

# Electronic flow switch with display For liquid media Model FSD-4

WIKA data sheet FL 80.02



## Applications

- Control of cooling lubricant systems
- Monitoring of coolant circuits
- Control of filter units
- Dry run protection in pumps

## Special features

- Wear-free flow monitoring of liquid media using the calorimetric principle
- Flexibly configurable switching and analogue outputs for flow and temperature
- Easily parameterisable via 3-button operation or optionally via IO-Link 1.1
- Exact adaptation to the conditions on-site



Electronic flow switch, model FSD-4

## Description

The model FSD-4 electronic flow switch offers full flexibility in monitoring and controlling flow based on the velocities of liquid media. The switch points of the model FSD-4 can be freely configured very easily via the 3-button operation directly on the instrument or optionally via IO-Link. The model FSD-4 can output both absolute values in various units and relative flow values and display them on the digital indicator.

### Exact matching to the conditions on-site

The flow is determined by many factors such as the pipe diameter, the system set-up or the medium. Therefore, depending on the application, the actual flow value may differ from the calibrated value. Thanks to the teach function, the model FSD-4 can be set to the zero point and the maximum flow at the respective measuring location and thus optimally adjusted to the measuring conditions. The compression fitting on the flow switch offers additional flexibility. Depending on the pipe diameter, the immersion depth and alignment can be individually adjusted.

### Flexibly configurable switching outputs

Depending on the configuration, the model FSD-4 has up to two switch points plus analogue output, which can be freely programmed. Since the switch determines its flow data using a calorimetric measurement principle, the second switching output can also be enabled for a temperature value, while the first outputs a switching signal using the flow value. The flow switch can thus additionally be used for simple temperature-controlled processes.

### Easy access via IO-Link version 1.1

The parameters are set either via 3-button operation on the instrument or, optionally, via IO-Link. When changing the instrument, the settings for the respective measuring location can be transferred directly to the new flow switch. This eliminates the need for any repeat parameterisation at the measuring location and reduces the necessary integration effort. With IO-Link, additional functions such as an operating hours counter or max value memory can be called up and used for condition monitoring.

## Specifications

The model FSD-4 features a flow outlet as standard. A temperature output is available as an option.

| Accuracy specifications   |   |   |
|---|---|---|
| <b>Accuracy under calibration conditions</b>                      | <p>The accuracy of the flow switch depends on various parameters such as flow profile, flow conditions, viscosity and/or thermal conductivity of the medium, possible contamination and/or deposits on the sensor. Therefore, the reference measured values given only constitute an accuracy under calibration conditions.</p> <p>The model FSD-4 offers extensive adjustment possibilities to adapt the instrument to the on-site conditions in the best possible way.</p> <p>As a flow switch it is used for reliable monitoring, for example, of dry running. The flow value output should only be used as a trend indicator in order to monitor process changes.</p> |   |
| Flow  | 0.05 ... ≤ 1 m/s  | ≤ ±5 % of end value of measuring range  |
|   | > 1 ... ≤ 1.75 m/s  | ≤ ±10 % of end value of measuring range |
|   | > 1.75 ... 3 m/s  | ≤ ±20 % of end value of measuring range |
| Temperature   | ≤ ±2 K  |   |
| Non-repeatability per IEC 62828-1                                 |   |   |
| Flow  | ±2 % of end value of measuring range  |   |
| Temperature   | ≤ 0.5 K (for flow ≥ 0.2 m/s)  |   |
| <b>Temperature error, flow at -20 ... +85 °C [-4 ... +185 °F]</b> | 0.13 % of end value of measuring range per K (typical)  |   |
| <b>Reference conditions</b>                                       | Per IEC 62828-1   |   |
| Calibration conditions  |   |   |
| Medium  | Water   |   |
| Nominal position  | Process connection downwards<br>Inner diameter of pipe 26 mm<br>Upstream/Downstream pipe 1 m/0.5 m<br>Marking towards the upstream flow side ±5° twist  |   |

