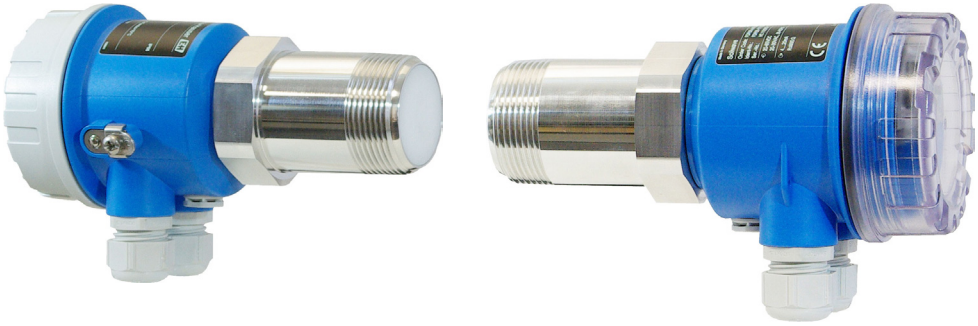
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LENNTECH
WATER TREATMENT SOLUTIONS

Technical Information
Soliwave FDR56/FQR56

Microwave barrier



Compact microwave barrier for non-contact limit detection for bulk solids

Application

- Point level switch for all kinds of bulk solids and liquids, for counting piece goods, also in explosive areas
- Process temperature range: -40 to +450 °C (-40 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

- Compact devices with integrated power unit
- Easy mounting using G1½, R1½ or 1½ NPT thread or a suitable mounting adapter
- Different functions for optimal adaptation to the application
- Detection even with changing product properties
- Can also be used in difficult applications where other measurement methods fail
- Local display on the FDR56
- Electronics housing can be rotated by 360°, allowing orientation into optimum position after installation
- Analogue 4-20 mA current output for analysis of build-up, fouling etc.
- Compliant with ATEX, CSA, EAC, IECEx and UKCA

Endress+Hauser
People for Process Automation

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About this document

Symbols

Safety symbols

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

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

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

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

Electrical symbols

⏚ Protective Earth (PE)
A terminal which must be connected to ground prior to establishing any other connections.

Symbols for certain types of information

✓ Permitted
Procedures, processes or actions that are permitted.

✗ Forbidden
Procedures, processes or actions that are forbidden.

ℹ Tip
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

Configuration mode
Indicates the function number or value

Normal operation
Indicates only the signal strength of the limit detection

Free path
Indicates the free path between FDR and FQR

Covered path
Indicates the covered path between FDR and FQR

Key (+)
Indicates the key for increasing a function value

Key (-)
Indicates the key for reducing a function value

Function and system design

Measuring principle

The Soliwave FQR56/FDR56 is a microwave barrier for point level detection, which operates according to the transmitter-receiver principle. It emits microwaves which are attenuated by the medium to be detected. The received microwave signal is evaluated and a corresponding output signal (relay, solid-state relay or 4 - 20 mA current output) is generated.

The microwave barrier is typically used for notification when containers, silos or similar are full and/or empty. Full notification is used to protect against overflow while empty notification is used, for example, to protect downstream conveyor devices from running dry.

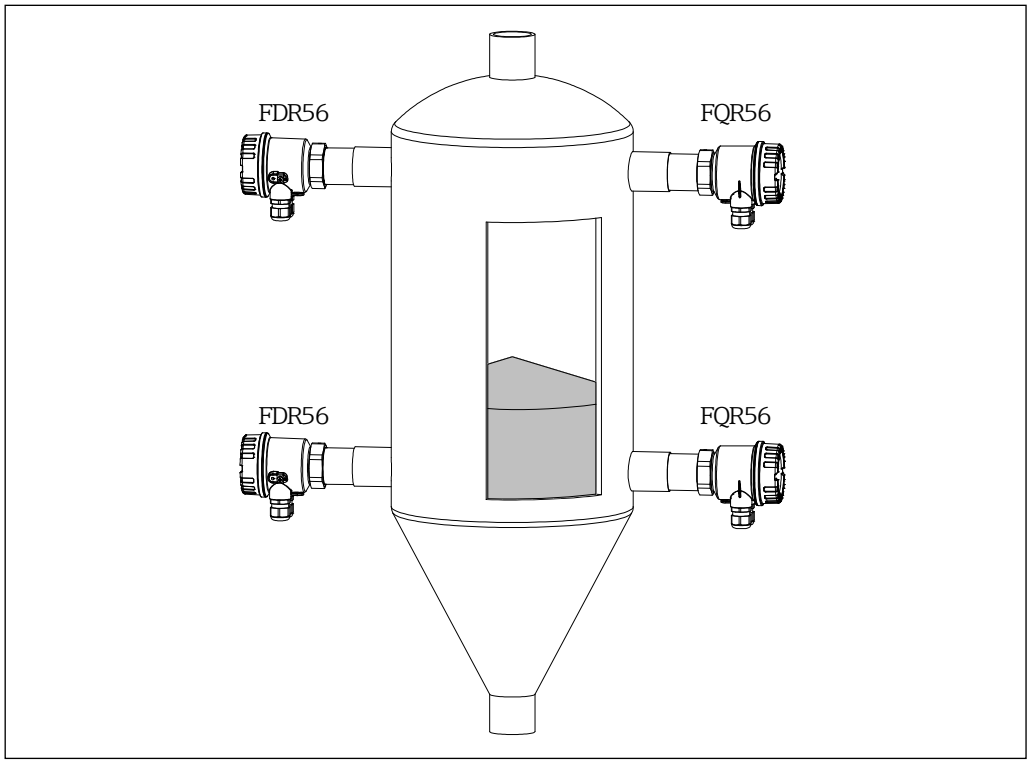
The microwave barrier can also be used for object detection as well as for control and counting purposes.

With the help of the analog output (current 4 to 20 mA), fouling and build-up can be detected; an increase in the fouling of a filter, for example, is indicated by a falling current value.

- The range of the microwave signal is influenced by the different types of materials. The attenuation is dependent on the electrical properties of the damping material. Materials with the capacity to conduct electricity, such as metals, reflect the waves, while other materials with lower conductivity only weaken them or are even penetrated.
- The attenuation of the microwaves is reduced as the damping of the material to be permeated is lower.
- The FQR56 transmitter and the FDR56 transceiver are compact devices for connection to one shared power supply or two separate power supplies.
- The FDR56 transceiver has an integrated switching amplifier; therefore, no external switching amplifier is required.
- The FQR56/FDR56 device types are mechanically compatible to the type FQR16/FDR16 (with 1½ process connection), FQR50/FDR50 and FQR57/FDR57; the same process adapter can be used for all types.
- The compact variant FQR56/FDR56 is electrically incompatible to the FQR16/FDR16 device type, as these devices communicate with each other via their interface.
- The compact variant FQR56/FDR56 is electrically incompatible to the FQR50/FDR50 device type, as these devices have to be operated with the external switching amplifier Nivotester FTR325.
- The compact variant FQR56/FDR56 is electrically incompatible to the FQR57/FDR57 device type, as these devices have to be operated with the external switching amplifier Nivotester FTR525.

Example min/max point level detection of a vessel

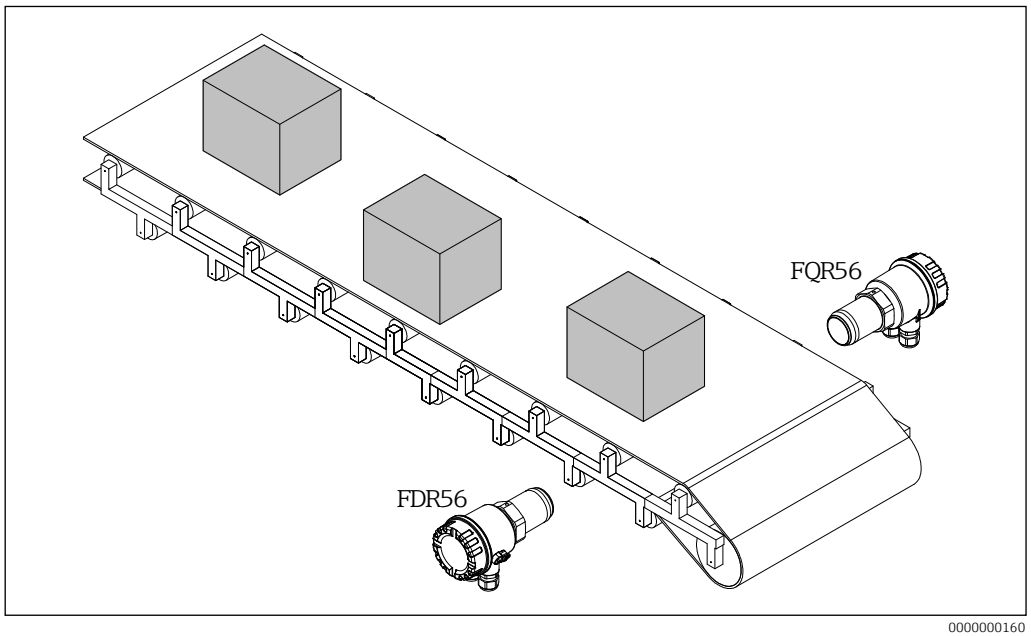
With the help of two microwave barriers, the overshoot of the upper (e.g. product overflow) and the undercut of the lower point level value (e.g. dry running of the discharge screw conveyor) can be detected safely.



1 Example min/max point level detection

Example counting piece goods

The microwave barrier detects piece goods reliably, even under dusty conditions. As the piece goods are being transported on a conveyor belt with a certain distance between them, their quantity can be determined through evaluation of the relay output (switches once for each piece good).

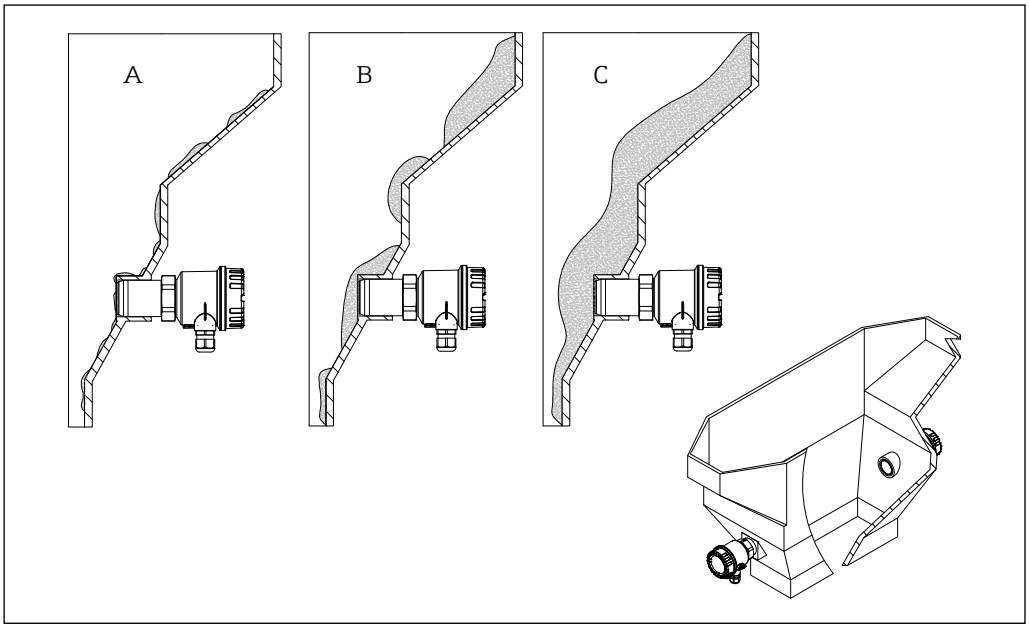


2 Example counting piece goods

Example detection of build-up

Using the optional 4-20 mA current output, the microwave barrier can detect deposit build-ups or similar on container walls. With a free microwave path and increasing deposit build-up, the output current decreases, giving an indication of the grade of build-up which can be evaluated.

Thus, deposit build-up can be detected early to avoid critical conditions and plant standstills.



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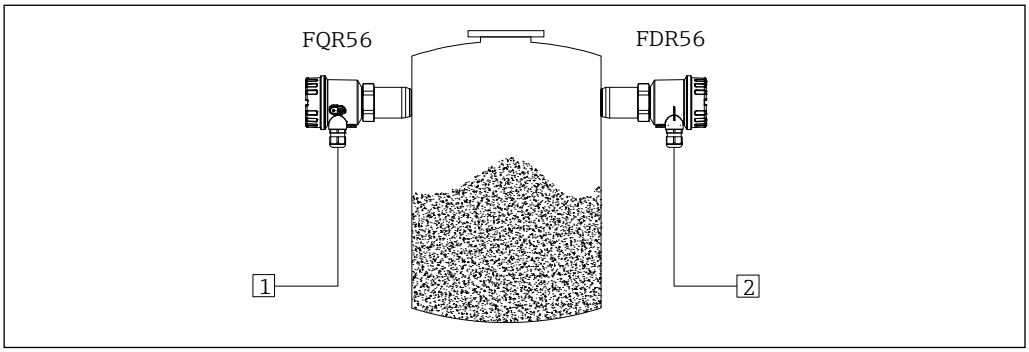
3 Example detection of build-up

A Minimum build-up
B Medium build-up
C Strong build-up

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. → 28

Measuring system

The complete measuring system consists of the devices FDR56 and FQR56 of the microwave barrier Soliwave, e.g. for connection to programmable logic controllers (PLC).



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4 Example of a measuring system

1 Power supply
2 Power supply and switching unit, PLC etc.

Input

Measured variable

Absorption of the radiated electromagnetic waves

Measuring range (Detection range)

- With free path between FQR56 and FDR56, the maximum range is 100 m (3937 in).
- The range also depends on the container walls to be penetrated.

Operating frequency

24 GHz ISM

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/cm^2
- Power density at a distance of 1 m: Approx. 0.3 $\mu W/cm^2$

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.

