



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

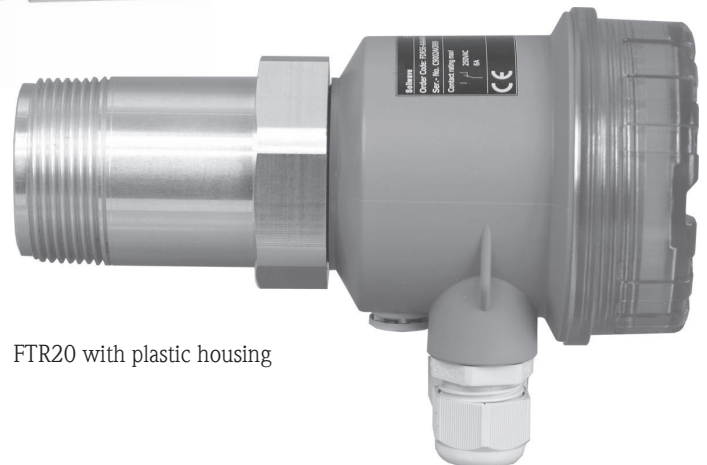
Technical Information

Solimotion FTR20

Flow indicator for bulk solids



FTR20 with stainless steel housing



FTR20 with plastic housing

Application

The FTR20 flow indicator for bulk solids is a non-contact device based on microwave technology. It is ideally suited for monitoring pneumatic and mechanical transport processes for bulk solids.

The compact device can be used wherever the cost-effective monitoring of bulk solids movement is required.

Typical areas of application or bulk solids are:

- Building materials industry:
Cement, plaster, wood chips etc.
- Chemical industry:
Fertilizers, plastic powder and granules, silica etc.
- Food industry:
Coffee, tea, tobacco, cereals, malt, animal feeds etc.
- Energy production:
Coal, carbon dust, fly-ash, coke etc.

Individual adjustments to the application are carried out by means of configurable functions (including automatic calibration). In addition, changes in the mass flow can be analyzed by the optional 4 - 20 mA current output.

Your benefits

- Compact device:
Sensor, transmitter and power unit are mounted in a housing, which means less effort is required for installation and mounting.
- The device can be used wherever cost-effective monitoring of a mass flow (present or not present) is required.
- Flush-mounted installation, non-contact installation possible
- Easy mounting using R 1½ or 1½ NPT thread or a suitable mounting bracket
- Electronics housing can be rotated by 360°, allowing orientation into optimum position after installation
- Mechanical robustness
 - No wear
 - Process-wetted ceramic sensor diaphragm (optional)
 - Long service life
 - Maintenance-free
- Signaling of mass flow
- Adjustable sensitivity
- Compliant with ATEX, CSA and IECEx

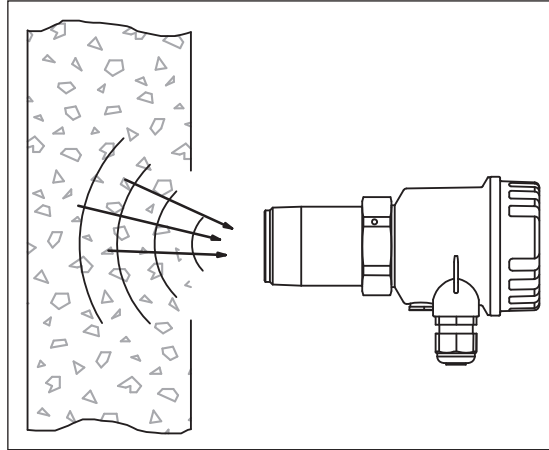
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Function and system design

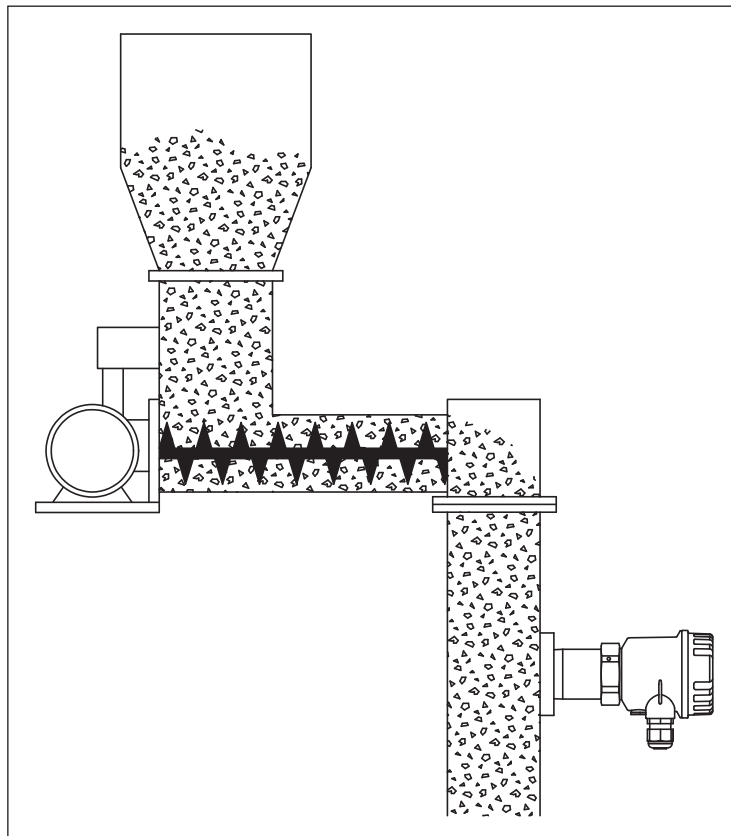
Operating principle

The FTR20 flow indicator for bulk solids works using microwave technology. A signal is transmitted, and this signal is reflected by the moving bulk solids. The FTR20 measures the strength of the reflected, frequency-shifted (Doppler effect) energy, this is analyzed and put out via the display or the signal output.



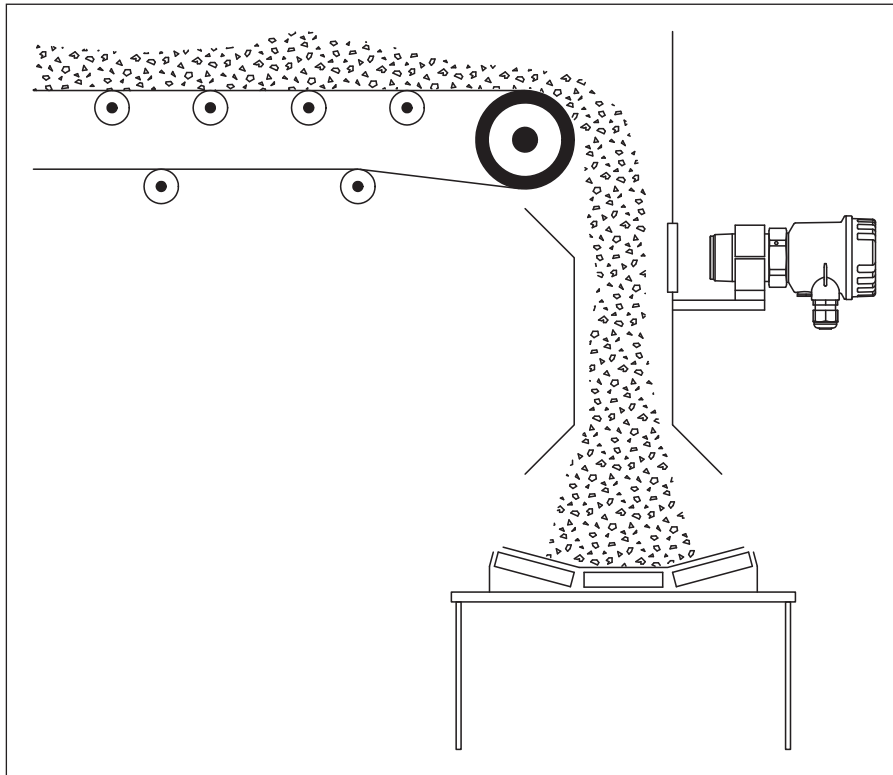
The range of the FTR20 is influenced by varying materials, with the attenuation depending on the damping characteristics of the bulk solids.

