=	Probe capacitance in air (see also → Page 29, "Technical data (probe)")
εr	=	Dielectric constant e.g. oil = 2.0

Output

Galvanic isolation	FEI51, FEI52 between rod probe and power supply FEI54: between rod probe, power supply and load FEI53, FEI55, FEI57S see connected switching device (functional galvanic isolation in the electronic insert)
Switch behavior	Binary or Δs mode (e.g. controlling a screw conveyor)
Switch-on behavior	When the power supply is switched on, the switching status of the outputs corresponds to the signal on alarm. The correct switch condition is reached after max. 3 seconds.
Fail-safe mode	Minimum/maximum quiescent current safety can be switched at the electronic insert (for FEI53 and FEI57S only in Nivotester FTC) MAX = minimum safety: The output switches safety-oriented when the probe is uncovered (signal on alarm). Used for dry-running protection and screw conveyor, for example MAX = maximum safety: The output switches safety-oriented when the probe is covered (signal on alarm). For use with overfill protection for example
Switching delay	FEI51, FEI52, FEI54, FEI55 Can be adjusted incrementally at the electronic insert: 0.3 to 10 s FEI53, FEI57S Depends on the connected Nivotester transmitter

Electronic insert FEI51 (AC 2-wire)

Note!
Connect in series with an external load.

Power supply

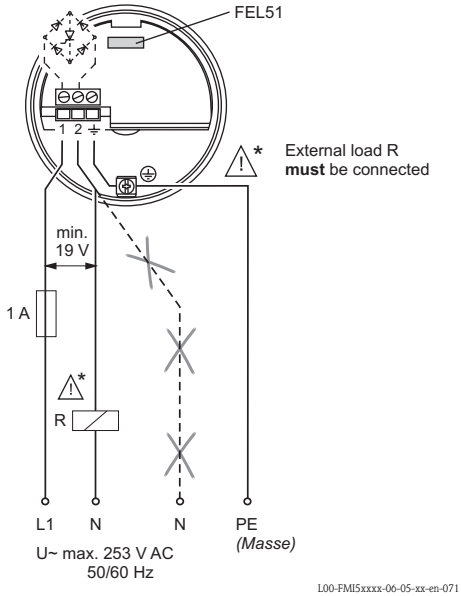
Supply voltage: 19 to 253 V AC
Power consumption: < 1.5 W
Residual current consumption: < 3.8 mA
Short-circuit protection
FEI51 overvoltage protection: overvoltage category II

Electrical connection

Connect the FEI51 (AC 2-wire) as follows:

1. Make the connection as shown in the graphic.
2. Tighten the cable gland.
3. Set the function switch (5) to position 1 (operation).

   Note!
   Do not switch on the supply voltage until you have familiarized yourself with the device functions as described in Section 5 "Operation". This will ensure that you do not accidentally trigger any processes by switching on the supply voltage.
4. Switch on the supply voltage.



Signal on alarm

Safety mode	Level	Output signal	LEDs gn gn rd gn gn ye
MAX		L+ 1 → I_L → + 3	☀ ● ● ● ● ☀
		1 - - - - - → < 3,8 mA 3	☀ ● ● ● ● ●
MIN		L+ 1 → I_L → + 3	☀ ● ● ● ● ☀
		1 - - - - - → < 3,8 mA 3	☀ ● ● ● ● ●
Maintenance required		I_L / < 3,8 mA 1 - - - - - → 3	☀ ● ☀ ● ● ●
Instrument failure		1 - - - - - → < 3,8 mA 3	☀ ● ☀ ● ● ●

BA300Fen017

Output signal

Output signal on power failure or in the event of damage to the sensor: < 3.8 mA

Connectable load

- For relays with a minimum holding power or rated power > 2.5 VA at 253 V AC (10 mA) or > 0.5 VA at 24 V AC (20 mA)
- Relays with a lower holding power or rated power can be operated by means of an RC module connected in parallel.
- For relays with a maximum holding power or rated power < 89 VA at 253 V AC or < 8.4 VA at 24 V AC
- Voltage drop across FEI51 max. 12 V
- Residual current with blocked thyristor max. 3.8 mA
- Load switched directly into the power supply circuit via the thyristor.