Switching frequency

Max. 4 Hz

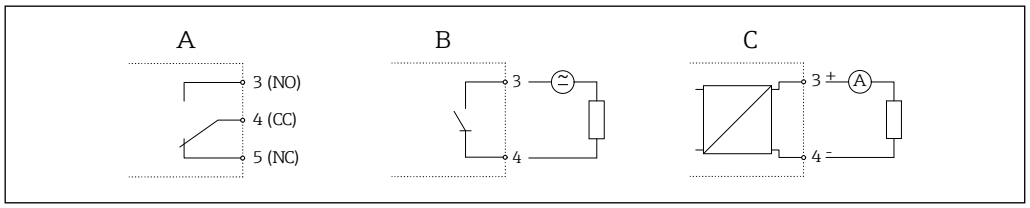
Antenna opening angle (3 dB)

Approx. ± 11°

Output

Output signal

- Potential-free relay changeover contact (A)
- Switching contact semiconductor relay (B)
- Current 4-20 mA (C)



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5 Output signal

A Relay
B Solid-state relay
C Current

Switching output

- Switching capacity
  - Relay: 250 V AC / 4 A, 125 V DC / 0.4 A or 30 V DC / 4 A (Harting connector type HAN8D max. 50 V)
  - Solid-state relay: 30 V AC / 0.4 A or 40 V DC / 0.4 A
- Switching delay parameterizable (off, 100 ms to 20 s)
- Switching hysteresis adjustable
- Switching frequency max. 4 Hz
- Safety-related circuit: MIN or MAX point level: The electric switch opens when the point level is reached, in case of malfunctions or power failure.
  - Maximum point level detection (MAX): e.g. for overfill protection
    The microwave barrier keeps the electrical switch closed as long as the beam path is **free**.
  - Minimum point level detection (MIN): e.g. for no-load protection
    The microwave barrier keeps the electrical switch closed as long as the beam path is **covered**.

The contact material of the relay is also suitable for switching small signal circuits, if no inductive loads or higher currents have been switched previously.

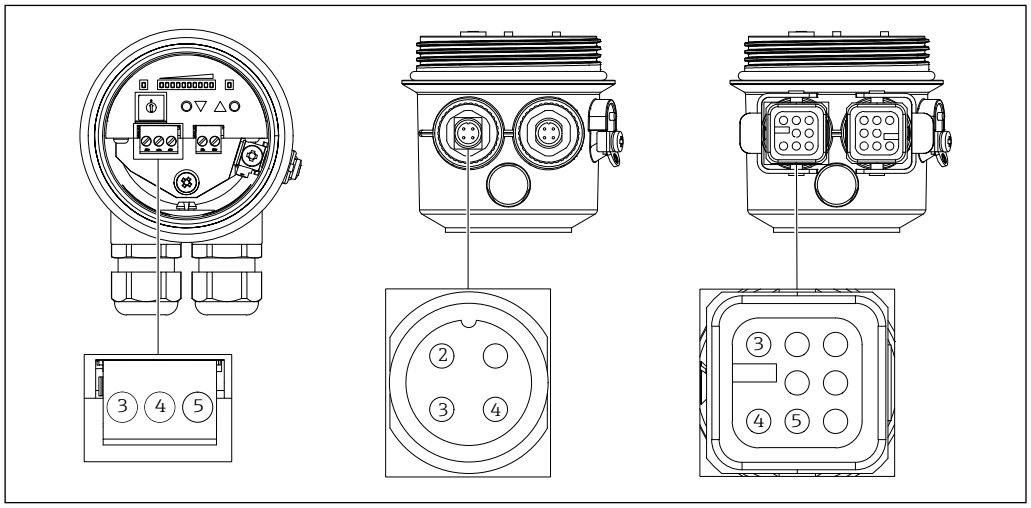
Current output

- Current 4-20 mA, active
- Load max. 600 Ω

The value of the current output corresponds to the signal strength.

Terminal and connector assignment

A suitable wire or connector is used to connect the signal output of the FDR56 to the downstream evaluation. → 28



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6 *Terminal and connector assignment (Connector 2) output signal*

Electrical connection	Output signal		
	Relay	Solid-state relay	4-20 mA
Terminals	3(NO) - 4(CC) - 5(NC)	3 - 4	3(+) - 4(–)
Connector M12A	Connector 2, contact 2(NO) - 3(CC) - 4(NC)	Connector 2, contact 3 - 4	Connector 2, contact 3(+) - 4(–)
Connector Harting HAN8D	Connector 2, contact 3(NO) - 4(CC) - 5(NC)	Connector 2, contact 3 - 4	Connector 2, contact 3(+) - 4(–)

Connector 2 for the signal output is only available on the FDR56.

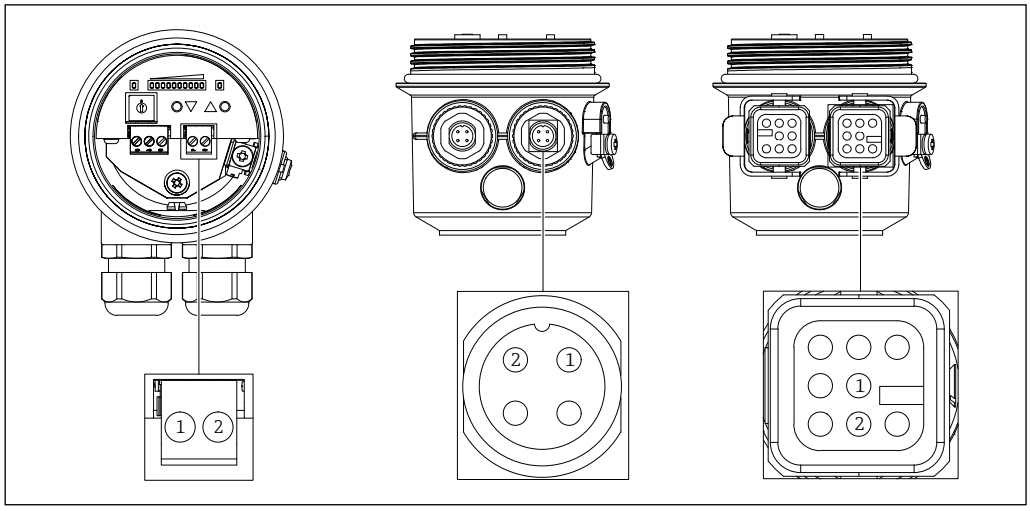
Ex connection data

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

Terminal and connector assignment

A suitable wire or connector is used to connect the FDR56/FQR56 to the power supply. → 28



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7 *Electrical connection supply voltage*

Electrical connection	Supply voltage
Terminals	1 - 2
Connector M12A	Connector 1, contact 1 - 2
Connector Harting HAN8D	Connector 1, contact 1 - 2

Available connectors

- M12, A-coded, 4-pole, max. 0.75 mm²
- Harting HAN8D, 0.14 to 2.5 mm²

- In the case of devices with a plug, it is not necessary to open the housing for connection purposes.
- Suitable mating connectors are available as an order variant or as accessories.
- Suitable mating prefabricated connection cables are available as accessories.
- Accessories → 28

Supply voltage

- 85 to 253 V AC, 50/60 Hz
- 20 to 60 V DC or 20 to 30 V AC, 50/60 Hz

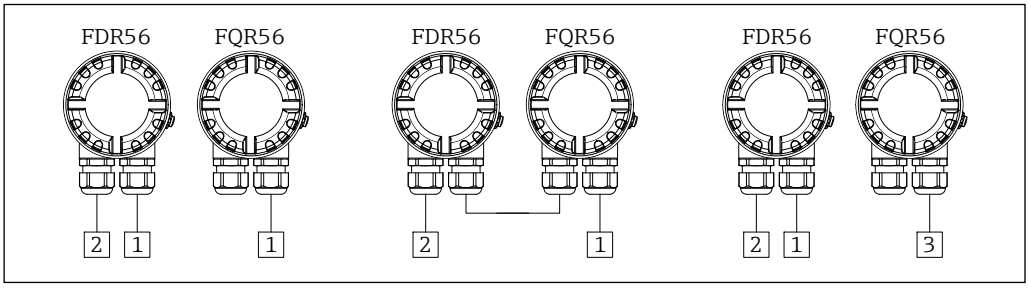
- The polarity of the supply voltage can be set as required.
- Provide overcurrent protection device (max. 10 A) for the supply voltage.
- In accordance with IEC/EN61010 a suitable circuit breaker must be provided for the measuring device.
- The electrical connection with connector is only available for the power supply with 20 to 60 V DC or 20 to 30 V AC, 50/60 Hz (ordering option "E").

Power consumption

- FQR56:
  - 7 VA (85 to 253 V AC, 50/60 Hz)
  - 1 W (20 to 60 V DC) / 1.5 VA (20 to 30 V AC, 50/60 Hz)
- FDR56:
  - 9 VA (85 to 253 V AC, 50/60 Hz)
  - 2.4 W (20 to 60 V DC) / 4 VA (20 to 30 V AC, 50/60 Hz)

Electrical connection

The FDR56 and FQR56 are electrically connected via a common or two separate power supplies.



8 Connection examples

1 Power supply 1
2 Signal evaluation (switchgear, PLC, etc.)
3 Power supply 2 (optional)

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 FDR56/FQR56 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.

Terminals

Max. 1.5 mm²

Cable entries

- Cable gland M20 x 1.5 or cable entry ½ NPT
- Degree of protection: IP66
- Cable gland (⚠):
  - Material: Plastic, Grey
  - Clamping range: 5 to 10 mm (0.2 to 0.39 in) (EN 61444) / 7 to 10 mm (0.28 to 0.39 in) (UL-514 B)
  - Tightening torque: max. 6 Nm
- Cable gland (⚠Ex):
  - Material: Nickel-plated brass, Silver
  - Clamping range: 7 to 10.5 mm (0.28 to 0.41 in)
  - Tightening torque: max. 10 Nm
- Quantity: 2 pieces per device

Only use the cable gland for the connection of permanently installed cables and lines; the operator must ensure appropriate strain relief.

Cable specification

- Normal instrument cable is sufficient
- Conductor cross-section: max. 1.5 mm²

Overvoltage protection

Devices without optional overvoltage protection

Equipment from Endress+Hauser fulfills the requirements of the product standard IEC/DIN EN 61326-1 (Table 2 Industrial Environment).

Depending on the type of port (DC supply, input/output port) different test levels according to IEC/DIN EN 61326-1 against transient overvoltages (Surge) are applied (IEC/DIN EN 61000-4-5): Test level on DC power ports and input/output ports is 1 000 V line to earth

Overvoltage category

Overvoltage category II

Pollution degree

Pollution degree 2

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 microwave barrier.

Influence ambient temperature

The ambient temperature has no direct influence on the device (the devices are temperature compensated internally).

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 (±X, ±Y, ±Z)
- Test temperature: -40 to +70 °C

Mounting

Mounting location

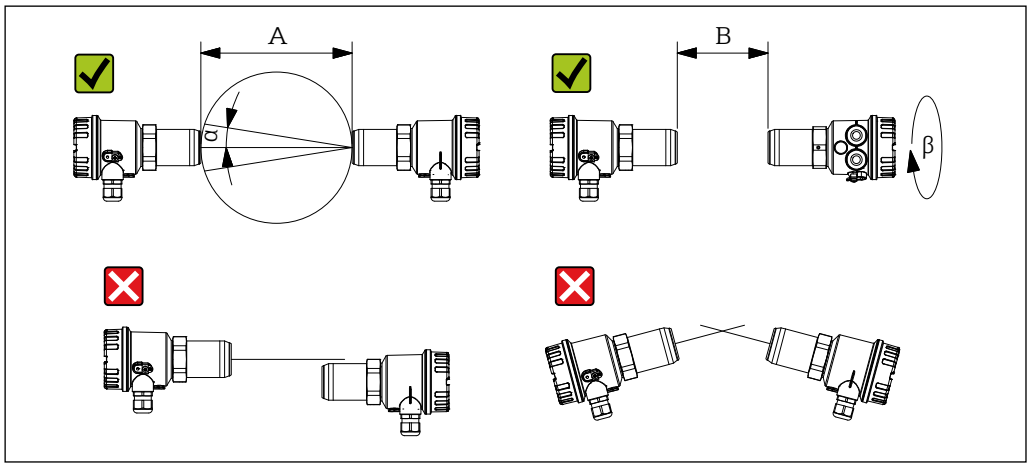
The mounting location must be selected in such a way that application-specific influences are minimized.

- Observe mechanical protection of the equipment (for example in case of larger falling pieces of product). → 28
- In case of vibrating mounting locations use devices with encapsulated electronics (see ordering structure "Accessory mounted").
- 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

Mount the FQR56 and the FDR56 opposite each other (maximum angle between both devices (antenna opening angle) = 9°), otherwise any mounting position.



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9 *Mounting position*

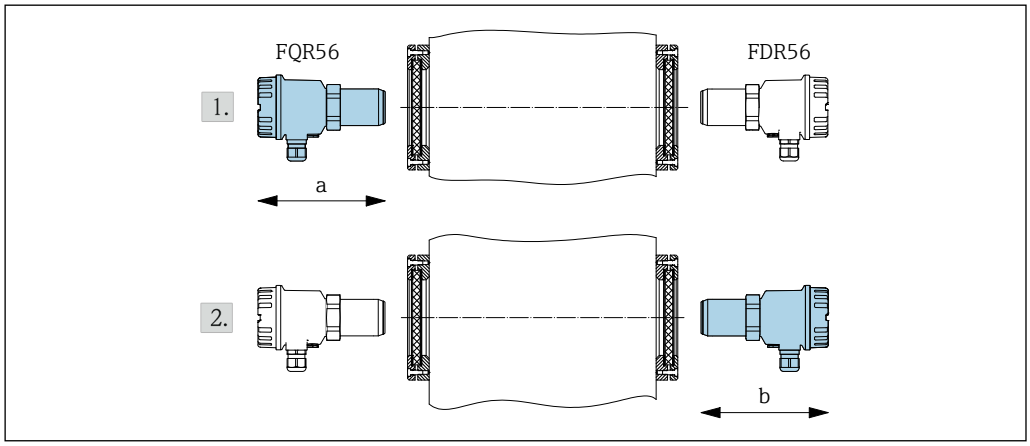
A Detection range 0.3 to 100 m (11.8 to 3937 in)
B Detection range 0.03 to 0.3 m (1.18 to 11.8 in)
α Antenna opening angle approx. 11°
β 90°

Alignment notes

- Since the microwaves are polarized, do not rotate FQR56 and FDR56 against each other about their longitudinal axis (except by 180° or for detection ranges smaller than 300 mm (11.8 in), see below).
- Maintain a minimum distance of 30 mm (1.18 in) between FQR56 and FDR56.
- **To avoid overdrive in the detection range smaller than 300 mm (11.8 in), mount the FQR56 or the FDR56 rotated by 90°.**

Optimization of the signal quality

If the microwave barrier devices are installed in front of microwave-permeable windows or plugs, it is possible to optimize the signal quality by moving FQR56 and FDR56 on their longitudinal axis **after an automatic adjustment has been performed**.



