

Technical Information

Solimotion FTR16

Flow indicator for bulk solids



Ultra-compact flow indicator for monitoring pneumatic and mechanical transport processes of bulk solids

Application

- Flow indicator for monitoring pneumatic and mechanical transport processes of bulk materials of all kinds, also in hazardous areas
- Process temperature range: -20 to +450 °C (-4 to +842 °F) with optional high temperature adapter
- Process pressure range: 0.5 to 21 bar (7 to 305 psi) absolute with optional high pressure adapter
- Non-contact detection: use in containers, pipelines, shafts or free-fall shafts (detection from the outside is possible for non-metallic container materials)

Your benefits

- Ultra-compact device with integrated power supply and connectors
- Easy mounting using G1, G1½ or 1½ NPT thread or a suitable mounting adapter
- Adjustable sensitivity and switching delay
- Detection even with changing product properties
- Use even in difficult-to-access or confined installation conditions
- Function control on site via LED indication
- Robust stainless steel housing
- Simple and cost-effective commissioning
- Meets the requirements of EU 1935/2004
- DC-PNP power amplifier

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About this document

Symbols

Safety symbols



This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.



This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

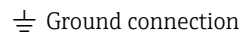


This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.



This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

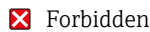


Grounded clamp, which is grounded via a grounding system.

Symbols for certain types of information



Procedures, processes or actions that are permitted.



Procedures, processes or actions that are forbidden.



Indicates additional information



Reference to documentation



Reference to another section



Reference to graphic



1., 2., 3. Series of steps

Symbols in graphics

A, B, C ... View

1, 2, 3 ... Item numbers

Device-specific symbols



LED on
Indicates an illuminated LED



LED off
Indicates a non-illuminated LED



LED undefined
Indicates an undefined or arbitrary light state of the LED



Maximum bulk flow
Indicates a maximum bulk movement

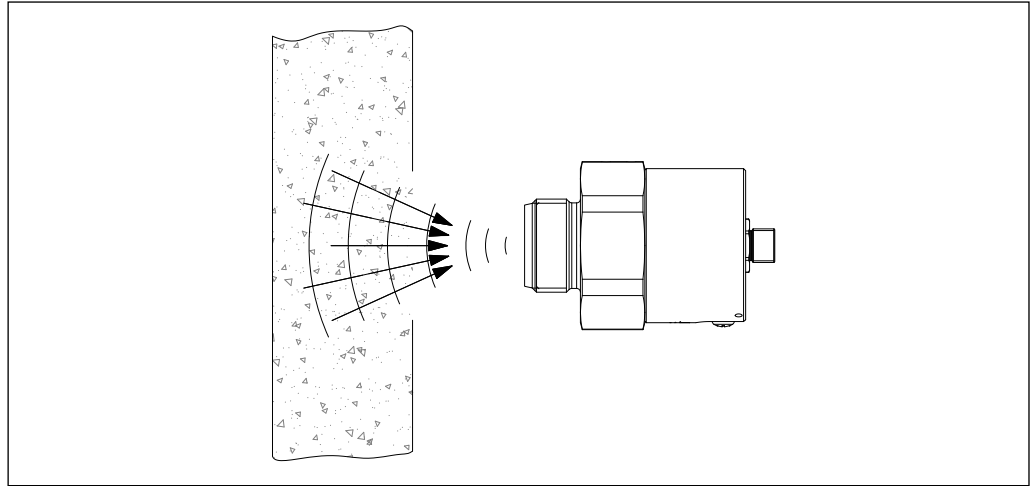


Minimum bulk flow
Indicates a minimum or absent bulk movement

Function and system design

Measuring principle

The FTR16 flow indicator operates on a microwave basis. The device emits a signal which is reflected by the moving bulk material. The FTR16 measures the strength of the reflected frequency-shifted (Doppler effect) energy, this is evaluated and output via the display or the signal output.



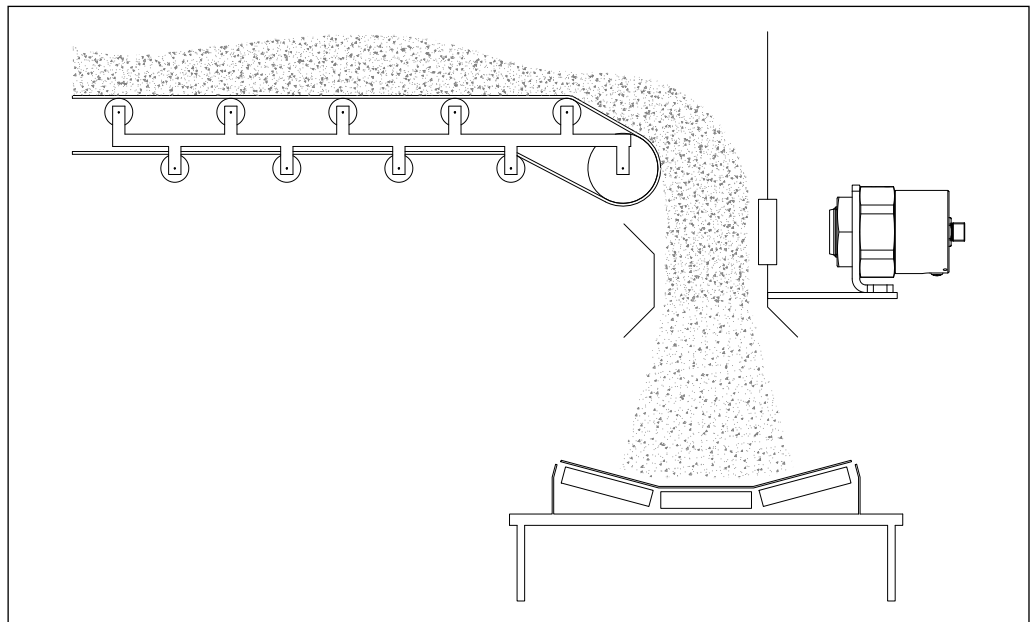
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1 Measuring principle

The range of the FTR16 depends on the reflection characteristics of the bulk solids.

Example of a conveyor belt

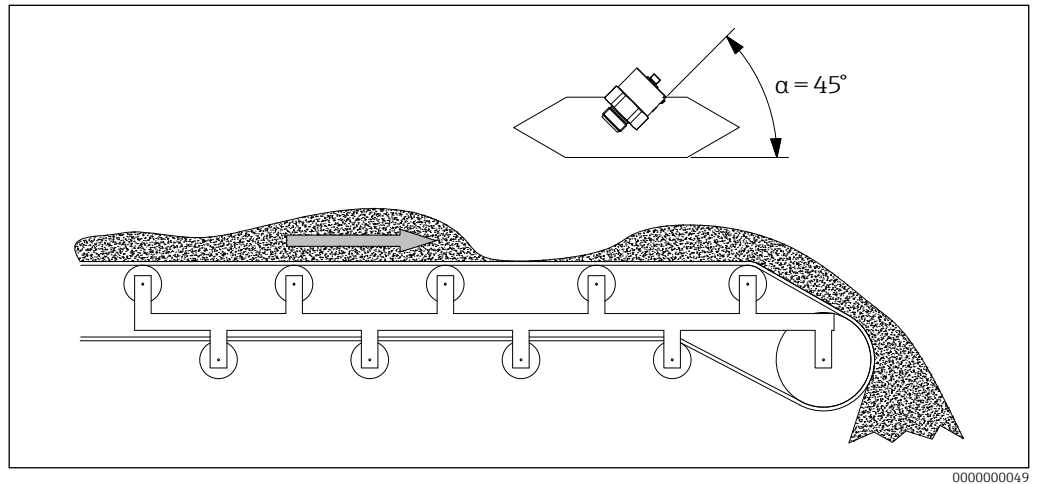
The FTR16 monitors the continuous mass movement at a transition point, a break in the flow is detected and put out at the signal output.



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2 Example transition point monitoring

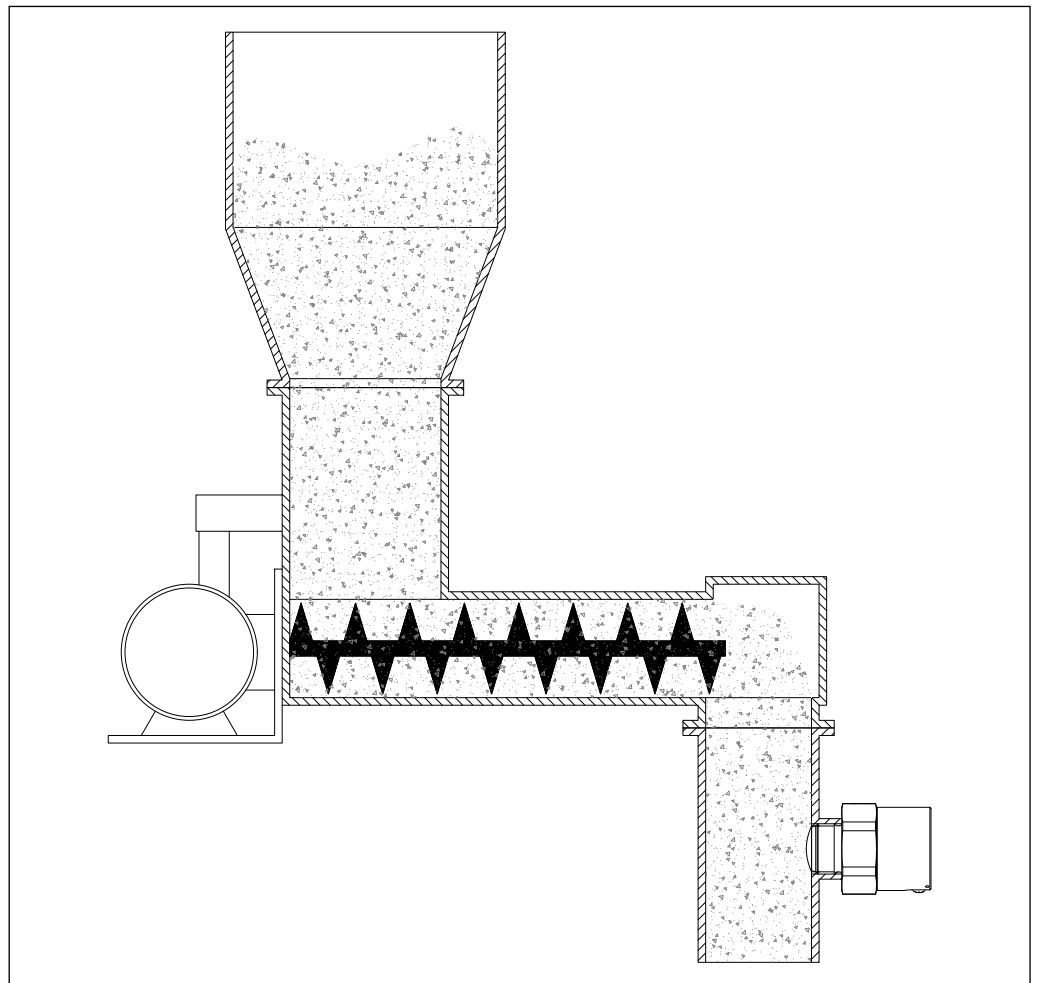
The FTR16 monitors if there is material on the conveyor belt.



3 Example conveyor belt monitoring

Example of volumetric dosing

The FTR16 monitors the discharge of a screw conveyor. If the movement 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 downstream system.

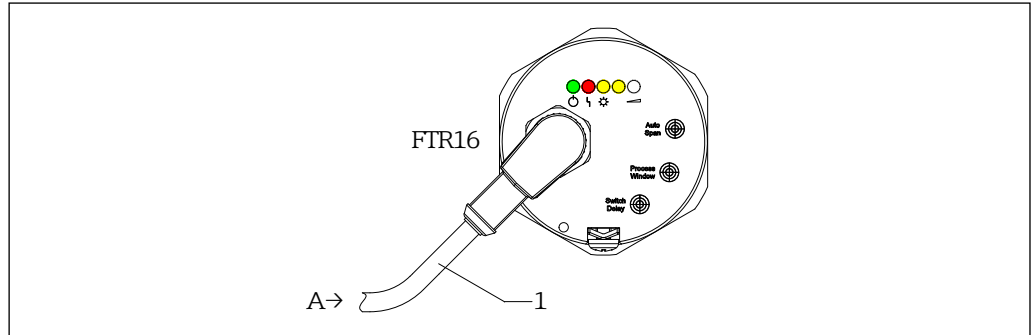


4 Example of volumetric dosing

-  The FTR16 device type (with G1½ or 1½ NPT process connection) is mechanically compatible to the FTR20, the same process adapter can be used for all types.
- The FTR16 device type is electrically incompatible to the FTR20.
- For optimum mounting on the process, the device can be extended with appropriate accessories such as weld-in nozzles, sight glasses or high temperature adapters for process separation. →  24

Measuring system

The measuring system consists of a flow indicator Solimotion FTR16, e.g. for connection to programmable logic controllers (PLC).