Example of volumetric dosing

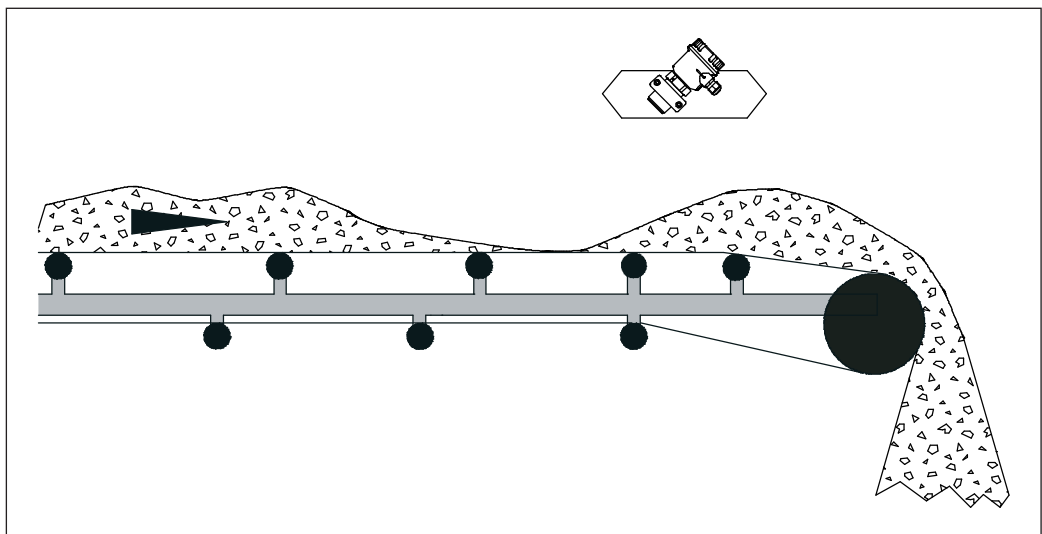


The FTR20 monitors the outflow of a screw conveyor. If the flow of material slows down (for example due to clogging of the pipe leading downwards or if there is no material being conveyed due to a failure in the screw conveyor), the device generates a message to this effect. This can then be processed further in the system.

Example of a conveyor belt



The FTR20 monitors the continuous mass flow at a transition point, a break in the flow is detected and put out at the signal output.



The FTR20 monitors if there is material on the conveyor belt.

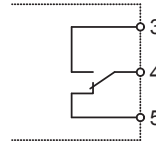
Input

Measured variable	Doppler frequency
Measuring range (detection range)	With an unobstructed radiation path to the surface of the bulk solids, the maximum range is 20 m. This is reduced if container walls, sight glasses or similar need to be penetrated.
Operating frequency	24.15 GHz \pm 80 MHz
Transmission power	<p>The power produced by the FTR20 is maximum 100 mW e.i.r.p. (equivalent isotrope radiation performance).</p> <ul style="list-style-type: none">■ Power density directly in front of the device: approx. 1 mW/cm²■ Power density at a distance of 1 m: approx. 0.3 μW/cm² <p>Note: The power density is clearly under the recommended limit values of the ICNIRP guidelines "<i>Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)</i>" and thus is completely harmless for humans.</p>
Switching frequency	max. 2 Hz
Opening angle of antenna (3 dB)	approx. \pm 11°
Detectable speed	0.09 ... 62 m/s

Output

Relay

- Potential-free change-over contact
- Switching capacity:
 - AC: 250 V / 4 A (FTR20-CA*/FTR20-CB*: 6 A)
 - DC: 125 V / 0.4 A or
30 V / 4 A (FTR20-CA*/FTR20-CB*: 5 A)
- Contact material: AgCdO (gold-flashed)
- Switching frequency: max. 2 Hz

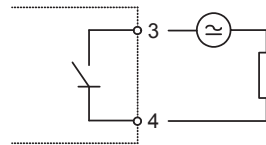


Note:

The contact material is also suitable for switching small signal circuits. However, this is possible only if no inductive loads or higher currents have been switched previously.

Solid-state relay

- Switching contact of a semiconductor relay
- Switching capacity:
 - AC: 30 V / 0.4 A
 - DC: 40 V / 0.4 A
- Switching frequency: max. 2 Hz

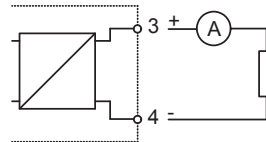


Note:

Unlike the switching contact of the relay output, this can be used to evaluate higher switching frequencies (for example for piece goods counting).

Current

- Current output 4 - 20 mA
- Active
- Max. load: 600 Ω

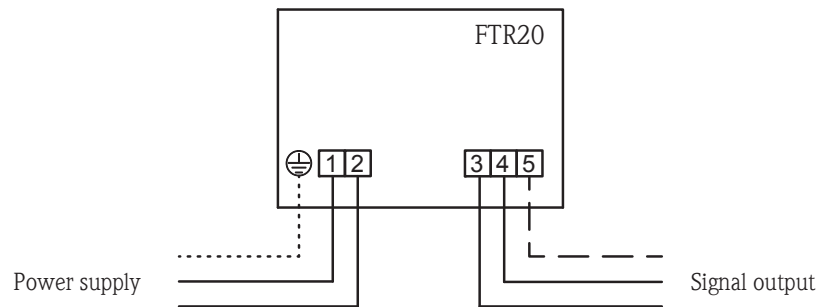


Power supply

Electrical connection

A suitable wire (see wire specification) is used to connect the FTR20 to the power supply.

Wiring



Supply voltage

- AC version: 85 - 253 V (AC), 50/60 Hz
- DC version: 20 - 60 V (DC) or 20 - 30 V (AC), 50/60 Hz

Note:

- The polarity of the supply voltage can be set as required.
- When using the public powers supply, install an easy accessible power switch in the proximity of the instrument. Mark the power switch as a disconnecter for the instrument (EN/IEC 61010).
- You should use a fuse to protect the power supply against short-circuit.

Power consumption

- max. 4.8 VA (85 - 253 V (AC), 50/60 Hz)
- max. 2.2 W (20 - 60 V (DC)) or 3 VA (20 - 30 V (AC), 50/60 Hz)

Cable entry

- M20 x 1.5
- ½ NPT

Cable gland

- M20 x 1.5:
- Degree of protection IP66
 - Scope of supply: 2

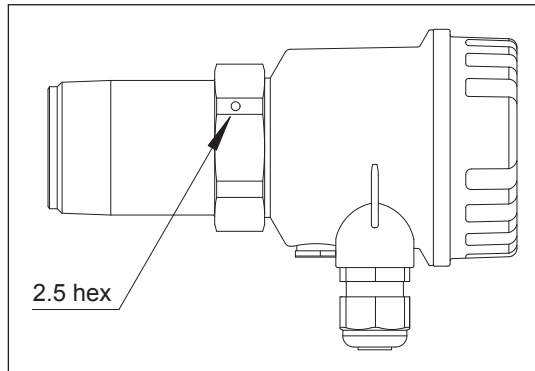
Wire specification

- Usual commercial installation wire
- Conductor cross-section: max. 1.5 mm²

Operating conditions

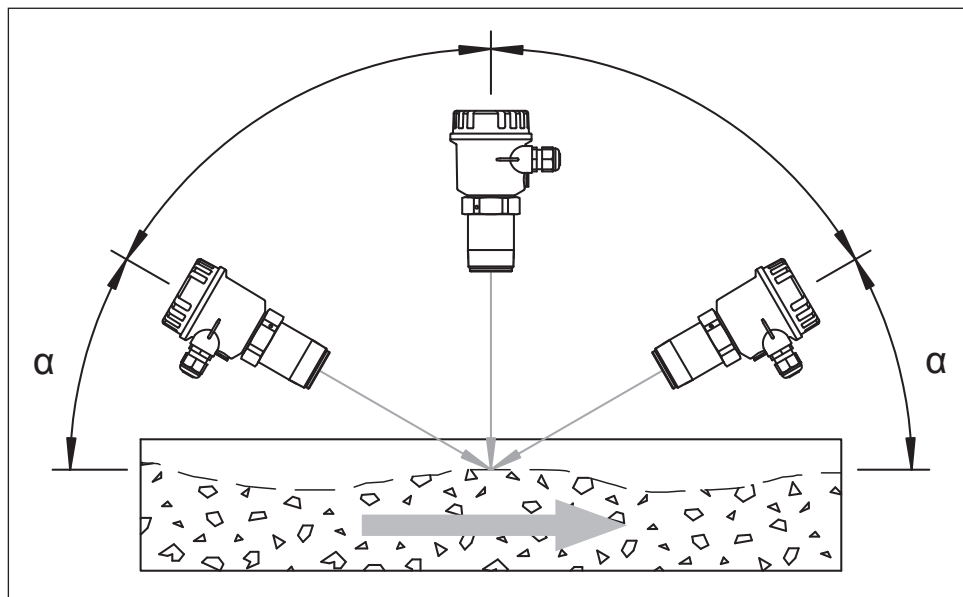
Installation instructions

The FTR20 bulk solids motion detector comes with a standard thread (R 1½ as per EN 10226 or 1½ NPT as per ANSI/ASME B1.20.1) as a process connection. This enables easy installation in existing container couplings or nozzles. For optimal orientation after installation in the process, the electronics housing can be rotated as desired (by 360°).