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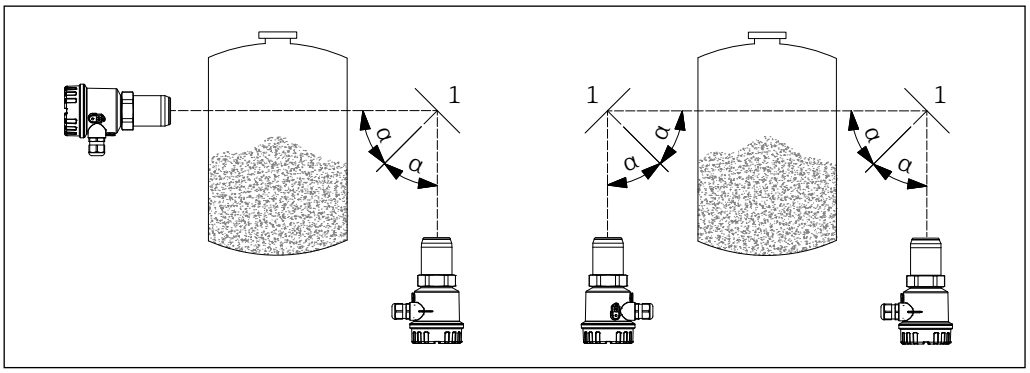
10 *Optimization of the signal quality*

1. Loosen device 1 (here FQR56) and move it slowly by **a** = ±10 mm (±0.4 in) until a signal maximum is reached (LED signal strength), fix device again. → 25
2. Then loosen device 2 (here FDR56) and move it slowly by **b** = ±10 mm (±0.4 in) until a signal maximum is reached, fix the device again.

Perform an automatic adjustment again after each change in the position of the devices (in this case, horizontal movement).

Reflector operation

If a direct comparison of FQR56 and FDR56 is not possible for structural reasons, the microwave beam can be redirected via plane metal mirrors (reflectors).



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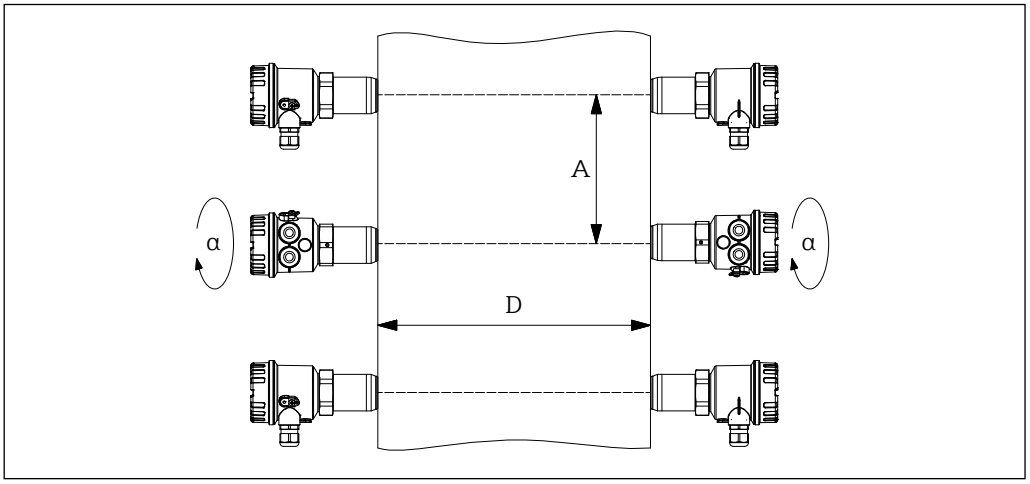
11 Reflector operation

1 Reflector
α Angle of entrance = angle of emission

- Arrange FQR56 and FDR56 symmetrically to the reflector (entrance angle = exit angle), otherwise the FDR56 will not receive an evaluable signal.
- The use of reflectors reduces the range of the microwave barrier by approx. 10 % in each case.

Parallel operation

In practice, it can happen that several microwave barriers are operated in parallel at one point (for example, when detecting several point levels in a pipeline). To avoid mutual interference as far as possible, rotate every second microwave barrier by 90°.



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12 Parallel operation

A Distance between microwave barriers
D Detection range
α 90°

- Under ideal conditions, the distance **A** should not be less than **D/2**.
- Increase the distance additionally in applications where stronger reflections are to be expected (e.g. metallic shafts).
- In case of small distances between the microwave barriers, we recommend the use of the devices Soliwave FDR57/FQR57 with the Nivotester FTR525, with these a parallel operation of up to 5 barriers is possible without considering the individual distances.

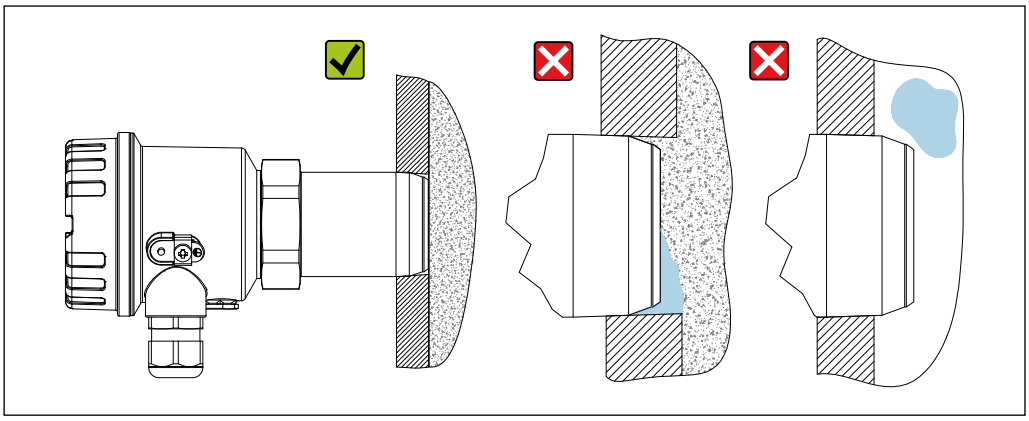
Installation instructions

Basically, there are two ways to mount the FDR56 and FQR56 devices:
- 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. → 28

Mounting in contact with the process

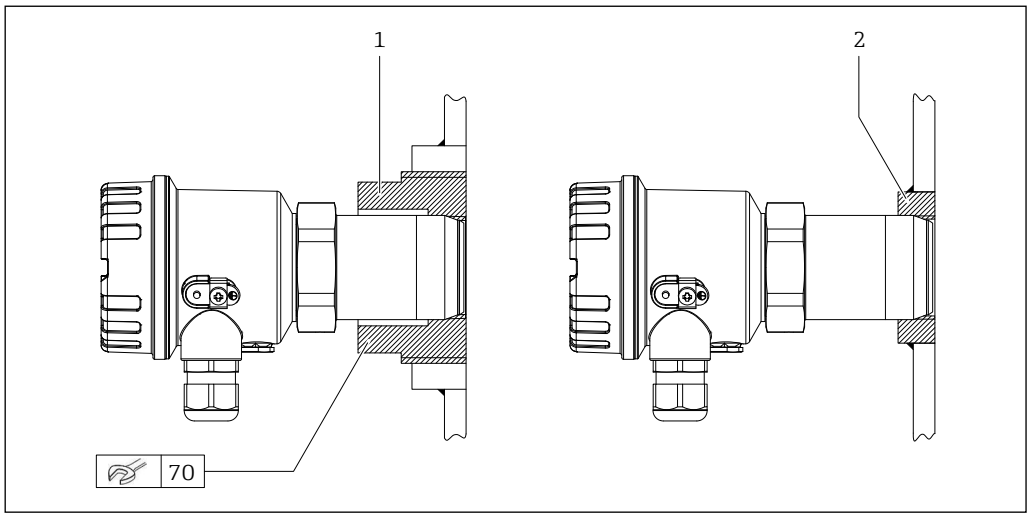
The device is screwed directly into the process (for example in existing threads or vessel sleeves) with its process connection (standard threads R 1½ according to EN 10226, G 1½ according to ISO 228-1 or 1½ NPT according to ANSI/ASME B1.20.1).



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13 *Direct mounting with threaded connection*

- 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 counternut, the device can be mounted flush particularly easily, as it is a cylindrical thread.
- Weld-in adapters of type FAR52-A* with corresponding internal 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.
- Accessories → 28

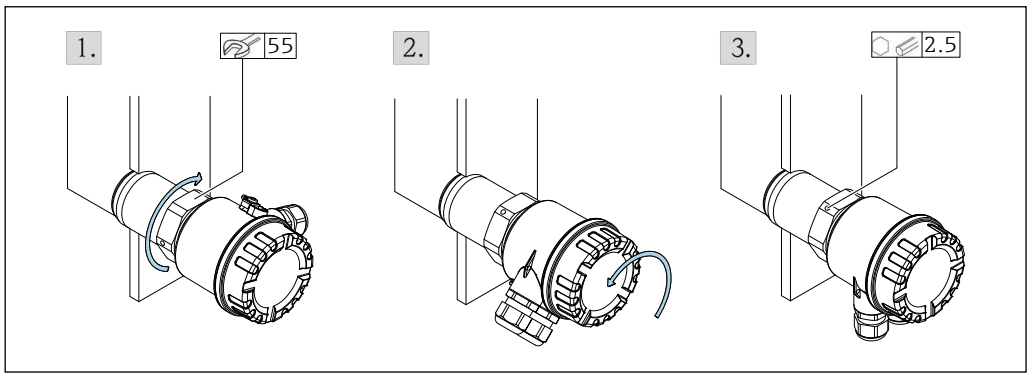


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14 Weld-in or screw-in adapter FAR52. Unit of measurement mm (in)

1 Screw-in adapter
2 Weld-in adapter

Mounting samples



0000000166

15 Mounting with connection thread

1. Screw in connection thread. For G 1½ thread: Tighten counternut.
2. Align the electronics housing (cable gland or plug connector of both devices must point in the same direction).
3. Fix the housing in place.

All installation variants are sealed with a suitable sealant (to be provided by the customer).

Mounting not in contact with the process

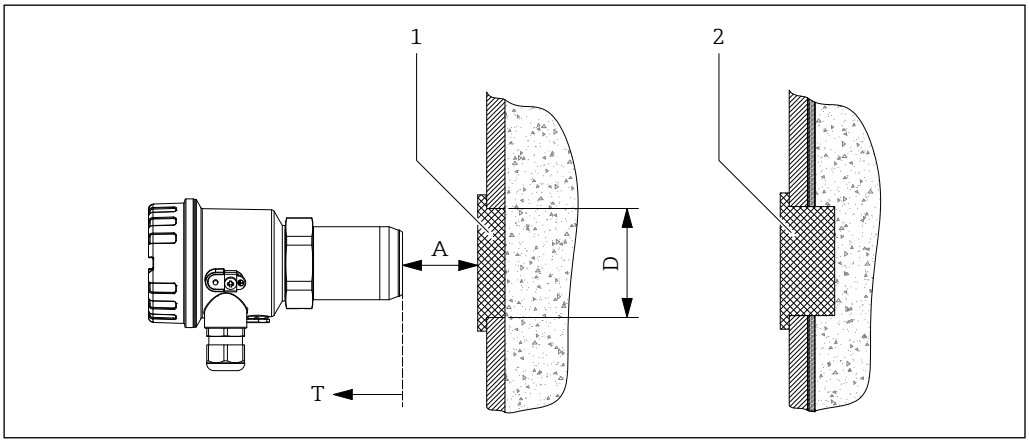
The device is mounted in one of the following three ways:
- For a microwave-impermeable process wall (for example, metal vessel wall), mounting is done in front of microwave-permeable windows such as plastic plugs, ceramic disks, or sight glass fittings.
- In the case of a microwave-permeable process 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. → 23
- 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)).
- 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. → 33



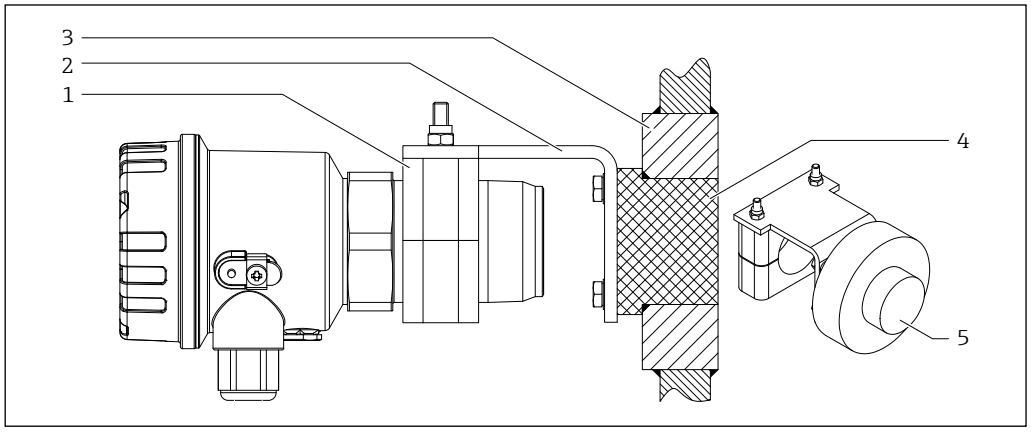
0000000191

16 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 with weld-in adapter with mounting arm

For unpressurized applications under normal ambient and process temperatures, this weld-in adapter enables simple installation in the process wall; a PE-UHMW plug ensures safe separation of the device and process. For servicing, only the mounting bracket is loosened and the device is removed, the process remains separated.



