

# Speed sensor type FAM52 with pre-settable frequency multiplier



Scanning type	Non-contacting
Measuring principle	Magneto-resistive principle
Frequency range(input)	0 ... 30,000 Hz
Output signal	Multiplier 1x, 2x, 4x, 8x input frequency (other factors on request)
Supply voltage	9 ... 32 VDC
Scanning object	Ferromagnetic materials, magnetic pole wheels
Protection class	Housing: IP66/IP68/IP69 Connection: IP66/IP68; Only -XGT and -XGS: IP69
Material	Flange: Stainless steel
Measuring channels	2 measuring channels
Output signal and signal type	2 square wave signals or 2 square wave signals + 2 inverted square wave signals
Output stage	Push-pull amplifier
Options	Customisable frequency multiplier, especially in use with magnetic pole wheel



Speed Sensor FAM52

## Application range

Speed sensors type series FAM use the magneto-resistive measurement principle. With this measurement principle, a higher signal resolution can be achieved. It is therefore suitable for applications in which very precise measurement results are required. The input range is designed for frequencies from 0 to 30 kHz. The output frequency can be multiplied if necessary to increase the resolution. In particular, the adjustability with quotients results in new control options for retrofit projects. The type 52 flange housing is particularly suitable for applications in transport technology. With the type test according to DIN EN 50155, applications in rail vehicles can be implemented.

## Specific features

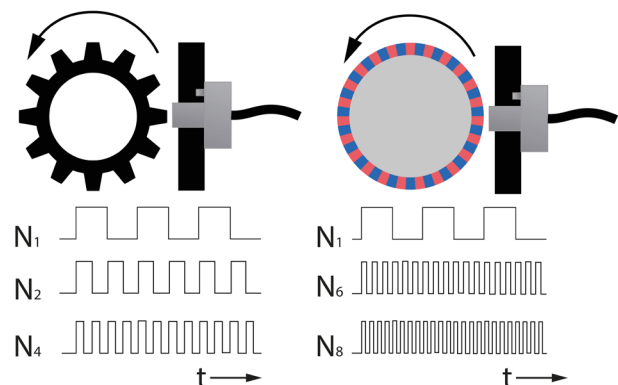
- High resolution output signal (frequency multiplication)
- In use with pole wheel for more accurate measurement, even ratios as multiplier are possible
- Robust and high quality housing: IP69 pressure-tight and individually tested at 5 bar (for details see technical data)
- High degree of EMC immunity for difficult electrical environment
- Due to its design and type approval according to DIN EN 50155 especially suitable for transport technology

## Measuring principle

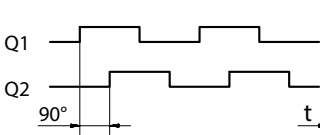
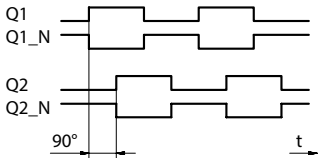
Speed sensors of the FAM52 series operate according to the magneto-resistive principle:

A resistance measuring bridge in the sensor detects the changes in the magnetic field angle caused by a ferromagnetic object or a magnetic pole wheel. The speed sensor converts these changes into square-wave signals.

Due to the measuring principle, high-precise measurement results can be achieved. The sensor can detect any number of threshold points. In use with a toothed wheel, the output frequency can be multiplied by factor 2 or 4. If required, even ratios are possible. In use with a magnetic pole wheel, higher multipliers are possible (factors 6 or 8).

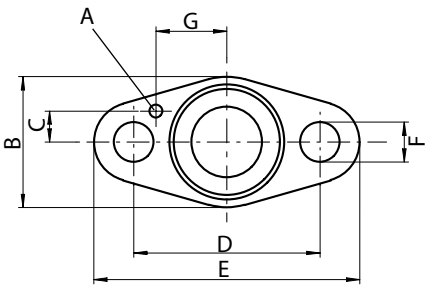
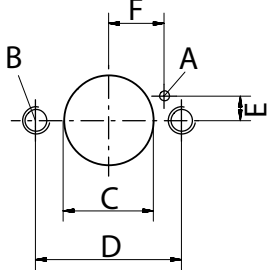
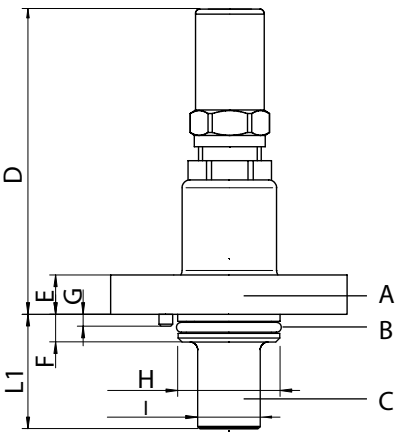
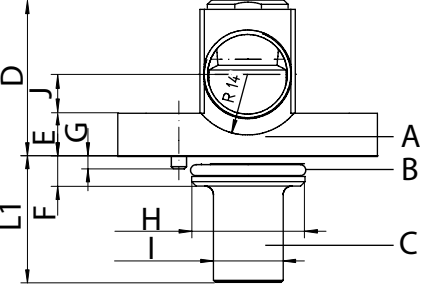