 5 Measuring system

A Supply and signal circuit

1 Connection cable M12 socket

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 5 m (196.9 in) depending on bulk solids (reflection characteristics). ■ The range also depends on the container walls to be penetrated.
Operating frequency	24.15 to 24.25 GHz
Detectable speed	0.09 to 62 m/s (3.54 to 2441 in/s)
Transmitting power	The radiated power is maximum 100 mW e.i.r.p. (equivalent isotrope radiation performance). ■ 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  The power density is clearly below the recommended limit values of the ICNIRP guidelines "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)" and thus is completely harmless for humans.
Antenna opening angle (3 dB)	Approx. ± 12°

Output

Switching output

- 3-wire DC-PNP (positive voltage signal at the switching output of the electronics)
- 2 DC-PNP outputs, antivalent switched
- Max. 200 mA per output, short-circuit proof
- Switching delay parameterizable (off, 500 ms to 10 s)
- Safety-related switching: The electrical switch opens in the presence or absence of bulk material movement, in the event of malfunctions or power failure.
 - Maximum bulk flow
The FTR16 will keep the electrical switch closed as long **as bulk movement is present**.
 - Minimum or no bulk flow.
The FTR16 keeps the electrical switch closed as long as **there is little or no bulk movement**.

Ex connection data

See safety instructions (XA): All data relating to explosion protection are provided in separate Ex documentation and are available from the Downloads Area of the Endress+Hauser-website. The Ex documentation is supplied as standard with all Ex devices.

Power supply

Supply voltage

- $U = 18$ to 30 V DC
- In accordance with IEC/EN61010 a suitable circuit breaker must be provided for the measuring device.
- Voltage source: Non-hazardous contact voltage or Class 2 circuit (North America).

 The device is internally equipped with a fine-wire fuse 500 mA (slow-blow) according to IEC 60127-2, this cannot be changed by the user in the event of a fault.

Power consumption

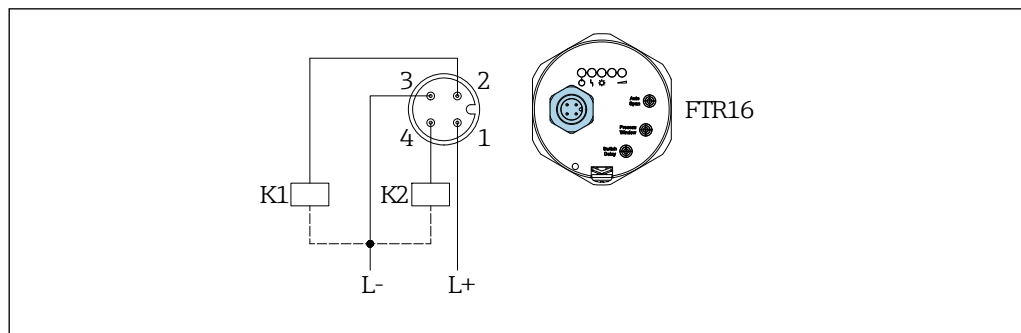
$P \leq 1.1$ W

Current consumption

$I \leq 60$ mA (without load)

Electrical connection

- The electrical connection is made via M12 connectors. → 
- Suitable connection cables for use in hazardous and nonhazardous areas are available as accessories. → 



 6 Electrical connection

Kx External load

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Bulk movement	Signal strength (LED white)	Sensor state	Switching output	
	LED on or flashing fast (approx. 9 to 15 Hz)			
	LED off or flashing slowly (approx. 2 to 8 Hz)			

Function test

With a two-channel evaluation, a function monitoring of the FTR16 can be realized in addition to the flow monitoring.

When both outputs are connected, both outputs assume opposite states (antivalence) in fault-free operation. In the event of a fault or a line break, both outputs drop out.

Bulk movement	Sensor state	Error/Warning	Switching output	
		Warning  LED flashing		
				
 / 		Error  LED lights up permanently		

Load Max. 200 mA

Potential equalization Requirements:

- The potential equalization must be connected to the external ground terminal on the device.
- For optimum electromagnetic compatibility, keep the potential equalization line as short as possible.
- The recommended cable cross-section is 2.5 mm².
- The potential equalization of the FTR16 must be included in the local potential equalization.

Ex connection data See safety instructions (XA): All data relating to explosion protection are provided in separate Ex documentation and are available from the Downloads Area of the Endress+Hauser-website. The Ex documentation is supplied as standard with all Ex devices.

Device connector

- M12-A, 4-pole
- Built-in plug for connecting the supply voltage and the signal outputs

Connecting cable

- Max. 5 Ω/wire
- Total capacity < 100 nF

 Suitable prefabricated connection and connecting cables for the Ex-free and Ex-area are available as order variants and accessories.

Performance characteristics

Reference conditions Each application is different with regard to its geometry (such as influencing reflection edges), the medium as well as the medium properties (such as attenuation and degree of humidity) and therefore always requires an individual basic adjustment of the flow indicator.

Influence ambient temperature The ambient temperature has no direct influence on the device (FTR16 is temperature compensated internally).

Influences on bulk flow detection**Distance of FTR16 from the medium**

The signal strength is influenced by the distance from the medium to the device. The installation location should therefore be selected so that this distance is as small as possible. If the distance of the medium to the device fluctuates, the flow indicator should be adjusted under the most unfavorable conditions (at maximum distance).

Movement in the vicinity of the measuring point

The flow indicator also detects movements in the vicinity of the measuring point within the detection range, such as vibrating plant components, moving objects and persons. The installation location should therefore be selected so that there are as few moving sources of interference as possible in the surrounding area.

Vibration influence**Vibration resistance - vibration according to EN 60068-2-6**

- Excitation: Sine
- Frequency range: 5 to 500 Hz
- Amplitude: 5 to 15 Hz (5.5 mm) peak / 15 to 500 Hz 5 g
- Passing speed: 1 octave per minute
- Test directions: 3 directions (X, Y, Z)
- Test duration: approx. 140 minutes per direction (approx. 70 minutes per temperature/direction)
- Test temperature: -40 to +70 °C

Shock resistance - shock according to EN 60068-2-27

- Excitation: half sine
- Shock duration: 18 ms
- Amplitude: 30 g
- Number of shocks: 3 per direction and temperature
- Test directions: 6 directions ($\pm X$, $\pm Y$, $\pm Z$)
- Test temperature: -40 to +70 °C

Mounting

Mounting location

The mounting location must be selected in such a way that application-specific influences are minimized.



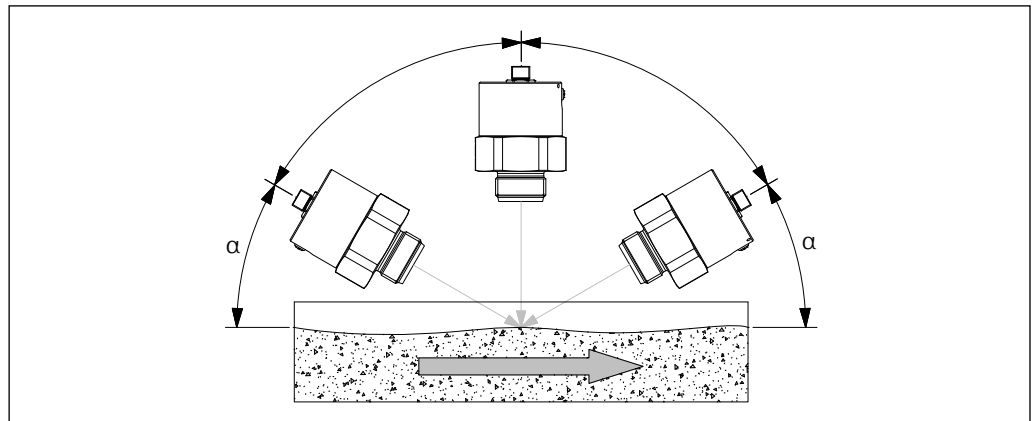
- Observe mechanical protection of the equipment (for example in case of larger falling pieces of product). →  24
- Depending on the mounting location, different process adapters are available as accessories.



For a device for the hazardous area:
Observe the instructions in the Ex documentation (XA).

Mounting position

The installation position is arbitrary for the FTR16. However, a small angle α may increase the signal quality. We recommend an angle of 45° for material detection on conveyor belts. → 5



7 Mounting position

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Installation instructions

Basically, there are two ways to mount the FTR16 device:

- Process-contact mounting: The process connection with the transmission window come into direct contact with the medium.
- Mounting not in contact with the process: The process connection with the transmission window do not come into direct contact with the medium.



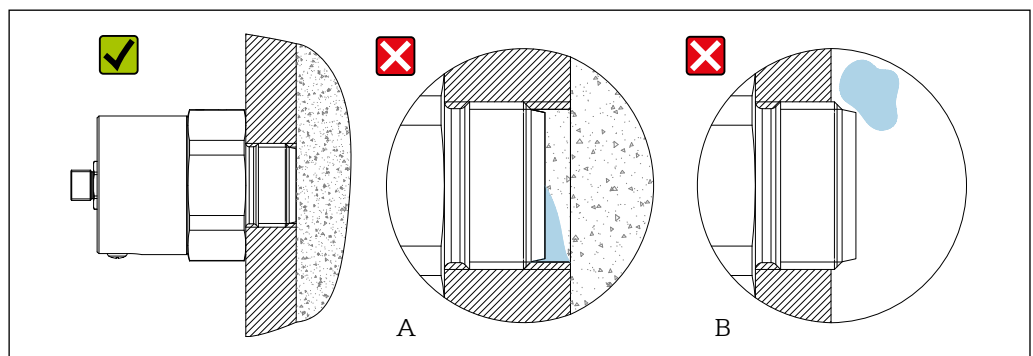
- For optimum alignment after mounting on the process, rotate the electronics housing as required (by 360°).
- Extensive accessories are available for adapting to the respective process conditions.
→ 24

Mounting in contact with the process

The device is screwed directly into the process (for example in existing threads or vessel sleeves) with its process connection (standard threads G 1 and G $1\frac{1}{2}$ according to ISO 228-1 or $1\frac{1}{2}$ NPT according to ANSI/ASME B1.20.1).

Direct mounting with threaded connection

The simplest mounting method is by screwing into the process wall. To do this, a corresponding internal thread (G 1, G $1\frac{1}{2}$ or $1\frac{1}{2}$ NPT) must be available in the process.