| Measuring range                             |  |  |
|---|--|--|
| Measuring range                             |  |  |
| Flow  | 0 ... 3 m/s [0 ... 9.84 ft/s]  |  |
|   | The in-factory adjustment is carried out with the medium water. It is recommended to carry out the adjustment, relative to the minimum/maximum flow of the system, via the menu.   |  |
| Temperature                                 | -20 ... +85 °C [-4 ... +185 °F]  |  |
| <b>Turndown ratio (flow or temperature)</b> | The analogue output signal is freely scalable within the range of 5:1<br>When setting turndown, there is a proportional increase in the measuring deviation and temperature error. |  |
| Digital display                             |  |  |
| Indication range                            | 14 segments  |  |
| Unit  | Flow   | % , m/s, l/min, m <sup>3</sup> /h, ft/s, ft <sup>3</sup> /min, gal(US)/min, gal(l)/min<br>Factory setting: m/s |
|   | Temperature  | °C, °F<br>Factory setting: °C  |
|   |  | The units are freely configurable.   |
| Colour                                      | Red (LED)  |  |
| Character size                              | 9 mm [0.35 in]   |  |
| Digits                                      | 4-digit  |  |
| Display                                     | The display can be rotated electronically through 180°.  |  |

| Process connection                         |           |                    |  |
|--|-----------|--------------------|--|
| Standard                                   | Thread    | Insertion length L | Sealing  |
| ISO 225-1                                  | M18 x 1.5 | 52 mm [2.05 in]    | FPM/FKM  |
| DIN EN ISO 1179-2<br>(formerly DIN 3852-E) | G ¼ A     | 28 mm [1.1 in]     | <ul style="list-style-type: none"> <li>■ NBR (standard)</li> <li>■ FPM/FKM (option)</li> <li>■ Without (option)</li> </ul> |
|  | G ½ A     | 30 mm [1.18 in]    |  |
|  | G ½ A     | 49 mm [1.93 in]    |  |
|  | G ½ A     | 79 mm [3.11 in]    |  |
|  | G ½ A     | 119 mm [4.69 in]   |  |
| ANSI/ASME B1.20.1                          | ¼ NPT     | 22 mm [0.87 in]    | -  |
|  | ½ NPT     | 38 mm [1.5 in]     | -  |
| - 1)                                       | Without   | 140 mm [5.51 in]   | -  |

1) For version with compression fitting

### Output signal

When ordering the FSD-4, only one of the three following output signal variants has to be selected. The signal type, as well as the assignment of the second switching output and the analogue output, can be individually programmed during commissioning.

IO-Link is optionally available for all output variants.

| Output signal    | Switching output 1 | Switching output 2 | Analogue output | IO-Link option |
|------------------|--------------------|--------------------|-----------------|----------------|
| Output variant 1 | x                  | x                  | -               | x              |
| Output variant 2 | x                  | -                  | x               | x              |
| Output variant 3 | x                  | x                  | x               | x              |

| Further details on: Output signal |   |
|-----------------------------------|---|
| <b>Signal type</b>                |   |
| Switching output 1                | <ul style="list-style-type: none"> <li>■ Flow, PNP</li> <li>■ Flow, NPN</li> </ul> Factory setting: Flow, PNP   |
| Switching output 2                | <ul style="list-style-type: none"> <li>■ Flow, PNP</li> <li>■ Flow, NPN</li> <li>■ Temperature, PNP</li> <li>■ Temperature, NPN</li> </ul> Factory setting: Flow, PNP                                       |
| Analogue output                   | <ul style="list-style-type: none"> <li>■ Flow, 4 ... 20 mA</li> <li>■ Flow, 0 ... 10 V</li> <li>■ Temperature, 4 ... 20 mA</li> <li>■ Temperature, 0 ... 10 V</li> </ul> Factory setting: Flow, 4 ... 20 mA |
| IO-Link                           | IO-Link is optionally available for all output signal configurations.   |
| <b>Switching function</b>         | <ul style="list-style-type: none"> <li>■ Hysteresis</li> <li>■ Window</li> </ul> Factory setting: Hysteresis  |
| <b>Contact function</b>           | <ul style="list-style-type: none"> <li>■ Normally closed</li> <li>■ Normally open</li> </ul> Factory setting: Normally open   |