Following installation, the housing must be secured using the Allen head screw (2.5 AF).

Orientation



Any orientation is possible for the FTR20 bulk solids motion detector. However, a small angle α may increase the signal quality.

We recommend an angle of 45° for material detection on conveyor belts (see "Function an system design").

Environment

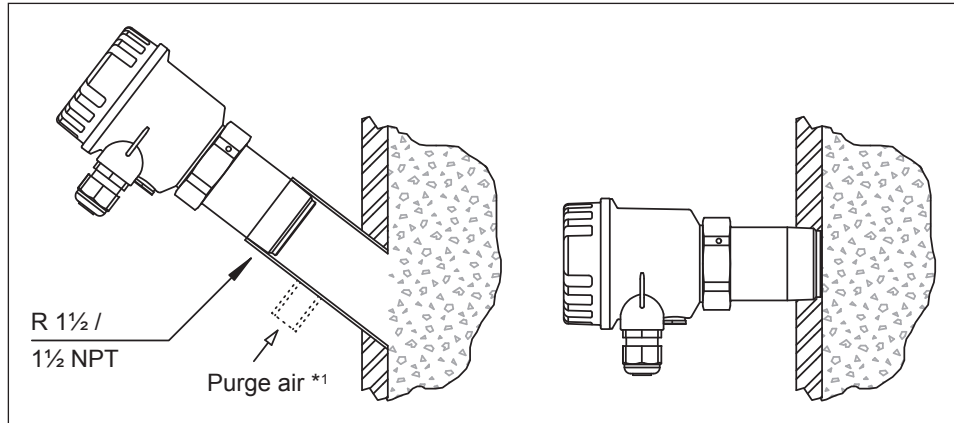
Ambient temperature	<ul style="list-style-type: none">■ -40°C to +70°C
Storage temperature	<ul style="list-style-type: none">■ -40°C to +80°C
Degree of protection	<ul style="list-style-type: none">■ IP 66 (when housing is closed)■ IP 20 (when housing is open)
Electromagnetic compatibility (EMC)	<ul style="list-style-type: none">■ Interference Emission to EN 61326, Electrical Equipment Class B■ Interference Immunity to EN 61326, Appendix A (Industrial)
Vibration resistance - Endurance stress with sliding frequency acc. to EN 60068-2-6	<ul style="list-style-type: none">■ Excitation mode: sine■ Frequency range: 10 ... 55 Hz■ Amplitude: 0.75 mm peak constant■ Speed of sweep: 1 oct per minute■ Excitation direction: 3 directions (X, Y, Z)■ Number of cycles: 20 per direction■ Test duration: approx. 1 h 38 min per direction■ Test temperature: room temperature
Additional conditions CSA C/US	<p>The following additional conditions apply for the FDR56-CA* and FQR56-CA* (CSA C/US General Purpose):</p> <ul style="list-style-type: none">■ Pollution degree 2■ Installation category II■ Altitude max. 2000 m

Process

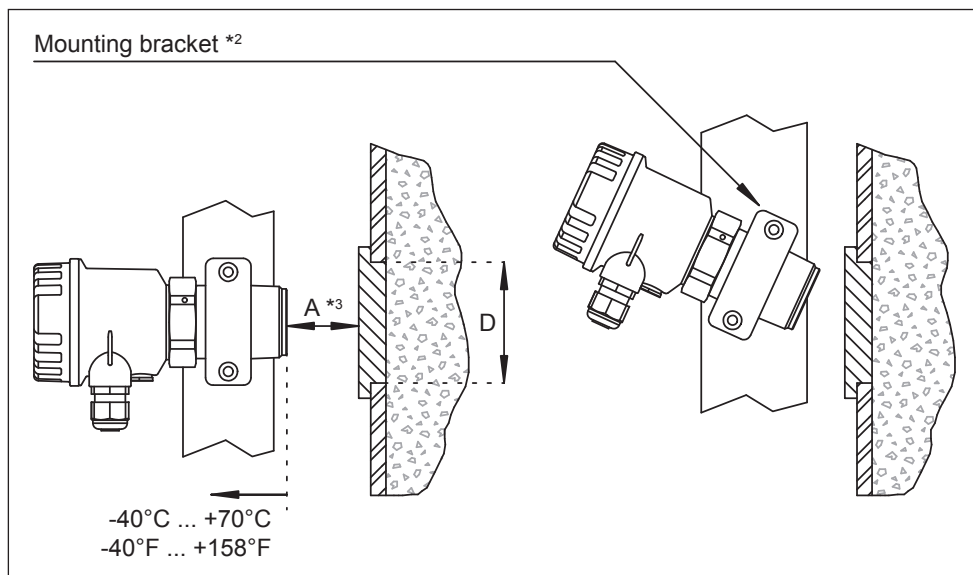
Process temperature	<ul style="list-style-type: none">■ -40°C to +70°C (without optional adapter for temperature reduction)■ -40°C to +450°C (with optional adapter for temperature reduction, see "Accessories")
Process pressure	<ul style="list-style-type: none">■ 50 to 680 kPa absolute (0.5 to 6.8 bar absolute) (applies only when the FTR20 is installed directly in the process)■ 80 to 510 kPa absolute (0.8 to 5.1 bar absolute) (applies only when using the optional adapter for temperature reduction)

Installation

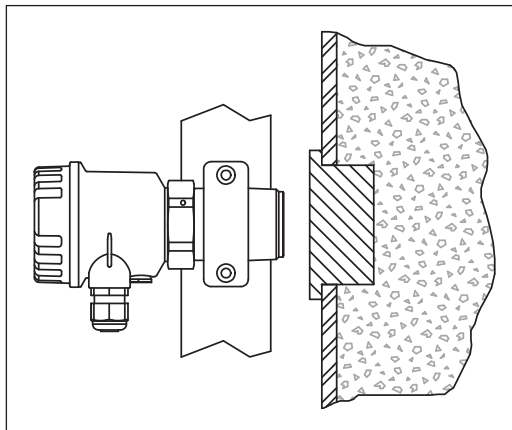
Direct installation using threaded connection



Mounting bracket in front of microwave-permeable window

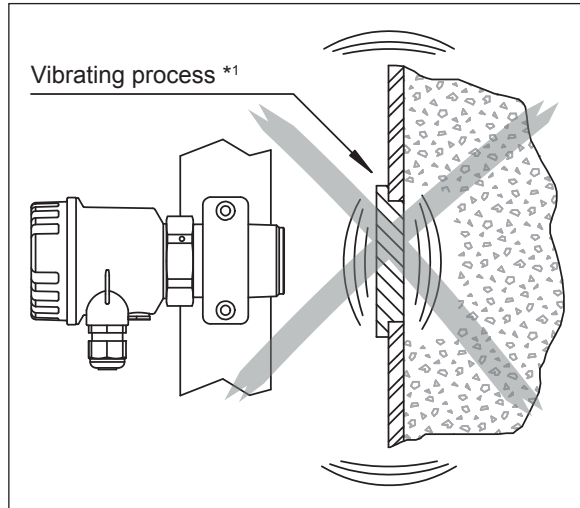


Mounting bracket in front of microwave-permeable window with danger of condensation on the container's inner wall

