



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



Solutions

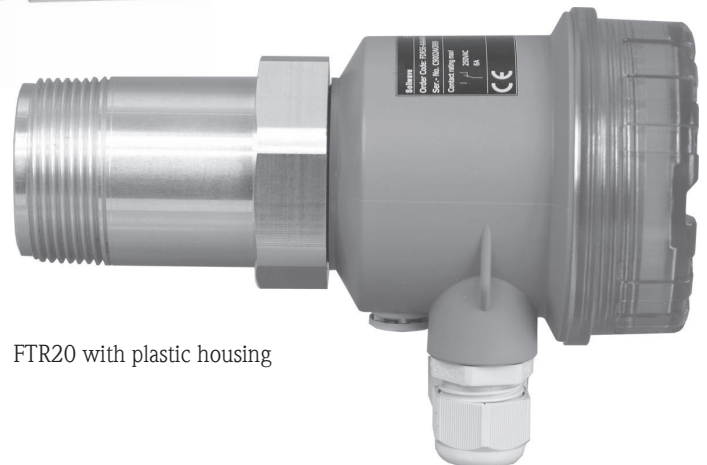
## Technical Information

# 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 (incl. 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 and IECEx

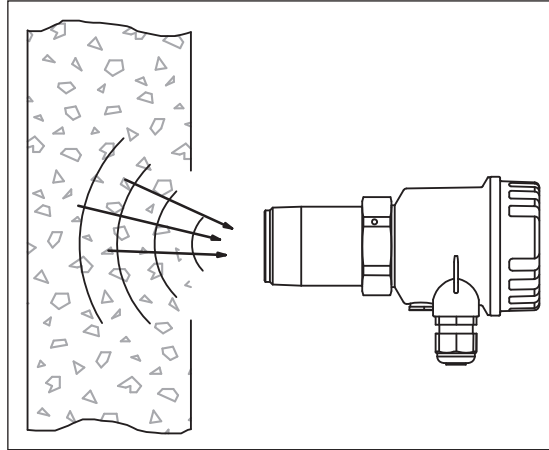
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## Function and system design

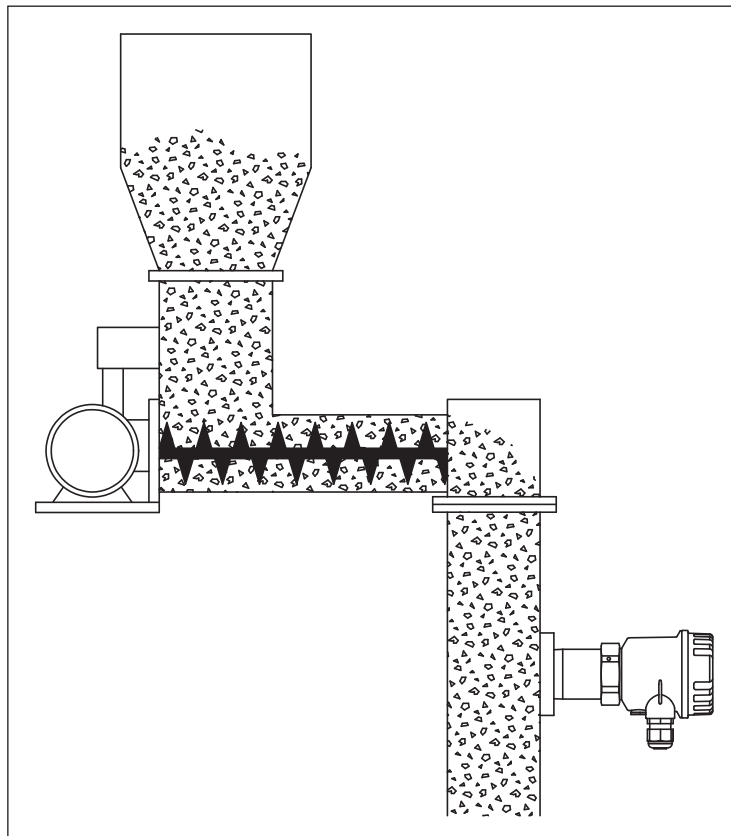
### Operating principle

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.



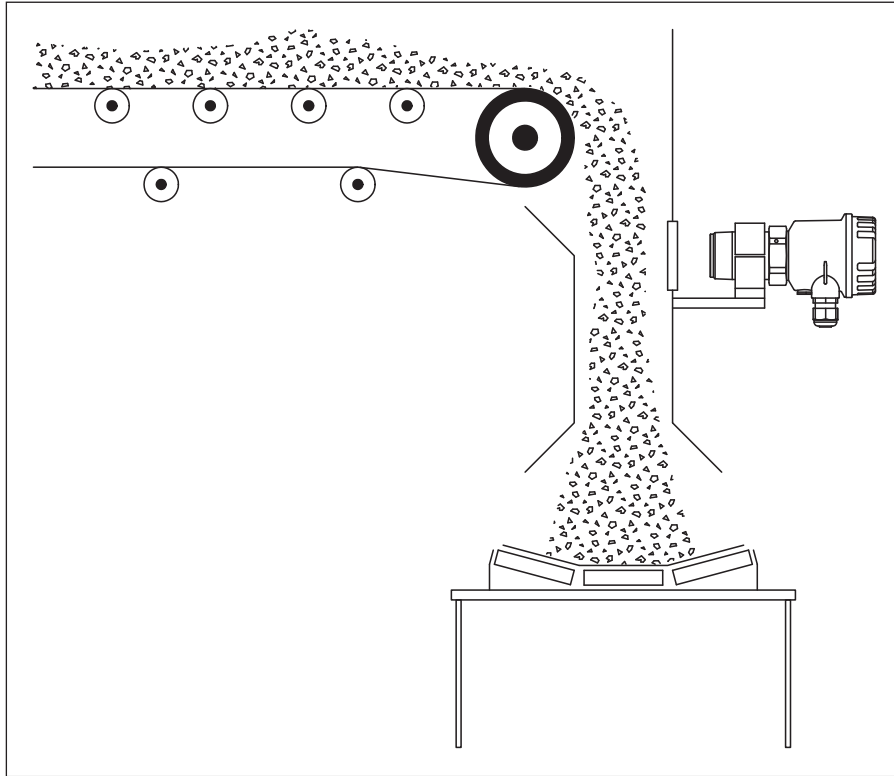
The range of the FTR20 is influenced by varying materials, with the attenuation depending on the damping characteristics of the bulk solids.