| Further details on: Output signal         |  |  |
|---|--|--|
| <b>Setting range of the switch points</b> |  |  |
| Flow                                      | 0.05 ... 3 m/s [0.16 ... 9.84 ft/s]<br>Factory setting: 3 m/s  |  |
| Temperature                               | -18.2 ... +85 °C [-0.8 ... +185 °F]<br>Factory setting: 85 °C  |  |
| <b>Switch hysteresis</b>                  |  |  |
| Flow                                      | Adjustable, min. 1.7 % of end value of measuring range<br>Factory setting: 0.3 m/s   |  |
| Temperature                               | Min. 1.8 K<br>Factory setting: 1.8 K   |  |
| <b>Load in <math>\Omega</math></b>        |  |  |
| Analogue signal 4 ... 20 mA               | $\leq 500 \Omega$  |  |
| Analogue signal DC 0 ... 10 V             | $> \text{max. output voltage} / 1 \text{ mA}$  |  |
| <b>Signal clamping</b>                    | <ul style="list-style-type: none"> <li>■ <math>I_{\min} = 3.8 \text{ mA}</math></li> <li>■ <math>I_{\max} = 20.5 \text{ mA}</math></li> <li>■ <math>U_{\min} = 0 \text{ V}</math></li> <li>■ <math>U_{\max} = 10.3 \text{ V}</math></li> </ul> |  |
| <b>Switching current</b> <sup>1)</sup>    | Max. 250 mA per switching output   |  |
| <b>Switching voltage</b>                  | Supply voltage - 1 V   |  |
| <b>Communication</b>                      |  |  |
| Communication protocol                    | IO-Link 1.1, if IO-Link option has been selected   |  |
| <b>Voltage supply</b>                     |  |  |
| Supply voltage                            | DC 15 ... 35 V   |  |
| Current supply                            | Max. 650 mA including switching current  |  |
| Oversvoltage protection                   | DC 40 V  |  |
| <b>Dynamic properties per IEC 62828-1</b> |  |  |
| Settling time                             | Flow   | ■ 6 s (0 ... 100 %, 100 ... 0 %)         |
|   | Temperature  | ■ 4 s ( $t_{90}$ )<br>■ 2 s ( $t_{63}$ ) |
| Warm-up time                              | 10 s   |  |

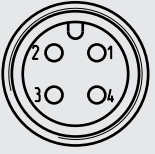
1) For max. switching currents, see derating curves on page 6.

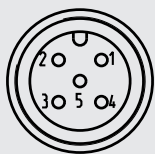
| Electrical connection   |  |
|---|--|
| <b>Connection type</b>  | <ul style="list-style-type: none"> <li>■ Circular connector M12 x 1 (4-pin)</li> <li>■ Circular connector M12 x 1 (5-pin) <sup>1)</sup></li> </ul> |
| <b>Pin assignment</b>   | → See below  |
| <b>Ingress protection (IP code) per IEC 60529</b> <sup>2)</sup> | IP65 and IP67  |
| <b>Short-circuit resistance</b>                                 | S+ / SP1 / SP2 vs. U-  |
| <b>Reverse polarity protection</b>                              | U+ vs. U-  |
| <b>Insulation voltage</b>                                       | DC 500 V   |

1) Only for version with two switching outputs and additional analogue output signal.

2) The stated IP codes (per IEC 60529) only apply when plugged in using mating connectors that have the appropriate IP code.

## Pin assignment

| Circular connector M12 x 1 (4-pin)  |                        |   |
|---|------------------------|---|
|  | U+                     | 1 |
|   | U-                     | 3 |
|   | S+ / SP2 <sup>1)</sup> | 2 |
|   | SP1 / C                | 4 |

| Circular connector M12 x 1 (5-pin)  |         |   |
|---|---------|---|
|  | U+      | 1 |
|   | U-      | 3 |
|   | S+      | 5 |
|   | SP1 / C | 4 |
|   | SP2     | 2 |

1) Depending on the configuration of the output signals

### Legend:

|     |                                |
|-----|--------------------------------|
| U+  | Positive power supply terminal |
| U-  | Negative power supply terminal |
| SP1 | Switching output 1             |
| SP2 | Switching output 2             |
| S+  | Analogue output                |
| C   | Communication with IO-Link     |