FEI52 electronic insert (DC PNP)

Power supply

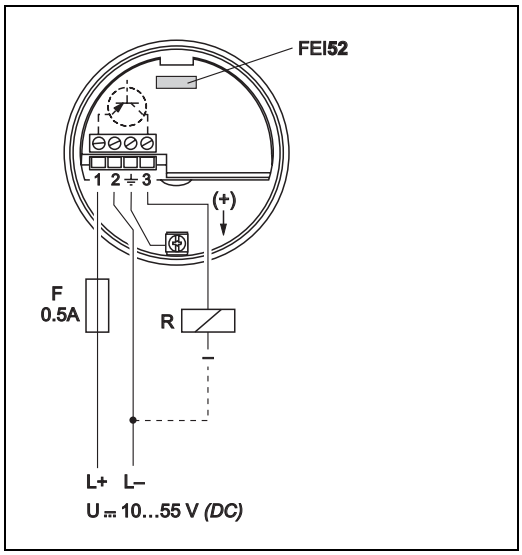
Supply voltage: 10 to 55 V DC
Ripple: max. 1.7 V, 0…400 Hz
Current consumption: < 20 mA
Power consumption without load: max. 0.9 W
Power consumption with full load (350 mA): 1.6 W
Reverse polarity protection: yes
Separation voltage: 3.7 kV
FEI52 overvoltage protection: overvoltage category II

Electrical connection

Three-wire DC connection

Preferably in conjunction with programmable logic controllers (PLC),
DI modules in accordance with EN 61131-2.

Positive signal present at the switch output of the electronic system (PNP).



TI418F42

Output signal

Safety mode	Level	Output signal	LEDs gn gn rd gn gn ye
MAX		L+ 1 I_L + 3	☼ ● ● ● ● ☼
		1 I_R 3	☼ ● ● ● ● ●
MIN		L+ 1 I_L + 3	☼ ● ● ● ● ☼
		1 I_R 3	☼ ● ● ● ● ●
Maintenance required		1 I_L / I_R 3	☼ ● ☼ ● ●
Instrument failure		1 I_R 3	☼ ● ☼ ● ● ●

TI418Fen43

I_L = Load current (switched through)
I_R = Residual current (blocked)

☼ Lit
☼ Flashes
● Unlit

TI418F44

Signal on alarm

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

Connectable load

- Load switched via transistor and separate PNP connection, max. 55 V
- Load current max. 350 mA (cyclical overload and short-circuit protection)
- Residual current < 100 µA (with transistor blocked)
- Capacitive load max. 0.5 µF at 55 V; max. 1.0 µF at 24 V
- Residual voltage < 3 V (for transistor switched through)

Electronic insert FEI53 (3-wire)

Power supply

Supply voltage: 14.5 V DC
Current consumption: < 15 mA
Power consumption: max. 230 mW
Reverse polarity protection: yes
Separation voltage: 0.5 kV

Electrical connection

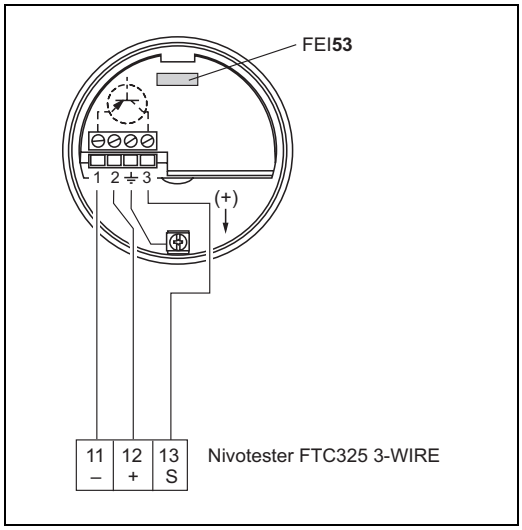
Three-wire DC connection

3 to 12 V signal

For connecting to the switching unit, Nivotester FTC325 3–WIRE from Endress+Hauser.

Switching between minimum/maximum Safety in the Nivotester FTC325 3-WIRE.

Level limit adjustment directly at the Nivotester.



Output signal

Mode	Output signal	LEDs green	LEDs red
Normal operation	3...12 V at terminal 3	Flashes	Unlit
Maintenance required *	3...12 V at terminal 3	Flashes	Flashes
Instrument failure	< 2,7 V at terminal 3	Flashes	Lit

TI418Fen46

Lit
Flashes
Unlit

TI418F44

Signal on alarm

Voltage at terminal 3 vis-à-vis terminal 1: < 2.7 V

Connectable load

- Floating relay contacts in the connected switching unit Nivotester FTC325 3–WIRE
- For the contact load capacity, refer to the technical data of the switching device.