### 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.

## Input

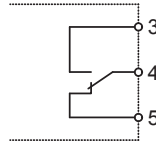
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<b>Measured variable</b>	Doppler frequency
<b>Measuring range (detection range)</b>	With an unobstructed radiation path to the surface of the bulk solids, the maximum range is 20 m. This is reduced if container walls, sight glasses or similar need to be penetrated.
<b>Operating frequency</b>	24.15 GHz $\pm$ 80 MHz
<b>Transmission power</b>	<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"><li>■ Power density directly in front of the device: approx. 1 mW/cm<sup>2</sup></li><li>■ Power density at a distance of 1 m: approx. 0.3 <math>\mu</math>W/cm<sup>2</sup></li></ul> <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>
<b>Switching frequency</b>	max. 2 Hz

## Output

### Relay

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

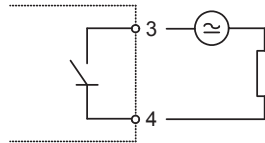


Note:

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

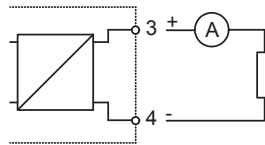


Note:

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

### Current

- Current output 4 - 20 mA
- Active
- Max. load: 600  $\Omega$

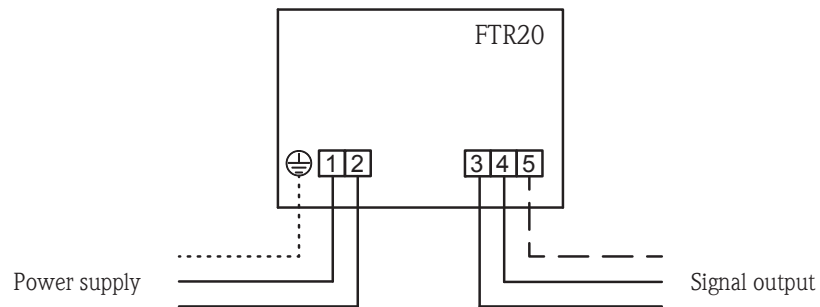


## Power supply

### 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

### Power consumption

- AC version: max. 4 VA
- DC version: max. 1.5 W

### Cable entry

- M20 x 1.5 or
- ½ NPT

### Cable gland

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

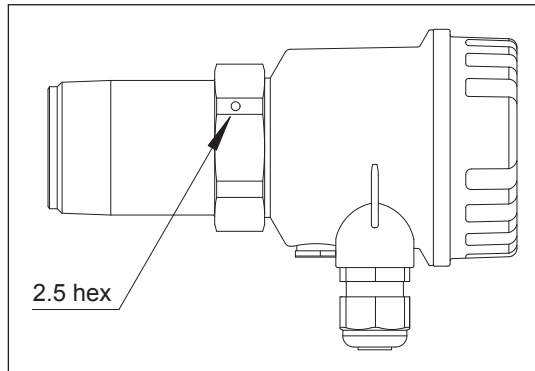
### Wire specification

- Usual commercial installation wire
- Conductor cross-section: max. 1.5 mm<sup>2</sup>

## Operating conditions

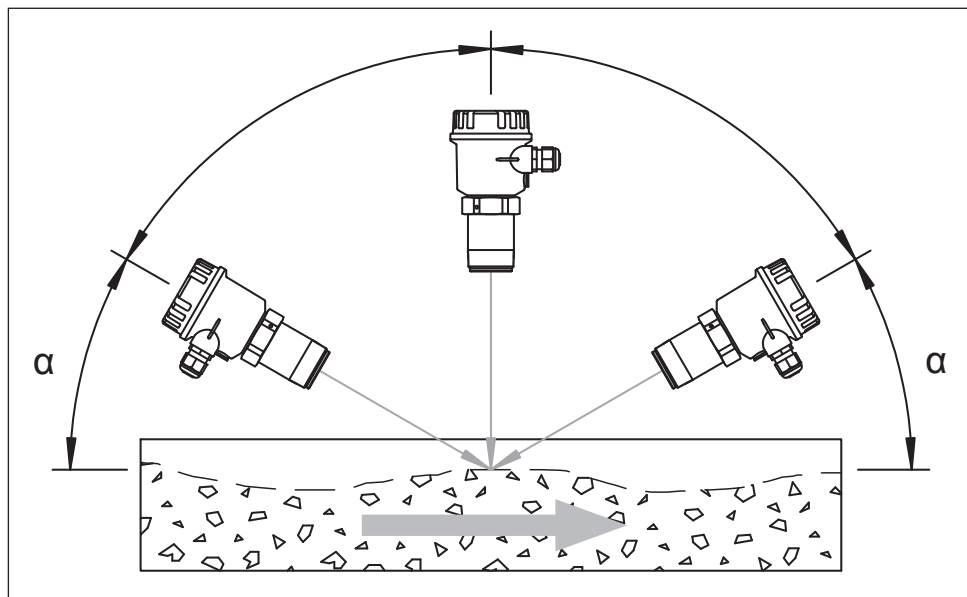
### Installation instructions

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



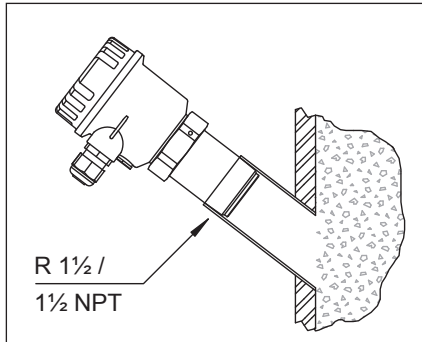
Any orientation is possible for the FTR20 bulk solids motion detector. However, a small angle  $\alpha$  may increase the signal quality.