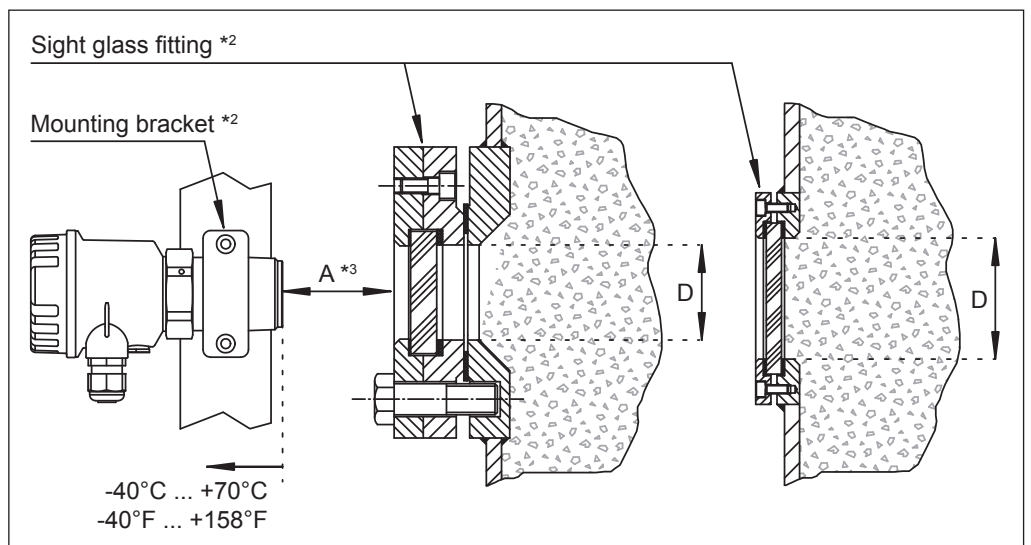


- *1 We recommend using purge air to prevent fouling (material accumulation) in the nozzle that is open to the process. Alternatively, you can also close the nozzle using a plastic plug (see next page).
- *2 Suitable mounting brackets are available as accessories (types and dimensions see "Accessories").
- *3 The distance **A** depends on the open entry area **D** and the temperature at this area. To prevent possible signal attenuation, we recommend keeping the distance as short as possible (for example max. 40 mm at DN50).

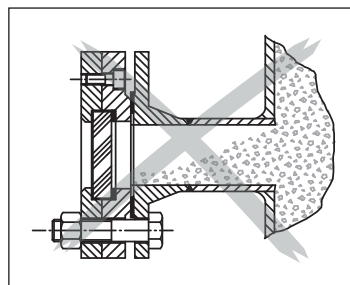
Installation with mounting bracket at vibrating processes *1



Mounting bracket in front of microwave-permeable sight glass fitting *1



Installation position to avoid with sight glass fittings *4



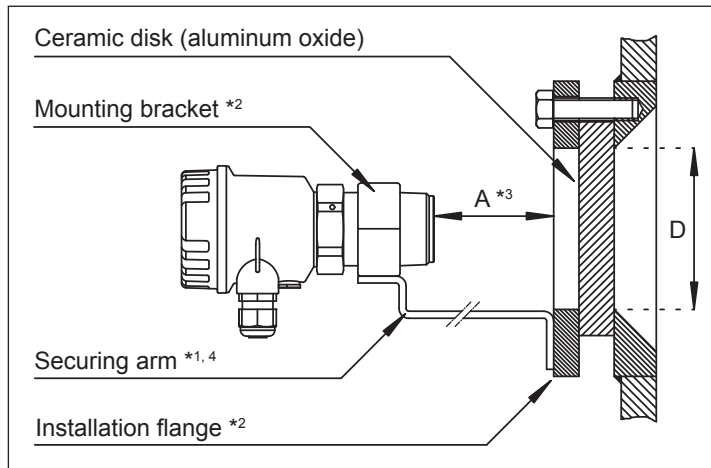
*1 The FTR20 should not detect through a window or such if the process vibrates, because the device would detect the movement of the window instead of the flow. If there are only small vibrations, it is permitted to **tightly fix** the FTR20 to the process.

*2 Suitable sight glass fittings and mounting brackets are available as accessories (types and dimensions see "Accessories").

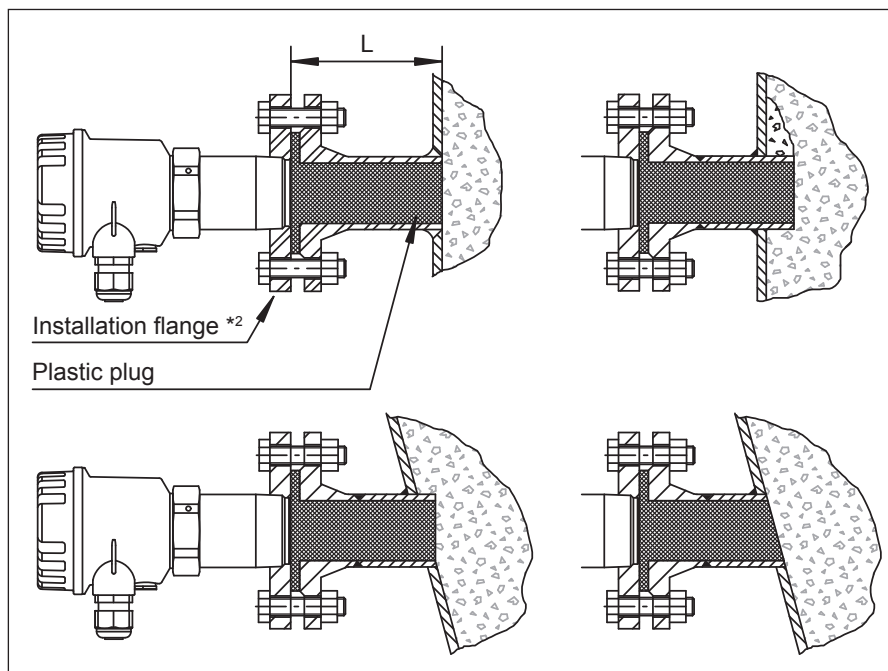
*3 The distance **A** depends on the open entry area **D** and the temperature at this area. To prevent possible signal attenuation, we recommend keeping the distance as short as possible (for example max. 40 mm at DN50).

*4 Contamination (material accumulation) in the nozzle that is open to the process should always be avoided.

Installation with securing arm on container *1,4



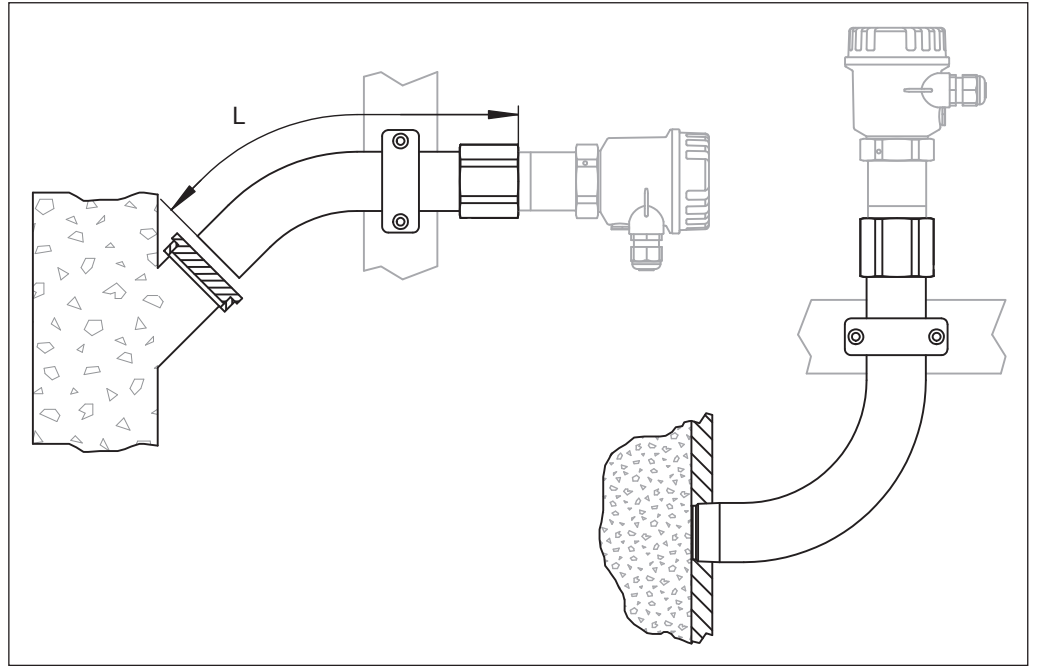
Flange mounting using screw in flange and plastic plug *5