FEI54 electronic insert (AC/DC with relay output)

Power supply

Supply voltage: 19 to 253 V AC, 50/60 Hz or 19 to 55 V DC
Power consumption: max. 1.6 W
Reverse polarity protection: yes
Separation voltage: 3.7 kV
FEI54 overvoltage protection: overvoltage category II

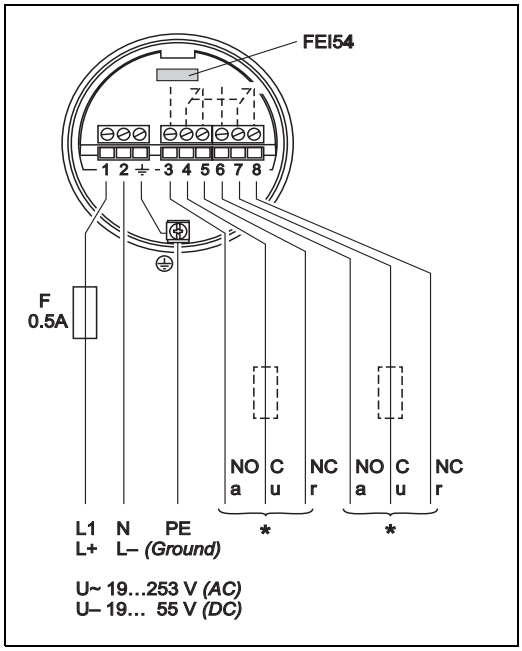
Electrical connection

Universal current connection with relay output (DPDT)

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

Output:
When connecting an instrument 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 on short-circuiting.
Both relay contacts switch simultaneously.

* See below "Connectable load"



TI418F47

Output signal

Safety mode	Level	Output signal	LEDs gn gn rd gn gn ye
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	☀ ● ● ● ● ●
Maintenance required			☀ ● ☀ ● ● ●
Instrument failure		3 4 5 6 7 8	☀ ● ☀ ● ● ●

TI418Fen48

Relay energized
Relay de-energized
Lit
Flashes
Unlit

TI418F49

Signal on alarm

Output signal on power failure or in the event of device failure: relay de-energized

Connectable load

- Loads switched via 2 floating changeover contacts (DPDT)
- I~ max. 6 A, U~ max. 253 V; P~ max. 1500 VA at cos φ = 1, P~ max. 750 VA at 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 isolation as per IEC 1010: Sum of voltages of relay output and power supply max. 300 V

FEI55 electronic insert (8/16 mA; SIL2/SIL3)

Power supply

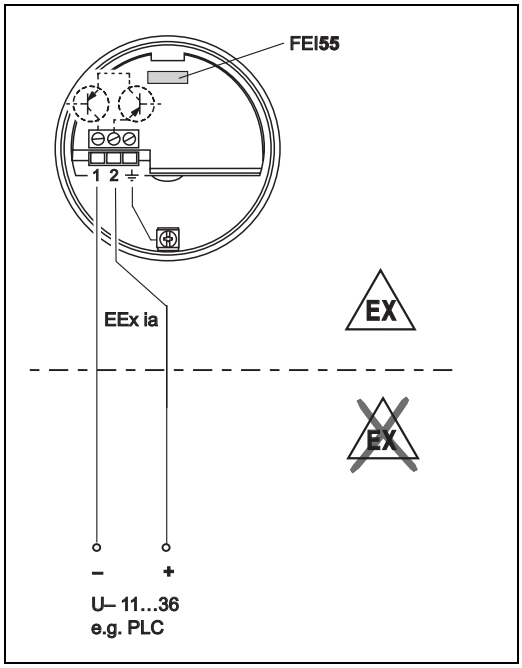
Supply voltage: 11 to 36 V DC
Power consumption: < 600 mW
Reverse polarity protection: yes
Separation voltage: 0.5 kV

Electrical connection

Two-wire connection for separate switching unit

For connecting to programmable logic controllers (PLC), AI modules 4 to 20 mA in accordance with EN 61131—2.

The level limit signal is sent via an output signal jump from 8 mA to 16 mA.



TI418Fen50

Output signal

Safety mode	Level	Output signal	LEDs gn gn rd gn gn ye
MAX		+ 2 ~16 mA 1	☼ ● ● ● ● ☼
		+ 2 ~8 mA 1	☼ ● ● ● ● ●
MIN		+ 2 ~16 mA 1	☼ ● ● ● ● ☼
		+ 2 ~8 mA 1	☼ ● ● ● ● ●
Maintenance required *		+ 2 8/16 mA 1	☼ ● ☼ ● ● ●
Instrument failure		+ 2 < 3.6 mA 1	☼ ● ☼ ● ● ●