## Overview speed sensors FA[.]52

Type	Measuring principle	Signal outputs	Signal form
FAMZ52	Magneto-resistive	Two square wave signals, Q2 to Q1 is 90° phase shifted	 <p>Q1 Q2 90° t</p>
FAMQ52	Magneto-resistive	Two + Two inverted square wave signals, Q1 to Q2 and Q1_N to Q2_N are 90° phase shifted	 <p>Q1 Q1_N Q2 Q2_N 90° t</p>

# Dimensions, connections and drawings

## Dimensions and mounting drawing

 <p><b>Fig.: FA[..]52_Front View_Dimensions</b></p>	<p><b>Explanation to the left illustration</b></p> <ul style="list-style-type: none"> <li>A) Locator pin 3 mm (installing position) acc. DIN1481-3</li> <li>B) Length 29 mm</li> <li>C) Length 7 mm</li> <li>D) Length 42 mm</li> <li>E) Length 60 mm</li> <li>F) <math>\varnothing 9^{-0.5}</math> mm</li> <li>G) Length 16 mm</li> </ul>
 <p><b>Fig.: Borehole for FA[..]52_Top view</b></p>	<p><b>Explanation to the left illustration</b></p> <ul style="list-style-type: none"> <li>A) Borehole depth for locator pin 3 mm (installing position) acc. DIN1481-3, borehole <math>\varnothing 4</math> to 5 mm</li> <li>B) Borehole size M8</li> <li>C) <math>\varnothing 26^{H10}</math> mm</li> <li>D) Length <math>42^{\pm 0.2}</math> mm</li> <li>E) Length 7 mm</li> <li>F) Length 16 mm</li> </ul> <p>Recommended fixing: Hexagon socket screw DIN912 M8x20 with spring washer.</p>
 <p><b>Fig.: FA[..]52_Straight connection outlet</b></p>	<p><b>Explanation to the left illustration</b></p> <ul style="list-style-type: none"> <li>A) Flange: Stainless steel</li> <li>B) O-ring 21 x 2.5 mm</li> <li>C) Sensor tube: Stainless steel</li> <li>D) Length 53...78 mm (depending on connection)</li> <li>L1) Nominal length L1 (see type code)</li> <li>E) Length 10 mm</li> <li>F) Length 7 mm</li> <li>G) Length 3 mm</li> <li>H) <math>\varnothing 26^{d10}</math> mm</li> <li>I) <math>\varnothing 20</math> mm</li> </ul>
 <p><b>Fig.: FA[..]52_lateral connection outlet</b></p>	<p><b>Explanation to the left illustration</b></p> <ul style="list-style-type: none"> <li>A) Flange: Stainless steel</li> <li>B) O-ring 21 x 2.5 mm</li> <li>C) Sensor tube: Stainless steel</li> <li>D) Length <math>36 \pm 1</math> mm (for <math>L1 \geq 38</math> mm) Length <math>46 \pm 1</math> mm (for <math>L1 &lt; 38</math> mm)</li> <li>L1) Nominal length L1 (see type code)</li> <li>E) Length 10 mm</li> <li>F) Length 7 mm</li> <li>G) Length 3 mm</li> <li>H) <math>\varnothing 26^{d10}</math> mm</li> <li>I) <math>\varnothing 20</math> mm</li> <li>J) Length 9 mm</li> </ul>

**Mounting position and scan object distance**

**Explanations to the left illustration**

- A) Sensor housing (flange)
- B) Sensor tube
- C) Toothed Wheel
- D) Recommended distance from scanning object see technical data

**Connection cables and pin assignment**

The following table shows an overview about the speed sensors and the related connection cables. All cables are available without protective tubing (-X type), with textile reinforced protective tubing (-XGT type), with steel reinforced protective tubing (-XGS type) or with polyamide protective tubing (-XP).