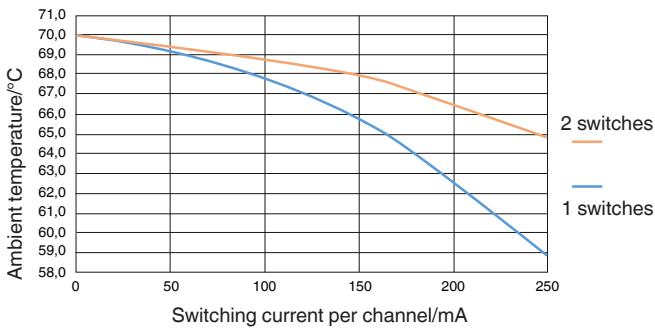
| Material  |                            |
|---|----------------------------|
| <b>Material (wetted)</b>                          |                            |
| Process connection, probe                         | Stainless steel 316Ti      |
| Sealing   | → See "Process connection" |
| <b>Material (in contact with the environment)</b> |                            |
| Case  | Stainless steel 304        |
| Keyboard  | TPE-E                      |
| Display window                                    | PC                         |
| Display head                                      | PC+ABS blend               |

| Operating conditions                    |  |
|---|--|
| Medium temperature range <sup>1)</sup>  | -20 ... +85 °C [-4 ... +185 °F]  |
| Ambient temperature range <sup>1)</sup> | -20 ... +70 °C [-4 ... +158 °F]  |
| Storage temperature range               | -20 ... +80 °C [-4 ... +176 °F]  |
| Derating curves                         | → See below  |
| Max. operating pressure                 | <ul style="list-style-type: none"> <li>■ 40 bar [580 psi]</li> <li>■ 30 bar [435 psi] with process connection M18 x 1.5</li> <li>■ 20 bar [290 psi] with optional compression fitting (→ see "Accessories")</li> </ul> |
| Vibration resistance per IEC 60068-2-6  | <ul style="list-style-type: none"> <li>■ 6 g, under resonance</li> <li>■ 3 g, 10 ... 500 Hz (with compression fitting)</li> </ul>  |
| Shock resistance per IEC 60068-2-27     | 50 g, mechanical   |
| Mounting position                       | → See operating instructions   |
| Ingress protection per IEC 60529        | → See "Electrical connection"  |
| Service life                            | 100 million switching cycles   |

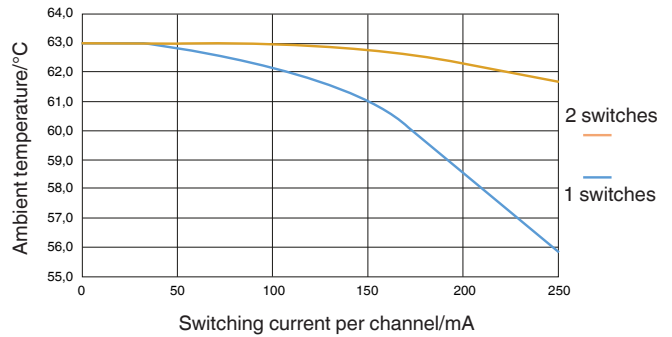
1) For permissible medium and ambient temperature, see derating curves on page 6.

## Derating curves

Max. ambient temperature, if ambient temperature  $\geq$  medium temperature



Max. ambient temperature, if medium temperature = 85 °C [185 °F]



## Packaging and instrument labelling

|                             |   |
|-----------------------------|---|
| <b>Packaging</b>            | Individual packaging  |
| <b>Instrument labelling</b> | <ul style="list-style-type: none"> <li>■ WIKA product label, glued</li> <li>■ Customer-specific product label on request</li> </ul> |

## Approvals

### Approvals included in the scope of delivery

| Logo | Description  | Country        |
|------|--|----------------|
|      | <b>EU declaration of conformity</b><br>EMC directive<br>EN 61326 emission (group 1, class B) and immunity (industrial application)<br>RoHS directive | European Union |
|      | <b>UL</b><br>Safety (e.g. electr. safety, overpressure, ...)   | USA and Canada |