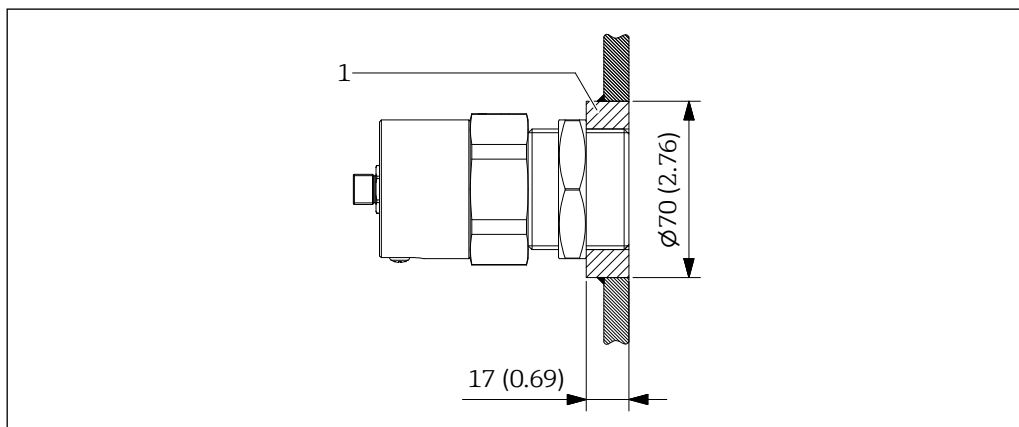


8 Direct mounting with threaded connection

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- If the process connection is not screwed far enough into the process wall, there is a risk that material will accumulate in front of the device (**A**), thereby damping the microwave signal.
- If, on the other hand, the process connection is screwed too far into the process (**B**), there is a risk of damage occurring as a result of large product items falling.
- When using the G 1½ process connection (standard thread according to ISO 228-1, hexagon SW55) and using the optional counter nut, the device can be mounted flush particularly easily, as it is a cylindrical thread.
- Weld-in adapters of type FAR52-A* with G 1½ and 1½ NPT female threads are available as accessories.
- In case of existing deviating female threads in the process wall (R 2 to R 4 or 2 NPT to 4 NPT), additional screw-in adapters of type FAR52-B* are available as accessories.
- Weld-in sleeves G 1 half length according to EN 10241 are also available as accessories.
- Accessories → 24

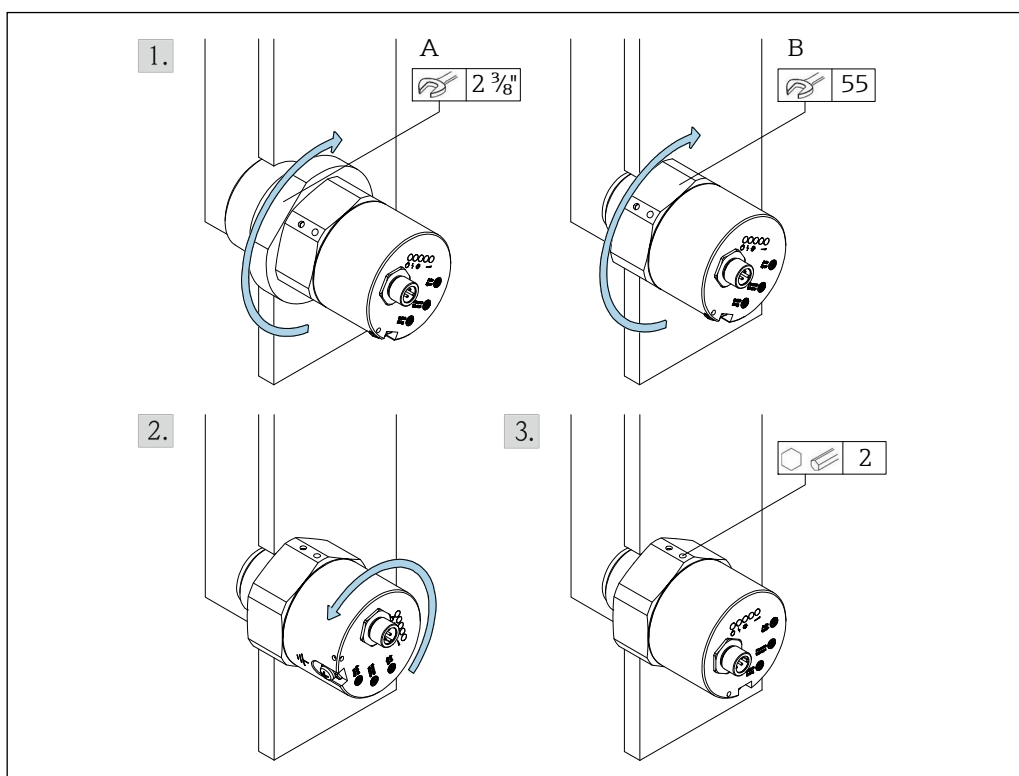


9 Weld-in adapter FAR52. Unit of measurement mm (in)

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1 Weld-in adapter

Mounting samples



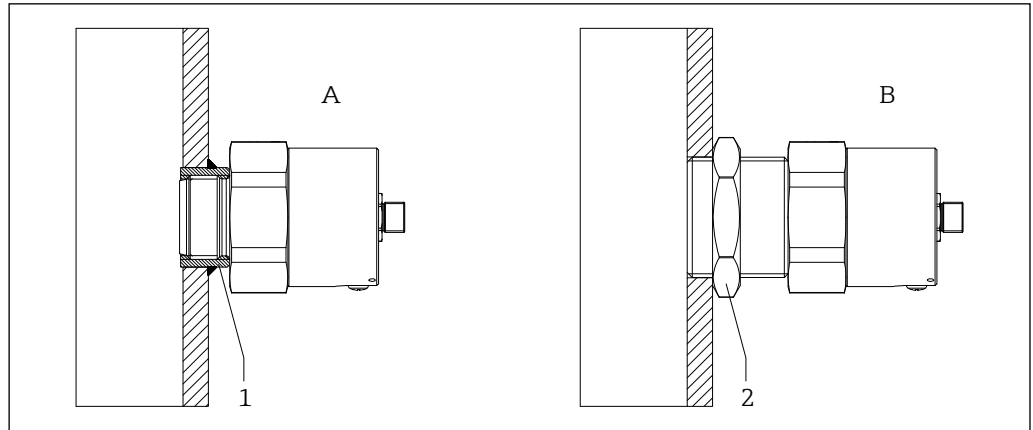
10 Mounting with connection thread

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A 1½ NPT
B G 1 / G 1½

1. Screw in conical (A) or cylindrical (B) connection thread.
2. Align the housing of the electronics (potential equalization terminal of both devices must point in the same direction).
3. Fix the housing in place.

Mounting alternatives



11 Mounting alternatives

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- 1 Welding sleeve G 1
- 2 Counternut G 1½

- When mounting with welding socket G 1 (A), the device is screwed in as far as it will go.
- When using the G 1½ process connection (B) and using the optional counter nut, the device can be mounted flush particularly easily, as it is a cylindrical thread.
- All installation variants are sealed with a suitable sealant (to be provided by the customer).

i Weld-in sleeve and counter nuts are available via the ordering structure ("Accessories enclosed" option) and individually as accessories. → 24

Mounting not in contact with the process

The device is mounted in one of the following three ways:

- For a microwave-impermeable process wall (for example, metal vessel wall), mounting is done in front of microwave-permeable windows such as plastic plugs, ceramic disks, or sight glass fittings.
- In the case of a microwave-permeable process wall (for example, plastic container), mounting is carried out directly from the outside on the wall using appropriate adapters (for example, mounting brackets).
- For open processes, the mounting is arbitrary.

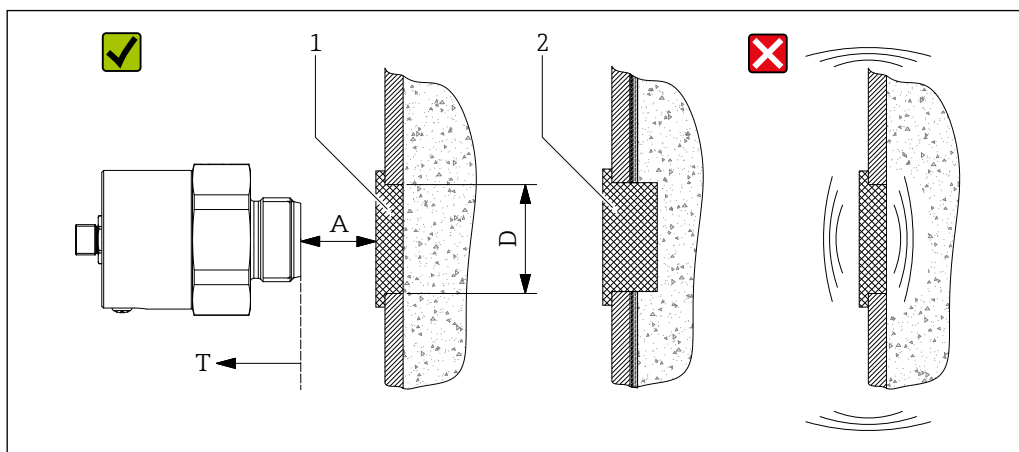
Mounting in front of microwave-impermeable process wall

If, due to process conditions (such as high temperatures, high pressures or hazardousness of the material), direct installation in the microwave-impermeable process wall is not possible, it is possible to have the device radiated through an additionally installed plug.

The following materials have been tested and are suitable for radiating through:

- Plastics (virginal, unfilled) such as Polytetrafluoroethylene (PTFE), Polyethylene (PE) or Polypropylene (PP)
- Aluminum oxide ceramics (purity min. 99 %, uncolored)
- Borosilicate glass (uncolored)

- The maximum temperature T at the process connection must be observed. → 19
- When mounting in front of a microwave-permeable plug and the risk of condensation forming on the inner wall of the process, use a plug (2) that protrudes into the process.
- The distance A depends on the free passage area D . Select a distance as small as possible to avoid possible signal attenuation (for example, max. 40 mm (1.57 in) with a passing surface of 50 mm (1.97 in)).
- Avoid moving passage surfaces (for example container walls or stoppers), as the movement cannot be distinguished from bulk material movement.
- Depending on the material, coloring or added (colored) additives can sometimes cause high signal attenuation and are therefore generally unsuitable for this application.
- Matching plugs made of PTFE or aluminum oxide ceramic of type FAR54 are available in different lengths and diameters as accessories. → 29



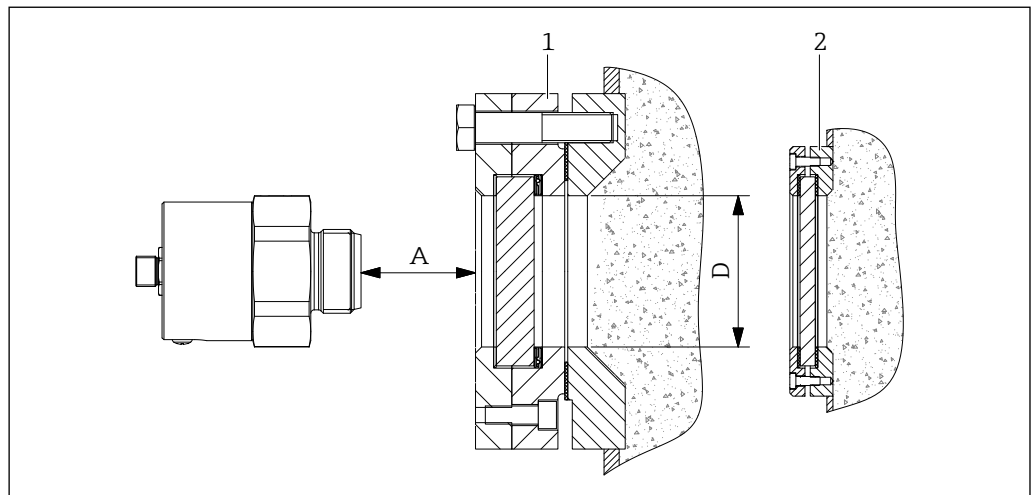
12 Mounting in front of microwave-impermeable process wall

- 1 Microwave-permeable plug
- 2 Microwave-permeable plug in case of condensate formation on the inner process wall

Mounting in front of microwave permeable sight glass fitting

If the process wall cannot be radiated through, it is also possible to have the device radiated from the outside through a suitable sight glass fitting. The sight glass in these fittings is made of uncolored borosilicate glass.

- The maximum temperature at the process connection must be observed. → 19
- The distance A depends on the free passage area D . Select a distance as small as possible to avoid possible signal attenuation (for example, max. 40 mm (1.57 in) with a passing surface of 50 mm (1.97 in)).

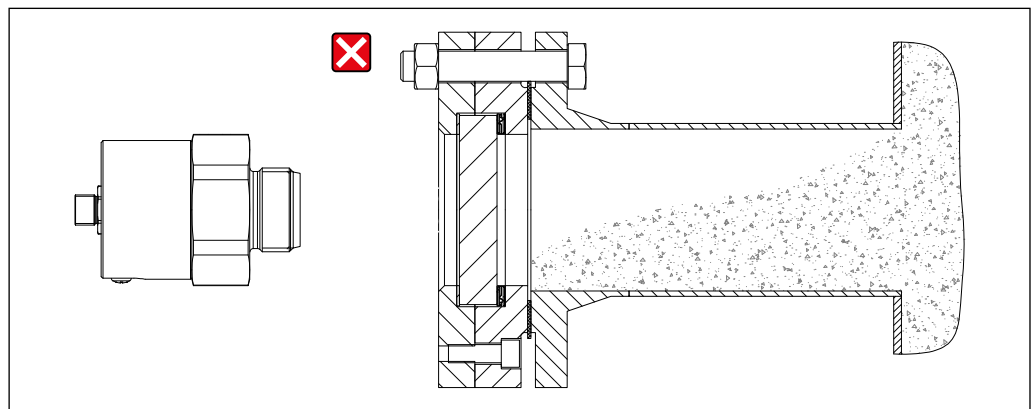


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13 Mounting in front of microwave permeable sight glass fitting

- 1 Sight glass fitting for processes up to 10 bar (145 psi)
- 2 Sight glass fitting for unpressurized processes

Always install sightglasses only in places where no material can accumulate on the process side (risk of incorrect measurements).