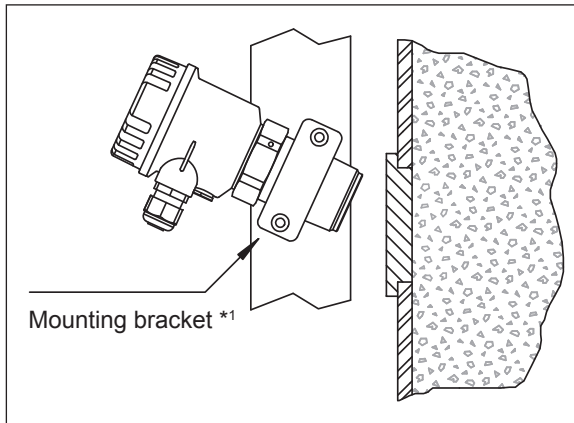


## Installation

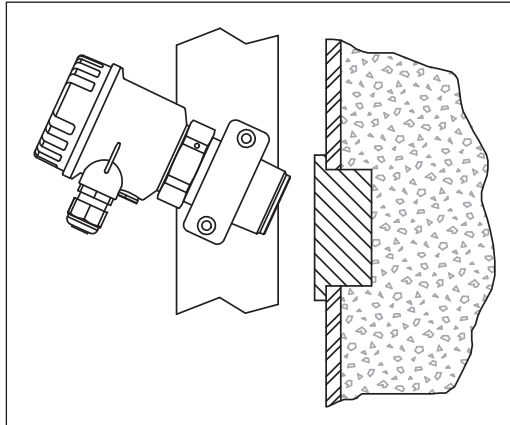
Direct installation using threaded connection



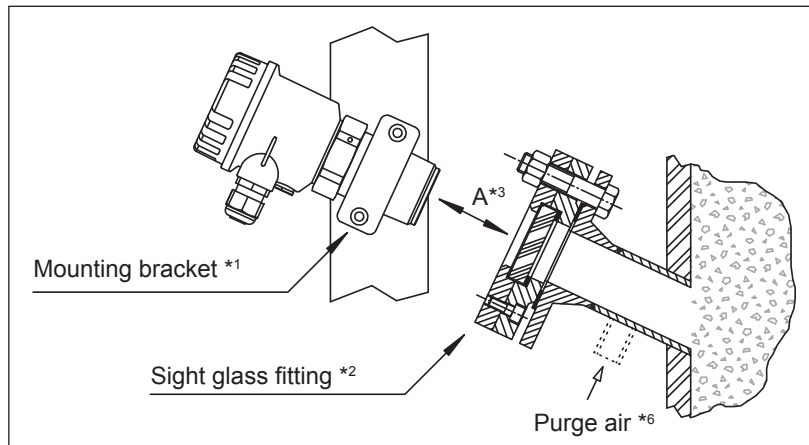
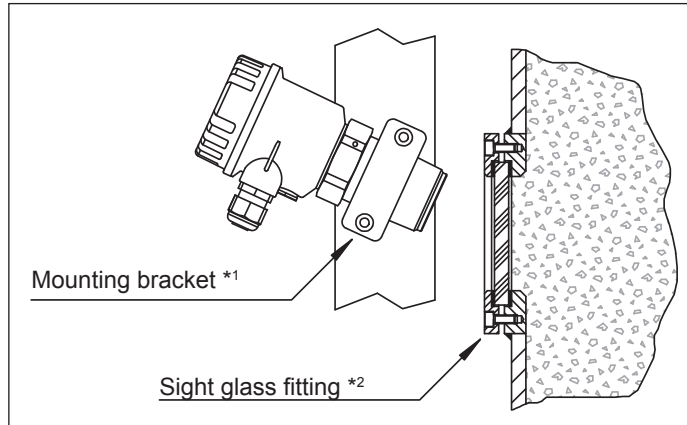
Mounting bracket in front of microwave-permeable window



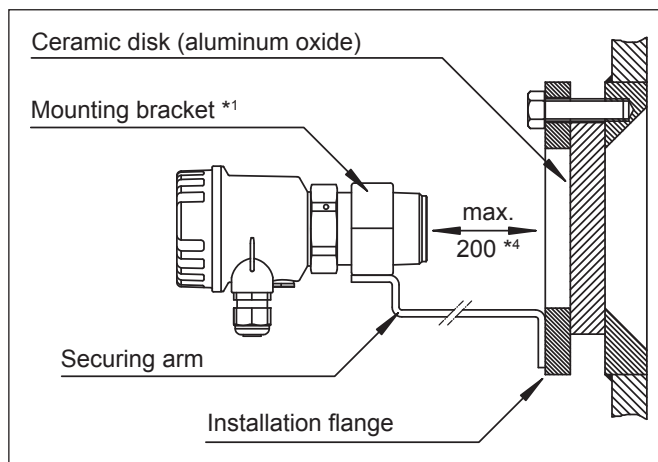
Mounting bracket in front of microwave-permeable window with danger of condensation on the container's inner wall



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

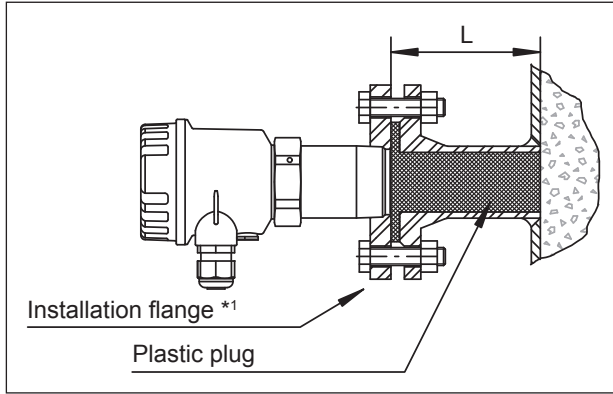


**Angle installation on container \*5**



- \*1 Suitable mounting brackets are available as accessories, see "Accessories".
- \*2 Suitable microwave-permeable sight glass fittings are available as accessories, see "Accessories".
- \*3 The distance **A** is based on the nominal width of the sight glass fitting (or the diameter of the sight glass) and the temperature at the fitting. To prevent possible signal attenuation, we recommend keeping the distance as short as possible (e.g. max. 40 mm at DN50).
- \*4 Distance to temperature reduction between process temperature and max. 70°C at the flow indicator for bulk solids.
- \*5 Various installation adapters (e.g. for angle installation) are available as special equipment packages.
- \*6 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).

