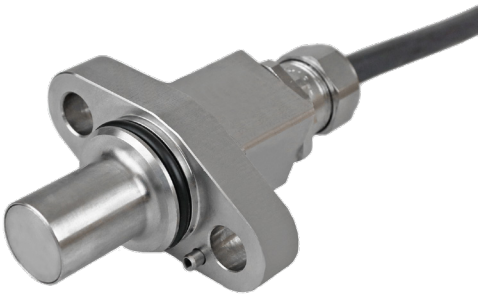
# Type FAH52 non-contact single- and double-channel speed sensor, Hall effect, with flange housing and stainless steel sensor rod

| | |
|---|---|
| Scanning type | Non-contacting |
| Measuring method | Hall principle |
| Frequency range | 0 ... 25,000 Hz |
| Supply voltage | 9 ... 32 VDC |
| Scanning object | Ferromagnetic materials |
| Protection class | Housing: IP66/IP68/IP69<br>Connector: IP66/IP68<br>Conductor with XGT protective tube: IP69 |
| Material | Flange: Stainless steel |
| Measuring channels | 1 or 2 measuring channels |
| Output signal and signal type | 2 square wave signals or<br>2 square wave signals + 1 status signal (standstill or direction of rotation) or<br>2 square wave signals + 2 inverted square wave signals |
| Output stage | Voltage output: push-pull output stage<br>Current output: current regulation |
| Options | Inverted output signals, output signals galvanically isolated; status signal for recognising standstill or direction of rotation |



Speed Sensor FAH52

## Area of application

Type FAH[..]52 speed sensors are used particularly in transport technology and in plant construction and machinery. They usually detect the rotational speed of ferromagnetic of gears (made of steel, for example). In addition, they can be used to detect the movements of ferromagnetic parts, such as those of:

- Gears with various tooth shapes
- Screw heads
- Bores, cutouts, grooves
- Pulse bands in the case of smooth shafts (accessory)

## Features

- Robust and high quality housing: IP69 pressure-tight and individually tested at 5 bar (for details see technical data)
- Measuring channels can be galvanically isolated in a housing as a voltage signal or current output signal respectively
- Excellent vibration and shock resistance
- High degree of EMC immunity for difficult electrical environment
- Straight or lateral conductor outlet, available with conductor protection system
- Individual tests for electrical safety, wiring and functioning are carried out at the factory
- Particularly suitable for transport technology due to its design and type testing in accordance with EN 50155

# Dimensioned drawings and installation diagrams

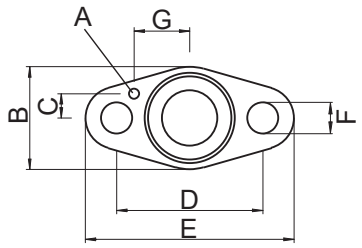



**Fig.: FA[..]52_Front_view_dimension**

**Key for figure to the left**

A) Fixing pin 3 mm (defines installation position) in accordance with ISO 8752-3
B) Length 29 mm
C) Length 7 mm
D) Length 42 mm
E) Length 60 mm
F) Ø 9 $^{-0.5}$ mm
G) Length 16 mm

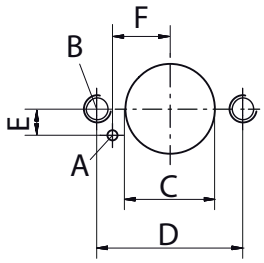



**Fig.: Bore hole for FA[..]52_top_view**

**Key for figure to the left**

A) Fixing pin 3 mm (defines installation position) in accordance with ISO 8752-3, bore: Ø 4 mm, bore depth 5 mm
B) Threaded bore M8
C) Ø 26 $^{H10}$ mm
D) Length 42 $^{\pm 0.2}$ mm
E) Length 7 mm
F) Length 16 mm

Recommended fastener:
Hexagon socket head cap screw ISO 4762 M8x20 with spring washer.