TI418Fen51

~ 16 mA = 16 mA ± 5 %
~ 8 mA = 8 mA ± 6 %

☼ Lit
☼ Flashes
● Unlit

TI418F44

Signal on alarm

Output signal on power failure or in the event of device failure: < 3.6 mA

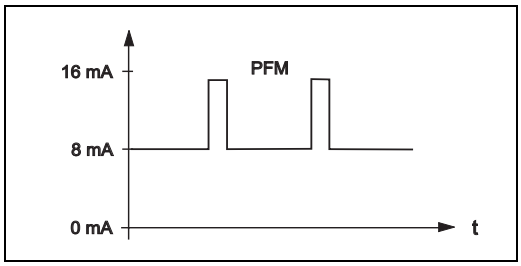
Connectable load

- U = Connection DC voltage:
  - 11 to 36 V DC (non-hazardous area and Ex ia)
  - 14.4 to 30 V DC (Ex d)
- I_{max} = 16 mA

FEI57S electronic insert (PFM)

Power supply

Supply voltage: 9.5 to 12.5 VDC
Power consumption: < 150 mW
Reverse polarity protection: yes
Separation voltage: 0.5 kV



Frequency: 17 to 185 Hz

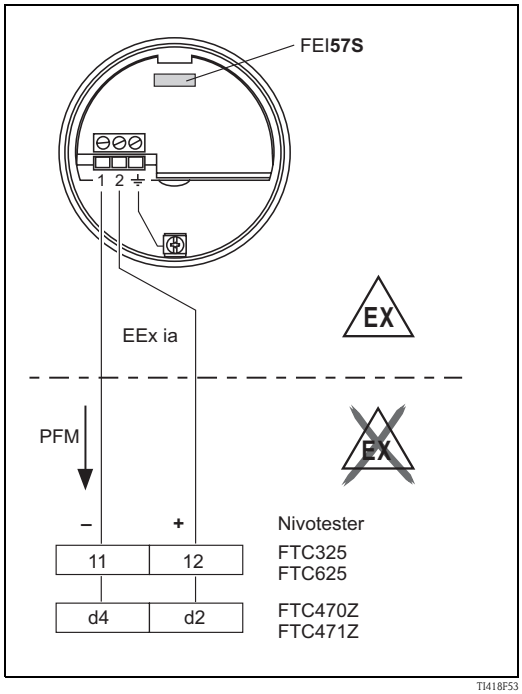
Electrical connection

Two-wire connection for separate switching unit

For connecting to switching units Nivotester FTC325, FTC625, FTC470Z, FTC471Z from Endress+Hauser.

PFM signal 17 to 185 Hz

Switching between minimum/maximum safety in the Nivotester.



Output signal

PFM 60 to 185 Hz (Endress+Hauser)

Signal on alarm

Mode	Output signal	LEDs green	LEDs red
Normal operation	60...185 Hz, 1 → 2	☼	●
Maintenance required *	60...185 Hz, 1 → 2	☼	☼
Instrument failure	< 20 Hz, 1 → 2	☼	☼

TI418Fen54

☼ Lit
☼ Flashes
● Unlit

TI418F44

Connectable load

- Floating relay contacts in the connected switching unit Nivotester FTC325, FTC625, FTC470Z, FTC471Z
- For the contact load capacity, refer to the technical data of the switching device.

Power supply

Electrical connection

Connection compartment

Five housings with the following protection classes are available:

	Standard	EEx ia	Dust ignition-proof	gas-tight process seal
Plastic housing F16	X	–	–	–
Stainless steel housing F15	X	X	X	–
Aluminum housing F17	X	X	X	–
Aluminum housing F13	X	X	X	X
Aluminum housing T13 (with separate connection compartment)	X	X	X	X

Cable entry

- Cable gland: M20x1.5
  Two cable glands are included in the scope of delivery.
- Cable entry: M20, G ½ or NPT ½, NPT ¾

Performance characteristics

Reference operating conditions

- Temperature: +20 °C ±5 °C
- Pressure: 1013 mbar abs. ±20 mbar
- Humidity: 65 % ±20%

Switchpoint deviation

Reproducibility: 0.1 % (related to the probe length)