**Flange mounting using screw-in flange**

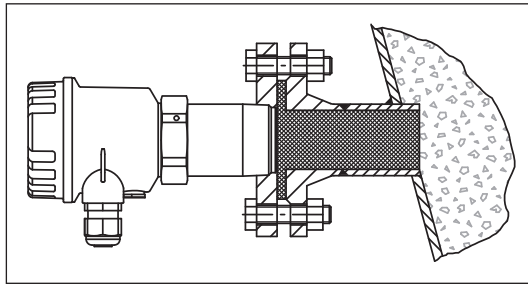


\*1 Suitable installation flanges are available as accessories, see "Accessories"

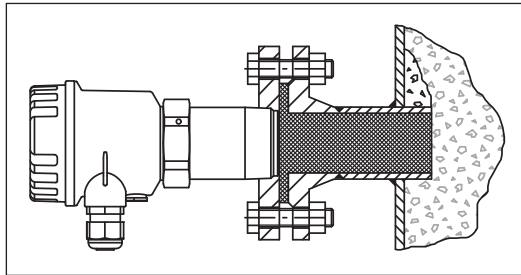
**Note:**

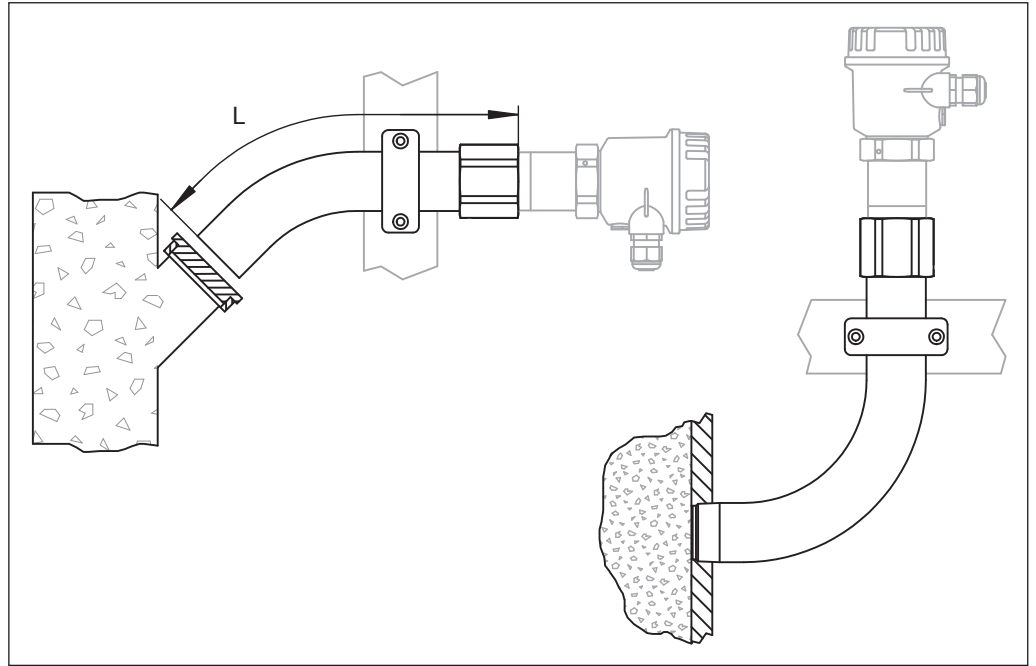
- The maximum length **L** depends on the dielectric constant and the water absorption of the plastic material. Observe the manufacturer's specifications.
- We recommend PTFE as the material, as this allows the length to be up to 300 mm.

**Flange mounting using screw-in flange for oblique conical containers**



**Flange mounting using screw-in flange with danger of build-up**

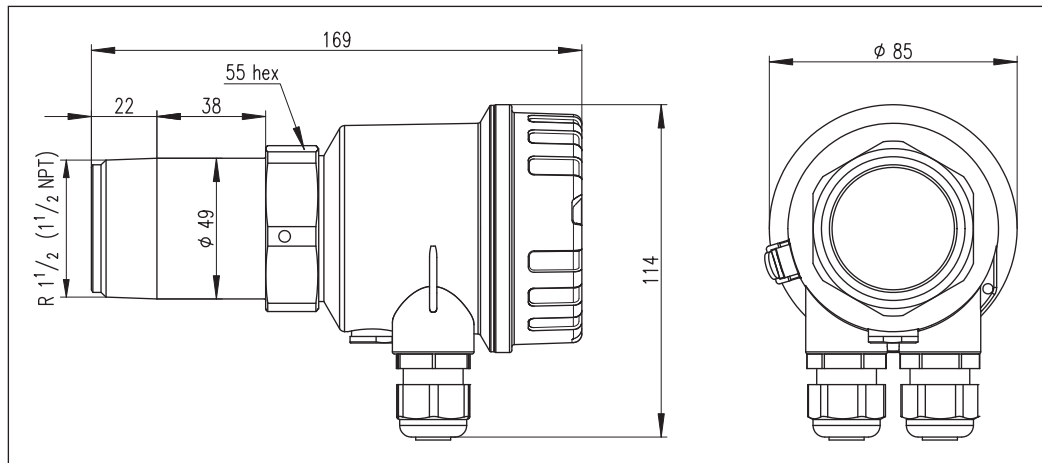


**Installation with pipe  
as wave guide****Note:**

- 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 F16-housing (polyester)