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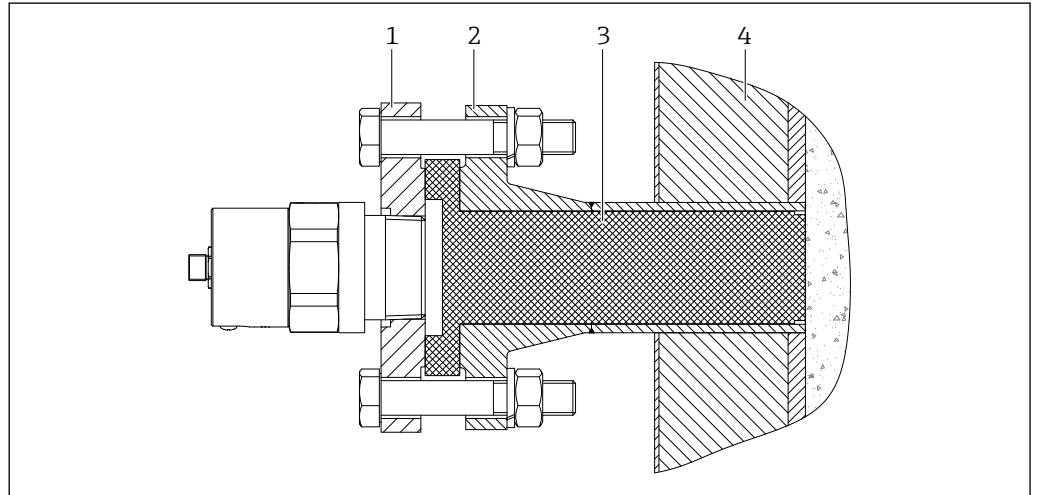
14 Impermissible mounting with the risk of material accumulation

 Suitable sight glass fittings are available as accessories in various designs. →  30

Mounting on process nozzle

Mounting on a process nozzle offers the following advantages:

- By using existing nozzles, no modifications have to be made to the process.
- The use of suitable plugs prevents material from accumulating in the nozzle.
- At the same time, the plug provides wear protection for the device.
- The assembly or disassembly of the devices can be carried out during operation, which represents a significant simplification in the case of maintenance.



15 Mounting on process nozzle

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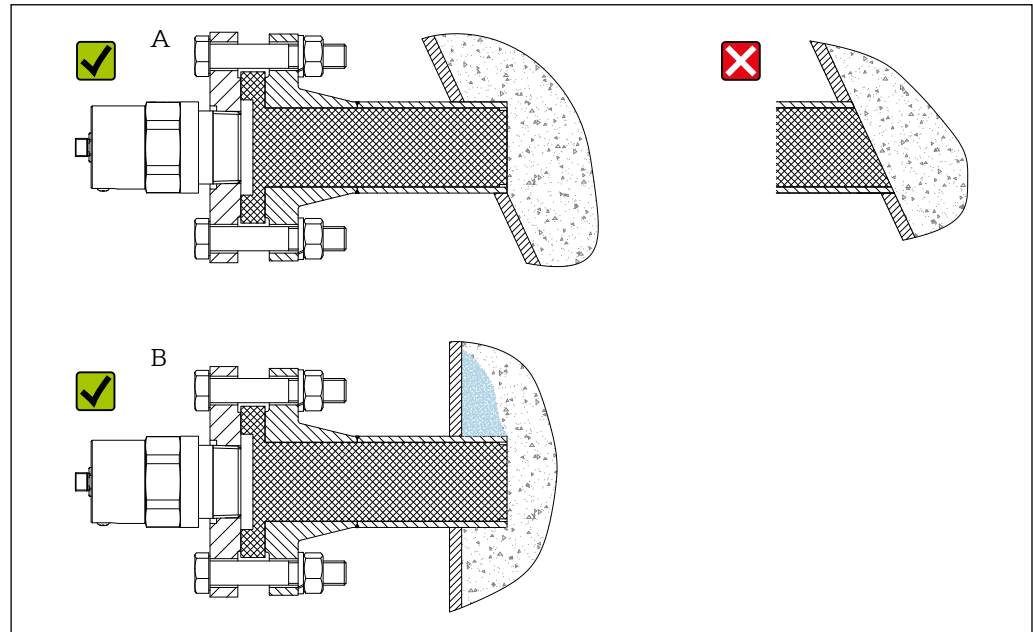
- 1 Mounting flange
- 2 Existing process nozzle
- 3 Plug
- 4 Process insulation



- Suitable mounting flanges with corresponding stainless steel connection threads and plugs made of PTFE or aluminum oxide ceramic for existing process nozzles are available as accessories.
- Type FAR50 process nozzles consisting of weld-in nozzles, plugs and mounting flanges are available as accessories for the G 1½ device connection thread in various sizes and materials.
- Accessories → 24

If there is a risk of buildup, avoid assembly methods that could promote this process.

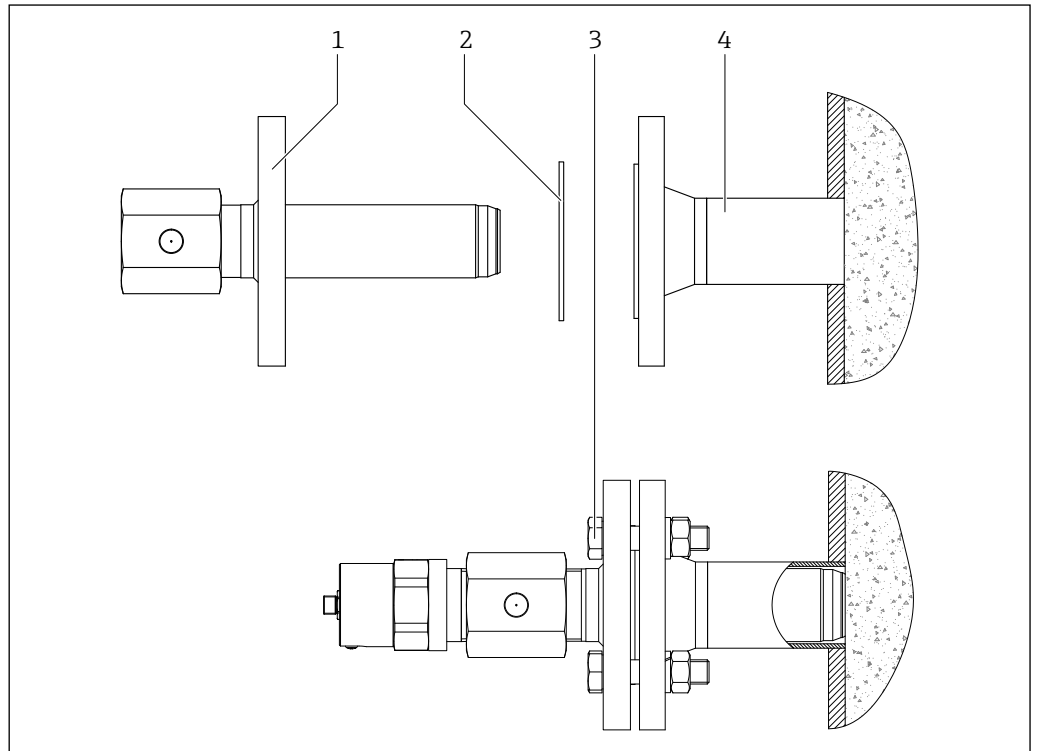
- In the case of a non-vertical process wall, mount the process nozzle so far into the process that no material can accumulate in front of it (**A**).
- When mounting the process nozzle and there is a risk of material accumulating on the inner process wall, use a nozzle that protrudes into the process (**B**).
- The maximum plug length depends on the attenuation and the water absorption of the material; manufacturer's instructions in this respect must be observed.
- If there is a risk of condensation forming between the process connection of the device and the plug, use the process connection piece type FAR50, this is equipped with a mounting flange with pressure compensation element. → 32



16 Mounting with risk of buildup

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For existing process nozzles, the optionally available plug-in adapters of type FAR51 can be used. These are simply plugged in and fixed, which significantly reduces the mounting effort (also with regard to maintenance).



17 Mounting with insertion adapter FAR51

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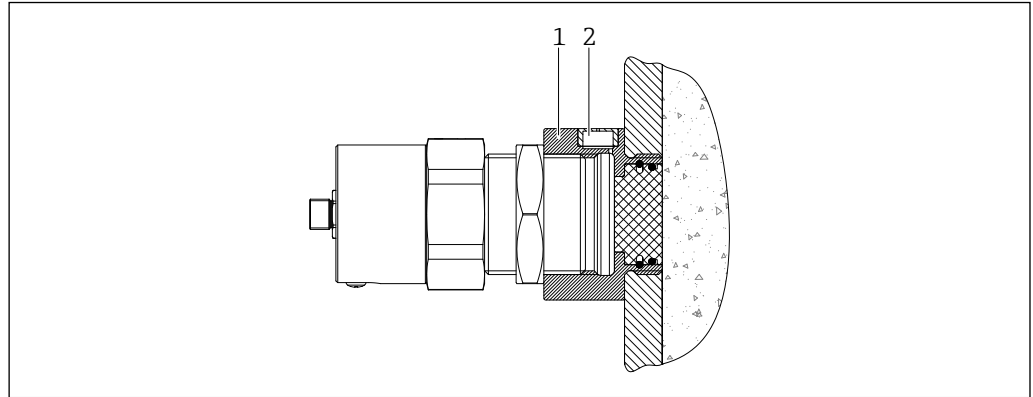
- 1 Insertion adapter
- 2 Customer-supplied gasket
- 3 Customer-supplied installation material
- 4 Process nozzle

i For process temperatures of +60 to +450 °C (+140 to +842 °F), plug-in adapters for existing process connections of type FAR51 made of stainless steel are available as accessories for the device connection threads G 1½ and 1½ NPT. → 31

Mounting with high pressure adapter

For applications with high process pressure up to 21 bar (305 psi), absolutely use the following high-pressure adapter. →  29

-  The maximum temperature at the process connection must be observed. →  19
- The high pressure adapter is suitable for the device connection threads G 1½ and 1½ NPT.



 18 Mounting with high pressure adapter

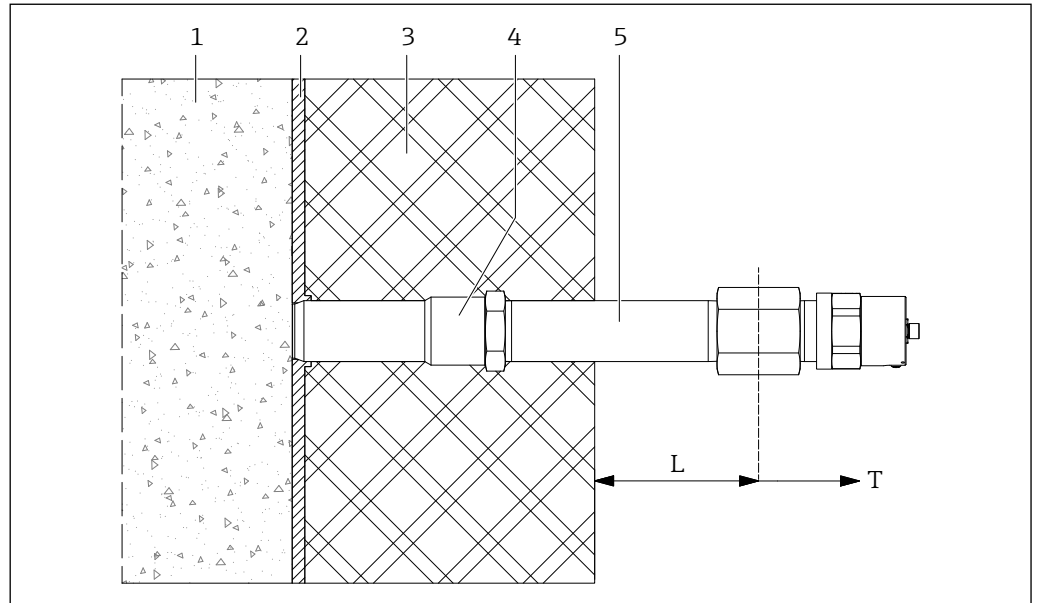
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- 1 High pressure adapter
- 2 Integrated venting element

Mounting with high temperature adapter and extensions

For simple and easily accessible high temperature applications in the range of +60 to +450 °C (+140 to +842 °F), there is a simple adapter for the device connection threads G 1½ and 1½ NPT with flush aluminum oxide ceramic, this can be extended with extensions.