Ambient temperature effect

Electronic insert

< 0.06 % / 10 K related to the full scale value

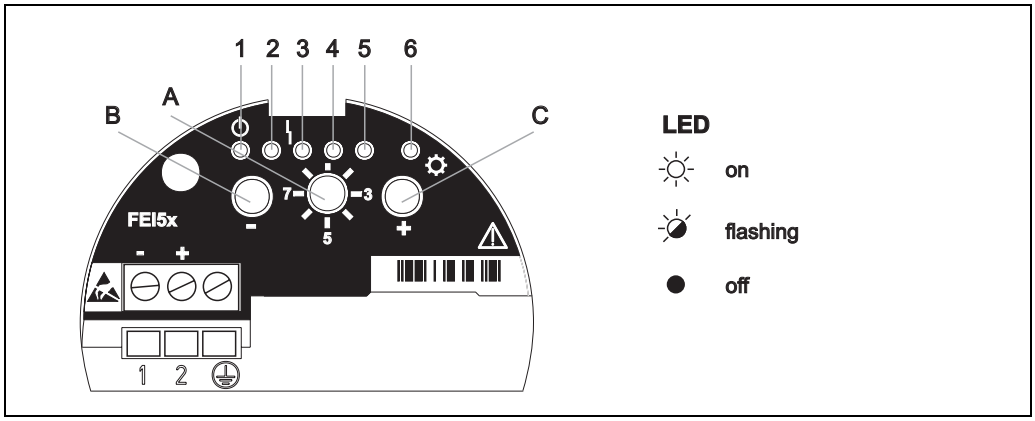
Separate housing

Capacitance change of connecting cable per meter 0.15 pF/10K

Human interface

Electronic inserts

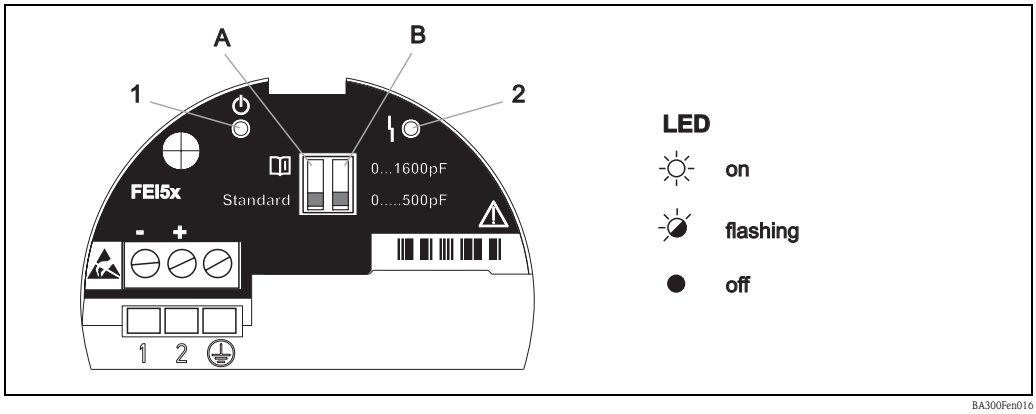
FEI51, FEI52, FEI54, FEI55



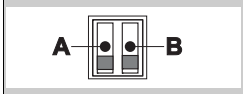
Green LED 1 (⏻ ready for operation), red LED 3 (↯ error indicated), yellow LED 6 (✲ switching state)

Function switch position	Function	– key	+ key	Light emitting diodes (LED signals)					
				⏻		↯			✲
				1 (green)	2 (green)	3 (red)	4 (green)	5 (green)	6 (yellow)
1	Operation			**Flashes** Operational LED	**On** (MIN-SIL)	**Flashes** (warning/ alarm)	**On** (MAX-SIL)		**On/off/ flashes**
	Restore factory setting	Press both keys for approx. 20 s		**On**	–>	–>	–>	–>	**On/off/ flashes**
2	Empty calibration	Press		**On** (present)					**On/off/ flashes**
	Full calibration		Press					**On** (present)	**On/off/ flashes**
	Reset: Calibration and switchpoint adjustment	Press both keys for approx. 10 s		**On**	–>	–>	–>	–>	**On/off/ flashes**
3	Switch point shift	Press for <	Press for >	**On** (2 pF)	**Off** (4 pF)	**Off** (8 pF)	**Off** (16 pF)	**Off** (32 pF)	**On/off/ flashes**
4	Measuring range	Press for <		**On** (500 pF)	**Off** (1600 pF)				**On/off/ flashes**
	Two-point control Δs		Press once					**On**	**On/off/ flashes**
	buildup mode		Press twice				**On**	**On**	**On/off/ flashes**
5	Switching delay	Press for <	Press for >	**Off** (0.3 s)	**On** (1.5 s)	**Off** (5 s)	**Off** (10 s)		**On/off/ flashes**
6	Self-test (function test)	Press both keys		**Off** (inactive)				**Flashes** (active)	**On/off/ flashes**
7	MIN-/MAX Fail-safe mode	Press for MIN	Press for MAX	**Off** (MIN)				**On** (MAX)	**On/off/ flashes**
	SIL mode*** lock/unlock	Press both keys			**On** (MIN-SIL)		**On** (MAX-SIL)		**On/off/ flashes**
8	Upload/download sensor DAT (EEPROM)	Press for download	Press for upload	**Flashes** (download)				**Flashes** (upload)	**On/off/ flashes**