### Weight

- Max. 1 kg

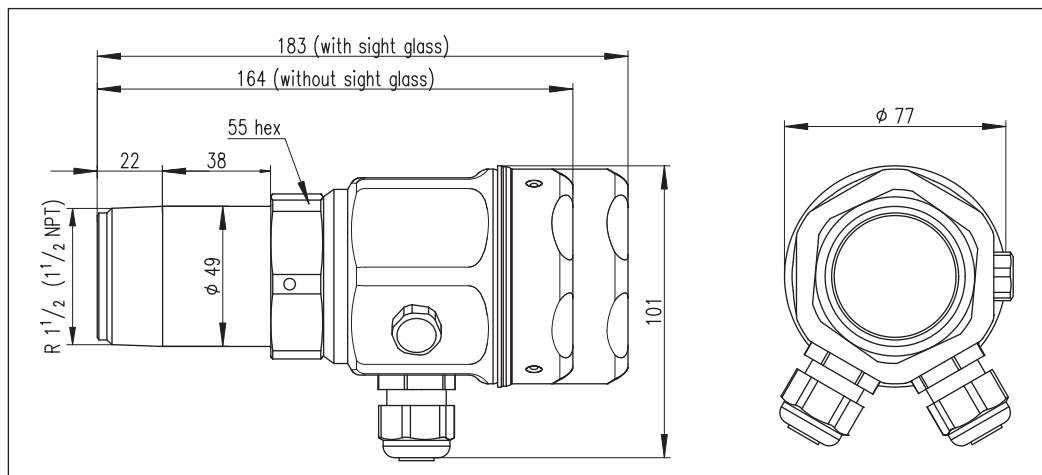
### Materials

- Housing: Polyester
- Process connection (wetted parts):
  - Aluminium or stainless steel 316Ti/1.4571
  - Sensor diaphragm: PTFE or ceramic
- Cable glands: PA

### Process connection

- Thread R 1 1/2 (EN 10226) or
- 1 1/2 NPT (ANSI/ASME B1.20.1)

### Design/ dimensions F15 housing (sanitary stainless steel)



### Weight

- Max. 1.4 kg

### Materials

- Housing: Stainless steel 316L
- Process connection (wetted parts):
  - Stainless steel 316Ti/1.4571
  - Sensor diaphragm: Ceramic or PTFE (device version with approval)
- Cable glands:
  - PA (device version without approval)
  - Brass, nickel-plated (device versions with approval)

### Process connection

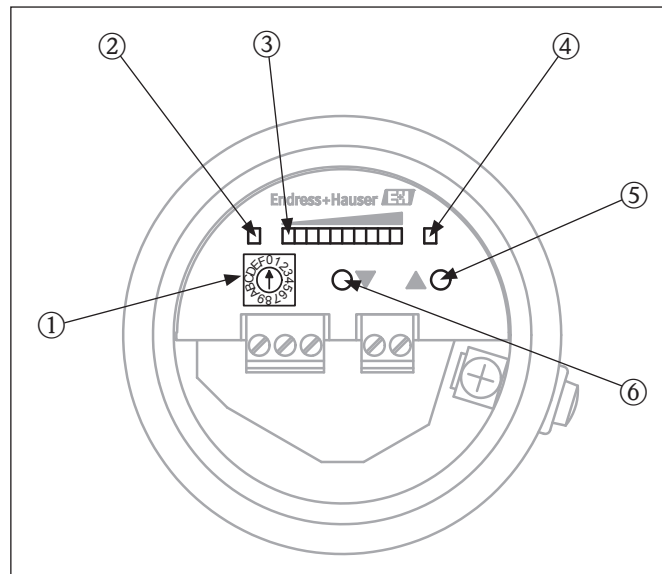
- Thread R 1 1/2 (EN 10226) or
- 1 1/2 NPT (ANSI/ASME B1.20.1)

## 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.

## Display

The signal strength of the product as well as the configured values (in the function selection) are displayed locally using a bar graph display ③. In addition, a green LED ② indicates that the device is ready to operate (supply voltage is present) and a yellow LED ④ displays the status of the switch output (LED off: relay in rest position, solid-state relay high-impedance).


Note:

- Toggling the encoding switch for the function selection (<> 0) puts the FTR20 into parameter configuration mode. The bulk solids motion detector continues to work in the background, changed settings are taken into account directly.
- Remember to reset the function selection to **0 = operation** when you have finished configuring settings.
- For current output, the yellow LED ④ has no function and remains off.

## Parameter configuration

Parameter configuration is performed as follows:

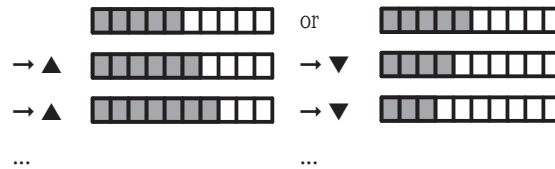
1. Select any function (the available functions can be found in the section "Programming functions")
  - Encoding switch ① = 1 to F
  - The display shows the selected function for two seconds.

Example function 3: 

2. Setting the selected function

Example: Function 3 (manual calibration with movement of bulk solids)

- Using the ⑥ ▼ and ⑦ ▲ keys, the sensitivity can be increased or reduced in 10% increments.

































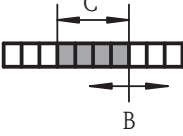


3. The configured value is stored as soon as the function is switched. The value can be displayed again at any time by selecting the corresponding programming function and changed if necessary.
4. Once parameter configuration is complete (i.e. once the motion detector has been adapted to the bulk solids in question), the encoding switch must be returned to the "0" position. The FTR20 is now ready for operation.