-  The maximum process pressure of 0.8 to 5.1 bar (12 to 74 psi) absolute at the high temperature adapter must be observed. →  19
- The maximum temperature **T** at the process connection of the device must be observed; exceeding this will lead to destruction. →  20
- **L** must be selected depending on the process and ambient temperatures.
- Suitable high temperature adapters and stainless steel extensions are available as accessories. →  32



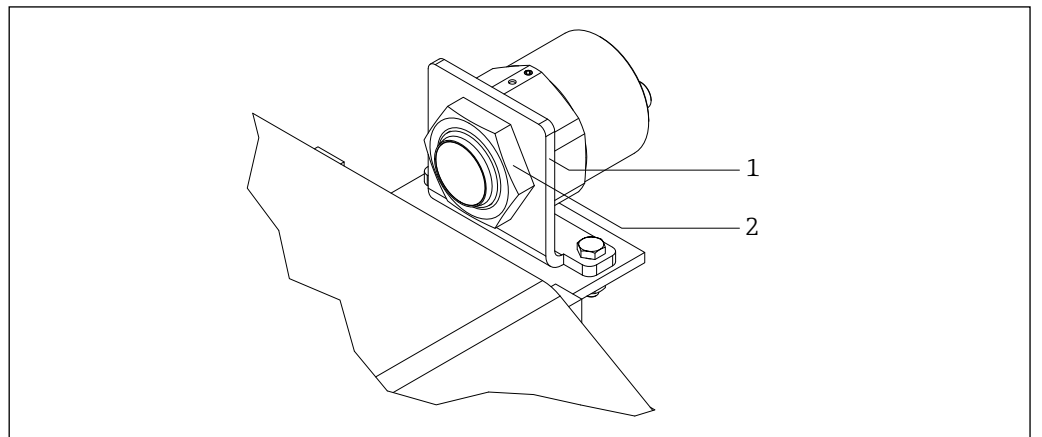
19 Mounting with high temperature adapter and extensions

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- 1 Process
- 2 Wall
- 3 Insulation
- 4 High temperature adapter
- 5 Length extensions (optional)

Mounting for open processes

Mounting in open processes can be done with a simple mounting bracket.



20 Mounting for open processes

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- 1 Mounting bracket
- 2 Counternut

i Counternuts and mounting bracket for G 1 are available individually as accessories. → **26**

Environment

Ambient temperature -20 to +60 °C (-4 to +140 °F)

Storage temperature See ambient temperature

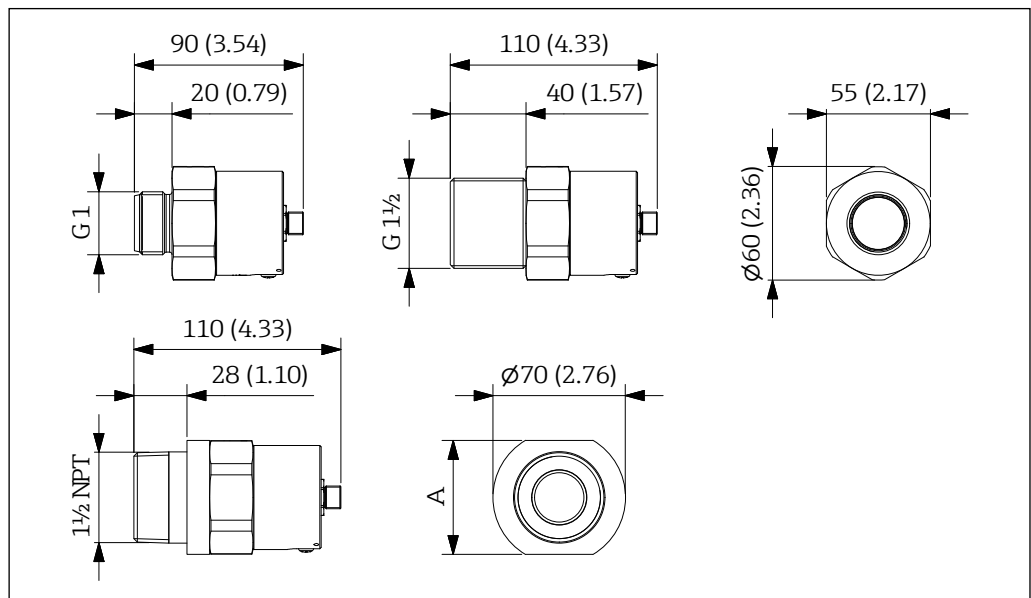
Degree of protection	■ $\boxtimes$: IP69 ■ $\triangle$: IP67
Vibration resistance	See vibration influence → 9
Electromagnetic compatibility	■ Interference emission to EN 61326, Electrical Equipment Class B ■ Interference immunity to EN 61326, Appendix A (Industrial)
Reverse polarity protection	Integrated; No damage in case of reverse polarity or short circuit

Process

Process temperature	■ -20 to +60 °C (-4 to +140 °F) ■ -20 to +450 °C (-4 to +842 °F) with optional high temperature adapter ■ Observe deviating temperature ranges for the accessories offered!
Process pressure	■ 0.5 to 6.8 bar (7 to 99 psi) absolute, only to be observed for direct process mounting ■ 0.8 to 5.1 bar (12 to 74 psi) absolute, when using the optional high temperature adapter ■ 0.5 to 21 bar (7 to 305 psi) absolute, when using the optional high pressure adapter ■ Observe deviating pressure ranges for the accessories offered!
Vibration	See vibration influence → 9

Mechanical construction

Dimensions



21 Dimensions. Unit of measurement mm (in)

A 2 3/8" (60.325 mm / 2.375 in)

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Weight	Depending on the selected housing and process connection (max. 1.7 kg (3.75 lb))
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Materials

- Stainless steel 316L (1.4404): Housing with process connection
- Brass nickel plated: Connector housing
- PTFE: Transmission windows

Process connection

Connection thread:

- G 1 and G 1½ according to ISO 228-1
- 1½ NPT according to ANSI/ASME

Operability

By using frequencies in the 24 GHz range, also products with low attenuation can be detected, even if the product quantities are low.

The calibration options for the flow indicator offer the necessary flexibility to ensure that the device can be easily adapted to the application:

- Adjustable sensitivity
- Switching delay: off, 500 ms to 10 s
- LED signal strength indicator as adjustment and positioning aid

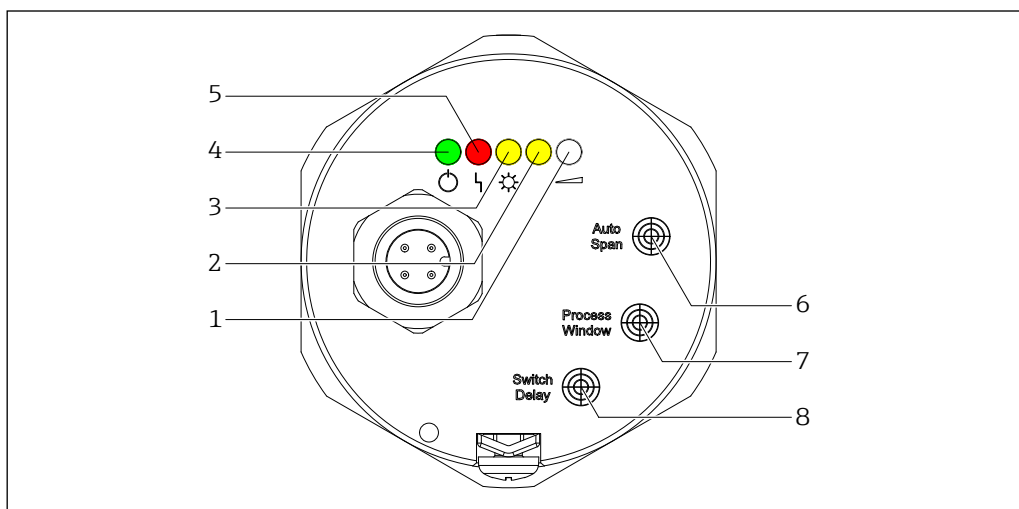
Operation concept**Fast and safe commissioning**

The FTR16 is parameterized with the help of the operating magnet. Hereby an automatic adjustment to the sensitivity necessary for a clear material flow detection takes place. If there is sufficient movement of the bulk material, the FTR16 reacts with a corresponding output signal.



The operating magnet is included in the scope of delivery of the FTR16. It can be optionally cancelled or ordered as an accessory. → 26

The parameterization is stored internally and is retained even after the supply voltage is removed. No operation is required while the device is working. Adaptation to the application must only be carried out during initial installation. However, subsequent changes can be made and saved at any time.



22 Display and operating elements of the FTR16

0000000010

- 1 Signal strength (LED white)
- 2 Only for parameterization: LED yellow
- 3 Sensor state (LED yellow)
- 4 Operation (LED green)
- 5 Error/warning (LED red)
- 6 Parameterization point automatic adjustment
- 7 Parameterization point process window
- 8 Parameterization point switch delay

Efficient diagnostic behavior increases the availability of the measurement

- Distinction between recoverable (warning) and unrecoverable faults (error).
- Warnings: Adjustment could not be performed successfully
- Errors:
 - Internal hardware error
 - Initialization failed (memory error)
 - Permissible ambient temperature exceeded/fallen below
- In addition to the permanent self-diagnosis, a manual function test can also be performed on the FTR16. → 23

Light signals (LEDs)

Display	Meaning
 ○ ○ ○ ○	Operation LED lights up: Device is ready for operation (supply voltage is applied) LED flashes: Device is in parameterization mode
○  ○ ○ ○	Error/Warning LED lights up: Error/device failure (unrecoverable error) LED flashes: Warning/maintenance required (recoverable error)
○ ○  ○ ○	Sensor state LED off: Movement of the bulk material LED on: No movement of the bulk material
○ ○ ○  ○	For parameterization only: see operating instructions → 33
○ ○ ○ ○ 	Signal strength The signal strength is indicated by a white LED, the light state (off, 2 to 15 Hz or permanently lit) is proportional to the strength of the signal.

Output signal

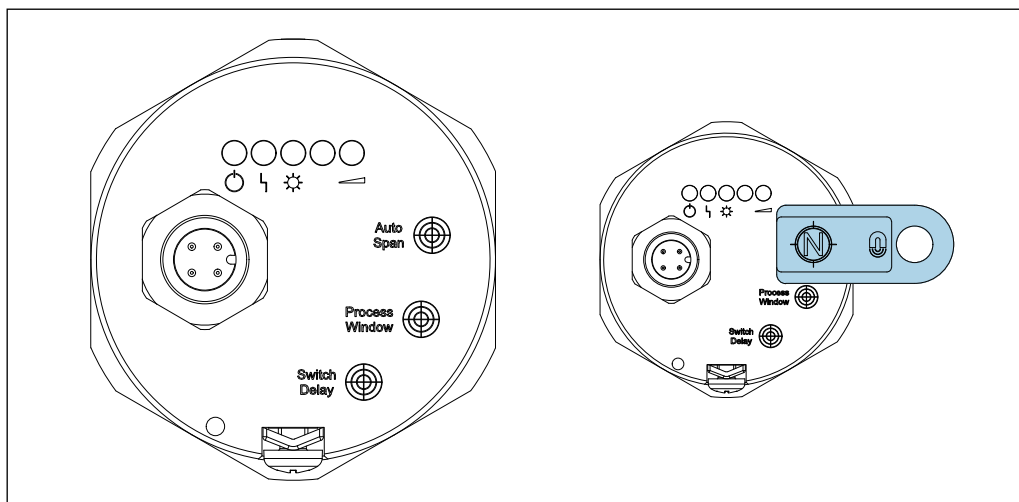
The following table shows the behavior of the two antivalent signal outputs in connection with the display of the signal strength when the point level is exceeded or not reached.

Bulk movement	Signal strength (LED white)	Sensor state	Switching output	
	LED on or flashing fast (approx. 9 to 15 Hz)			
	LED off or flashing slowly (approx. 2 to 8 Hz)			

The following table shows the behavior of the two signal outputs in the event of an error.

Bulk movement	Sensor state	Error/Warning	Switching output	
		Warning 		
		LED flashing		
		Error  LED lights up permanently		

On-site operation



23 On-site operation

000000011

To operate, place the operating magnet (north pole visible as shown) on the marked areas of the FTR16.