- *1 Various installation adapters (for example for angle installation) are available as special equipment packages.
- *2 Suitable mounting brackets and installation flanges are available as accessories (types and dimensions see "Accessories").
- *3 The distance **A** depends on the open entry area **D** and the temperature at this area. To prevent possible signal attenuation, we recommend keeping the distance as short as possible (for example max. 40 mm at DN50).
- *4 The FTR20 should not detect through a window or such if the process vibrates, because the device would detect the movement of the window instead of the flow. If there are only small vibrations, it is permitted to **tightly fix** the FTR20 to the process.
- *5 An appropriate venting element should be installed to prevent condensation between the FTR20 and the plastic plug. Suitable installation flanges with integrated venting element are available on request.

Note:

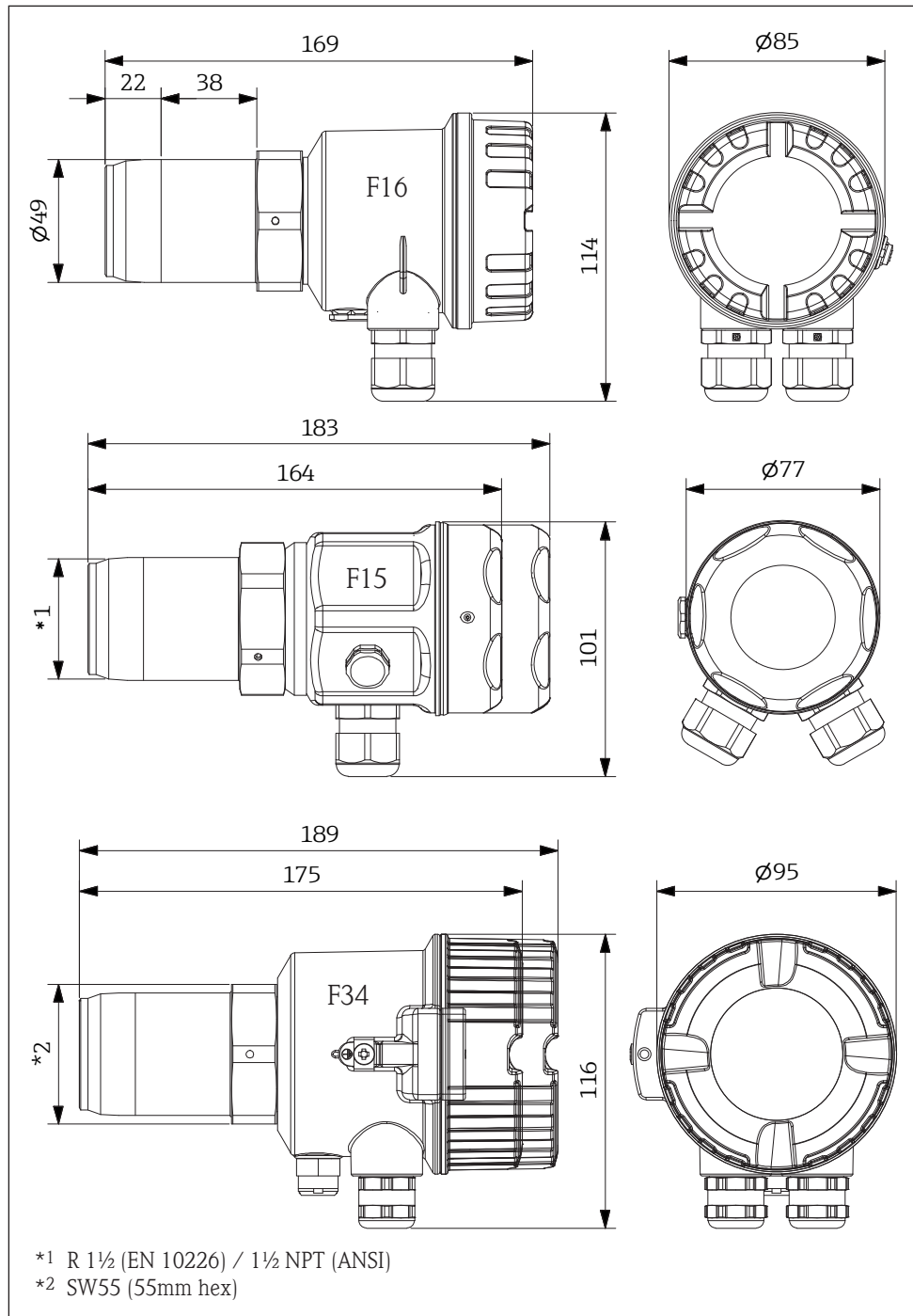
- Please use a plastic plug to avoid accumulation of bulk solids inside the nozzle, because the FTR20 cannot work in this case.
- The maximum length **L** depends on the dielectric constant and the water absorption of the plastic material. Observe the manufacturer's specifications.
- We recommend PTFE as the material, as this allows the length to be up to 300 mm.

**Installation with pipe
as wave guide****Note:**

- This type of mounting is recommended if conditions at the process or in the area surrounding the process are unfavorable (such as high temperatures or heavy contamination) or if the building's situation does not permit direct installation.
- The pipe can be made from any metallic material, and the length is not important due to the wave guide effect.
- Edges inside the pipe (for example at transitions) can cause signal attenuation and thus should be avoided wherever possible.

Mechanical construction

Design / dimensions



Materials / weight

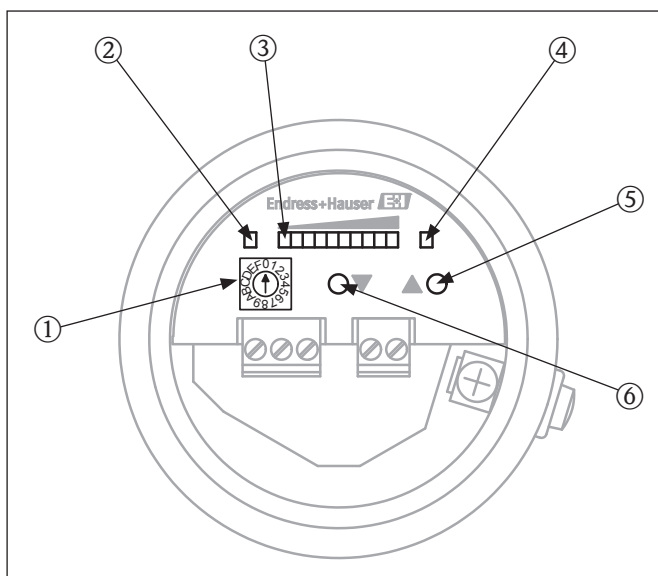
	F16 Plastic	F15 Stainless steel	F34 Aluminium
Materials	Housing: - Polyester Process connection (medium-wetted parts): - Aluminium or stainless steel 316Ti/1.4571 - Sensor diaphragm: PTFE or ceramic Cable gland or thread adapter: - PA	Housing: - Stainless steel 316L Process connection (medium-wetted parts): - Stainless steel 316Ti/1.4571 - Sensor diaphragm: Ceramic or PTFE (device versions with approval) Cable gland: - PA (device version without approval) - Brass, nickel-plated (device versions with approval) Thread adapter: - PA (device version without approval) - Stainless steel 316L (device versions with approval)	Housing: - Aluminium Process connection (medium-wetted parts): - Aluminium or stainless steel 316Ti/1.4571 - Sensor diaphragm: PTFE or ceramic Cable glands or thread adapter: - Stainless steel 316L
Weight	0.6 ... 1.1 kg (depending on the version)	1.1 ... 1.4 kg (depending on the version)	1.1 ... 1.6 kg (depending on the version)

Settings

By using frequencies in the 24 GHz range, the material flow of products with low attenuation can be detected, even if the product quantities are low. The calibration options for the FTR20 flow indicator for bulk solids offer the necessary flexibility to ensure that the device can be easily adapted to the application:

- Adjustable sensitivity
- Switchable signal function:
 - Switch point exceeded = max. safety (e.g. overflow protection) or
 - Switch point not reached = min. safety (e.g. dry running protection)
- Adjustable switching hysteresis (not for current output)
- Switching delay (not at current output):
 - 100 ms to 20 s
 - Response and drop-out delay, can be selected separately
- LED field strength indicator as an adjustment and positioning aid





























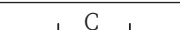

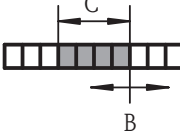




Operation



The FTR20 is configured using the function selection ① and the two operating keys ⑤ and ⑥. For this purpose, calibration to a sensitivity necessary for clear and unambiguous material flow identification of the products is carried out. If the movement of the bulk solids is sufficient, the FTR20 responds with an output signal to this effect.