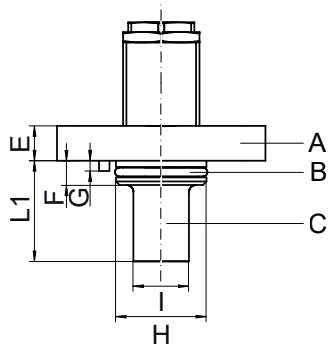



**Fig.: Fa[..]52_straight connector outlet**

**Key for figure to the left**

A) Stainless steel flange
B) O-ring 21 x 2.5 mm
C) Stainless steel sensor tube
D) Length 50…78 mm (depending on connector)
L1) Nominal length L1 (see part code)
E) Length 10 mm
F) Length 7 mm
G) Length 3 mm
H) Ø 26 $^{d10}$ mm
I) Ø 16 mm

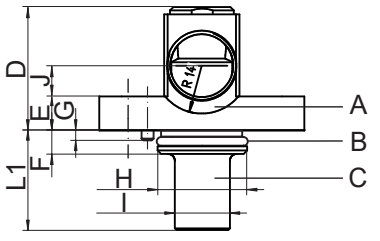



**Fig.: Fa[..]52_lateral connector outlet**

**Key for figure to the left**

A) Stainless steel flange
B) O-ring 21 x 2.5 mm
C) Stainless steel sensor tube
D) Length 36 $^{\pm 1}$ mm (with L1 ≥ 39 mm)
Length 46 $^{\pm 1}$ mm (with L1 < 39 mm)
L1) Nominal length L1 (see part code)
E) Length 10 mm
F) Length 7 mm
G) Length 3 mm
H) Ø 26 $^{d10}$ mm
I) Ø 16 mm
J) Length 9 mm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Installation position and distance from scan object; definition of the direction of rotation

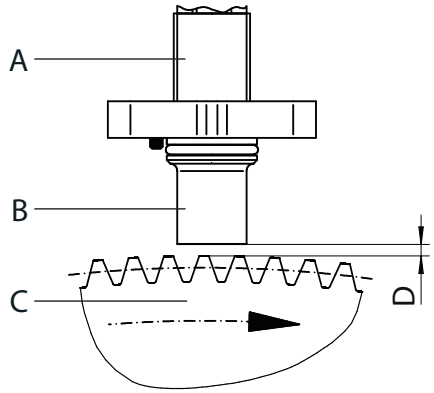
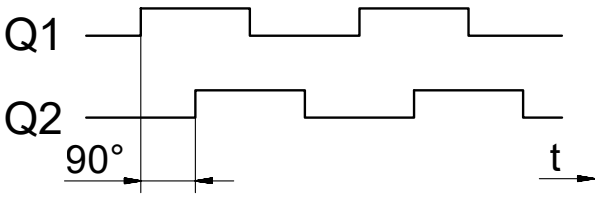



**Fig.: Fa[..]52_installation position and scan distance**

**Key for figure to the left**

A) Sensor housing (flange)
B) Sensor tube
C) Gear
D) For recommended scan distance see technical data

Standard: Q1 precedes Q2 by 90°. Customer-specific adjustment possible (e.g. Q1 precedes Q2 for left-turning pulse gear).





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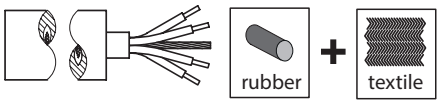
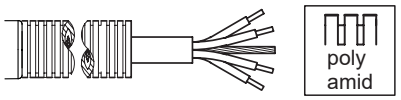
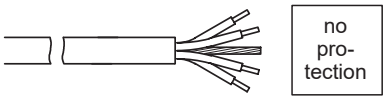
# Custom configurations

To find the best solution for your use case and achieve optimal installation conditions, we offer a wide range of tailored adjustments:

- Custom flange geometry, e.g. sensor tube length
- Customer-specific connector cable design (cross-section, ready-to-use cable length)
- Freely selectable connector plug
- Custom adjustment of status output: detection of outage or direction of rotation (clockwise or anticlockwise)
- Signal output: Voltage signal or current signal
- Detected frequency range
- Effectiveness of the conductor protection