## Manufacturer's information

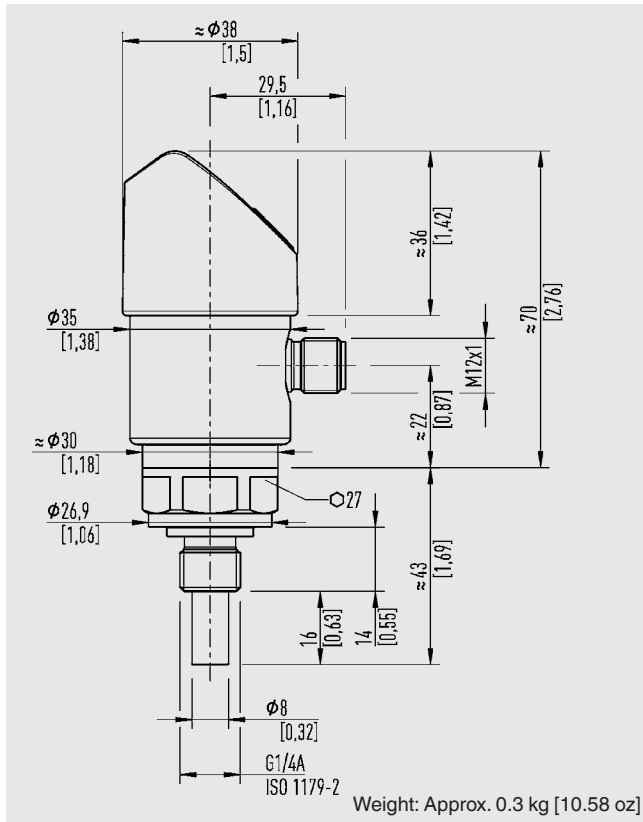
| Logo | Description          |
|------|----------------------|
| -    | China RoHS directive |

→ Approvals and certificates, see website

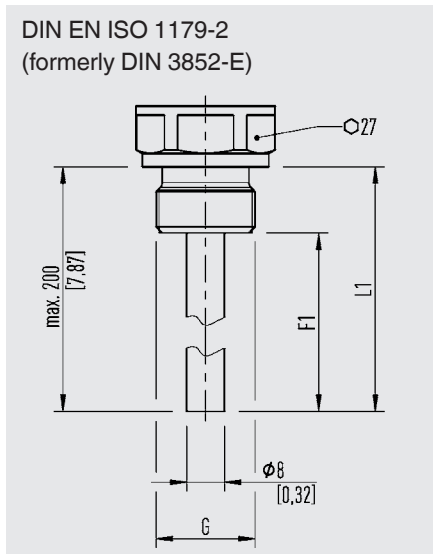
## Safety-related characteristic values

| Safety-related characteristic values |             |
|--------------------------------------|-------------|
| <b>MTTF</b>                          | > 100 years |

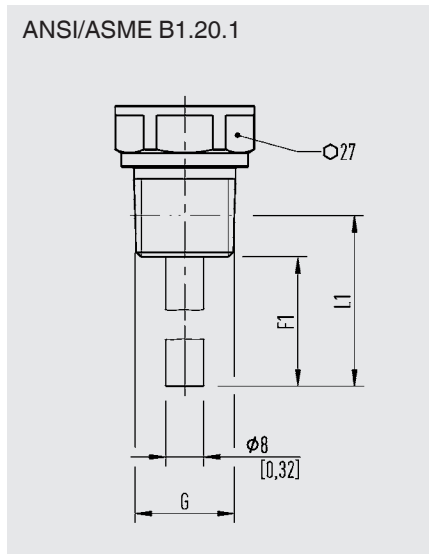
## Dimensions in mm [in]