The parameter configuration is stored internally and is retained even after the supply voltage is disconnected. No other operator intervention is necessary during operation. The adaptation to the application is required during initial installation only. However, subsequent changes can be made and stored at any time.

Configuration functions

Function/meaning	Value range
1 =  Automatic calibration with movement of bulk solids	—
2 =  Automatic calibration with no movement of bulk solids	—
3 =  Manual calibration with movement of bulk solids	 →  minimum (upper limit from function 1) ...  maximum
4 =  Manual calibration with no movement of bulk solids	 →  minimum (lower limit from function 1) ...  maximum
5 =  Hysteresis setting	 ...  
6 =  Selection of the limit signal function (Min./Max. safety, relay output only)	 Relay switches with movement of bulk solids  Relay switches with slow movement or no movement of bulk solids
7 =  Switching delay setting (response delay)	 Off (no delay)  100 ms ... (200/300/500 ms, 1/2/3/5/10 s)
8 =  Switching delay setting (drop-out delay)	 20 s
9 =  Enable simulation mode	 Low level of bulk solids movement ...  High level of bulk solids movement
A =  Attenuation setting	 Off (no attenuation)  100 ms ... (200/300/500 ms, 1/2/3/5/10 s)  20 s
B =  Configuring the amplification	 Display and, if necessary, adjustment of settings made in function 1 to 4
C =  Setting of detection range (window width)	
D = 	- without function
E = 	
F =  Reset to factory settings	—

Note:

Further information on settings and parameter configuration can be found in the Operating Instructions BA01136F.

Ordering information

Ordering information Solimotion FTR20

10	Approval:			
	AA	Non-hazardous area		
	BA	ATEX II 1/2D Ex ta/tb IIIC T102°C Da/Db IP66		
		ATEX II 2D Ex tb IIIC T102°C Db IP66		
	CA	CSA C/US General Purpose		
	CB	CSA C/US Class II, Div. 1, Group E-G		
	IA	IECEX Ex ta/tb IIIC T102°C Da/Db IP66		
		IECEX Ex tb IIIC T102°C Db IP66		
	99	Special version, to be specified		
20	Output:			
	1	Relay SPDT		
	2	Analog 4 - 20 mA		
	3	Solid-state relay		
	9	Special version, to be specified		
30	Power supply:			
	A	85 - 253 VAC, 50/60 Hz		
	E	20 - 60 VDC		
		20 - 30 VAC, 50/60 Hz		
	Y	Special version, to be specified		
40	Housing:			
	A	F16 polyester, IP66		
	B	F15 sanitary stainless steel, IP66		
	C	F15 sanitary stainless steel, IP66 + sight glass		
	D	F34 aluminium, IP66		
	E	F34 aluminium, IP66 + sight glass		
	Y	Special version, to be specified		
50	Electrical connection:			
	A	Gland M20 (EEx d > thread M20)		
	D	Thread ½ NPT		
	Y	Special version, to be specified		
60	Process connection:			
	XFA	Thread EN 10226 R 1½, Alu		
	VEA	Thread ANSI 1½ NPT, Alu		
	XF2	Thread EN 10226 R 1½, 316Ti		
	VE2	Thread ANSI 1½ NPT, 316Ti		
	YYY	Special version, to be specified		
70	Window transmission:			
	1	PTFE		
	2	Ceramic		
	9	Special version, to be specified		

FTR20 -

Notes on product structure

For the device versions FTR20-BA***** and FTR20-IA*****, the following limitations apply:

- **Housing (40): (A)** not permitted
- **Window transmission (70):** only (1) permitted

For the device version FTR20-CA*****, the following limitations apply:

- **Housing (40): (D) and (E)** not permitted

For the device version FTR20-CB*****, the following limitations apply:

- **Housing (40): (A), (D) and (E)** not permitted
- **Window transmission (70):** only (1) permitted

Safety instructions

General safety instructions for electrical equipment for hazardous areas

- Install it according to manufacturer's specifications and the standards and regulations applicable in your area.
- Installation, electrical connection, commissioning, operation and, if necessary, maintenance may be carried out only by trained specialists authorized to do so by the facility's owner-operator.
- Do not operate the FTR20 bulk solids motion detector outside the electrical, thermal and mechanical characteristic quantities.
- For additional information please refer to the following safety instructions:
 - XA00509F (FTR20-BA*****)
 - XA01245F (FTR20-CB*****)
 - XA00543F (FTR20-IA*****)

Accessories

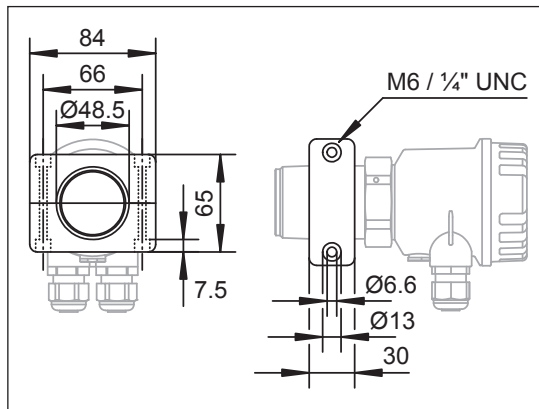
Mounting bracket

The FTR20 can be easily mounted on an existing frame using a mounting bracket.

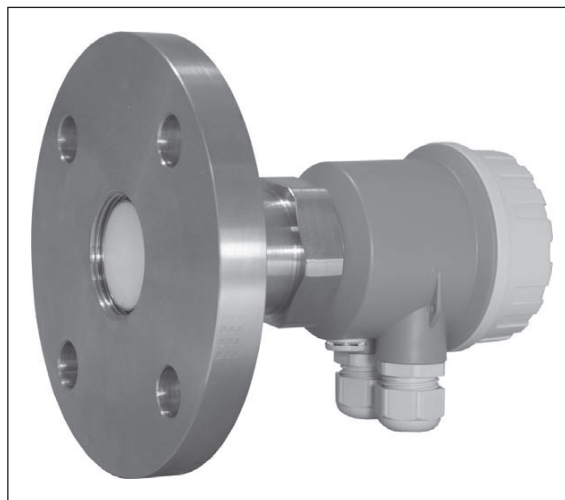


Mounting bracket for mounting on a frame

- Material aluminium: Part number 52017501
- Material plastic: Part number 52017502