Electronic inserts **FEI53, FEI57S**



Green LED (⏻ ready for operation), red LED (ϟ error indicated)

DIP switch 	Function	Light emitting diodes (LED signals)	
		1 (green) ⏻ Operational	2 (red) ϟ Fault
A 	Standard[1]: If the measuring range is exceeded **no** alarm is output.	**Flashes**	**Flashes/on**
A 	🕮: If the measuring range is exceeded **an** alarm is output.	**Flashes**	**Flashes/on**
B 	Span: The measuring range is between 0 and 500 pF.	**Flashes**	**Flashes/on**
B 	Span: The measuring range is between 0 and 1600 pF.	**Flashes**	**Flashes/on**

Certificates and approvals

CE approval

The devices are designed to meet state-of-the-art safety requirements, have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations that are listed in the EC Declaration of Conformity and thus meet the legal requirements of the EC Directives. Endress+Hauser confirms the conformity of the device by affixing to it the CE approval.

Ex approval

See "Ordering information", Page 41 ff.

Other standards and guidelines

EN 60529
Degrees of protection by housing (IP code)

EN 61010
Protection measures for electrical equipment for measurement, control, regulation and laboratory procedures

EN 61326
Interference emission (Class B equipment), interference immunity (Appendix A – Industrial).

NAMUR
Association for Standards for Control and Regulation in the Chemical Industry

IEC 61508
Functional safety

Ordering information

Note!
In this list, versions which are mutually exclusive are not marked.

Solicap M FTI55

10	Approval:		
	A	Non-hazardous areas	
	B	ATEX II 1/3 D	
	C	ATEX II 1/2 D	
	F	ATEX II 1 D, 1/2 D, 1/3 D	EEx ia D
	K	CSA General Purpose,	CSA C US
	L	CSA/FM IS Cl. I, II, III,	Div. 1+2, Gr. A-G
	M	CSA/FM XP Cl. I, II, III,	Div. 1+2, Gr. A-G
	N	CSA/FM DIP Cl. I, II, III,	Div. 1+2, Gr. E-G
	S	TIIS Ex ia IIC T3	
	T	TIIS Ex d IIC T3	
	1	NEPSI	Ex ia IIC T6
	3	NEPSI	DIP A20
	Y	Special version, to be specified	

20		Inactive length L3:	
	A	Not selected	
	B	Not selected + 125 mm/5 inch Active buildup compensation	316L
	1	.... mm	316L
	5	.... inch	316L
	9	Special version	

30			Active length L1:	
		A	.... mm,	steel
		B	325 mm,	steel
		C	.... mm,	316L
		D	325 mm,	316L
		E	600 mm,	steel
		H	.... inch,	steel
		K	13 inch,	steel
		M	.... inch,	316L
		N	13 inch,	316L
		P	24 inch,	steel
		Y	Special version, to be specified	

40				**Insulation:**									
				1			fully insulated PE,	max. 80 °C					
				2	75 mm L2,		partially insulated PPS,	max. 180 °C					
				3	3 inch L2,		partially insulated PPS,	max. 180 °C					
				9	Special version, to be specified								
50					**Process connection:**								
				AFJ	2",		150 lbs RF	316/316L					
				AGJ	3",		150 lbs RF	316/316L					
				AHJ	4",		150 lbs RF	316/316L					
				BSJ	DN80,		PN10/16 A	316L	EN1092-1 (DIN2527 B)				
				BTJ	DN100,		PN10/16 A	316L	EN1092-1 (DIN2527 B)				
				B3J	DN50,		PN25/40 A	316L	EN1092-1 (DIN2527 B)				
				KFJ	10K 50,		RF	316L	JIS B2220				
				KGJ	10K 80,		RF	316L	JIS B2220				
				KHJ	10K 100,		RF	316L	JIS B2220				
				RGJ	NPT 1½,			316L	thread ANSI				
				RG1	NPT 1½,			steel	thread ANSI				
				RVJ	R 1½,			316L	thread DIN2999				
				RV1	R 1½,			steel	thread DIN2999				
				YY9	Special version, to be specified								
60						**Electronics; output:**							
					1	FEI51; 2-wire		19 to 253VAC					
					2	FEI52; 3-wire PNP,		10 to 55VDC					
					3	FEI53; 3-wire,		3 to 12 V signal					
					4	FEI54; relay DPDT,		19 to 253VAC, 19 to 55VDC					
					5	FEI55; 8/16 mA,		11 to 36VDC					
					7	FEI57S;2–wire PFM							
					W	Prepared for FEI5x							
					Y	Special version, to be specified							
70							**Housing:**						
						1	F15 316L		IP66, NEMA4X				
						2	F16 polyester		IP66, NEMA4X				
						3	F17 aluminum		IP66, NEMA4X				
						4	F13 Alu + gas-tight probe seal		IP66, NEMA4X				
						5	T13 Alu + gas-tight probe seal + separate connection compartment		IP66, NEMA4X				
						9	Special version, to be specified						
80								**Cable entry:**					
							A	M20 Threaded joint					
							B	Thread G ½					
							C	Thread NPT ½					
							D	Thread NPT ¾					
							G	Thread M20					
							Y	Special version, to be specified					
90									**Probe design:**				
								1	Compact				
								2	2000 mm L4 cable	> separate housing			
								3	.... mm L4 cable	> separate housing			
								4	80 inch L4 cable	> separate housing			
								5	.... inch L4 cable	> separate housing			
								9	Special version, to be specified				
100										**Additional equipment:**			
									A	Basic version			
									D	EN10204-3.1 material (316L wetted),		Inspection certificate	
									E	EN10204-3.1 material (316L wetted), NACE MR0175		Inspection certificate	
									F	SIL Declaration of Conformity			
									Y	Special version, to be specified			
FTI55											Product designation		