Connection type -X, -XGS, -XP	FAMZ52	FAMQ52
Cable with 4 wires	X	-
Cable with 6 wires	-	X

**Connection cable type -X for sensors with 4 connecting wires**

**Explanation to the left illustration**

- A) Wires 4 x 0.33 mm<sup>2</sup> halogen-free
- B) Length 80 ±10 mm
- C) Length K1 ± 5% (K1 see customer drawing)
- D) Ø 7 ±0.5 mm

**Connection cable type -X for sensors with 6 connecting wires**

	<p><b>Explanation to the left illustration</b></p> <p>A) Wires 6 x 0.33 mm<sup>2</sup> halogen-free          B) Length 80 ±10 mm          C) Length K1 ±5% (K1 see customer drawing)          D) Ø 7 ±0.5 mm</p>
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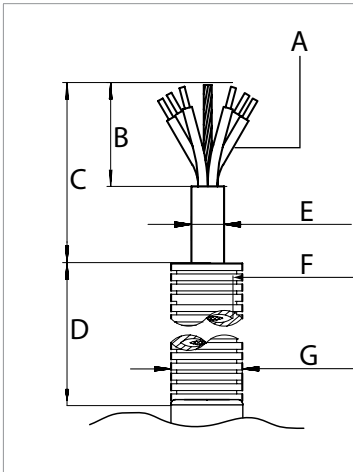
**Connection cable type -XGS[.], -XGT[.] (protective tubing steel or textile reinforced) for sensors with 4 connecting wires**

	<p><b>Explanation to the left illustration</b></p> <p>A) Wires 4 x 0.33 mm<sup>2</sup> halogen-free          B) Length 80 ±10 mm          C) Length 200 ±20 mm          D) Length K1 ±5% (K1 see customer drawing)          E) Ø 4.6 ±0.5 mm          F) Ø 6.4 ±0.5 mm          G) Ø 13.4 ±0.7 mm</p>
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**Connection cable type -XGS[.], -XGT[.] (protective tubing steel or textile reinforced) for sensors with 6 connecting wires**

	<p><b>Explanation to the left illustration</b></p> <p>A) Wires 6 x 0.33 mm<sup>2</sup> halogen-free          B) Length 80 ±10 mm          C) Length 200 ±20 mm          D) Length K1 ±5% (K1 see customer drawing)          E) Ø 7 ±0.5 mm          F) Ø 9.5 ±0.5 mm          G) Ø 16.5 ±0.5 mm</p>
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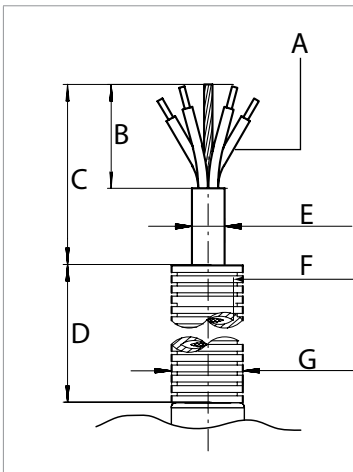
**Connection cable type -XP[.] (polyamide protective tubing) for sensors with 6 connecting wires**



**Explanation to the left illustration**

- A) Wires 6 x 0.33 mm<sup>2</sup> halogen-free
- B) Length 80 ±10 mm
- C) Length 200 ±20 mm
- D) Length K1 ±5% (K1 see customer drawing)
- E) Ø 7 ±0.5 mm
- F) Ø 9.6 ±0.5 mm
- G) Ø 13 ±0.5 mm

**Connection cable type -XP[.] (polyamide protective tubing) for sensors with 4 connecting wires**



**Explanation to the left illustration**

- A) Wires 4 x 0.33 mm<sup>2</sup> halogen-free
- B) Length 80 ±10 mm
- C) Length 200 ±20 mm
- D) Length K1 ±5% (K1 see customer drawing)
- E) Ø 7 ±0.5 mm
- F) Ø 9.6 ±0.5 mm
- G) Ø 13 ±0.5 mm