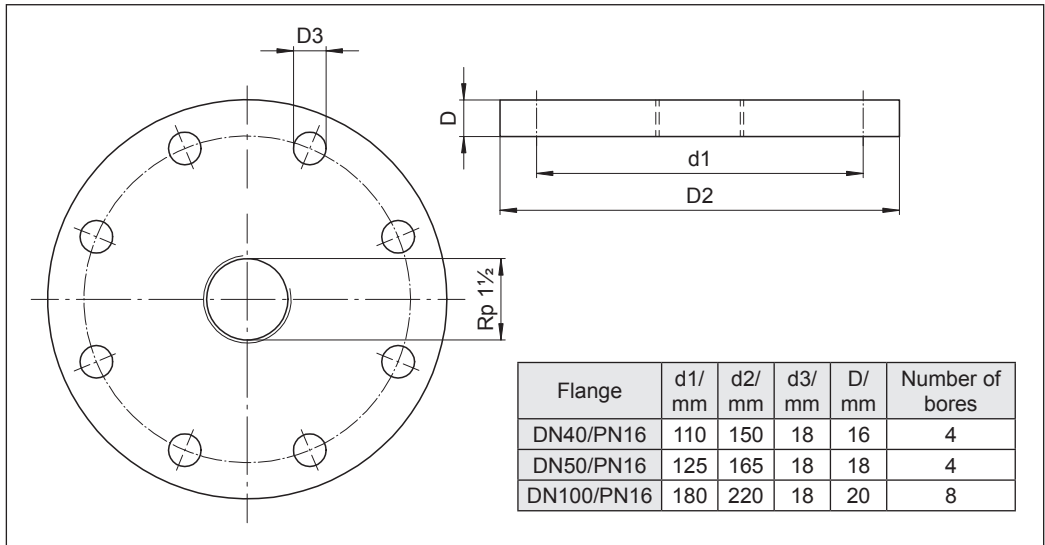


Installation flanges, material 316Ti (stainless steel)



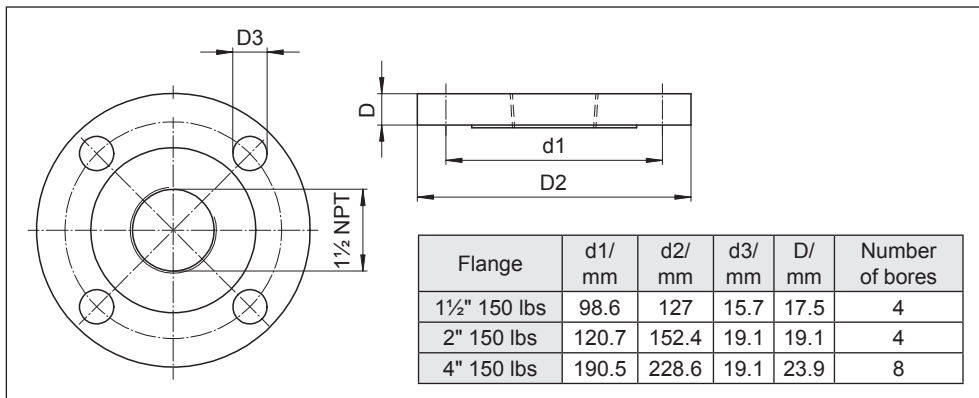
Connection dimensions as per DIN EN 1092-1, with Rp 1/2 internal thread:

- DN40 PN16 with inspection certificate as per EN 10204-3.1 Part number 71006348
- DN50 PN16 with inspection certificate as per EN 10204-3.1 Part number 71108383
- DN50 PN16 with inspection certificate as per EN 10204-3.1 Part number 71006350
- DN100 PN16 with inspection certificate as per EN 10204-3.1 Part number 71108388
- DN100 PN16 with inspection certificate as per EN 10204-3.1 Part number 71006352
- DN100 PN16 with inspection certificate as per EN 10204-3.1 Part number 71108390



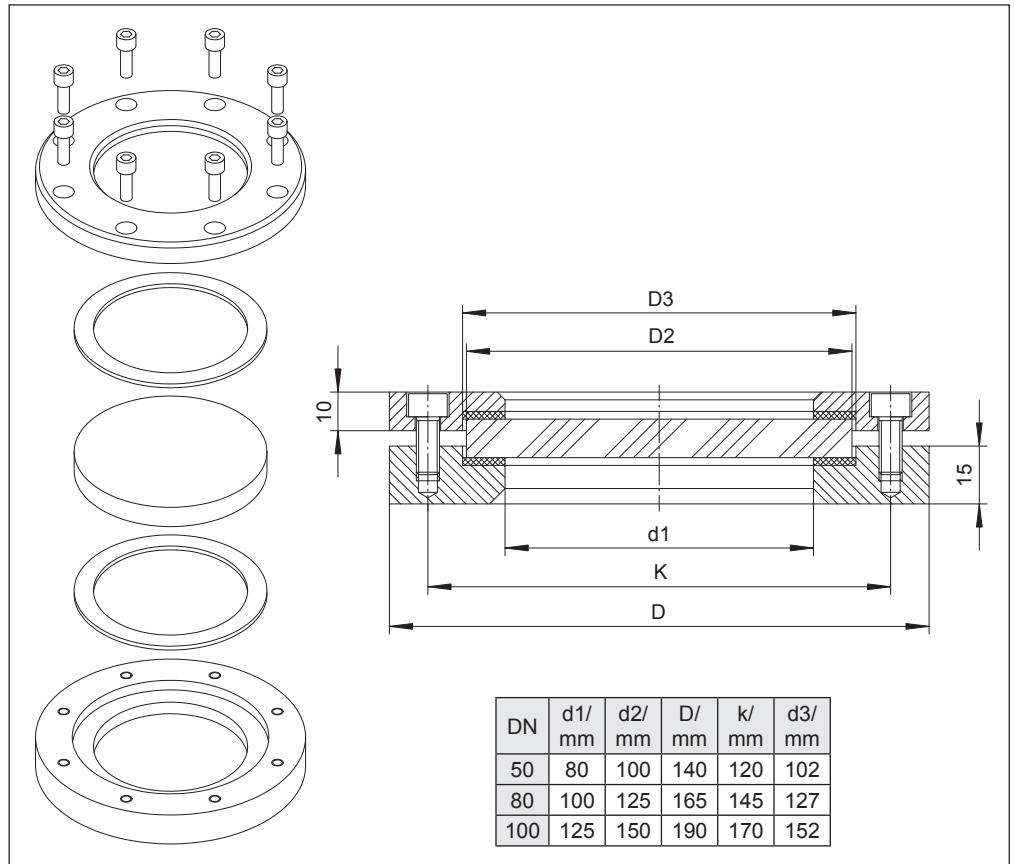
Connection dimensions to ANSI/ASME B16.5, with 1 1/2 NPT internal thread:

- 1 1/2" 150 lbs
with inspection certificate as per EN 10204-3.1
 - 2" 150 lbs
with inspection certificate as per EN 10204-3.1
 - 4" 150 lbs
with inspection certificate as per EN 10204-3.1
- Part number 71006349
Part number 71108387
Part number 71006351
Part number 71108389
Part number 71006353
Part number 71108391



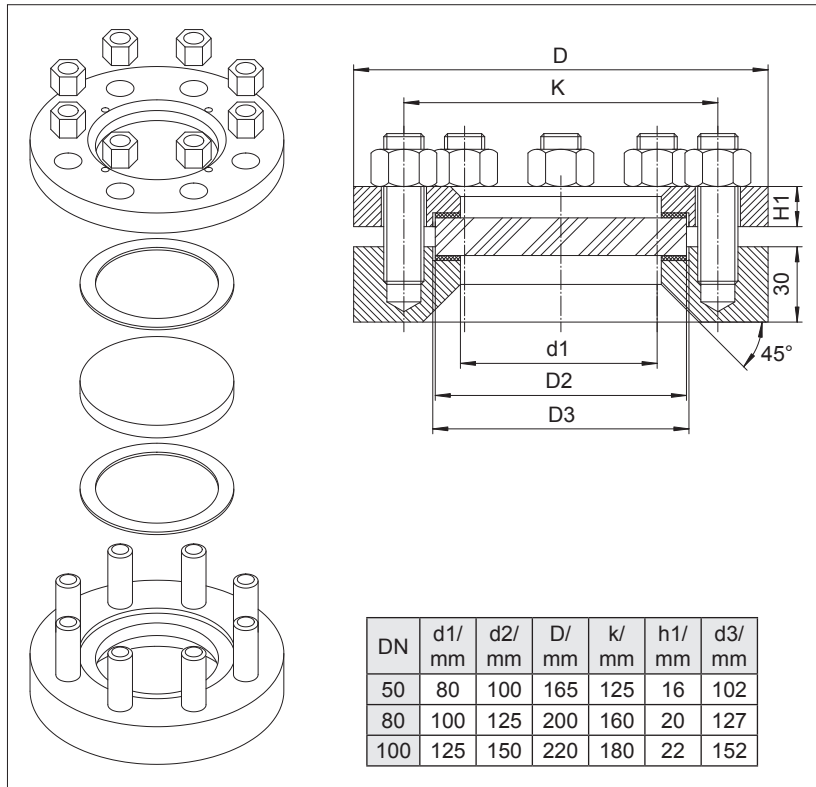
Sight glass fitting

Weld-in fitting for unpressurized containers, materials: stainless steel 316Ti and silicon, T_{max} = 200°C, borosilicate glass, screw-on installation