**Conductor protection types**

| | | |
|---|---|---|
|  | **Rubber protective tube with textile fibre reinforcement** – flexible in the case of mechanical force, resistant against rockfall | **XGT** |
|  | **Corrugated polyamide pipe** – protects against moderate mechanical force, e.g. occasional rockfall | **XP** |
|  | **Reinforced cable sheath** - additional FRNC jacket in case of mechanical stress or adverse climatic conditions (e.g., temperature fluctuations) | **XV** |
|  | **No conductor protection** – applications without rockfall or other mechanical force | **X** |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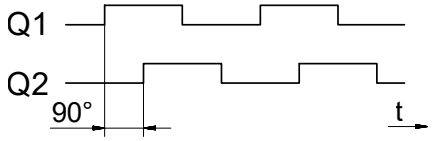
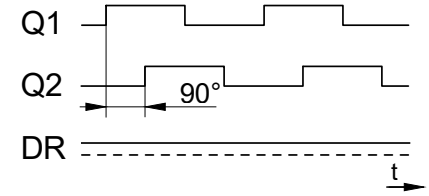
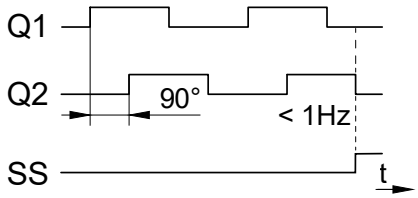
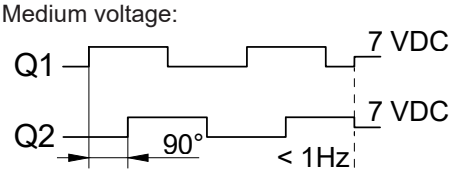
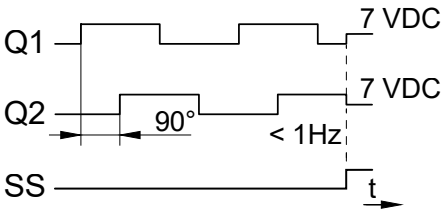
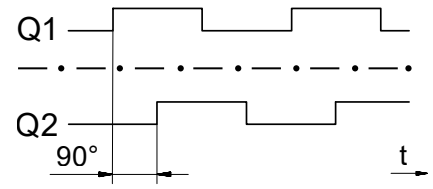
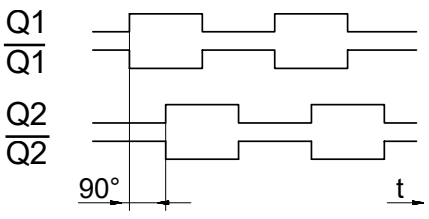
# Signal outputs in speed sensors with Hall principle

Unless stated otherwise, the sensors mentioned here have voltage signal outputs.

| Type | Signal outputs | Signal waveform |
|---|---|---|
| FAH52<br>FAHJ52 | A square wave signal;<br>FAH: Voltage signal output<br>FAHJ: Current signal output |  |
| FAHZ52 | Two square wave signals,<br>Q2 to Q1 phase offset by 90° |  |
| FAHS52 | Two square wave signals,<br>Q2 to Q1 phase offset by 90°, and<br>• a direction of rotation signal<br>• or a stillstand signal<br>• or a 7 V status level of Q1 and Q2 during outage (~medium voltage)<br>• or a 7 V status level of Q1 and Q2 during outage (~medium voltage) and an additional stillstand signal output | Direction of rotation:<br>  <br>Stillstand signal:<br>  <br>Medium voltage:<br>  <br>Medium voltage + stillstand signal:<br>  |
| FAHI52<br>FAHD52 | Two galvanically isolated square wave signals<br>Q2 to Q1 phase offset by 90°,<br>type FAHD with voltage signal output,<br>type FAHI with current signal output |  |
| FAHQ52 | Two square wave signals + two inverted square wave signals, Q1 to Q2 and Q1 to Q2 phase offset by 90° |  |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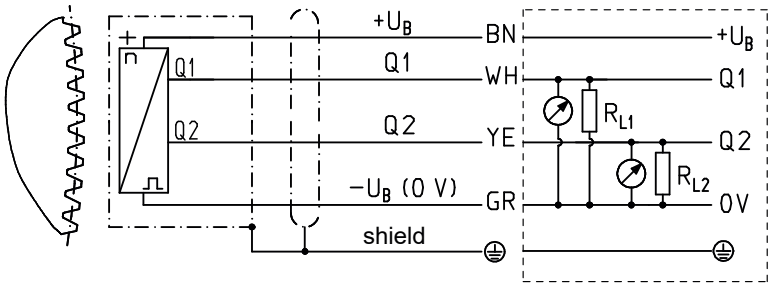
# Types of signal output

### Voltage signal output

The voltage signal output is designed to be a push-pull output stage. At a high level, the signal output is internally switched to the positive power supply in a low-resistance manner; at a low level, the signal output is internally switched to the negative power supply in a low-resistance manner. The sensor can therefore be operated as both a source and a sink, which allows a high interference immunity to be achieved under any operating conditions.