The following parameterization functions are available:

- Automatic adjustment
- Process window
- Switching delay
- Reset



- Activation of the parameterization mode with an operating magnet applied to one of the markings ("**Auto Span**", "**Process Window**" or "**Switch Delay**").
- If no action is taken within 10 minutes, the parameterization mode is terminated. The device switches to normal operation.
- The device continues to operate normally in the background depending on the current settings, so that, for example, an occurring bulk material movement leads to a changeover of the signal output.
- For details see Operating Instructions → 33

Function test

- An internal function test can be triggered with the aid of the operating magnet.
- For details see Operating Instructions → 33

Certificates and approvals

CE mark

The Solimotion flow indicator meets the legal requirements of the applicable EU guidelines. These are listed in the corresponding EU Declaration of Conformity, together with the applied standards. By applying the CE mark, Endress+Hauser confirms that the device has passed the necessary tests.

Ex approval

All explosion protection data is listed in separate documentation which is available from the download area. The Ex documentation is supplied as standard with all Ex-systems.

RoHS

The flow indicator complies with the substance restrictions of the Restrictions on Hazardous Substances Directive 2011/65/EU and the Delegated Directive 2015/863/EU.

Telecommunications

EN 300440
Short range radio devices (SRD) – radio devices for operation in a frequency range of 1 GHz to 40 GHz

Food suitability	The materials in contact with the process meet the requirements of EU Regulation 1935/2004 and 2023/2006.
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Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: www.endress.com → Click "Corporate" → Select your country → Click "Products" → Select the product using the filters and search field → Open product page → The "Configure" button to the right of the product image opens the Product Configurator.
- Endress+Hauser sales center: www.addresses.endress.com



Product Configurator – the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format

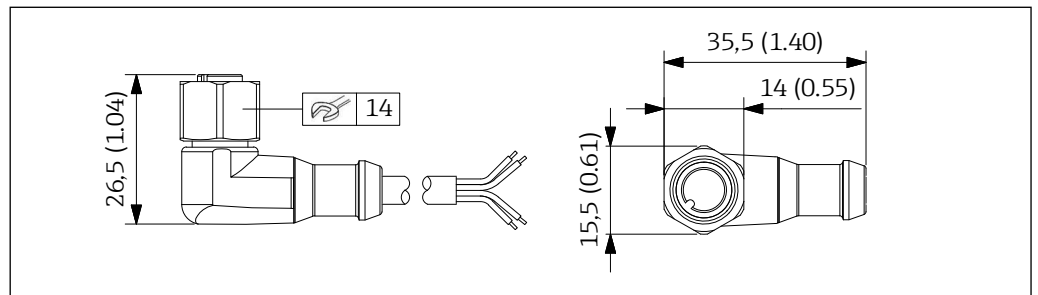
TAG	Measuring point (tag) (TAG) The device can be ordered with a tag name. Position of the tag name In the additional specification, select: ■ Tag plate, stainless steel ■ Plastic film ■ Supplied plate Definition of the tag name In the additional specification, specify: 3 lines, each containing up to maximum 18 characters The specified tag name appears on the selected label.
Scope of delivery	The scope of delivery includes the FTR16 in a box with Brief Operating Instructions included.
Preset switching delay	When ordering an FTR16 with the extended order option „Preset time delay“, this will be preset during manufacturing according to customer requirements.

Accessories

Various accessories are available for the device, and can be ordered with the device or at a later stage from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Prefabricated cables

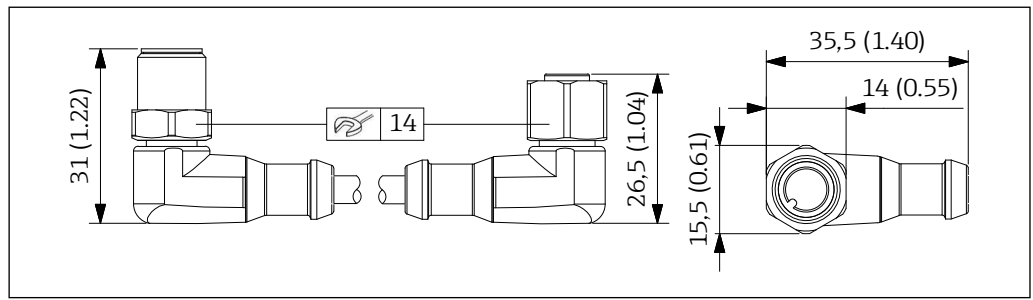
- Connection cable with M12 right-angle socket (☒)
- Number of poles/cross section: 4 x 0.34 mm²
- A-coded
- Operating temperature range: -25 to +90 °C (-13 to +194 °F)
- Materials:
 - TPU (housing)
 - FKM (seal)
 - PUR (cable)
- Protection: IP69
- Order number:
 - 71530949 (5 m (196.85 in))
 - 71530950 (10 m (393.70 in))
 - 71530953 (20 m (787.40 in))
- Connection cable with M12 right-angle socket (△/☒)
- Number of poles/cross section: 4 x 0.34 mm²
- A-coded
- Operating temperature range: -20 to +60 °C (-4 to +140 °F)
- Materials:
 - TPU (housing)
 - FKM (seal)
 - PUR (cable)
- Protection: IP67 (△) / IP69 (☒)
- Order number:
 - 71530971 (5 m (196.85 in))
 - 71530973 (10 m (393.70 in))



■ 24 Connection cable with M12 right-angle socket. Unit of measurement mm (in)

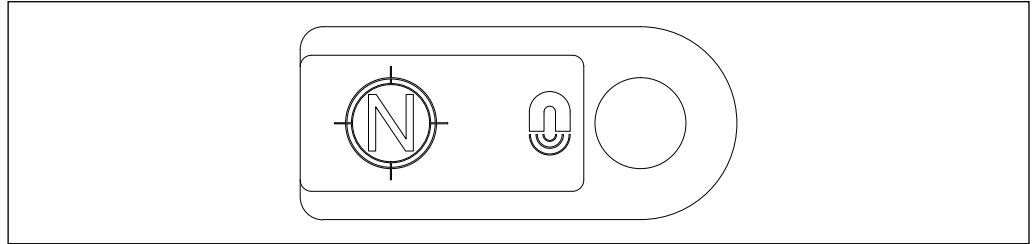
0000000133

- Connecting cable with M12 right-angle plug and M12 right-angle socket (☒)
- Number of poles/cross section: 4 x 0.34 mm²
- A-coded
- Operating temperature range: -25 to +90 °C (-13 to +194 °F)
- Materials:
 - TPU (housing)
 - FKM (seal)
 - PUR (cable)
- Protection: IP69
- Order number:
 - 71530943 (5 m (196.85 in))
 - 71530944 (10 m (393.70 in))
 - 71530947 (20 m (787.40 in))
- Connecting cable with M12 right-angle plug and M12 right-angle socket (△/☒)
- Number of poles/cross section: 4 x 0.34 mm²
- A-coded
- Operating temperature range: -20 to +60 °C (-4 to +140 °F)
- Materials:
 - TPU (housing)
 - FKM (seal)
 - PUR (cable)
- Protection: IP67 (△) / IP69 (☒)
- Order number:
 - 71530969 (5 m (196.85 in))
 - 71530970 (10 m (393.70 in))



25 Connecting cable with M12 right-angle plug and M12 right-angle socket. Unit of measurement mm (in) 0000000135

Operating magnet



26 Operating magnet 0000000132

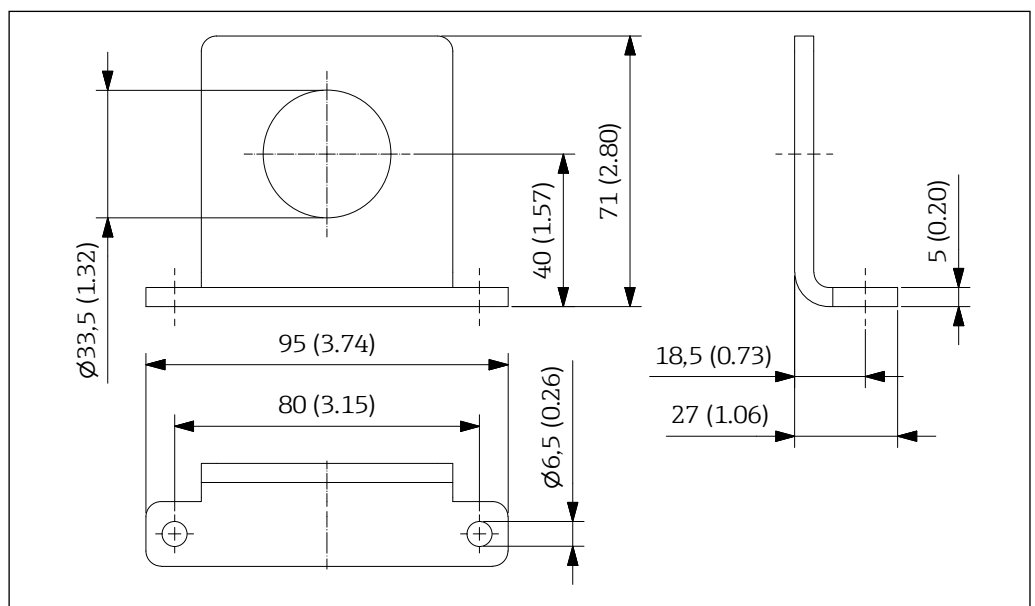
Order number: 71535426

Counternut

- Material: 316 (1.4401)
- Weight
 - G1: 0.04 kg (0.09 lb)
 - G 1½: 0.07 kg (0.15 lb)
- Order number:
 - 71530854 (G 1, SW40)
 - 71530857 (G 1½, SW55)

Mounting bracket

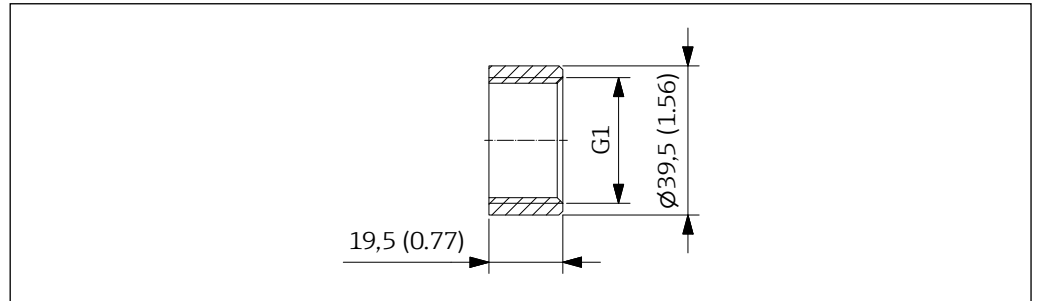
- Material: 304 (1.4301)
- Weight: 0.22 kg (0.49 lb)
- Mounting screws (2 x M6): to be provided by customer
- Order number: 71530850



27 Dimensions mounting bracket. Unit of measurement mm (in) 0000000037

Welding sleeve

- G 1 (ISO 228-1), half length according to EN 10241
- Material: 316Ti (1.4571)
- Weight: 0.07 kg (0.15 lb)
- Order number:
 - 71530862
 - 71530941 (with inspection certificate EN 10204 - 3.1 material)

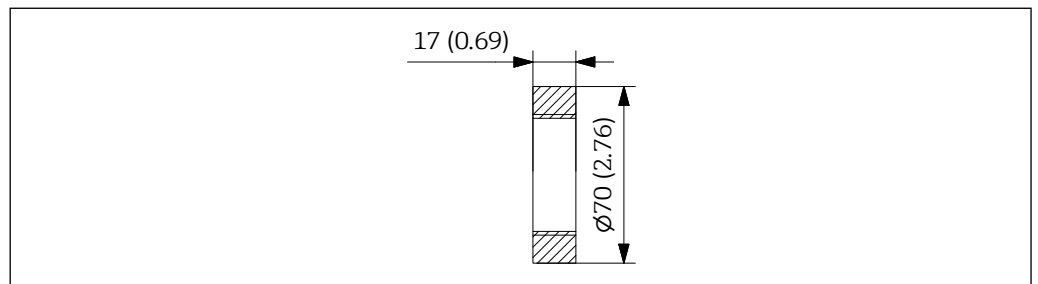


28 Dimensions welding sleeve. Unit of measurement mm (in)

000000036

Weld-in adapter

- Type FAR52 → TI01369F, internal thread G 1½
- Material: 316Ti (1.4571), steel P235GH (1.0345)
- Weight: 0.3 kg (0.66 lb)