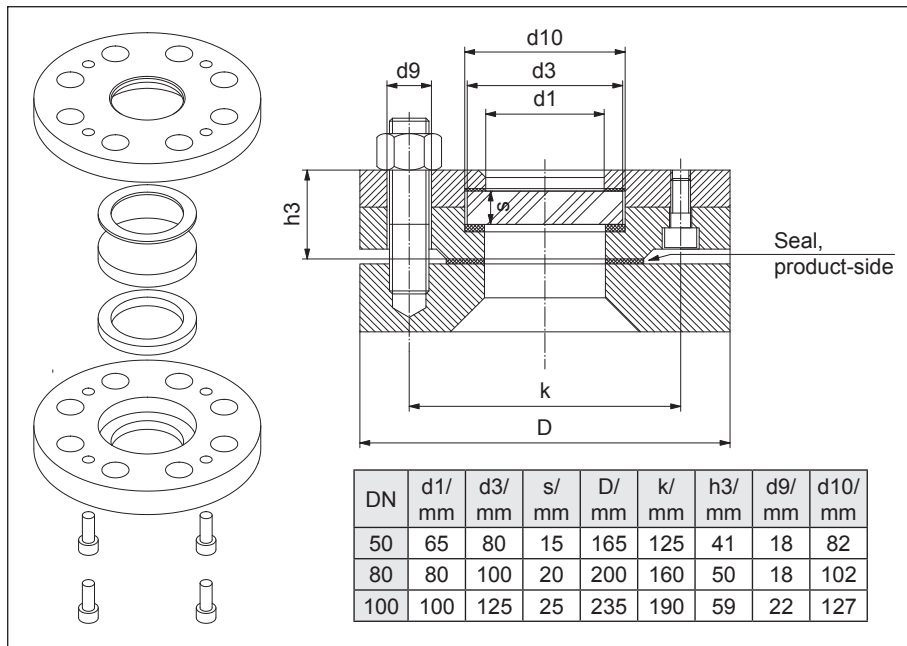
- DN50, Part number 71026443
- DN80, Part number 71026444
- DN100, Part number 71026445

Weld-in fitting as per DIN 28120, materials: stainless steel 316Ti/321 and silicon, Pmax = 1 MPa (10 bar), Tmax = 200°C, borosilicate glass, screw-on installation



- DN50, Part number 71026446
- DN80, Part number 71026447
- DN100, Part number 71026448

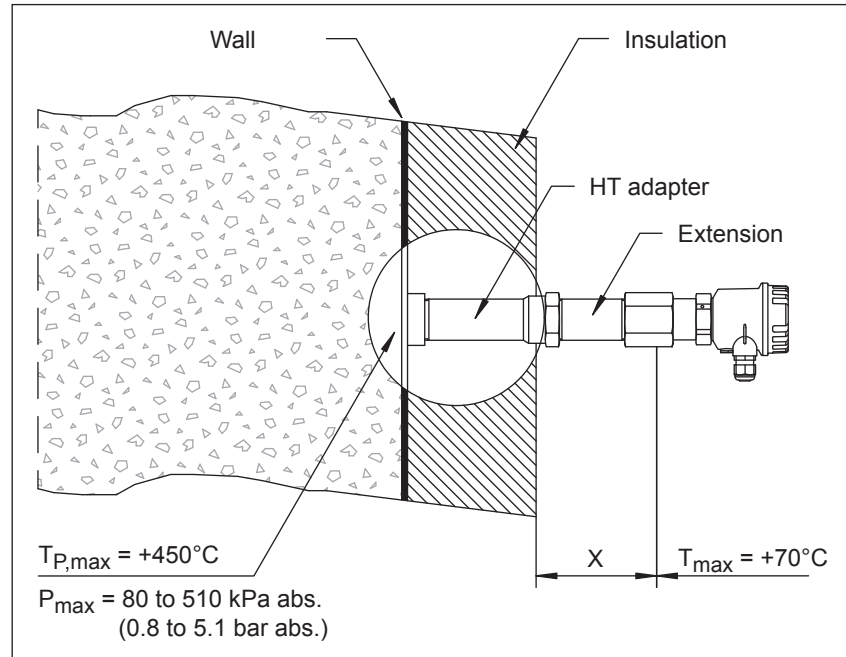
Flange fitting as per DIN 28121 to screw on to existing counter or pad flange, materials: stainless steel 316Ti, PTFE and C4400, Pmax = 2.5 MPa (25 bar), Tmax = 200°C, borosilicate glass



- DN50, Part number 71026449
- DN80, Part number 71026450
- DN100, Part number 71026451

High-temperature application

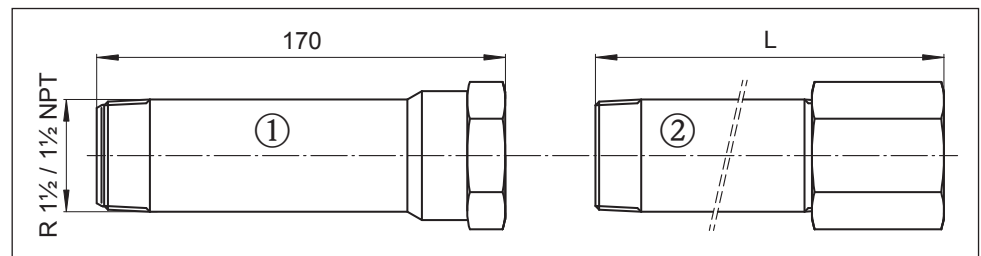
For applications with process temperatures up to +450°C, the temperature reduction to max. +70°C takes place on the FTR20 using an appropriate high-temperature adapter (with extension where necessary). The length of the adapter is based on the insulation thickness to be penetrated (if present) and the ambient conditions at the measuring point.



Note:

- To maintain the maximum temperature of +70°C at the FTR20, we recommend a minimum difference of (X) 200 mm between the process or the insulation and the device.
- The individual extensions can also be combined in any way desired.
- Each high-temperature adapter results in a reduction of the range.

High-temperature adapter and extension



HT adapter ① with flush-mounted ceramic disk:

- Thread R 1 1/2 and Rp 1 1/2 respectively, 55 hex, 316Ti/1.4571 Part number 71113441
- Thread 1 1/2 NPT, 55 hex, 316Ti/1.4571 Part number 71113449

Extension for HT adapter ②:

- Thread R 1 1/2 and Rp 1 1/2 respectively, 55 hex, 316Ti/1.4571
 - L = 225 mm Part number 71113450
 - L = 325 mm Part number 71113451
 - L = 525 mm Part number 71113452
- Thread 1 1/2 NPT, 55 hex, 316Ti/1.4571
 - L = 225 mm Part number 71113453
 - L = 325 mm Part number 71113454
 - L = 525 mm Part number 71113455

Certificates and approvals

CE mark

The Solimotion bulk solids motion detector meets the legal requirements of the EC directives.
By applying the CE mark, Endress+Hauser confirms that the device has passed the necessary tests.

Radio approval

- R&TTE according to EN 300440-2
- FCC Rule Parts 15C
- IC according to RSS-210 Issue 8, RSS-GEN Issue 3 and RSS-102 Issue 4

Ex approval

See "Ordering Information"

Other standards and guidelines

- EN 60529
Degrees of protection through housing (IP code)
- EN 61010-1
Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326-X
EMC product family standard for electrical equipment for measurement, control and laboratory use

Documentation

Operating Instructions

Solimotion FTR20
BA01136F

Safety Instructions

Solimotion FTR20-BA*
XA00524F

Solimotion FTR20-CB*
XA01245F

Solimotion FTR20-IA*
XA00544F

Subject to modifications and amendments

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