0000000199

17 Einschweißadapter für drucklose Prozesse

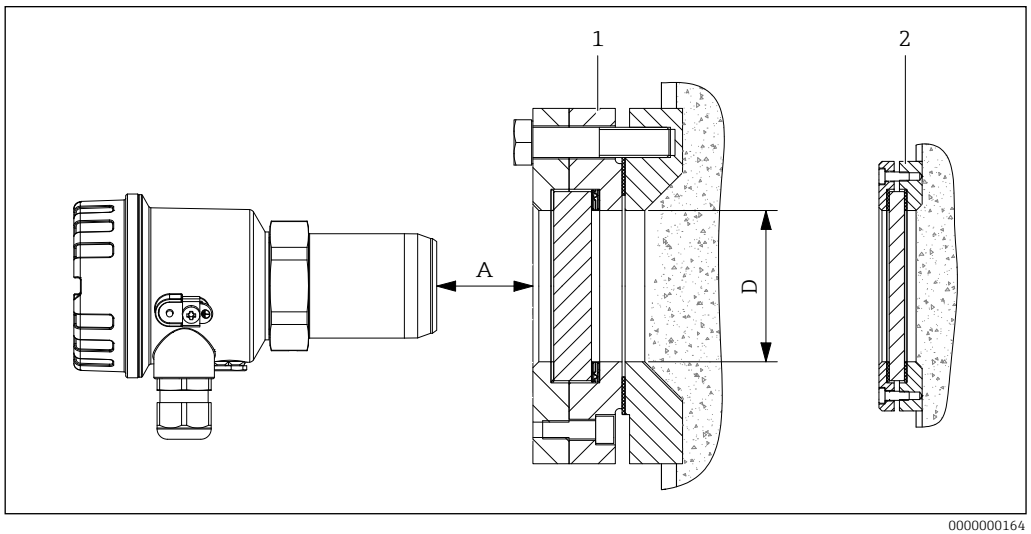
1 Mounting bracket
2 Mounting arm
3 Weld-in adapter
4 Microwave-permeable plug
5 Microwave-permeable plug in case of condensate formation on the inner process wall or inner process linings

Suitable weld-in adapter with mounting arm
→ 30

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. → 23
- 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)).

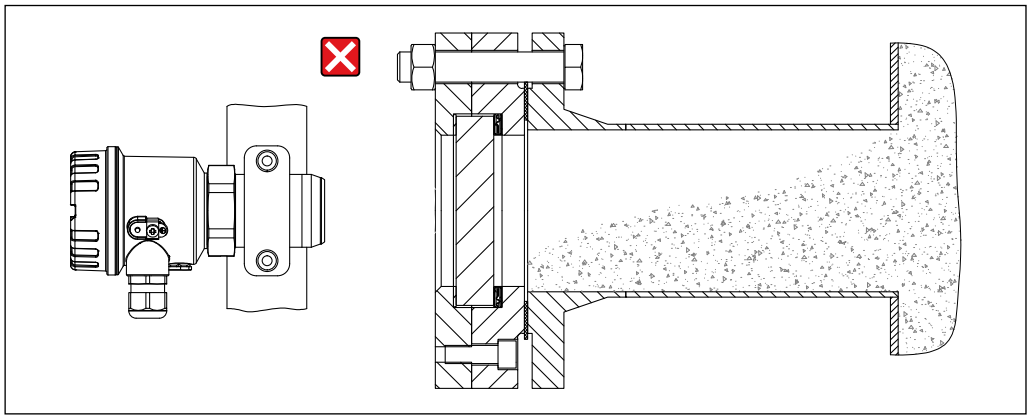


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18 Mounting in front of microwave permeable sight glass fitting

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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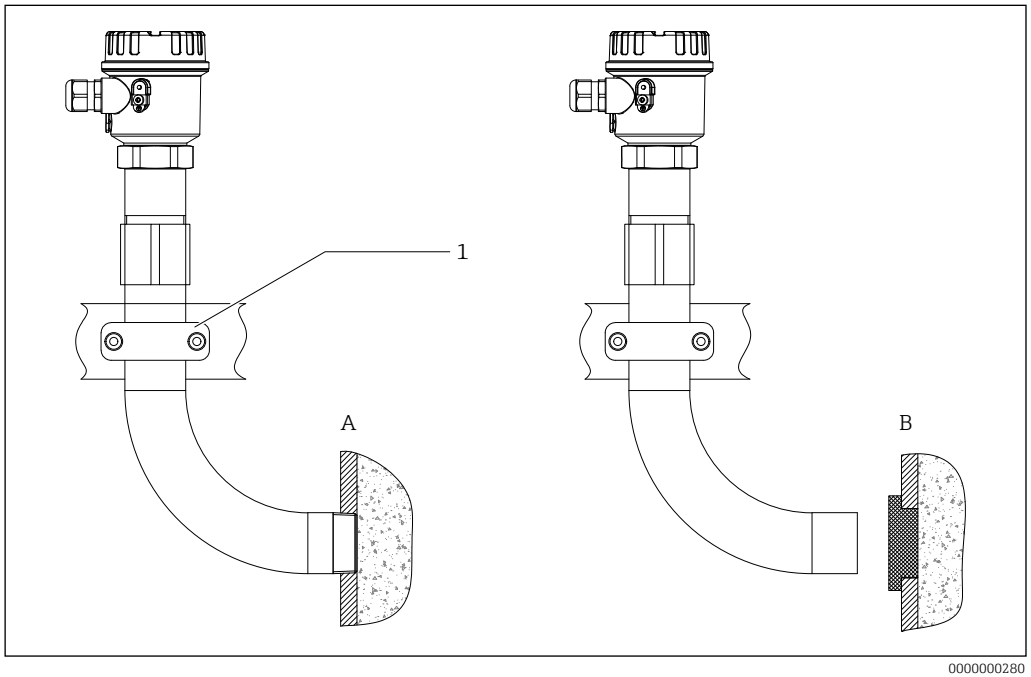
19 Impermissible mounting with the risk of material accumulation

Suitable sight glass fittings and individual sight glass plates are available as accessories in various designs. → 33

Mounting with wave guide

In case of barely accessible measuring points or cramped confines, it may be necessary to mount the device at an angle to the planned installation site. In this case, a spacer tube can be used as a wave guide, meaning that no additional signal attenuation occurs due to the wave guide effect.

- The pipe can be made of any desired metallic material.
- Edges inside the pipe (for example at transitions) can cause signal attenuation and thus should be avoided wherever possible.



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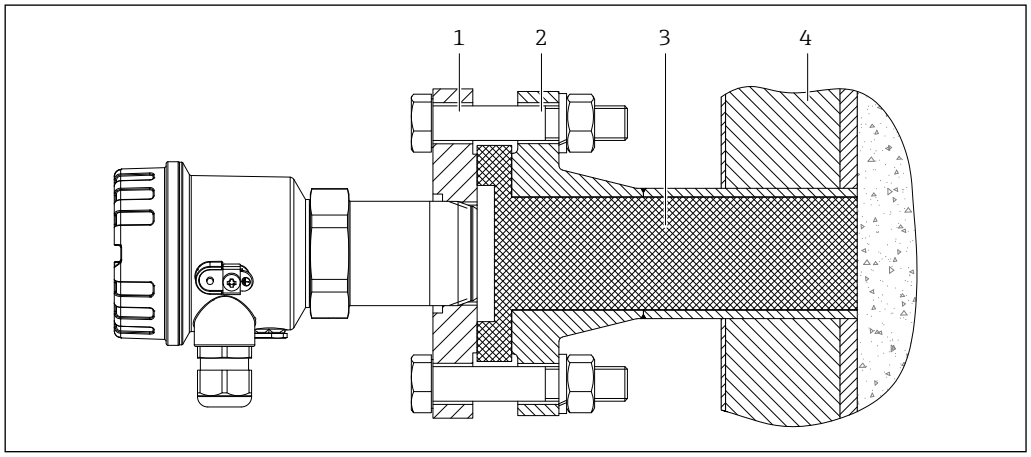
20 Mounting with wave guide

A Mounting directly in the process with connection thread
B Mounting in front of the process plug without connection thread
1 Mounting bracket

- Suitable stainless steel wave guides of type FAR55 are available as accessories in different versions. → 36
- Suitable wave guides (spacer tubes) of type FAR53 for high temperature applications → 36

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.



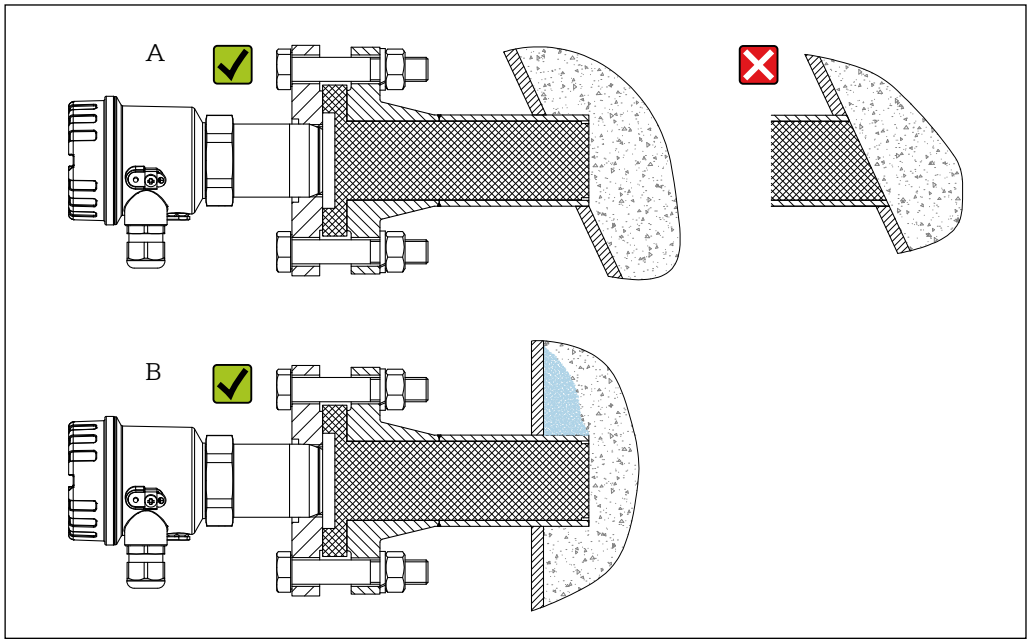
21 Mounting on process nozzle

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.
- Process nozzles of type FAR50, consisting of connection nozzle, plug and mounting flange, are available as accessories in different sizes and materials.
- Accessories → 28

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

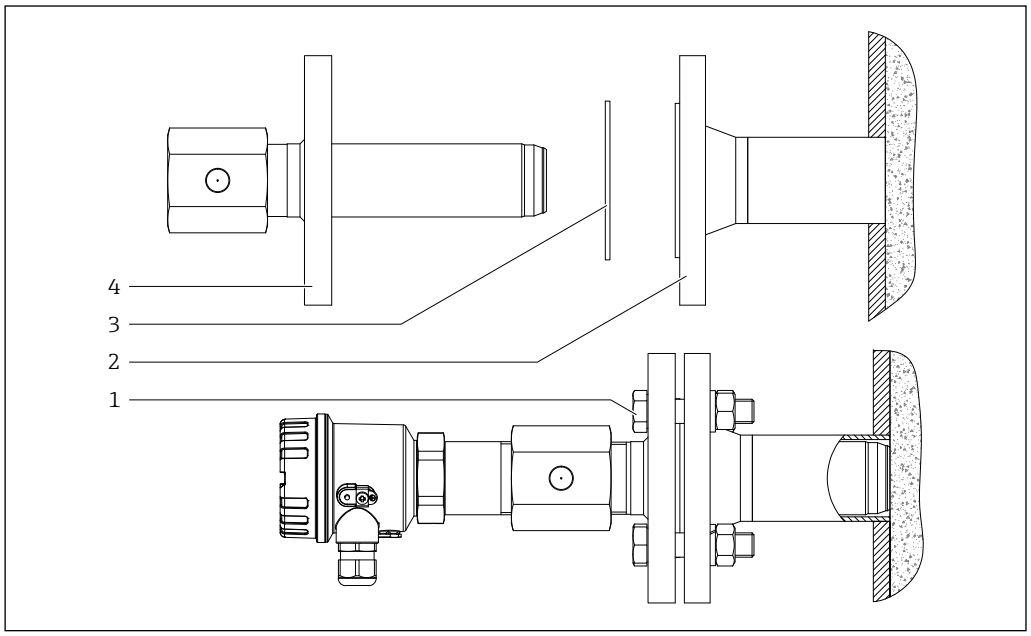
- In the case of a non-vertical process wall, mount the process nozzle so far into the process that no material can accumulate in front of it (**A**).
- When mounting the process nozzle and there is a risk of material accumulating on the inner process wall, use a nozzle that protrudes into the process (**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. → 35



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22 *Mounting with risk of buildup*

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).