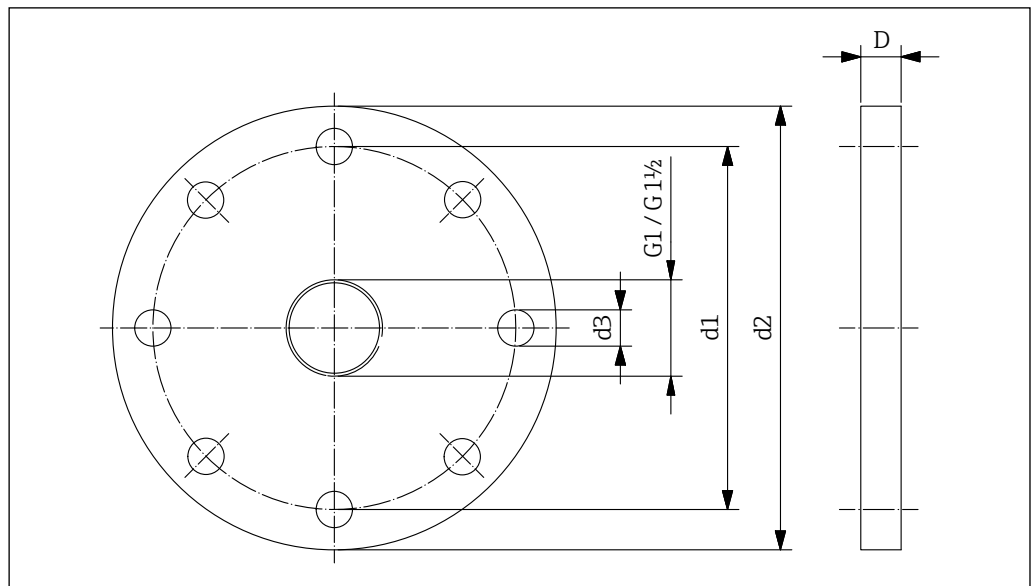


29 Dimensions weld-in adapter FAR52. Unit of measurement mm (in)

0000000138

Mounting flange

- Connection dimensions according to DIN EN 1092-1
- Material: 316Ti (1.4571)
- Weight: DN40 approx. 2.3 kg (5.07 lb) to DN100 approx. 5.8 kg (12.79 lb)
- Mounting screws and gasket: to be provided by customer
- Order number:
 - 71530977 (DN40 PN40, G 1)
 - 71530992 (DN40 PN40, G 1, with inspection certificate EN 10204 - 3.1 material)
 - 71381884 (DN40 PN16, G 1½)
 - 71381885 (DN40 PN16, G 1½, with inspection certificate EN 10204 - 3.1 material)
 - 71531009 (DN50 PN16, G 1)
 - 71531011 (DN50 PN16, G 1, with inspection certificate EN 10204 - 3.1 material)
 - 71381887 (DN50 PN16, G 1½)
 - 71381888 (DN50 PN16, G 1½, with inspection certificate EN 10204 - 3.1 material)
 - 71531014 (DN100 PN16, G 1)
 - 71531024 (DN100 PN16, G 1, with inspection certificate EN 10204 - 3.1 material)
 - 71381890 (DN100 PN16, G 1½)
 - 71381891 (DN100 PN16, G 1½, with inspection certificate EN 10204 - 3.1 material)

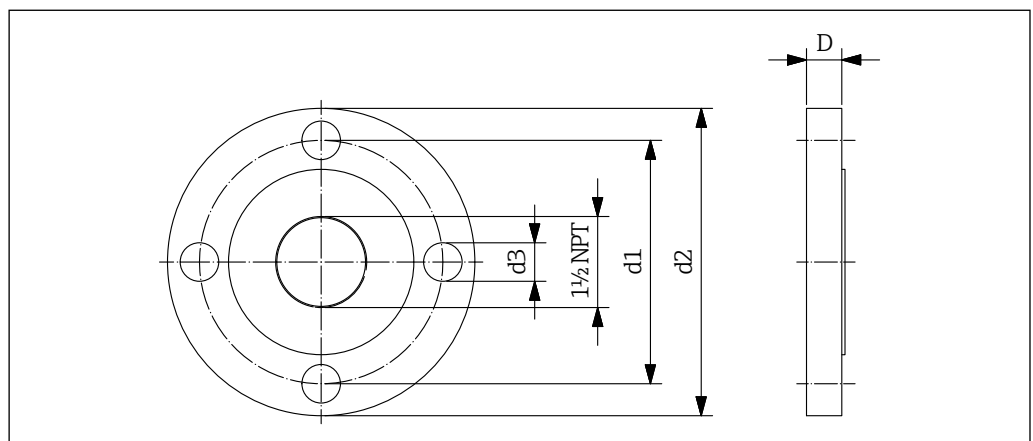


0000000038

30 Dimensions mounting flange (Connection dimensions according to DIN EN 1092-1)

Flange	d1 mm (in)	d2 mm (in)	d3 mm (in)	D mm (in)	Holes
DN40 PN40	110 (4.33)	150 (5.91)	18 (0.71)	18 (0.71)	4
DN50 PN16	125 (4.92)	165 (6.50)	18 (0.71)	18 (0.71)	4
DN100 PN16	180 (7.09)	220 (8.66)	18 (0.71)	20 (0.79)	8

- Connection dimensions according to ANSI/ASME B16.5
- Material: 316Ti (1.4571)
- Weight: 1½" approx. 1.5 kg (3.31 lb) to 4" approx. 6.8 kg (15.0 lb)
- Mounting screws and gasket: to be provided by customer
- Order number:
 - 71006349 (1½" 150 lbs, 1½ NPT)
 - 71108387 (1½" 150 lbs, 1½ NPT, with inspection certificate EN 10204 - 3.1 material)
 - 71006351 (2" 150 lbs, 1½ NPT)
 - 71108389 (2" 150 lbs, 1½ NPT, with inspection certificate EN 10204 - 3.1 material)
 - 71006353 (4" 150 lbs, 1½ NPT)
 - 71108391 (4" 150 lbs, 1½ NPT, with inspection certificate EN 10204 - 3.1 material)



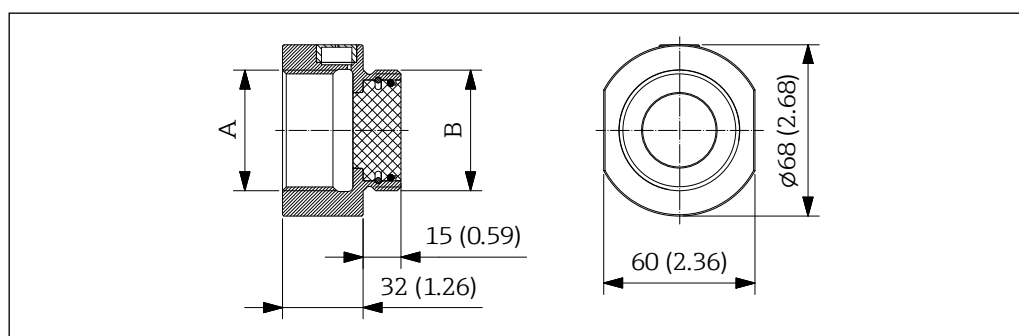
0000000039

31 Dimensions mounting flange (Connection dimensions according to ANSI/ASME B16.5)

Flange	d1 mm (in)	d2 mm (in)	d3 mm (in)	D mm (in)	Holes
1½" 150 lbs	98.6 (3.88)	127 (5.00)	15.7 (0.62)	17.5 (0.69)	4
2" 150 lbs	120.7 (4.75)	152.4 (6.00)	19.1 (0.75)	19.1 (0.75)	4
4" 150 lbs	190.5 (7.50)	228.6 (9.00)	19.1 (0.75)	23.9 (0.94)	8

High pressure adapter

- Process pressure: 21 bar (305 psi) absolute
- Material: 316Ti (1.4571), PTFE (window transmission)
- Weight: approx. 0.8 kg (1.76 lb)
- Seal: to be provided by the customer
- Order number:
 - 71381894 (G 1½ (A+B), ISO 228-1)
 - 71381898 (G 1½ (A+B), ISO 228-1, with inspection certificate EN 10204 - 3.1 material)
 - 71381899 (G 1½ (B), ISO 228-1, 1½ NPT (A), ANSI/ASME)
 - 71381904 (G 1½ (B), ISO 228-1, 1½ NPT (A), ANSI/ASME, with inspection certificate EN 10204 - 3.1 material)

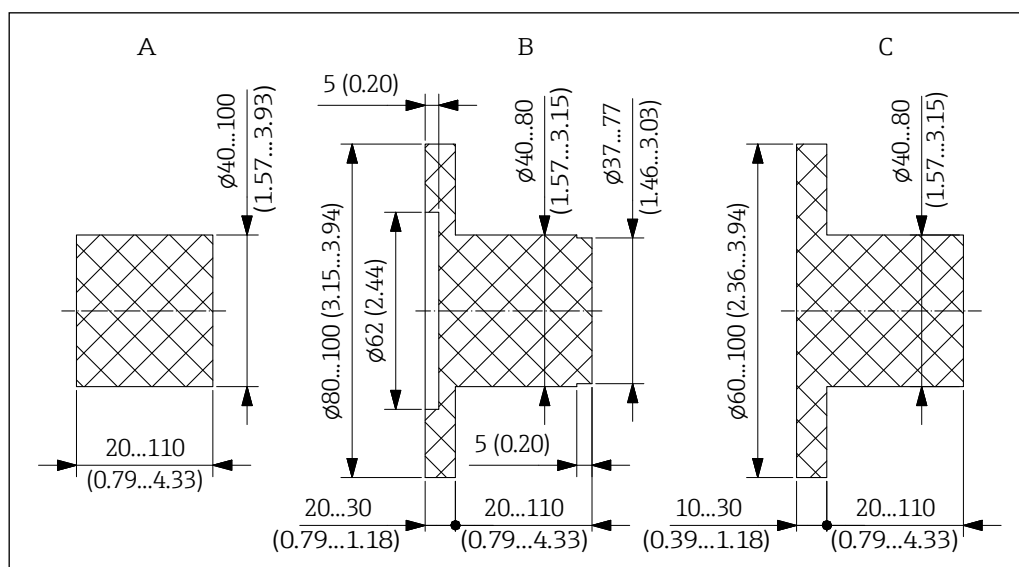


32 Dimensions high pressure adapter. Unit of measurement mm (in)

A Device connection thread
B Process connection thread

Plug

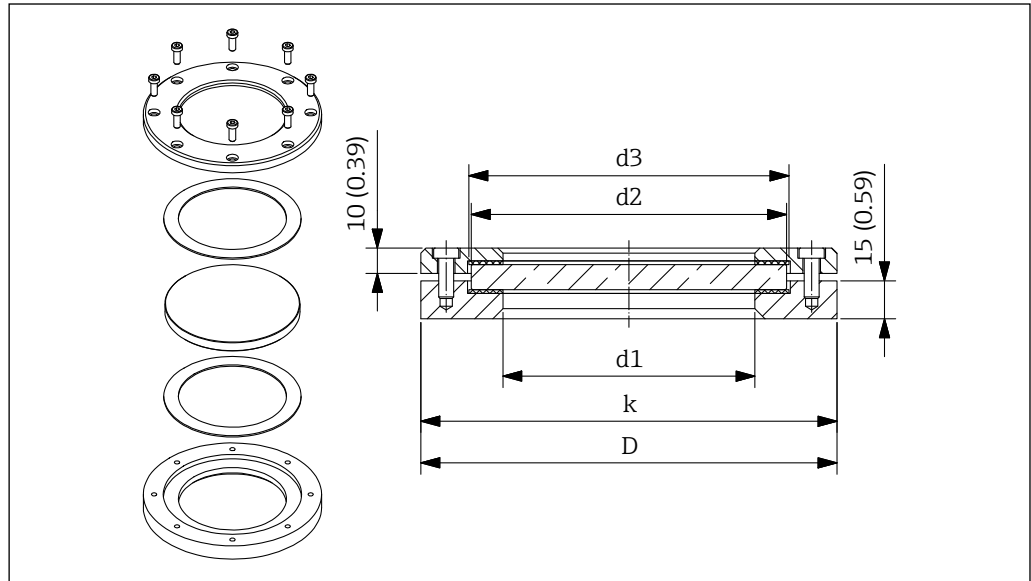
- Type FAR54 → TI01371F
- Material: PTFE, aluminum oxide ceramics
- Process temperature: -40 to +800 °C (-40 to +1472 °F)
- Weight: Depending on version (max. 3.2 kg (7.05 lb))