Solicap M FTI56

10 Approval:

A	Non-hazardous areas	
B	ATEX II 1/3 D	
C	ATEX II 1/2 D	
F	ATEX II 1 D, 1/2 D, 1/3 D	EEx ia D
K	CSA General Purpose,	CSA C US
L	CSA/FM IS Cl. I, II, III,	Div. 1+2, Gr. A-G
M	CSA/FM XP Cl. I, II, III,	Div. 1+2, Gr. A-G
N	CSA/FM DIP Cl. I, II, III,	Div. 1+2, Gr. E-G
1	NEPSI	Ex ia IIC T6
3	NEPSI	DIP A20
Y	Special version, to be specified	

20 Inactive length L3:

A	Not selected		
1	.... mm		316L
5	.... inch		316L
9	Special version		

30 Active length L1; tensioning weight:

A	.... mm,	6 mm rope	316L;	316L
B	.... mm,	12 mm rope	316L;	316L
C	.... mm,	8 mm rope	galvanized steel;	steel
D	.... mm,	14 mm rope	galvanized steel;	steel
H	.... inch,	0.2" rope	316L;	316L
K	.... inch,	0.5" rope	316L,	316L
M	.... inch,	0.3" rope	galvanized steel;	steel
N	.... inch,	0.6" rope	galvanized steel;	steel
Y	Special version, to be specified			

40 Insulation:

1		fully insulated PA,	max. 120 °C
2	500 mm L2,	partially insulated PTFE,	max. 180 °C
9	Special version, to be specified		

50 Process connection:

AFJ	2",	150 lbs RF	316/316L	
AGJ	3",	150 lbs RF	316/316L	
AHJ	4",	150 lbs RF	316/316L	
BSJ	DN80,	PN10/16 A	316L	EN1092-1 (DIN2527 B)
BTJ	DN100,	PN10/16 A	316L	EN1092-1 (DIN2527 B)
B3J	DN50,	PN25/40 A	316L	EN1092-1 (DIN2527 B)
KFJ	10K 50,	RF	316L	JIS B2220
KGJ	10K 80,	RF	316L	JIS B2220
KHJ	10K 100,	RF	316L	JIS B2220
RGJ	NPT 1½		316L	thread ANSI
RG1	NPT 1½,		steel	thread ANSI
RVJ	R 1½,		316L	thread DIN2999
RV1	R 1½,		steel	thread DIN2999
YY9	Special version, to be specified			

60 Electronics; output:

1	FEI51; 2-wire	19 to 253VAC
2	FEI52; 3-wire PNP,	10 to 55VDC
3	FEI53; 3-wire,	3 to 12 V signal
4	FEI54; relay DPDT,	19 to 253VAC, 19 to 55VDC
5	FEI55; 8/16 mA,	11 to 36VDC
7	FEI57S;2–wire PFM	
W	Prepared for FEI5x	
Y	Special version, to be specified	

70	**Housing:**		
	1	F15 316L	IP66, NEMA4X
	2	F16 polyester	IP66, NEMA4X
	3	F17 aluminum	IP66, NEMA4X
	4	F13 Alu + gas-tight probe seal	IP66, NEMA4X
	5	T13 Alu + gas-tight probe seal + separate connection compartment	IP66, NEMA4X
	9	Special version, to be specified	