**In this example, the cable shield is connected to the sensor housing**

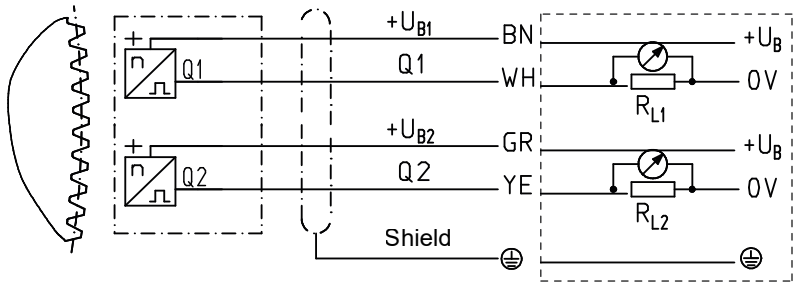
**Example for external connection**

Example of connector: FAHZ with shield support

### Current signal output

The current signal output is designed as a double conductor loop. The sensor regulates the current flow in a loop on the basis of the switch state (high or low). The current applied is not dependent on the electrical resistors in the conductor path. Current signal outputs have an extremely high immunity against electromagnetic interference, as induced voltages have almost no effect on the current flow applied. Furthermore, conductor interruptions in this signal type can be easily and reliably detected. For this reason, this signal type is preferable for applications with high safety requirements.

The evaluation of the current signal is carried out through, for example, the voltage drops at a load resistor. Our current signal outputs can be operated both with a load resistor in the conductor path of the positive supply voltage ($+U_{B;}$ high side load) and in the conductor path of the negative connector (Q; low side load).




**In the example shown: Shield is not connected to sensor housing**

**Example for external connection**

Example of connector: FAHI with low side load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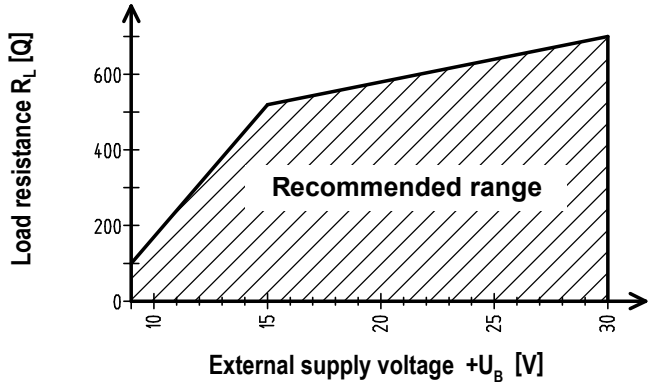
### Load resistor range of the current signal output

The recommended load resistance $R_L$ depends on the external supply voltage $+U_B$. By default, the sensors are designed for the following load resistance range:

| |
|---|
| $9\ V \leq +U_B \leq 15\ V: R_L \leq 68{,}67 \frac{\Omega}{V} \cdot +U_B\ [V] - 518\ \Omega$ |
| $15\ V \leq +U_B \leq 30\ V: R_L \leq 12{,}53 \frac{\Omega}{V} \cdot +U_B\ [V] + 324\ \Omega$ |




FAx current signal load resistor diagram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# Technical data

| Electrical connection | |
|---|---|
| Supply voltage | **FAH52,FAHZ52, FAHS52, FAHQ52:** 9 ... 32 VDC<br>**FAHD52:** 2 x 9 ... 32 VDC<br>**FAHI52:** 9 ... 30VDC<br>**FAHJ52:** 2 x 9 ... 30VDC |
| Nominal voltage | **FAHZ52, FAHS52, FAHQ52, FAHJ52:** 15 VDC<br>**FAHD52, FAHI52:** 2 x 15 VDC |
| Current consumption | **FAHZ52, FAHS52, FAHQ52, FAHD52:** < 20 mA (without output signal current)<br>**FAHI52:** 2 x 8.2 mA / 14.4 mA (depending on signal level)<br>**FAHJ52:** 1 x 8.2 mA / 14.4 mA |
| Reverse voltage protection | Yes |
| Over voltage protection | Yes |
| Connection | Cable end, customer-specific connectors, cf. customer drawing Cable end, customer-specific connectors, cf. customer drawing |
| Recommended conductor length | < 100 m |
| Conductor cross-section | Standard: 0.33 mm², shielded |