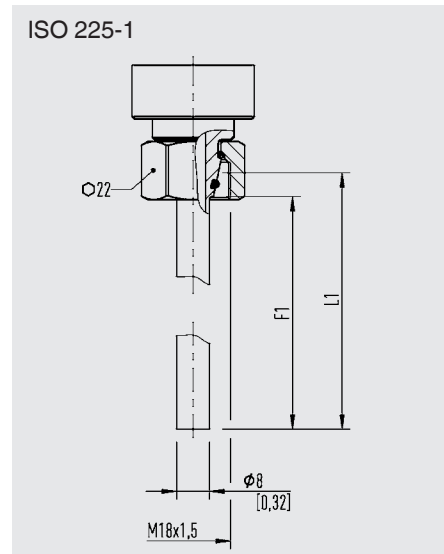
## Process connections



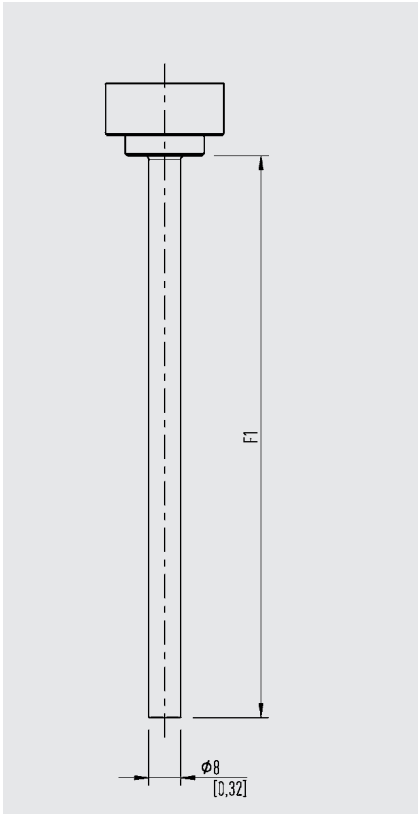
| G            | F1         | L1        |
|--------------|------------|-----------|
| <b>G ¼ A</b> | 16 [0.63]  | 43 [1.69] |
| <b>G ½ A</b> | 16 [0.63]  | 43 [1.69] |
|              | 35 [1.38]  | 62 [2.44] |
|              | 65 [2.65]  | 92 [3.62] |
|              | 105 [4.13] | 132 [5.2] |



| G            | F1        | L1        |
|--------------|-----------|-----------|
| <b>¼ NPT</b> | 16 [0.63] | 42 [1.65] |
| <b>½ NPT</b> | 30 [1.18] | 62 [2.44] |



| G                | F1                  | L1               |
|------------------|---------------------|------------------|
| <b>M18 x 1.5</b> | <b>46.2 [1.819]</b> | <b>52 [2.47]</b> |



| G | F1         |
|---|------------|
| - | 140 [5.51] |


**Legend**

F1 Probe length


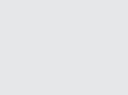


L1 Insertion length



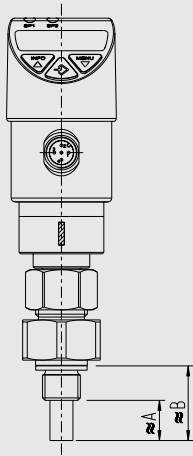
## Spare parts

| Sealings  | Description   |         | Order number |
|---|---|---------|--------------|
|  | Profile sealing G ¼ A DIN EN ISO 1179-2 (formerly DIN 3852-E) | NBR     | 1537857      |
|   |   | FPM/FKM | 1576534      |
|   | Profile sealing G ½ A DIN EN ISO 1179-2 (formerly DIN 3852-E) | NBR     | 1039067      |
|   |   | FPM/FKM | 1039075      |