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23 *Mounting with insertion adapter FAR51*

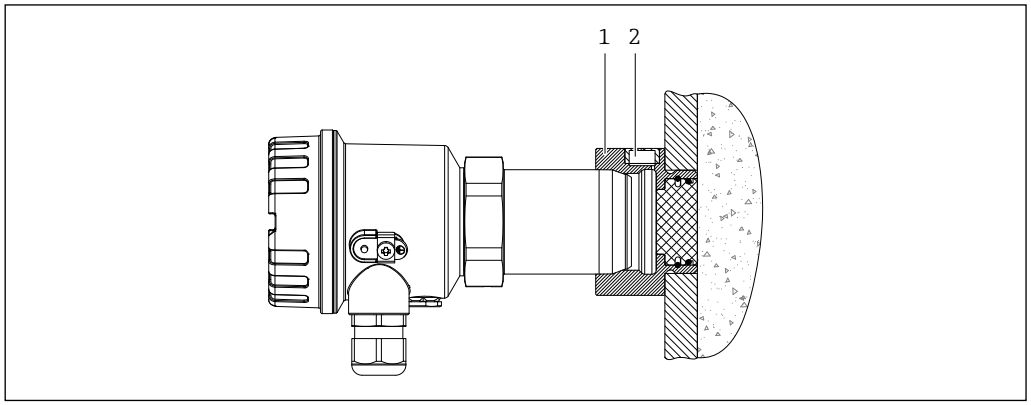
1 *Customer-supplied installation material*
2 *Process nozzle*
3 *Customer-supplied gasket*
4 *Insertion adapter*

For process temperatures of +70 to +450 °C (+158 to +842 °F), plug-in adapters for existing process connections of type FAR51 made of stainless steel are available as accessories.
→ 35

Mounting with high pressure adapter

For applications with high process pressure up to 21 bar (305 psi), absolutely use the following high-pressure adapter. → 32

The maximum temperature at the process connection must be observed.
→ 23



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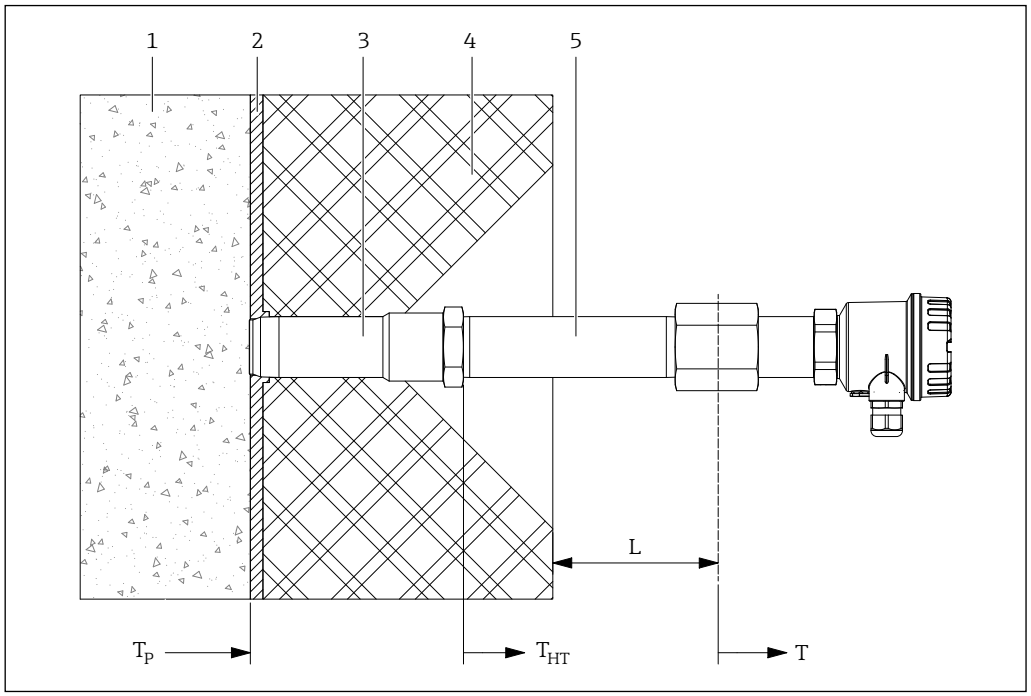
24 *Mounting with high pressure adapter*

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 +70 to +450 °C (+158 to +842 °F), there is a simple adapter 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. → 23
- The maximum temperature **T** at the process connection of the device must be observed; exceeding this will lead to destruction.
- **L** must be selected depending on the process and ambient temperatures.
- Suitable high temperature adapters and stainless steel extensions are available as accessories. → 37



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25 *Mounting with high temperature adapter and extensions*

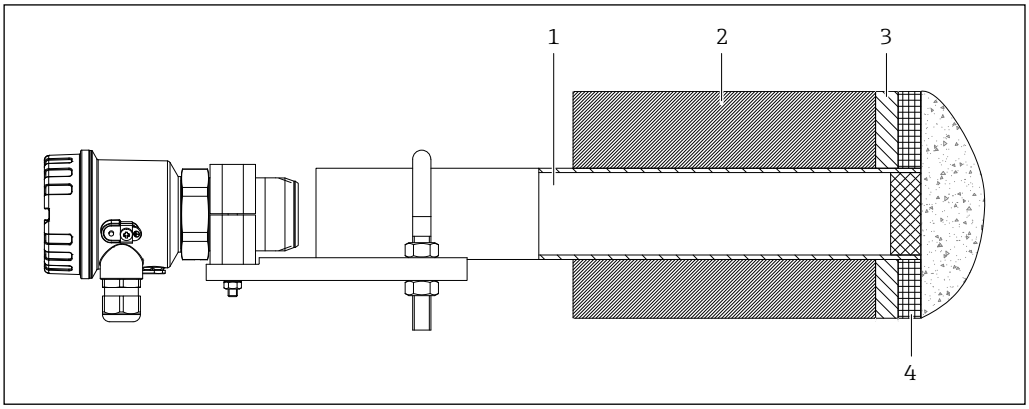
1 *Process*
2 *Wall*
3 *High temperature adapter*
4 *Insulation*
5 *Length extensions (optional)*

Observe the following temperatures:
- Temperature $\mathbf{T_P} \leq +450$ °C (+842 °F) at the process connection of the high-temperature adapter
- Temperature $\mathbf{T} \leq +70$ °C (+158 °F) at the device connection
- Temperature $\mathbf{T_{HT}} \leq +160$ °C (+320 °F) on the internal thread of the high-temperature adapter when using the extension, otherwise $\mathbf{T_{HT}} \leq \mathbf{T}$

L must be selected depending on the process and ambient temperatures.

Mounting with spacer tube (wave guide)

For many processes, mounting with a spacer tube is a simple and cost-effective way of separating the devices from the high process temperatures of +70 to +450 °C (+158 to +842 °F). The spacer tube can be secured in place in various ways, depending on the application conditions (e.g. screwed into the process wall, bolted-on mounting brackets, welded or clamped to available cross beams). We also recommend this mounting method for processes that are lined with clay or similar materials on the inside. The spacer tube can be glued into place, for example.



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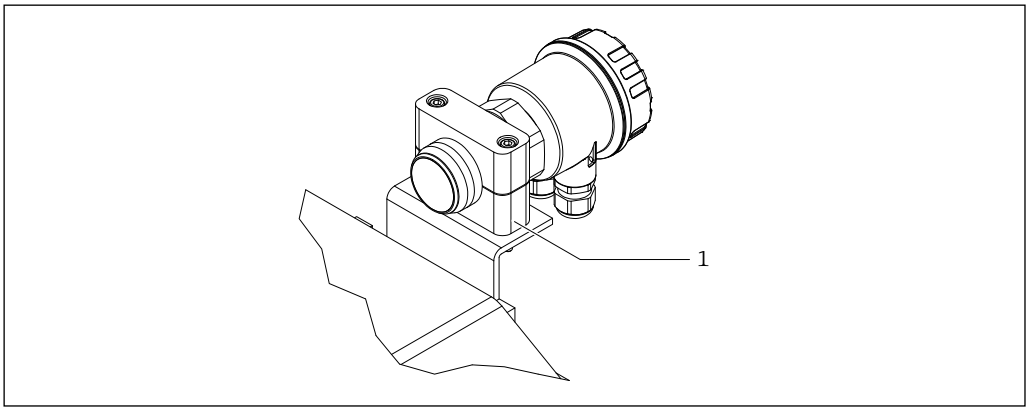
26 Mounting with spacer tube (wave guide)

1 Spacer tube
2 Process insulation
3 Process wall
4 Inner lining

Suitable spacer tubes of type FAR53, made of steel or stainless steel, are available as accessories in different versions. → 36

Mounting for open processes

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



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27 Mounting for open processes

1 Mounting bracket

Suitable mounting brackets made of plastic or aluminum are available as accessories. → 29

Environment

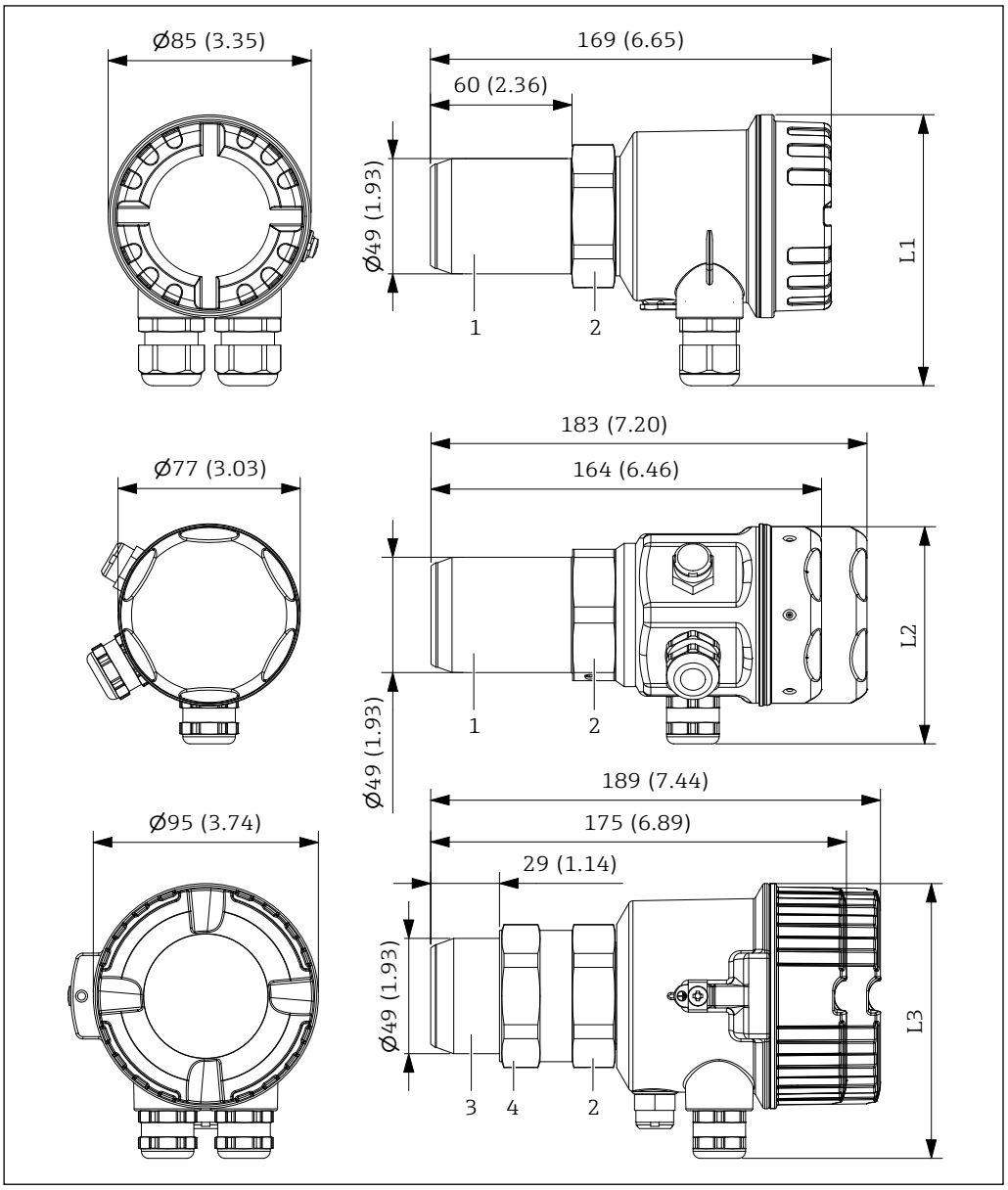
Ambient temperature	-40 to +70 °C (-40 to +158 °F) For outdoor operation in strong sunlight: ▪ Mount the device in the shade ▪ Avoid direct sunlight, particularly in warmer climatic regions ▪ Use weather protection cover (Accessories → 🖹55)
Storage temperature	See ambient temperature
Humidity	Operation up to 100 %. Do not open in a condensing atmosphere.
Operating height	Up to 2000 m (6600 ft) above sea level
Degree of protection	▪ IP66 (with closed housing) ▪ IP20 (with open housing)
Vibration resistance and shock resistance	See vibration influence → 🖹11
Pollution degree	Pollution degree 2
Electromagnetic compatibility	▪ Interference emission to EN 61326, Electrical Equipment Class B ▪ Interference immunity to EN 61326, Appendix A (Industrial)

Process

Process temperature	▪ -40 to +70 °C (-40 to +158 °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!
Vibrations	See vibration influence → 🖹11

Mechanical construction

Dimensions



0000000154

28 Dimensions. Unit of measurement mm (in)

1 *Connection thread R 1½ / 1½ NPT*
2 *Hexagon SW55*
3 *Connection thread G 1½*
4 *Counternut (SW55)*

Dimensions L1 to L3, depending on the housing and electrical connection:

Electrical connection	Housing (dimension)		
	F16 (L1) mm (in)	F15 (L2) mm (in)	F34 (L3) mm (in)
M20 cable gland	114 (4.49)	93 (3.66)	116 (4.57)
Thread 1/2" NPT	111 (4.37)	94 (3.70)	117 (4.60)
Connector M12A	101 (3.98)	88 (3.46)	111 (4.37)
Connector Harting HAN8D	133 (5.24)	120 (4.72)	143 (5.63)

Weight

- Depending on the selected housing and process connection (max. 1.7 kg (3.75 lb))
- On device variants with connector and extended ordering option "Electronics, encapsulated" the weight increases by 0.2 kg (0.44 lbs).