| Electrical output | |
|---|---|
| Measuring channels | **FAHZ52, FAHQ52:** 2 measuring channels<br>**FAHS52:** 2 measuring channels and status channel for rotation direction detection<br>**FAHD52, FAHI52:** 2 galvanically isolated measuring channels<br>**FAH52, FAHJ52:** 1 measuring channel |
| Output signal and signal type | **FAHZ52, FAHI52, FAHD52:** 2 square wave signals<br>**FAHS52:** 2 square wave signals, 1 status signal<br>**FAHQ52:** 2 square wave signals not inverted, 2 square wave signals inverted<br>**FAH52, FAHJ52:** 1 square wave signal |
| Output stage | **Voltage output:** push-pull output stage<br>**Current output:** current regulation |
| Continuous short circuit protection | Yes |
| Galvanic isolation | Types **FAHD** and **FAHI** only |
| Output level Low | **Sensors with voltage signal output:**<br>Per output: ≤ 0.8 V @ 15 VDC, 10 mA, 24 °C<br>**Sensors with current signal output:**<br>Per output: 8.2 mA +/- 4% @ 15 VDC, RL = 475 Ω, 24°C |
| Output level High | **Sensors with voltage signal output:**<br>Per output: ≥ +UB - 1.6 V @ 15 VDC, 10 mA, 24°C<br>**Sensors with current signal output:**<br>Per output: 14.4 mA +/- 4% @ 15 VDC, RL = 475 Ω, 24°C |
| Output current (sink)(voltage output only) | Per output: max. -50 mA [1] |
| Output current (load)(voltage output only) | Per output: max. 50 mA [1] |
| Internal resistance Ri | **Sensors with voltage signal output:** 45 Ω |
| Rise time | Voltage signal output: ≥ 10 V/µs; current signal output: ≥ 1 mA/µs |
| [1]The total of the output currents may not exceed 100 mA. | |


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| Signal acquisition | | |
|---|---|---|
| Measuring method | Hall principle | |
| Type of Frequency | Standard | F0 |
| Frequency range | 0.2 ... 20,000 Hz | 0 ... 25,000 Hz |
| Scanning object | Ferromagnetic materials,<br>Gear wheel: module m1 to m3 (other sizes on request)<br>Tooth width > 7 mm (spur gear DIN 867)<br>Bore: Ø ≥ 5 mm, bridge ≥ 2 mm, depth ≥ 4 mm<br>Groove: ≥ 4 mm, bridge ≥ 2 mm, depth ≥ 4 mm | |
| | optimised for scanning measurement objects with symmetrically interrupted surfaces, e.g., gears and impulse wheels | optimised for scanning objects with asymmetrically interrupted surfaces e.g. B. holes, screw heads and grooves<br>Output signal is issued faithfully according to the mechanical edges of the scanning object<br>Ideal for standstill detection and monitoring |
| Scanning object - distance | 0,2 ... 3 mm; recommended 1,0 ± 0,5 mm for m1,5 ... m3 \| 0,7 ± 0,4 mm @ m1...m1,25 | |
| Scanning object | Ferromagnetic materials | |
| Duty cycle | 50% ± 10% | |
| Phase shift | 90° ± 10% @ m1.5...m3 \| 90° ± 15% @ m1...m1.25 | |

| Environmental influences | |
|---|---|
| Operating temperature | -40 ... +120 °C |
| Storage temperature | Recommended: -25 ... +70 °C; max.: -40 ... +105 °C (max. limit values within 30 days per year @ relative humidity 5...95%) |
| Protection class | Housing: IP66/IP68/IP69<br>Connection: IP66/IP68; only -XGT: IP69 |
| Vibration resistance | IEC 61373, 30 g @ 10...500 Hz (Random) |
| Shock resistance | IEC 60068-2-27, 100 g @ 6 ms |
| Climatic test | IEC 60068-2-1/-2/-30 |
| EMI - HF immunity | IEC 61000-4-2, Lev. 3 (EMI - ESD)<br>IEC 61000-4-3, 10 V/m (RF - field)<br>IEC 61000-4-4, Lev. 3 (EMI - Burst)<br>IEC 61000-4-5, Lev. 2 (EMI - Surge)<br>IEC 61000-4-6, 10 Veff (RF - cabled)<br>IEC 61000-6-2<br>IEC 60553, 3 Veff (LF - cabled) |
| Emitted interference | IEC 61000-6-4, EN 55011 |
| Insulation | 500 VAC, 50 Hz @ 1 min (≥ 2 kV for FAH[..] upon request ) |
| Further standards | EN 50155, EN 50121-3-2, EN 55016 EMC A |