80	**Cable entry:**	
	A	M20 Threaded joint
	B	Thread G ½
	C	Thread NPT ½
	D	Thread NPT ¾
	G	Thread M20
	Y	Special version, to be specified

90	**Probe design:**	
	1	Compact
	2	2000 mm L4 cable > separate housing
	3	.... mm L4 cable > separate housing
	4	80 inch L4 cable > separate housing
	5	.... inch L4 cable > separate housing
	9	Special version, to be specified

100	**Additional equipment:**	
	A	Basic version
	F	SIL Declaration of Conformity
	Y	Special version, to be specified

FTI56	Product designation

Accessories

Weather protection cover

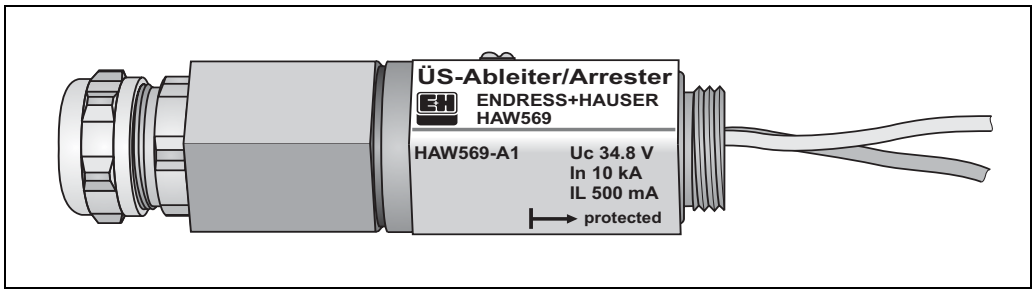
For F13 and F17 housing
Order number: 71040497

Overvoltage protection HAW569 for FEI55 and FEI57S

- HAW569–A11A (non-hazardous)
- HAW569–B11A (hazardous area)

Note!
These two versions can be screwed directly into the housing (M20x1.5).

Surge arrester for limiting overvoltage in signal lines and components. The HAW562Z module can be used in hazardous areas.



L00-FMI5xxxx-03-05-xx-xx-009

Spare parts

Electronic insert

- Electronic insert FEI51
  71042884
- FEI52 electronic insert
  71025819
- FEI53 electronic insert
  71025820
- FEI54 electronic insert
  71025814
- FEI55 electronic insert
  71025815
- FEI57S electronic insert
  71025816

Cover for housing

- Cover for aluminum housing F13: gray with sealing ring
  52002698
- Cover for stainless steel housing F15: with sealing ring
  52027000
- Cover for stainless steel housing F15: with clasp and sealing ring
  52028268
- Cover for polyester housing (F16), transparent plastic with seal
  52025790
- Cover for polyester housing F16, flat: gray with sealing ring
  52025606
- Cover for aluminum housing F17, flat: with sealing ring
  52002699
- Cover for aluminum housing T13 flat, electronics compartment: gray with sealing ring
  52006903
- Cover for aluminum housing T13 flat, connection compartment: gray with sealing ring
  52007103

Seal set for stainless steel housing

- Seal set for stainless steel housing F15: with 5 sealing rings
  52028179

Documentation

Note!
This documentation is available on the product pages at www.endress.com

Technical Information

- Fieldgate FXA320, FXA520
  TI369F/00/en

Operating Instructions

- Solicap M FTI55, FTI56
  BA300F/00/en

Safety information (ATEX)

- Solicap M FTI55, FTI56
  ATEX II 1 D Ex tD A20 IP65 T 90 °C,
  ATEX II 1/2 D Ex tD A20/A21 IP65 T 100 °C
  XA389F/00/a3
  pending
- Solicap M FTI55, FTI56
  DIP A21 T_A, T 100°C IP65
  NEPSI GYJ071369
  XA426F/00/a3

Control drawings

- Solicap M FTI55, FTI56
  FM
  ZD222F/00/en
- Solicap M FTI55, FTI56
  CSA
  ZD225F/00/en

Functional safety (SIL2/SIL3)

- Solicap M FTI55, FTI56
  SIL
  SD278F/00/en

Patents

This product is protected by at least one of the patents listed below.
Further patents are under development.

- DE 203 00 901 U1
- DE 103 22 279,
  WO 2004 102 133,
  US 2005 003 9528
- DE 203 13 695,
  WO 2005 025 015

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People for Process Automation

TI418F/00/en/10.08
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