Materials

- Stainless steel 316Ti (1.4571):
  - Process connection
  - Pressure equalization element (F15/F34 housing)
- Stainless steel 316L (1.4435):
  - F15 housing
  - Adapter ½ NPT (F15/F34 housing)
- aluminum: F34 housing
- Plastic:
  - F16 housing
  - M20 cable gland, adapter ½ NPT and pressure equalization element (F16 housing)
- Die-cast zinc:
  - M12 connector, nickel-plated
  - Harting connector, powder-coated
- Brass, nickel-plated: M20 cable gland (F15/F34 housing)

Process connection

Connection thread:
- R 1½ in accordance with EN 10226
- 1½ NPT in accordance with ANSI/ASME
- G 1½ in accordance with ISO 228-1

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 adjustment options for the microwave barrier offer the necessary flexibility to ensure that the devices can be easily adapted to the application:
- Adjustable sensitivity
- Switchable limit signal function
  - maximum safety or minimum safety
- Adjustable switching hysteresis (switching output)
- Switching delay (switching output)
  - 100 ms to 20 s
  - Switch-on and switch-off delay, can be selected separately
- Adjustable damping
- LED signal strength indicator as adjustment and positioning aid

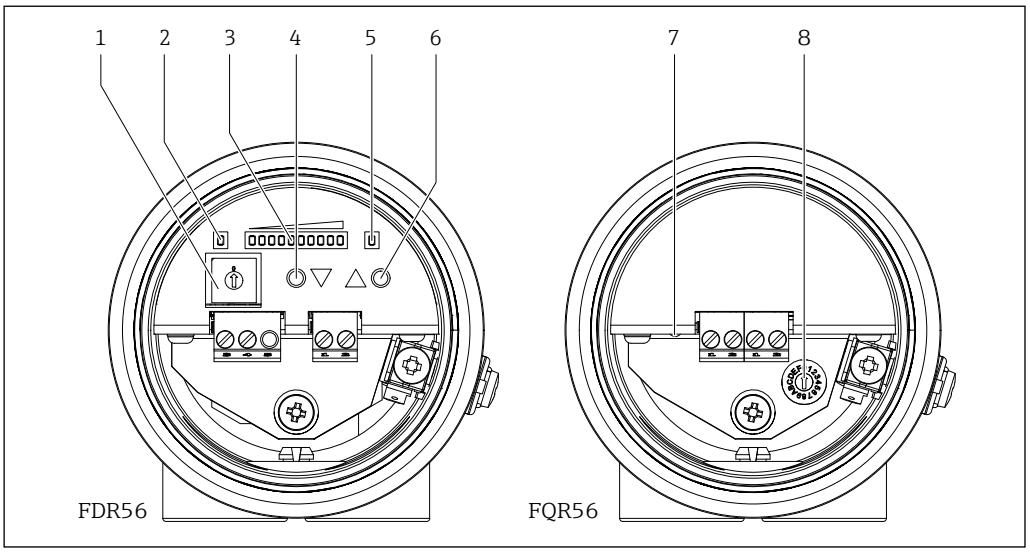
On the transmitter FQR56 there are no settings required, with the exception of those for parallel mode using multiple microwave barriers.

Operation concept

Transceiver FDR56

The microwave barrier is configured on the FDR56 using a function selection switch (encoding switch) and two operating buttons. With these, among other things, the adjustment of the sensitivity is carried out for clear and unambiguous limit detection. Upon sufficient attenuation, the microwave barrier reacts with a corresponding output signal.

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.



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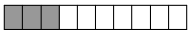
29 *Display and operating elements of the FDR56*

1 *Function selection switch*
2 *Ready for operation LED (green) (FDR56)*
3 *Display*
- *Normal operation: Signal strength*
- *Configuration mode: Function number and function value*
4 *Operating button ▼ (decrease or toggle)*
5 *Switch output LED (yellow), only relay*
6 *Operating button ▲ (increase or toggle)*
7 *Ready for operation LED (green) (FQR56)*
8 *Switch for adjusting the operating frequency*

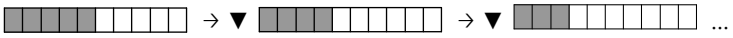
On-site operation

Parameter configuration on the FDR56 is performed as follows:

1. Select any function (for details see Operating Instructions → 39)
   → 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 adjustment with free path)
   → Reduce sensitivity (operating button ▼):



   → Increase sensitivity (operating button ▲):



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. After completion of the parameterization (after adaptation of the microwave barrier to the respective bulk material), return the coding switch to the "0" position, the FDR56 is now ready for operation.

- Toggling the encoding switch position unequal "0" (function selection) puts the FDR56 into parameter configuration mode. The limit detection continues to work in the background, changed settings are taken into account directly.
- For current output, the yellow LED (switching output) has no function and remains off.

Local display

Display

The signal strength as well as the configured values (in the function selection) are displayed locally using a bar graph display. In addition, a green LED indicates that the device is ready to operate (supply voltage is present) and a yellow LED displays the status of the switch output (function 6 = standard setting, LED off: relay in rest position, solid-state relay high-impedance).

Output signal

The following overview exemplarily shows the behavior of the possible signal outputs with regard to the display of the signal strenth during overshoot or undercut (function 6 = standard setting) of the limit (with an optimally performed synchronization).

The value of the current output corresponds to the signal strength (1 LED = 1.6 mA).

Point level	Signal strength	Switch output (LED yellow)	Output signal		
			Relay	Solid-state relay	4-20 mA
			Contact 3-4 closed	Contact closed (low-resistance)	20 mA
			Contact 4-5 closed	Contact open (high resistance)	4 mA

Certificates and approvals

CE mark

The Soliwave microwave barrier 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 microwave barrier complies with the substance restrictions of the Restrictions oh 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 for some device variants (for details see corresponding manufacturer's declaration).

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.

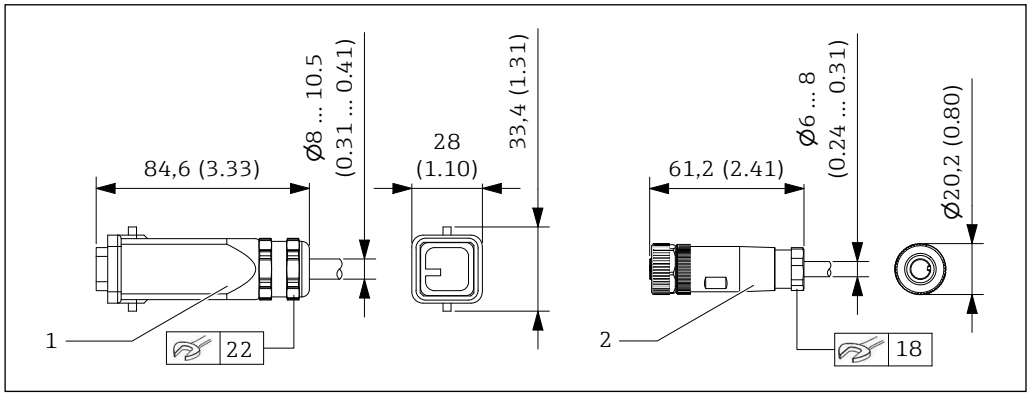
Scope of delivery

The scope of delivery includes the FDR56 or FQR56 in a box with Brief Operating Instructions included.

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.

Mating connectors



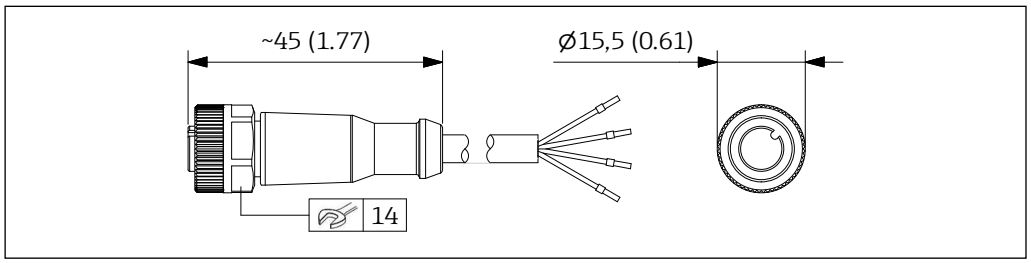
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30 Mating connectors. Unit of measurement mm (in)

1 Harting cable socket
2 M12 cable socket

- **Order number:**
  - 71381872 (M12, A-coded, 4-pole, max. 0.75 mm²)
  - 71381882 (Harting HAN8D, 0.14 to 2.5 mm²)

Pre-fabricated connection cables

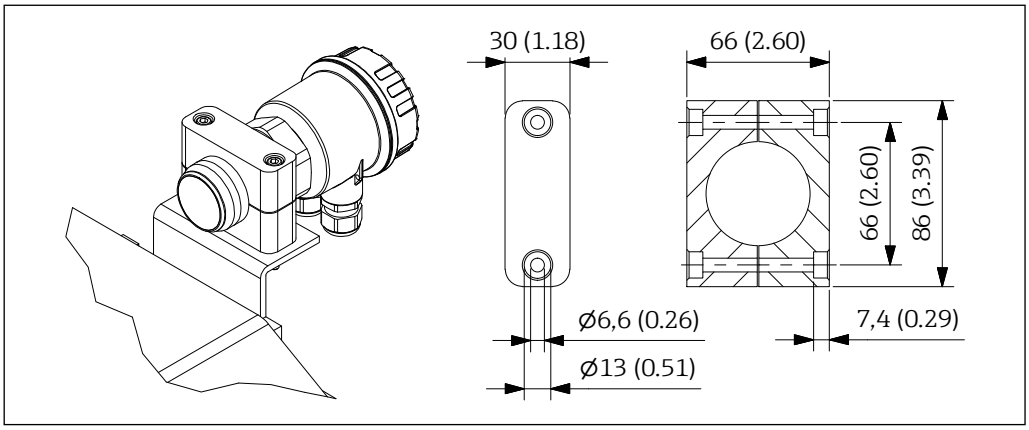


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31 Connection cable with M12 plug. Unit of measurement mm (in)

- M12 connector, A-coded
- Number of poles/cross section: 4 x 0.34 mm²
- Operating temperature range: -25 to +90 °C (-13 to +194 °F)
- Materials:
  - TPU (housing)
  - FKM (seal)
  - PUR (cable)
- Protection: IP65, IP67, IP68, IP69K
- Order number:
  - 71381853 (2 m (78.74 in))
  - 71381870 (5 m (196.85 in))

Mounting bracket

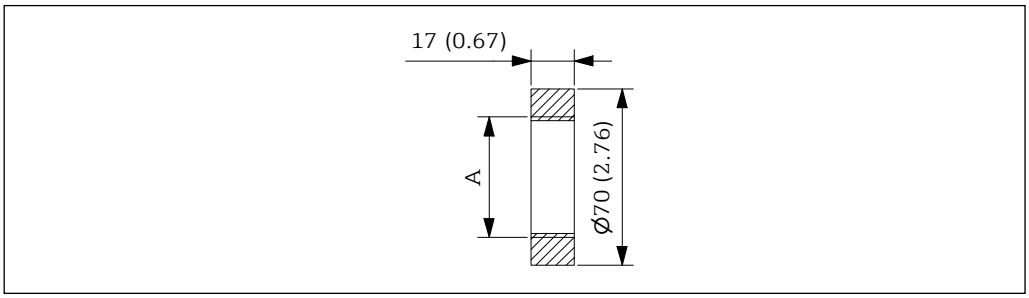


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32 *Dimensions mounting bracket. Unit of measurement mm (in)*

- Material: Plastic or aluminum
- Operating temperature:
  - Plastic: -20 to +70 °C (-4 to +158 °F)
  - Aluminum: -40 to +70 °C (-40 to +158 °F)
- Weight: max. 0.22 kg (0.49 lb)
- Mounting screws (2 x M6): to be provided by customer
- Order number:
  - 52017501 (Aluminum)
  - 52017502 (Plastic)

Weld-in adapter

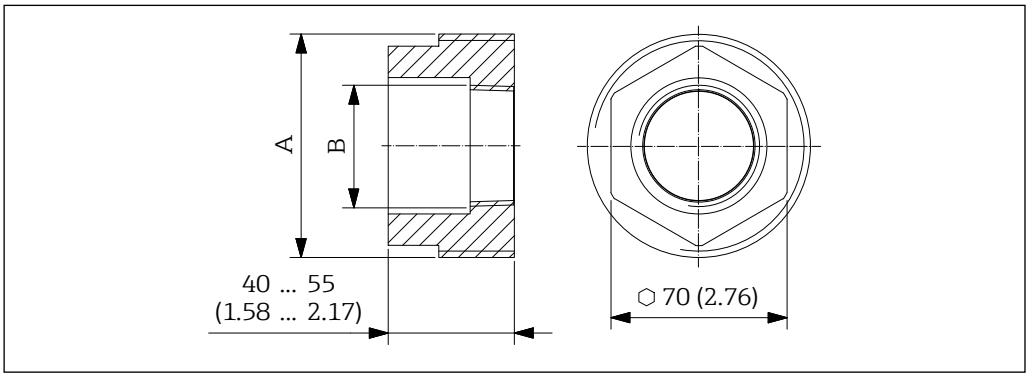


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33 *Dimensions FAR52-A. Unit of measurement mm (in)*

- Type FAR52-A → TI01369F
- Weld-in adapter with internal thread (A) Rp 1½, 1½ NPT and G 1½
- Material: 316Ti (1.4571), steel P235GH (1.0345)
- Weight: FAR52-AAAA1A approx. 0.3 kg (0.66 lb)

Screw-in adapter

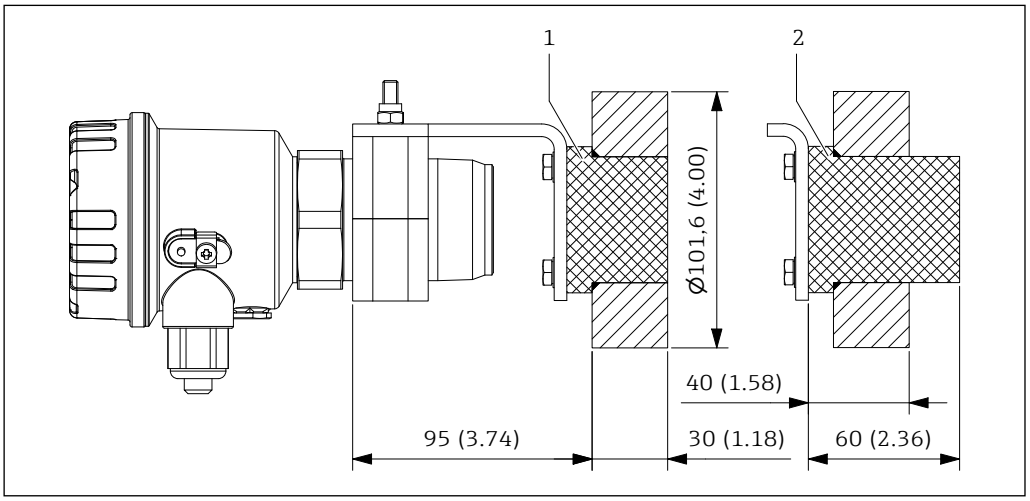


0000000288

34 *Dimensions FAR52-B. Unit of measurement mm (in)*

- Type FAR52-B → TI01369F
- Screw-in adapter for thread R 2 to R 4 and 2 NPT to 4 NPT, with internal thread R 1½ or 1½ NPT
- Material: 316Ti (1.4571), steel P235GH (1.0345)
- Weight: FAR52-BVL22B approx. 1.8 kg (4 lb)