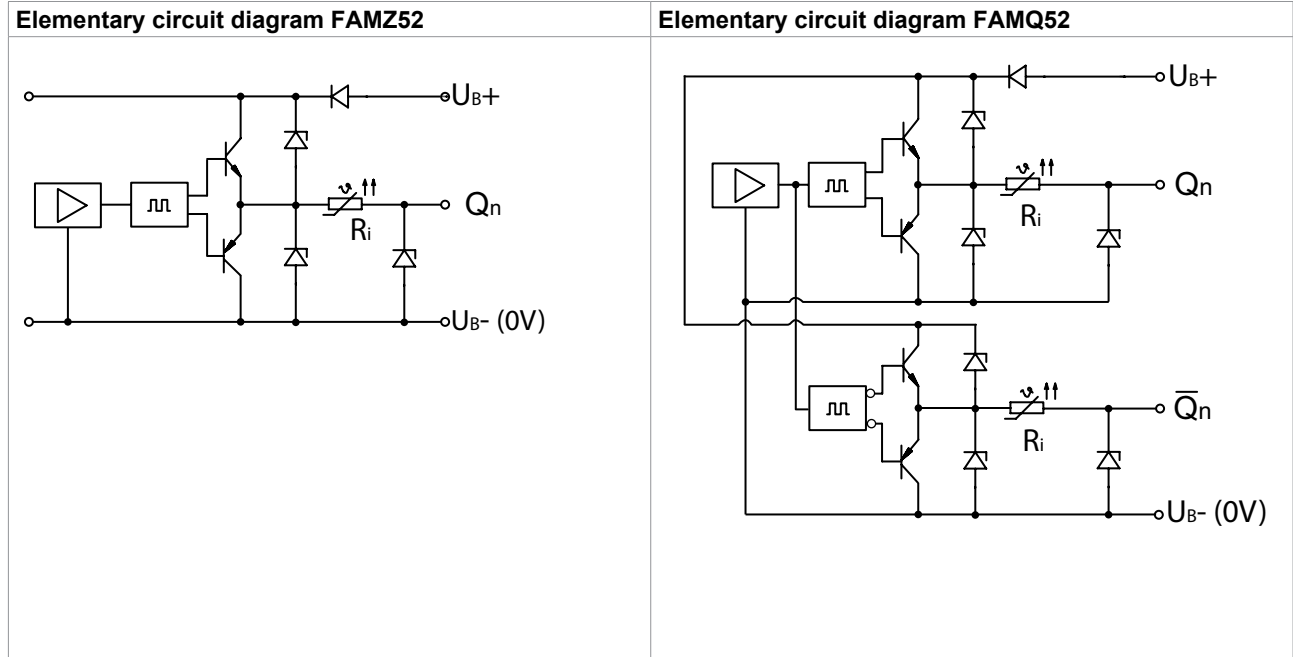
**Connection assignment for type FA[.].Z**

Colour	Explanation
Brown	U <sub>s</sub> +
Green	U <sub>s</sub> - (0V)
White	Signal Q1
Yellow	Signal Q2
Shield	Ground

**Connection assignment for type FA[.].Q**

Colour	Explanation
Brown	U <sub>s</sub> +
Green	U <sub>s</sub> - (0V)
White	Q1
Grey	Q1_N, inverted to Q1
Yellow	Q2
Pink	Q2_N inverted to Q2
Shield	Ground

**Electrical connection – Elementary circuit diagrams**



## General technical data

Electrical connection	
Supply voltage	9 ... 32 VDC
Nominal voltage	15 VDC
Current consumption	< 20 mA (without output current PNP)
Reverse voltage protection	Yes
Over voltage protection	Yes
Connection	Cable end, customized connections acc. customer drawing
Recommended cable length	< 100 m
Used cable cross section	0.33 mm <sup>2</sup> , shielded

Electrical output	
Measuring channels	2 measuring channels
Output signal and signal type	2 square wave signals or 2 square wave signals + 2 inverted square wave signals <b>Option:</b> frequency multiplier
Output stage	Push-pull amplifier
Continuous short circuit protection	Yes
Galvanic isolation	No
Output level Low	Per output: $\leq 0.8 \text{ V @ } 15 \text{ VDC, } 10 \text{ mA, } 24 \text{ }^\circ\text{C}$
Output level High	Per output: $\geq \text{US+} - 1.6 \text{ V @ } 15 \text{ VDC, } 10 \text{ mA, } 24 \text{ }^\circ\text{C}$
Output current NPN (Sink)	Per output: max. -50 mA
Output current PNP (Load)	Per output: max. 50 mA
Internal resistance Ri	60 $\Omega$
Rise time	$\geq 10 \text{ V}/\mu\text{s}$