Note:

When a calibration is carried out, it can be read out and, for example in the case of a device change, transferred directly to the new FTR20. If the new device is installed in the same position, this means that the device is correctly calibrated.



## 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)	
F =  Reset to factory settings	—

## Note:

Further information on settings and parameter configuration can be found in the Operating Instructions KA00293F/97.

## Ordering information

### Ordering information Solimotion FTR20

<b>10</b>	<b>Approval:</b>		
	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	
	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	
<b>20</b>	<b>Output:</b>		
	1	Relay SPDT	
	2	Analog 4 - 20 mA	
	3	Solid-state relay	
	9	Special version, to be specified	
<b>30</b>	<b>Power supply:</b>		
	A	85 - 253 VAC, 50/60 Hz	
	E	20 - 60 VDC 20 - 30 VAC, 50/60 Hz	
	Y	Special version, to be specified	
	<b>40</b>	<b>Housing:</b>	
A		F16 polyester, IP66	
B		F15 sanitary stainless steel, IP66	
C		F15 sanitary stainless steel, IP66 + sight glass	
Y		Special version, to be specified	
<b>50</b>	<b>Electrical connection:</b>		
	A	Gland M20 (EEx d > thread M20)	
	D	Thread ½ NPT	
	Y	Special version, to be specified	
	<b>60</b>	<b>Process connection:</b>	
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	
<b>70</b>	<b>Window transmission:</b>		
	1	PTFE	
	2	Ceramic	
	9	Special version, to be specified	

FTR20 -

**Notes on product structure**

For the device version FTR20-BA\*\*\*\*\*, the following restrictions apply:

- **Housing (40):** (A) not permitted
- **Electrical connection (50):** only (A) permitted
- **Process connection (60):** (XFA) and (VEA) not permitted
- **Window transmission (70):** only (1) permitted

For the device version FTR20-IA\*\*\*\*\*, the following restrictions apply:

- **Housing (40):** (A) not permitted
- **Process connection (60):** (XFA) and (VEA) not permitted
- **Window transmission (70):** only (1) permitted

For the device versions FTR20-\*\*\*B\*\*\* and FTR20-\*\*\*C\*\*\*, the following restrictions apply:

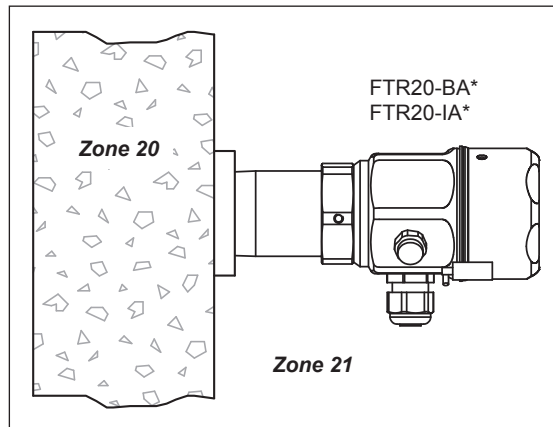
- **Process connection (60):** (XFA) and (VEA) not permitted

## 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 safety instructions, refer to XA00524F (ATEX) or XA00544F (IECEX)

### Zone classification



## Accessories

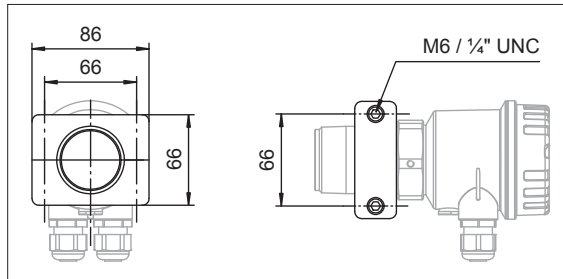
### Mounting bracket

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

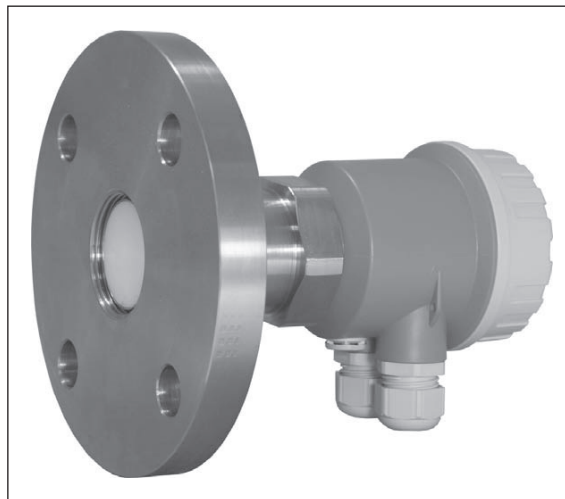


Mounting bracket for mounting on a frame

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



### Installation flanges, material 316Ti (stainless steel)



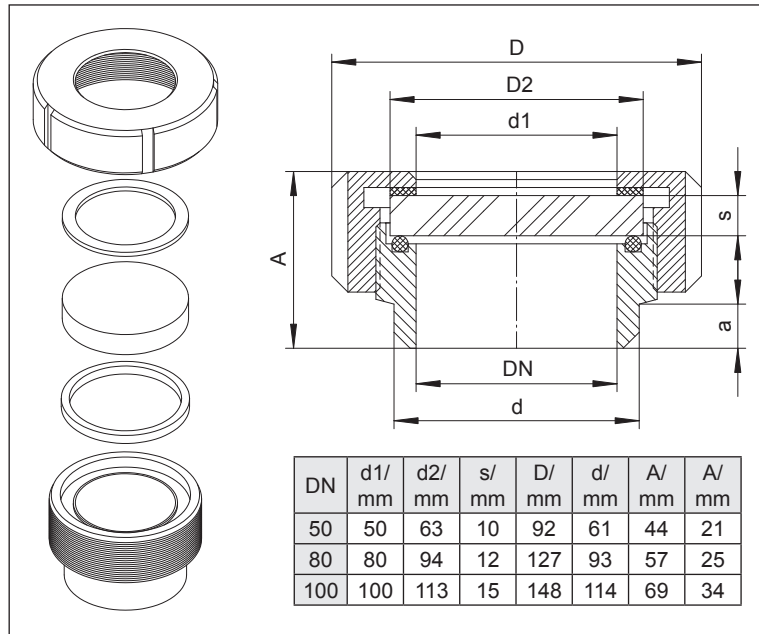
Connection dimensions as per DIN EN 1092-1, with Rp 1½ internal thread:

- 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
- DN100 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



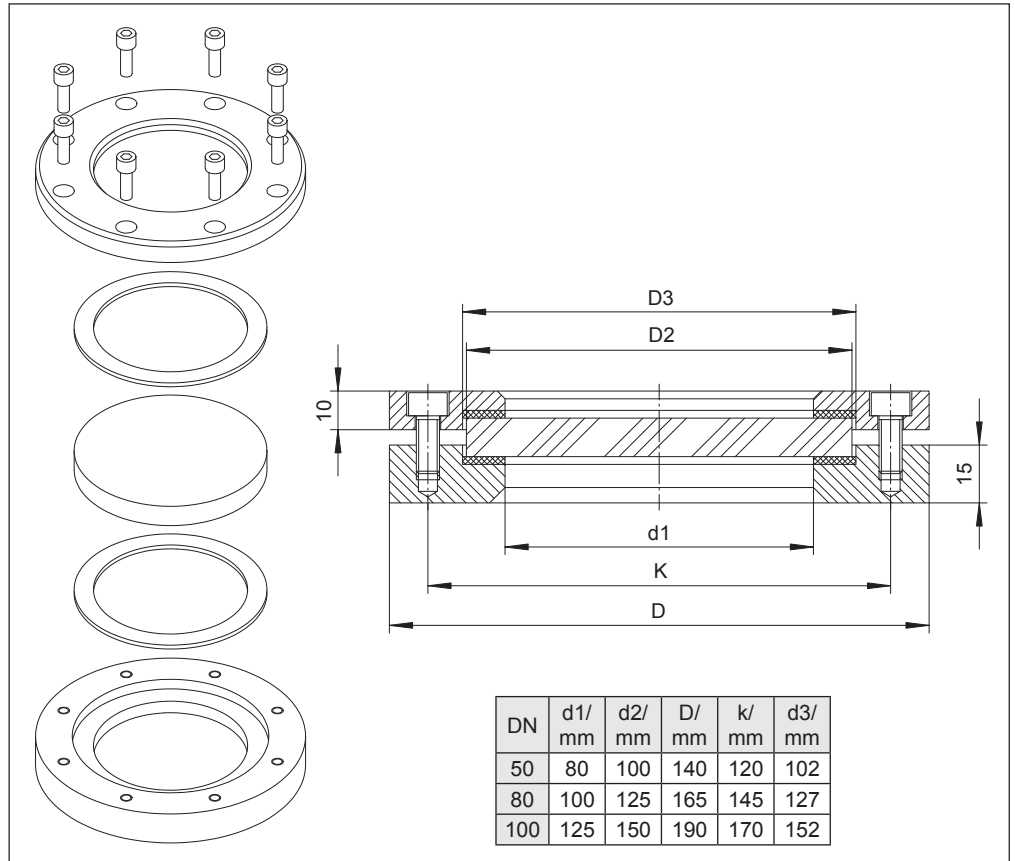
**Sight glass fitting**

Screw-type fitting similar to DIN 11851, materials: stainless steel 304, silicon and C4400, Pmax = 600 kPa (6 bar), Tmax = 200°C, borosilicate glass, screw-on installation, thread adapter nut



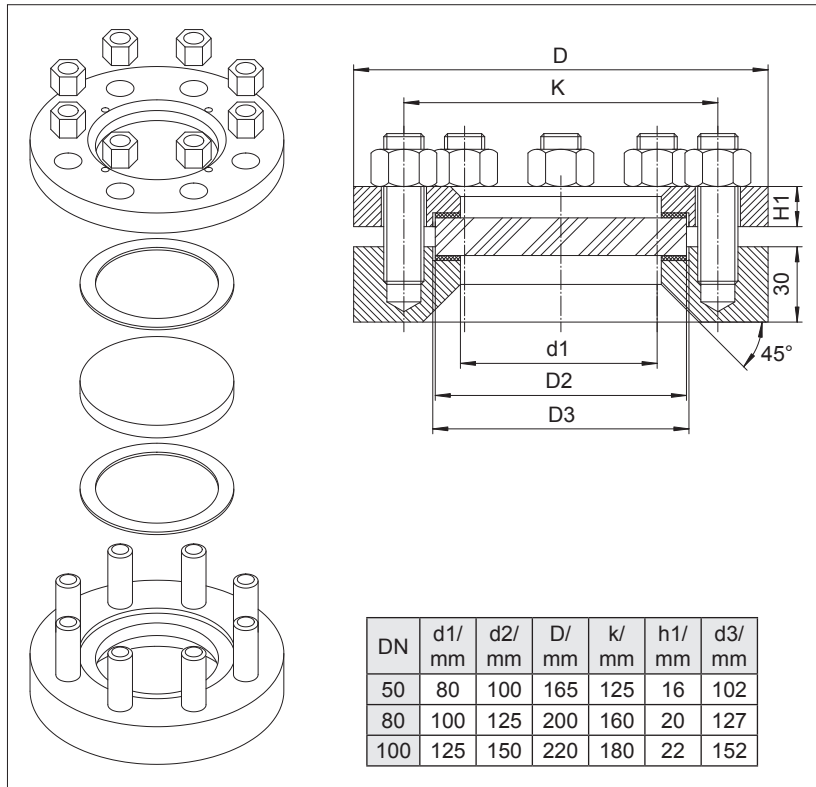
- DN50, Part number 71026440
- DN80, Part number 71026441
- DN100, Part number 71026442