Weld-in adapter with mounting arm



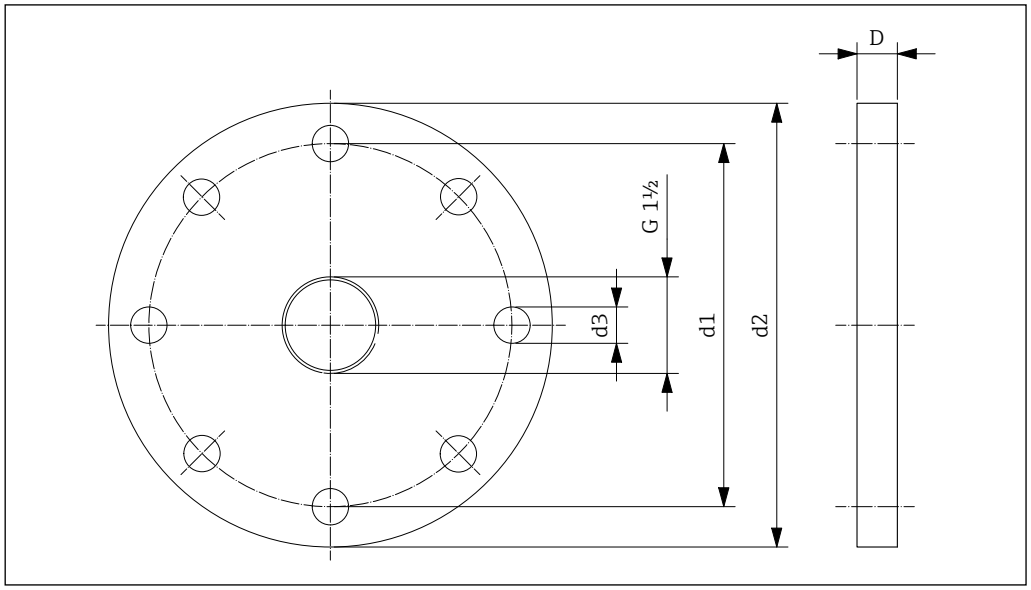
0000000287

35 *Dimensions weld-in adapter. Unit of measurement mm (in)*

1 Type SALS/SPPS
2 Type SAL/SPP

- Material:
  - Mounting arm: Stainless steel 304 (1.4301)
  - Mounting bracket: Plastic or aluminum
  - Weld-in adapter: Stainless steel 304 (1.4301)
  - Plug: Plastic PE-UHMW
- Operating temperature:
  - Mounting bracket aluminum: -40 to +70 °C (-40 to +158 °F)
  - Mounting bracket Plastic: -20 to +70 °C (-4 to +158 °F)
- Weight: approx. 2.6 kg (5.73 lb)
- Mounting screws enclosed
- Order number:
  - 71516954 Type SPPS (Mounting bracket plastic, short plug)
  - 71516947 Type SPP (Mounting bracket plastic, long plug)
  - 71516952 Type SALS (Mounting bracket aluminum, short plug)
  - 71516949 Type SAL (Mounting bracket aluminum, long plug)
- Plug (spare part)
  - 71517822 (Type SAL/SPP)
  - 71517824 (Type SALS/SPPS)

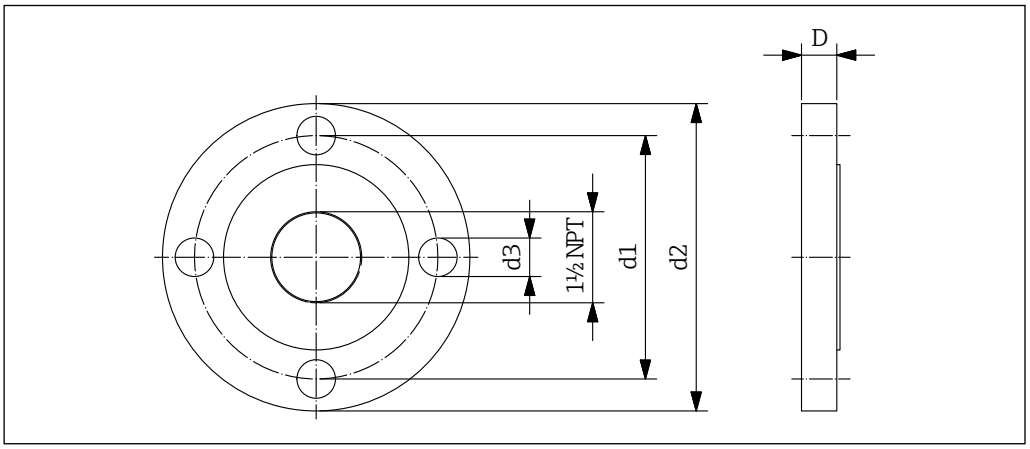
Mounting flange



36 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 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:
  - 71006348 (DN40 PN40, Rp 1½)
  - 71108383 (DN40 PN40, Rp 1½), with inspection certificate EN 10204 - 3.1 material
  - 71381884 (DN40 PN40, G 1½)
  - 71381885 (DN40 PN40, G 1½), with inspection certificate EN 10204 - 3.1 material
  - 71006350 (DN50 PN16, Rp 1½)
  - 71108388 (DN50 PN16, Rp 1½), 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
  - 71006352 (DN100 PN16, Rp 1½)
  - 71108390 (DN100 PN16, Rp 1½), 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

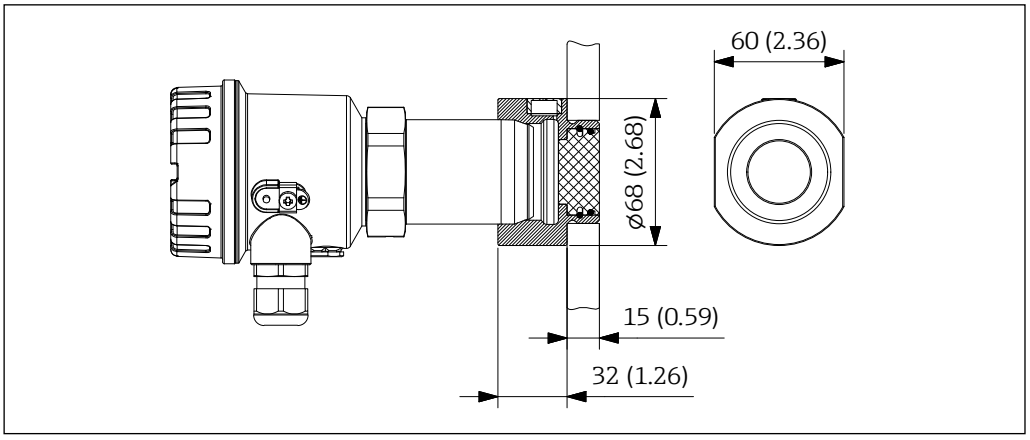


37 *Dimensions mounting flange (Connection dimensions according to ANSI/ASME B16.5)*

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

- 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

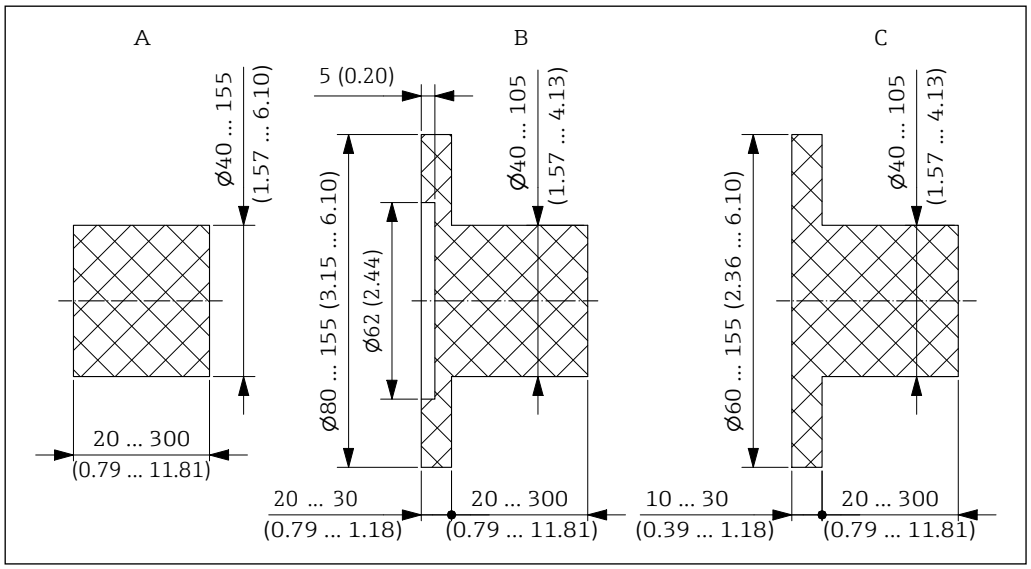
High pressure adapter



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

- Process pressure: 0.5 to 21 bar (7 to 305 psi) absolute
- Process temperature: -40 to +70 °C (-40 to +158 °F)
- 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 (Device connection thread + Process connection thread), ISO 228-1)
  - 71381898 (G 1½ (Device connection thread + Process connection thread), ISO 228-1, with inspection certificate EN 10204 - 3.1 material)
  - 71381899 (G 1½ (Process connection thread), ISO 228-1, 1½ NPT (Device connection thread), ANSI/ASME)
  - 71381904 (G 1½ (Process connection thread), ISO 228-1, 1½ NPT (Device connection thread), ANSI/ASME, with inspection certificate EN 10204 - 3.1 material)

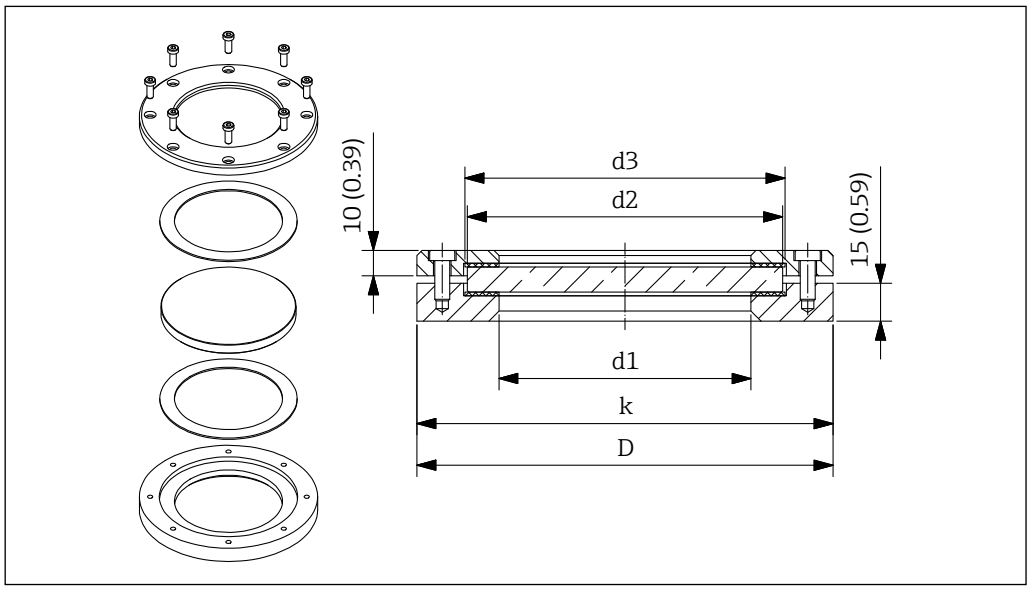
Plug



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

- Type FAR54 → TI01371F
- Material: PTFE, aluminum oxide ceramics
- Process temperature: -40 to +800 °C (-40 to +1472 °F)
- Weight: Depending on version (max. 12 kg (26.5 lb))

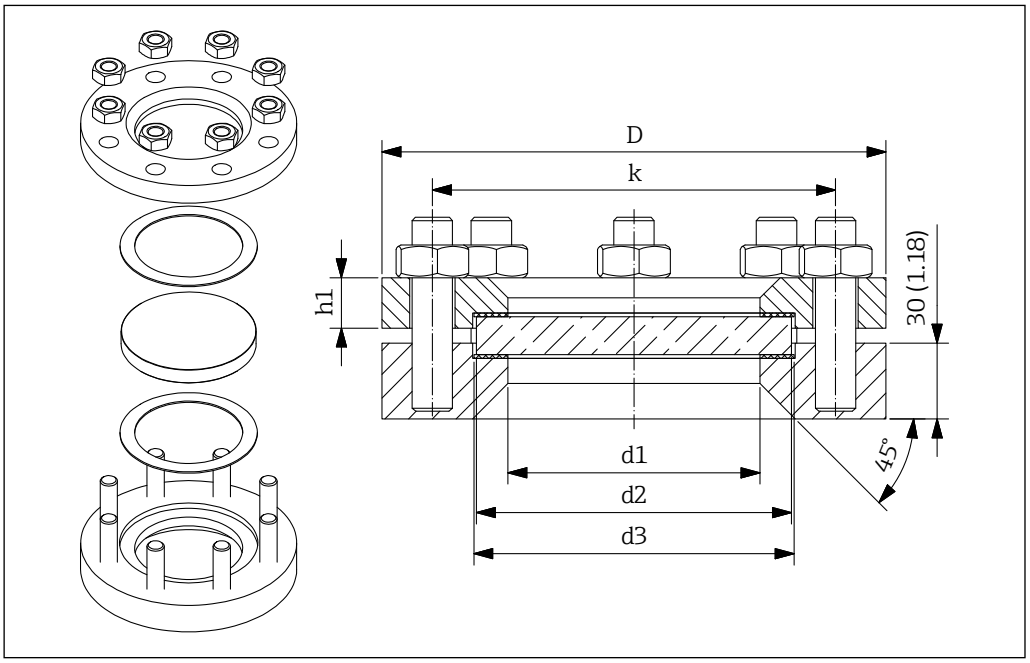
Sight glass fitting



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

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)