Signal acquisition	
Measuring principle	Magneto-resistive principle
Frequency range	0 ... 30,000 Hz
Scanning object - distance	Module 1: 0.2 ... 0.9 mm (recommended: $0.5 \pm 0.2 \text{ mm}$ ); Module 1.5: 0.2 ... 1.1 (recommended: $0.6 \pm 0.2 \text{ mm}$ ); Module 2: 0.2 ... 1.3 mm (recommended $0.7 \pm 0.2 \text{ mm}$ );
Scanning object	Ferromagnetic materials, magnetic pole wheels
Duty cycle	50 % $\pm$ 10 %
Phase shift	90° $\pm$ 10%



**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 Connection: IP66/IP68; Only -XGT and -XGS: IP69
Vibration resistance	IEC 60068-2-6, 40 g @ 100...2000 Hz (Sinus) IEC 61373, 30 g @ 10...500 Hz (Random)
Shock resistance	IEC 60068-2-27, 1000 m/s <sup>2</sup> @ 6 ms
Climatic test	IEC 60068-2-1/-2/-30
EMI - ESD	IEC 61000-4-2, Lev. 3
EMI - Burst	IEC 61000-4-4, Lev. 3
EMI - Surge	IEC 61000-4-5, Lev. 2
EMI - HF immunity	IEC 61000-4-3, 10 V/m IEC 61000-4-6 (RF - conducted), 10 Veff IEC 60553 (AF - conducted), 10 Veff
Emitted interference	CISPR 16-1, CISPR 16-2 EMC2
Insulation voltage	500 VAC, 50 Hz @ 1 min (≥ 2kV for FAH[...] type on request)
Further standards	EN 50155, EN 55016, EN 50121

**Mechanical properties**

Material	Sensor tube: Stainless steel Measuring area: Aluminium
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)

# Type code

## Type code structure

<b>FA</b>	<b>M</b>	<b>Z</b>	<b>52-</b>	<b>11-</b>	<b>S</b>	<b>X</b>	<b>07-</b>	<b>M30-</b>	<b>S0</b>	<b>Example: FAMZ52-11-SX07-M30-S0</b>
Measuring principle										
Measuring principle supplement										
Construction type and material										
Nominal length L1 of the sensor tube										
Connection outlet										
Electrical connection										
Sheath length										
Module										
Output signal multiplier										
Shield / Addition										

## Type code FAM[..**52**

<b>Measuring principle</b>	<b>M</b>	Magneto-resistive								
<b>Measuring principle supplement</b>	<b>Z</b>	2 output signals (voltage), galvanically connected								
	<b>Q</b>	4 output signals (voltage), galvanically connected								
<b>Construction type and material</b>	<b>52-</b>	Flange, stainless steel sensor tube								
<b>Nominal length</b>	<b>11-</b>	L1 = 29 mm								
<b>Connection outlet</b>		Without code: straight cable outlet								
	<b>S</b>	Lateral cable outlet								
<b>Electrical connection</b>	<b>X</b>	Cable end standard (without protective tubing)								
	<b>XGS</b>	Cable end, protective tubing, steel reinforced								
	<b>XGT</b>	Cable end, protective tubing, textile reinforced								
	<b>XP</b>	Cable end, protective tubing, polyamide								
<b>Sheath length</b>	<b>05-</b>	Sheath length 2.0 m, halogen-free								
	<b>07-</b>	Sheath length 5.0 m, halogen-free								
	<b>08-</b>	Sheath length 7.5 m, halogen-free								
	<b>09-</b>	Sheath length 10.0 m, halogen-free								
<b>Module (toothed wheel)</b>	<b>M10-</b>	Module m1								
	<b>M15-</b>	Module m1.5								
		Without code: Module m2								
<b>Pitch (magn. Pole wheel)</b>	<b>P20</b>	Pitch 2.0								
	<b>P25</b>	Pitch 2.5								
	<b>P50</b>	Pitch 5.0								
<b>Multiplier</b>		Without code: no multiplier								
	<b>N02</b>	Multiplier factor 2								
	<b>N03</b>	Multiplier factor 4								
	<b>N##</b>	Other factors on request								
<b>Shield</b>		Without code: Shield attached to the sensor housing								
	<b>S0</b>	Shield not attached to the sensor housing								
<b>FA</b>	--	--	--	--	--	--	--	--	--	<b>Example: FAMZ52-11-X07-N03</b>

### Special types

If our standard types do not correspond with your expectations, we are pleased to develop a special solution together with you.