| Mechanical properties | |
|---|---|
| Material | Flange: stainless steel<br>Measuring surface: stainless steel |
| Mounting | Via flange mounting |
| Length | See customer drawing |
| Installation position | Preset with direction of rotation definition, with position pin defined |
| Weight | ≥ 190 g (depending on connection) |
| Pressure resistance | 5 bar (measuring area) |


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# Type code

| Part code structure | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FA** | **H** | **Z** | **52-** | **11-** | **S** | **X** | **07-** | **Appendage** | **Example: FAHZ52-11-SX07-M30S0** |
| | Measuring principle | | | | | | | | |
| | | Measuring principle extension | | | | | | | |
| | | | Model and material | | | | | | |
| | | | | Nominal length L1 of the sensor tube | | | | | |
| | | | | | Connector outlet | | | | |
| | | | | | | Electrical connection | | | |
| | | | | | | | Jacket length | | |
| | | | | | | | | Design/shield/appendage etc. | |

| FAH[..]52 part code | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Measuring principle** | **H** | Hall | | | | | | | |
| **Measuring principle extension** | | | 1 Output signal (voltage) | | | | | | |
| | | **Z** | 2 Output signal (voltage), galvanic coupling | | | | | | |
| | | **D** | 2 Output signal (voltage), galvanically isolated | | | | | | |
| | | **I** | 2 Output signal (current), galvanically isolated | | | | | | |
| | | **J** | 1 Output signal (current) | | | | | | |
| | | **S** | 2 Output signal (voltage), galvanic coupling with status output (e.g. direction of rotation detection, desired definition specific to customer) | | | | | | |
| | | **Q** | 4 Output signal (voltage), galvanic coupling | | | | | | |
| **Design, material** | | | **52-** | Flange, stainless steel sensor tube | | | | | |
| **Nominal length** | | | | **11-** | L1 = 29 mm | | | | |
| **Connector output** | | | | | | No identifier: straight connector outlet | | | |
| | | | | | **S** | Lateral connector output | | | |
| **Electrical connection** | | | | | | **X** | Conductor end standard (without protective tube) | | |
| | | | | | | **XV** | Reinforced cable sheath with additional FRNC jacket | | |
| | | | | | | **XGT** | Conductor end, protective tube, reinforced with textile fibre braiding | | |
| | | | | | | **XP** | Conductor end, protective tube, polyamide | | |
| **Sheath length** | | | | | | | **05-** | Sheath length 2.0 m, halogen-free | |
| | | | | | | | **07-** | Sheath length 5.0 m, halogen-free | |
| | | | | | | | **08-** | Sheath length 7.5 m, halogen-free | |
| | | | | | | | **09-** | Sheath length 10.0 m, halogen-free | |
| **Module** (sensor leaves factory preconfigured for specified module size) | | | | | | | | | No identifier: module m2 |
| | | | | | | | | **M10** | Module m1 |
| | | | | | | | | **M12** | Module m1.25 |
| | | | | | | | | **M15** | Module m1.5 |
| | | | | | | | | **M25** | Module m2.5 |
| | | | | | | | | **M30** | Module m3 |
| **Shield/appendage** | | | | | | | | | No identifier: Frequency type “Standard” |
| | | | | | | | | | **F0** Frequency range starting at 0 Hz |
| | | | | | | | | | No identifier: shield applied to sensor housing |
| | | | | | | | | | **S0** Shield **NOT** applied to sensor housing |
| **FA** | _ _ | _ _ | _ _- | _ _- | _ _ | _ _ | _ _- | _ _ | _ _ **Example: FAHZ52-11-X07** |

### Customer-specific types

If you don’t find anything suitable among our standard types, we’ll be happy to develop a tailored solution with you to meet your requirements (-P types). They also meet the abovementioned standards thanks to our type-approved modular kits.


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