- 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)

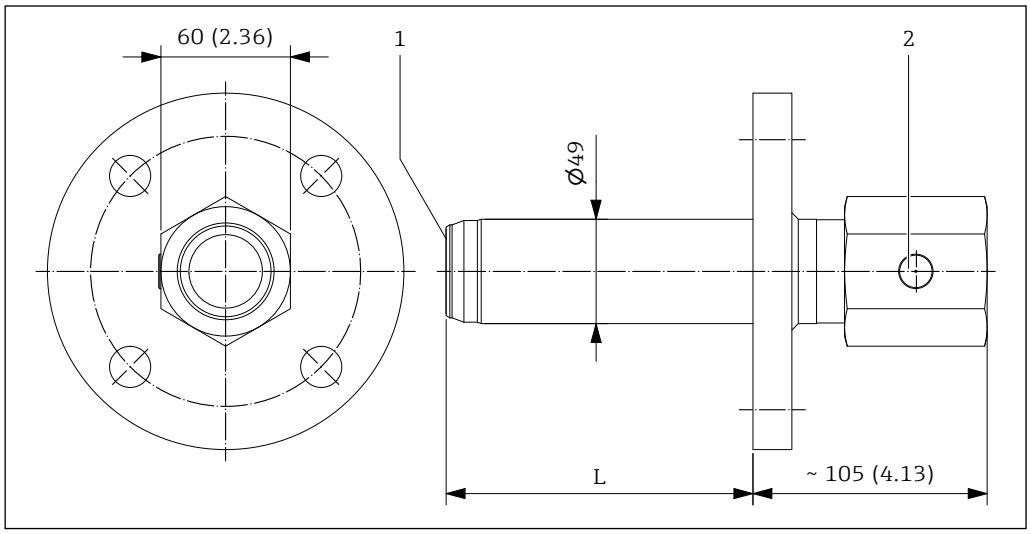


41 Dimensions sight glass fitting for processes up to 10 bar (145 psi). Unit of measurement mm (in)

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)

- 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)

Insertion adapter

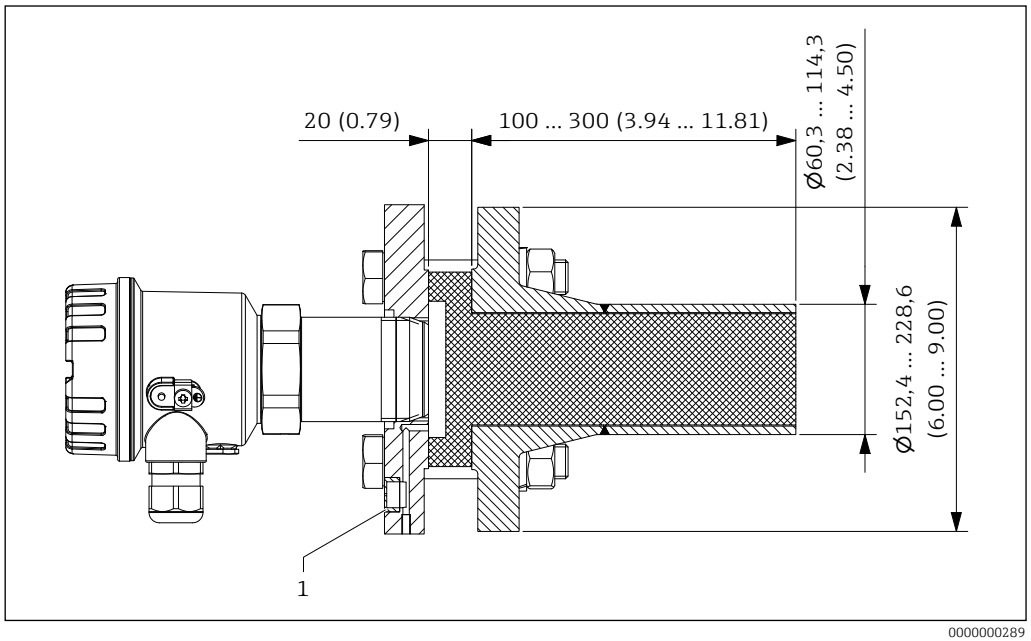


42 *Dimensions insertion adapter. Unit of measurement mm (in)*

1 Window with seal, optional
2 Integrated venting element

- 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 R 1½, 1½ NPT and G 1½
- Optionally with PTFE or aluminum oxide ceramics
- Process temperature: -40 to +450 °C (-40 to +842 °F)
- Process pressure: 0.8 to 1.1 bar (12 to 16 psi) absolute
- Material: 316Ti (1.4571)
- Weight: 5 to 10 kg (11 to 22 lb)

Weld-in nozzle

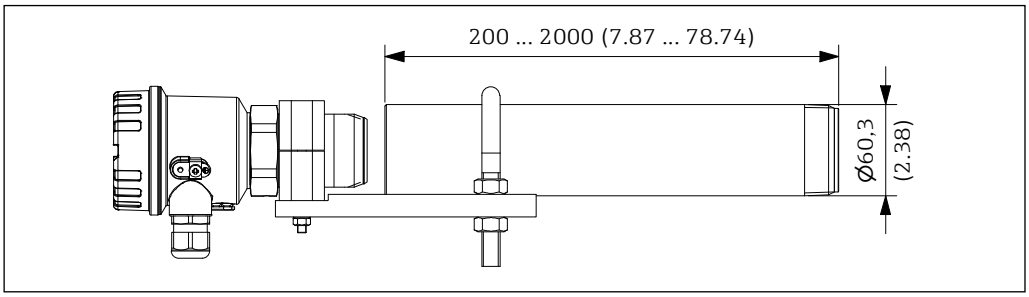


43 *Dimensions weld-in nozzle. Unit of measurement mm (in)*

1 Integrated venting element

- 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 R 1½, 1½ NPT and G 1½
- Process temperature: -40 to +200 °C (-40 to +392 °F)
- Process pressure: 0.8 to 1.1 bar (12 to 16 psi) absolute
- Material:
  - Nozzle: Stainless steel 316Ti (1.4571) or steel P235GH (1.0345)
  - Counter flange: Stainless steel 316Ti (1.4571) or steel P250GH (1.0460)
  - Plug: PTFE
- Weight: approx. 6 to 7 kg (13 to 15.5 lb)
- Mounting screws enclosed

Spacer tube (wave guide)

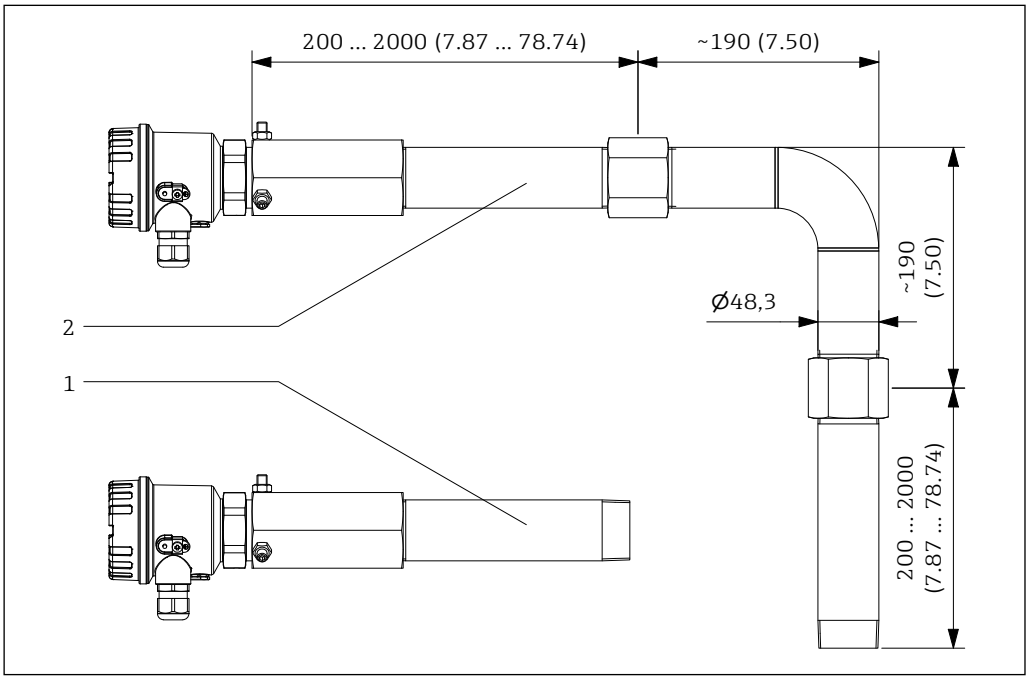


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44 *Dimensions spacer tube. Unit of measurement mm (in)*

- Type FAR53 → TI01370F
- Process connection: With or without thread R 2, 2 NPT and G 2
- With optional aluminum oxide ceramic disc
- Process temperature: -40 to +450 °C (-40 to +842 °F)
- Process pressure: 0.8 to 1.1 bar (12 to 16 psi) absolute
- Material: Stainless steel 316Ti (1.4571) or steel P235GH (1.0345)
- Weight: 200 mm approx. 5.3 kg (11.7 lbs) to 2000 mm approx. 22.2 kg (48.9 lbs)

Wave guide



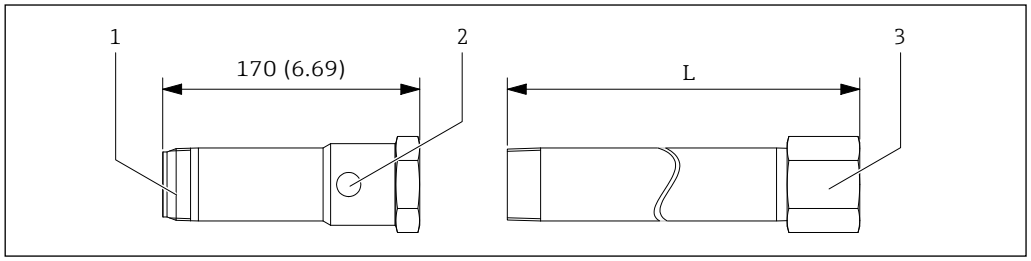
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45 *Dimensions wave guide. Unit of measurement mm (in)*

1 Straight version
2 Angulated version

- Type FAR55 → TI01372F
- Process connection: With or without thread R 1½ and 1½ NPT
- Lengths: L1 = 200 to 1500 mm (7.87 to 59.06 in), L2 = 200 to 2000 mm (7.87 to 78.74 in)
- Device connection: Receptacle, suitable for thread R 1½, 1½ NPT and G 1½
- Material: Stainless steel 316Ti (1.4571)
- Weight: FAR55-AAAACGAA2* approx. 2.0 kg (4.41 lbs) to FAR55-BAAADGDL2* approx. 17.8 kg (39.24 lbs)

High temperature adapter with extension



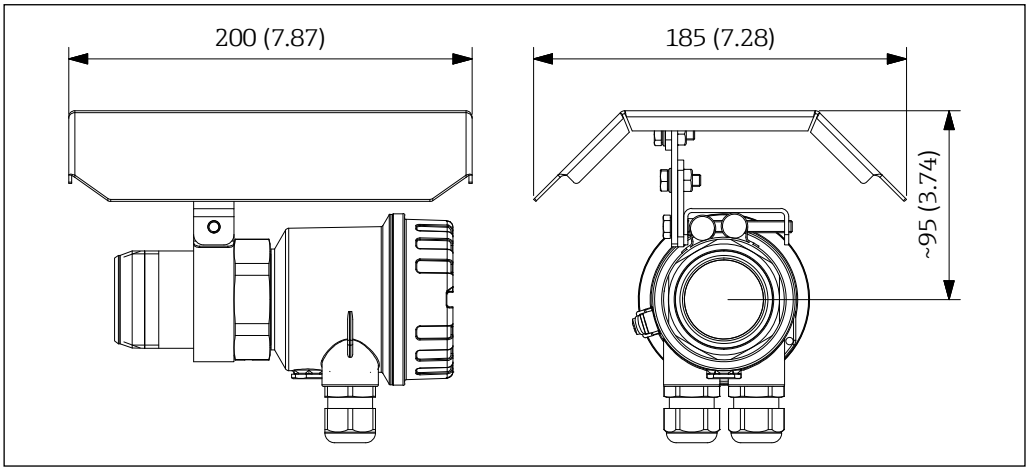
46 Dimensions high temperature adapter with extension. Unit of measurement mm (in)

1 High temperature adapter
2 Integrated venting element
3 Extension for high temperature adapter

High temperature adapter
- Process temperature: -20 to +450 °C (-4 to +842 °F)
- Process pressure: 0.8 to 5.1 bar (12 to 74 psi) absolute
- 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 (connection thread), G 1½ (internal thread))
  - 71478114 ((R 1½ (connection thread), G 1½ (internal thread), with inspection certificate EN 10204 - 3.1 material)
  - 71113449 (1½ NPT (internal and external thread))
  - 71478115 (1½ NPT (internal and external thread), with inspection certificate EN 10204 - 3.1 material)

Extension
- 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 (connection thread), G 1½ (internal thread), L = 225 mm (8.86 in))
  - 71113451 (R 1½ (connection thread), G 1½ (internal thread), L = 325 mm (12.80 in))
  - 71113452 (R 1½ (connection thread), G 1½ (internal thread), L = 525 mm (20.67 in))
  - 71113453 (1½ NPT (internal and external thread), L = 225 mm (8.86 in))
  - 71113454 (1½ NPT (internal and external thread), L = 325 mm (12.80 in))
  - 71113455 (1½ NPT (internal and external thread), L = 525 mm (20.67 in))

Weather protection cover



47 *Dimensions weather protective cover. Unit of measurement mm (in)*

- For outdoor installation in strong sunlight, the following weather protection cover can be used.
- Material: Stainless steel 316L (1.4404)
- Weight: approx.0.8 kg (1.76 lb)
- Mounting screws enclosed
- Order number: 71454446

Supplementary documentation

The certificates and approvals currently available can be accessed via the
- Product Configurator
- Endress+Hauser website: www.endress.com → Downloads.

Standard 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.
BA01684F

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.
KA01574F

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.

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