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



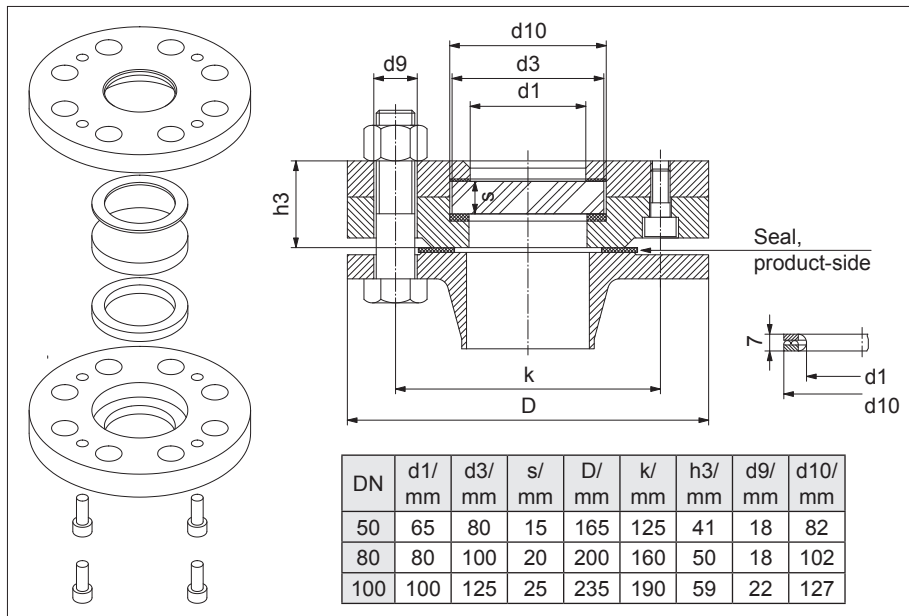
- DN50, Part number 71026443
- DN80, Part number 71026444
- DN100, Part number 71026445

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 flanges, materials: stainless steel 316Ti, PTFE and C4400, Pmax = 2.5 MPa (25 bar), Tmax = 200°C, borosilicate glass

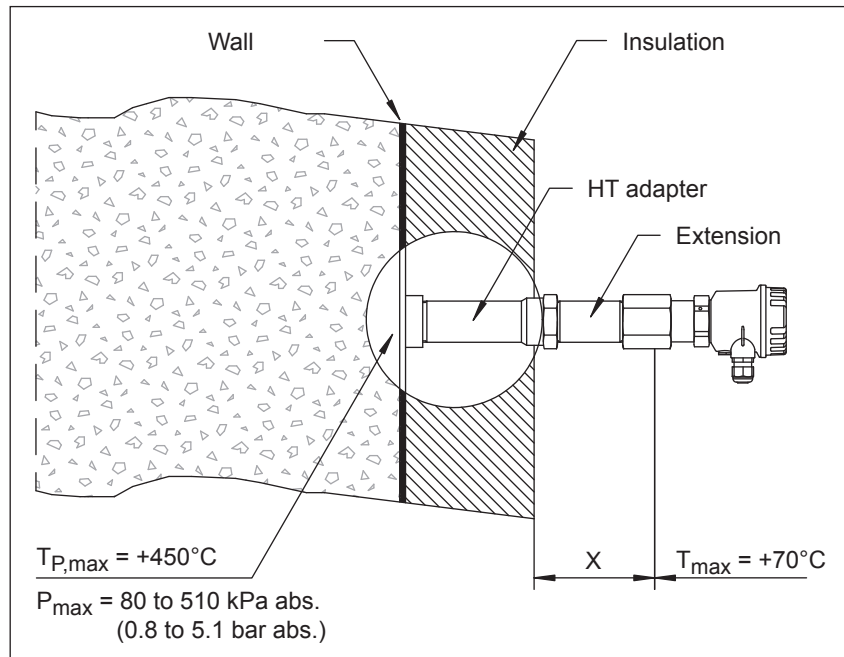


- DN50, Part number 71026449
- DN80, Part number 71026450
- DN100, Part number 71026451



### High-temperature application

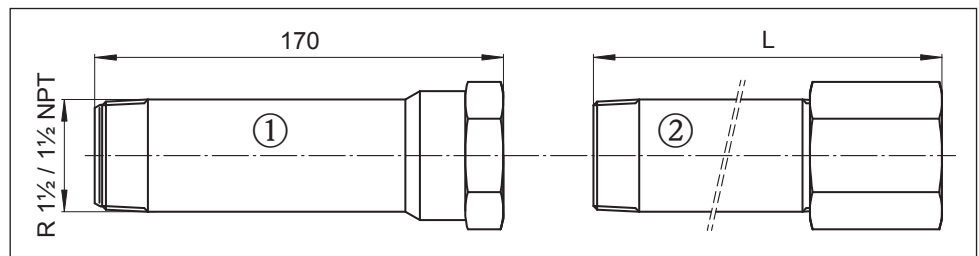
For applications with process temperatures up to +450°C, the temperature reduction to max. +70°C takes place on the FTR20 using an appropriate high-temperature adapter (with extension where necessary). The length of the adapter is based on the insulation thickness to be penetrated (if present) and the 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 1½ and Rp 1½ respectively, 55 hex, 316Ti/1.4571  
Part number 71113441
- Thread 1½ NPT, 55 hex, 316Ti/1.4571  
Part number 71113449

Extension for HT adapter ②:

- Thread R 1½ and Rp 1½ 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 1½ 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

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**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 as per EN 300440-2

**Ex approval**

ATEX II 1/2D or IECEx

**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

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<b>Operating Instructions (KA)</b>	<b>Solimotion FTR20</b> KA00293F/97/a6
<b>Safety Instructions (XA)</b>	<b>Solimotion FTR20-BA*</b> XA00524F
	<b>Solimotion FTR20-IA*</b> XA00544F

Subject to modifications and amendments

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