## Accessories

| Circular connector M12 x 1 with moulded cable                                      |   |          |         |                                    |                     |                |              |
|--|---|----------|---------|------------------------------------|---------------------|----------------|--------------|
| Model  | Description                                       | Material | IP code | Temperature range                  | Cable diameter      | Cable length   | Order number |
|   | Straight version, cut to length, 4-pin, UL listed | PUR      | IP67    | -20 ... +80 °C<br>[-4 ... +176 °F] | 4.5 mm<br>[0.18 in] | 2 m [6.6 ft]   | 14086880     |
|  |   |          |         |                                    |                     | 5 m [16.4 ft]  | 14086883     |
|  |   |          |         |                                    |                     | 10 m [32.8 ft] | 14086884     |
|   | Straight version, cut to length, 5-pin, UL listed | PUR      | IP67    | -20 ... +80 °C<br>[-4 ... +176 °F] | 5.5 mm<br>[0.22 in] | 2 m [6.6 ft]   | 14086886     |
|  |   |          |         |                                    |                     | 5 m [16.4 ft]  | 14086887     |
|  |   |          |         |                                    |                     | 10 m [32.8 ft] | 14086888     |
|   | Angled version, cut to length, 4-pin, UL listed   | PUR      | IP67    | -20 ... +80 °C<br>[-4 ... +176 °F] | 4.5 mm<br>[0.18 in] | 2 m [6.6 ft]   | 14086889     |
|  |   |          |         |                                    |                     | 5 m [16.4 ft]  | 14086891     |
|  |   |          |         |                                    |                     | 10 m [32.8 ft] | 14086892     |
|  | Angled version, cut to length, 5-pin, UL listed   | PUR      | IP67    | -20 ... +80 °C<br>[-4 ... +176 °F] | 5.5 mm<br>[0.22 in] | 2 m [6.6 ft]   | 14086893     |
|  |   |          |         |                                    |                     | 5 m [16.4 ft]  | 14086894     |
|  |   |          |         |                                    |                     | 10 m [32.8 ft] | 14086896     |

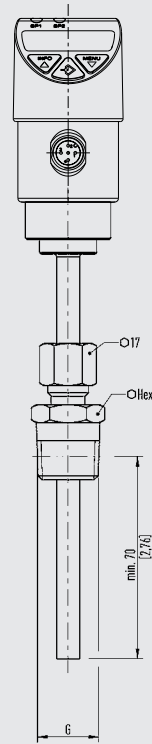
### FSD-4 with adapter



#### Legend:

- A Maximum probe immersion depth
- B Distance between sealing face and probe tip

### FSD-4 with compression fitting



### Adapters and compression fittings

| Model | Description                  | Recommended for pipe Ø                | B                                   | A                                 | Order number |
|-------|------------------------------|---------------------------------------|-------------------------------------|-----------------------------------|--------------|
|       | From M18 x 1.5 to G ¼        | 22 ... 50 mm<br>[0.86 ... 0.97 in]    | 28 mm<br>[1.10 in]                  | 16 mm<br>[0.63 in]                | 14242761     |
|       | From M18 x 1.5 to G ½, long  | 25 ... 60 mm<br>[0.98 ... 2.36 in]    | 31 mm<br>[1.22 in]                  | 17 mm<br>[0.67 in]                | 14242759     |
|       | From M18 x 1.5 to G ½, short | 32 ... 100 mm<br>[1.26 ... 3.93 in]   | 36 mm<br>[1.41 in]                  | 22 mm<br>[0.86 in]                | 14242760     |
|       | Compression fitting, G ½     | 140 ... 400 mm<br>[5.51 ... 15.75 in] | 70 ... 110 mm<br>[2.76 ... 4.33 in] | 56 ... 96 mm<br>[2.2 ... 3.78 in] | 3199551      |

| Adapters and compression fittings |                            |                                       |                                     |                                    |              |
|-----------------------------------|----------------------------|---------------------------------------|-------------------------------------|------------------------------------|--------------|
| Model                             | Description                | Recommended for pipe Ø                | B                                   | A                                  | Order number |
|                                   | Compression fitting, G ¼   | 140 ... 400 mm<br>[5.51 ... 15.75 in] | 70 ... 110 mm<br>[2.76 ... 4.33 in] | 58 ... 98 mm<br>[2.28 ... 3.86 in] | 11193396     |
|                                   | Compression fitting, ½ NPT | 140 ... 400 mm<br>[5.51 ... 15.75 in] | -                                   | 56 ... 96 mm<br>[2.20 ... 3.78 in] | 11397625     |
|                                   | Compression fitting, ¼ NPT | 140 ... 400 mm<br>[5.51 ... 15.75 in] | -                                   | 58 ... 98 mm<br>[2.28 ... 3.86 in] | 14268712     |

## Ordering information

Model / Output variant / Probe length / Process connection / Sealing / Accessories

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