33 Dimensions plug FAR54. Unit of measurement mm (in)

Sight glass fitting

- Unpressurized, weld-on or weld-in type
- Material: 316Ti (1.4571), seal silicone (max. +200 °C/+392 °F)
- Weight: DN50 approx. 2.4 kg (5.29 lb) to DN100 approx. 4.1 kg (9.04 lb)
- Mounting screws enclosed
- Order number:
 - 71026443 (DN50)
 - 71026444 (DN80)
 - 71026445 (DN100)
- Sight glass disc (spare part)
 - 71209118 (DN50)
 - 71209116 (DN80)
 - 71209115 (DN100)

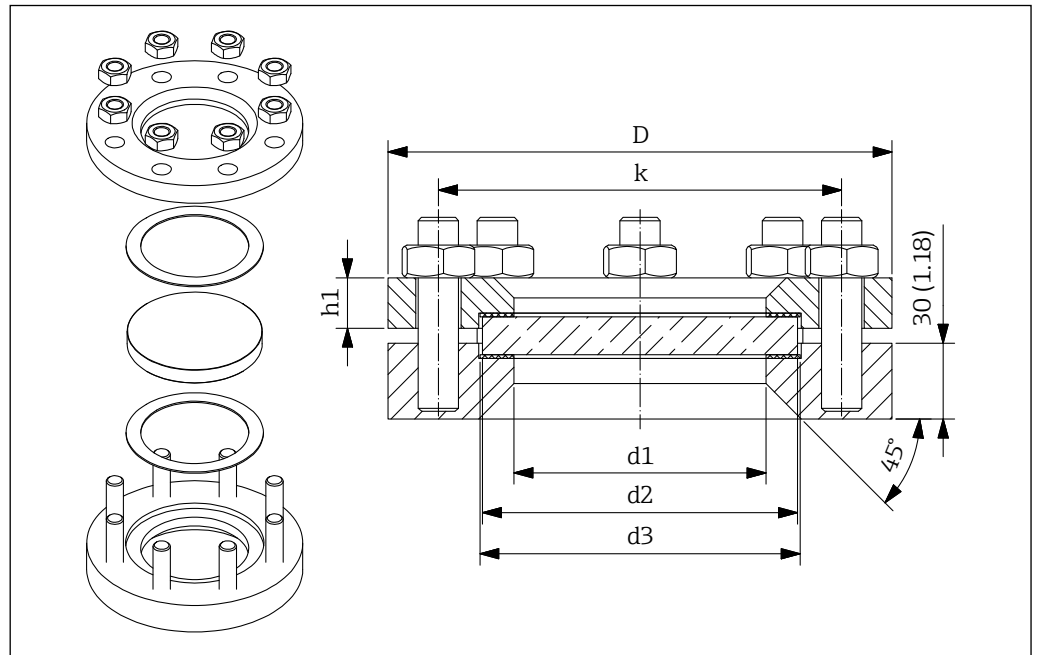


34 Dimensions sight glass fitting for unpressurized processes. Unit of measurement mm (in)

0000000042

DN	d1 mm (in)	d2 mm (in)	d3 mm (in)	D mm (in)	k mm (in)
50	80 (3.15)	100 (3.94)	102 (4.02)	140 (5.51)	120 (4.72)
80	100 (3.94)	125 (4.92)	127 (5.00)	165 (6.50)	145 (5.71)
100	125 (4.92)	150 (5.91)	152 (5.98)	190 (7.48)	170 (6.69)

- Process pressure: 10 bar (145 psi) absolute, weld-on or weld-in type
- Material: 316Ti (1.4571), seal KLINGERSIL® C-4400 (max. +200 °C/+392 °F)
- Weight: DN50 approx. 6.7 kg (14.77 lb) to DN100 approx. 13.0 kg (28.66 lb)
- Mounting screws enclosed
- Order number:
 - 71026446 (DN50)
 - 71026447 (DN80)
 - 71026448 (DN100)
- Sight glass disc (spare part)
 - 71209114 (DN50)
 - 71209111 (DN80)
 - 71209107 (DN100)



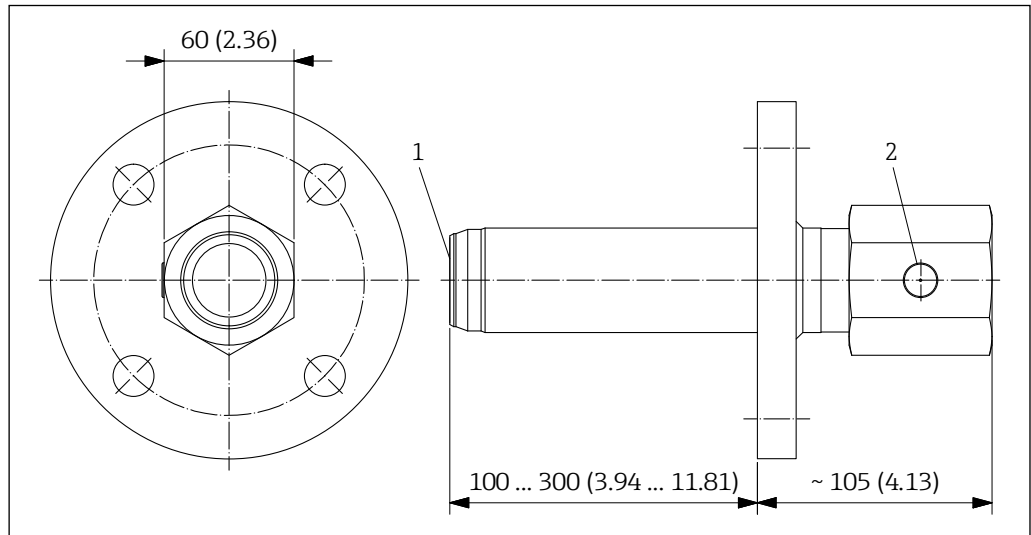
35 Dimensions sight glass fitting for processes up to 10 bar (145 psi). Unit of measurement mm (in)

0000000043

DN	d1 mm (in)	d2 mm (in)	d3 mm (in)	D mm (in)	k mm (in)	h1 mm (in)
50	80 (3.15)	100 (3.94)	102 (4.02)	165 (6.50)	125 (4.92)	16 (0.63)
80	100 (3.94)	125 (4.92)	127 (5.00)	200 (7.87)	160 (6.30)	20 (0.79)
100	125 (4.92)	150 (5.91)	152 (5.98)	220 (8.66)	180 (7.09)	22 (0.87)

Insertion adapter

- Type FAR51 → TI01368F
- Process nozzle
 - DN50 to DN100, PN16, Form A
 - NPS 2" to 4" 150 lbs, RF
- Nozzle length: 100 to 300 mm (3.94 to 11.81 in)
- Connection thread 1½ NPT, G 1½
- Optionally with PTFE or aluminum oxide ceramics
- Process temperature: -40 to +450 °C (-40 to +842 °F)
- Process pressure: 0.8 to 5.1 bar (12 to 74 psi) absolute
- Material: 316Ti (1.4571)
- Weight: 5 to 10 kg (11 to 22 lb)



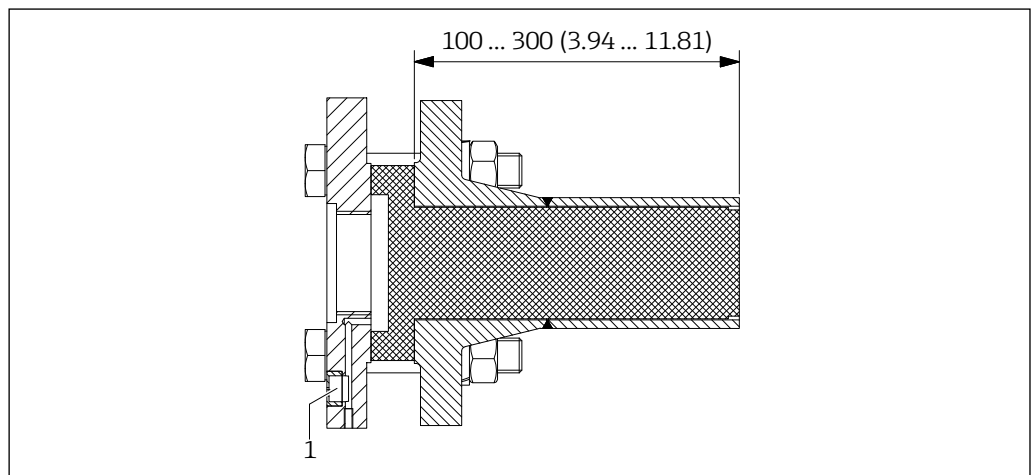
36 Dimensions insertion adapter. Unit of measurement mm (in)

000000045

- 1 Disc with seal, optional
2 Integrated venting element

Weld-in nozzle

- Type FAR50 → TI01362F
- Process nozzle:
 - DN50 to DN100, PN16, Form A
 - NPS 2" to 4" 150 lbs, RF
- Nozzle length: 100 to 300 mm (3.94 to 11.81 in)
- Connection thread 1½ NPT, G 1½
- Process temperature: max. -40 to +200 °C (-40 to +392 °F)
- Material: Stainless steel 316Ti (1.4571)
- Weight: approx. 6 to 7 kg (13 to 15.5 lb)
- Mounting screws enclosed



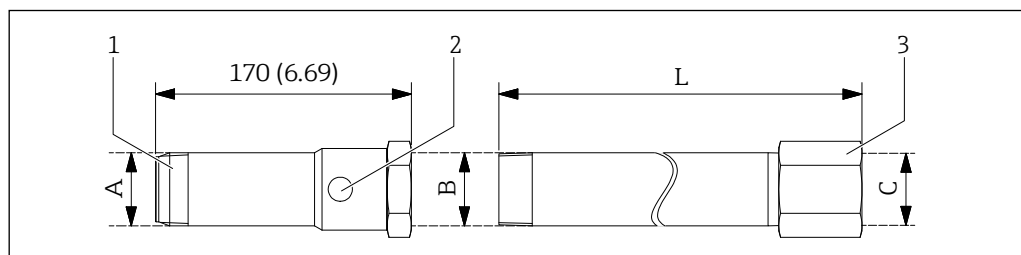
37 Dimensions weld-in nozzle. Unit of measurement mm (in)

0000000137

- 1 Integrated venting element

High temperature adapter with extension

- Process temperature: max. +450 °C (+842 °F)
- SW55
- Material: 316Ti (1.4571), aluminum oxide ceramics (front-flush disc)
- Weight: approx. 1.4 kg (3.09 lb)
- Seal: to be provided by the customer
- Order number:
 - 71113441 (R 1½ (A), G 1½ (B))
 - 71478114 ((R 1½ (A), G 1½ (B), with inspection certificate EN 10204 - 3.1 material)
 - 71113449 (1½ NPT (A+B))
 - 71478115 (1½ NPT (A+B), with inspection certificate EN 10204 - 3.1 material)



38 Dimensions high temperature adapter with extension. Unit of measurement mm (in)

0000000139

- 1 High temperature adapter (connection thread A, internal thread B)
- 2 Integrated venting element
- 3 Extension (connecting thread B, female thread C)

- Extension for high temperature adapter, SW55
- Material: 316Ti (1.4571)
- Weight: 225 mm (8.86 in) approx. 1.1 kg (2.43 lb) to 525 mm (20.67 in) approx. 2.2 kg (4.85 lb)
- Seal: to be provided by the customer
- Order number:
 - 71113450 (R 1½ (B), G 1½ (C), L = 225 mm (8.86 in))
 - 71113451 (R 1½ (B), G 1½ (C), L = 325 mm (12.80 in))
 - 71113452 (R 1½ (B), G 1½ (C), L = 525 mm (20.67 in))
 - 71113453 (1½ NPT (A+B), L = 225 mm (8.86 in))
 - 71113454 (1½ NPT (A+B), L = 325 mm (12.80 in))
 - 71113455 (1½ NPT (A+B), L = 525 mm (20.67 in))

Supplementary documentation



The certificates and approvals currently available can be accessed via the

- Product Configurator
- Endress+Hauser website: www.endress.com → Downloads.

Device-dependent supplementary documentation

Document type: Operating Instructions (BA)

Installation and initial commissioning – contains all functions in the operating menu that are required for a typical measuring task. Functions beyond this scope are not included.
BA02155F

Document type: Brief Operating Instructions (KA)

Quick guide to the first measured value – includes all essential information from the incoming acceptance to the electrical connection.
KA01536F

Document type: Safety Instructions, certificates

Depending on the approval, Safety Instructions are also supplied with the device, e. g. XA. This documentation is an integral part of the Operating Instructions.
The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

www.addresses.endress.com
