

# Non-contacting two-channel speed sensor FAHZ53 with signal amplifier, difference-hall-effect principle



Scan type:	Non-contacting Ferromagnetic materials Direction-sensitive
Frequency range:	0.2 ... 20,000 Hz
Supply voltage:	8...24 VDC
Scan object - distance:	0.2 ... 3 mm; recommended: $1.0 \pm 0.5$ mm; Tooth wheel: Module $\geq m1$ to $m3$ ; tooth face width $> 7$ mm (spur gear DIN867)
Degree of protection:	Housing: IP66/IP68 Connection Type X IP67; Type XG/XP IP68
Material:	Sensor tube: Stainless steel
Length:	See drawing
Mounting:	Flange mounting
Output channels:	2 channels
Output signal:	2 x square wave signals, level approx. UB
Output stage:	Push-pull amplifier
Galvanic separation:	No



Speed Sensor FAHZ53

## Application range

Speed sensors of the FAHZ53 series are especially designed for use in: Transport technology. They measure (non-contacting) the speed of ferromagnetic toothed wheels. Furthermore they can be used to measure any movement of ferromagnetic parts, e. g.:

- Toothed wheels with different tooth forms
- Bolt heads
- Lands detects holes, openings or grooves
- Impuls bands for plain shafts

## Measurement principle

Speed sensors of the FAHZ53 series operate according to the difference-hall-effect principle.

Two closely spaced Hall elements are located on the sensor chip. The field of the magnet generates a constant voltage in the Hall elements. Ferromagnetic objects with an interrupted surface moving past the Hall elements cause the Hall voltage to change. When the moving part covers a Hall element and the other does not, a differential voltage is generated to provide a measuring signal. The frequency of this signal is proportional to the speed of movement (rotational speed). The difference-hall-effect principle is direction sensitive.

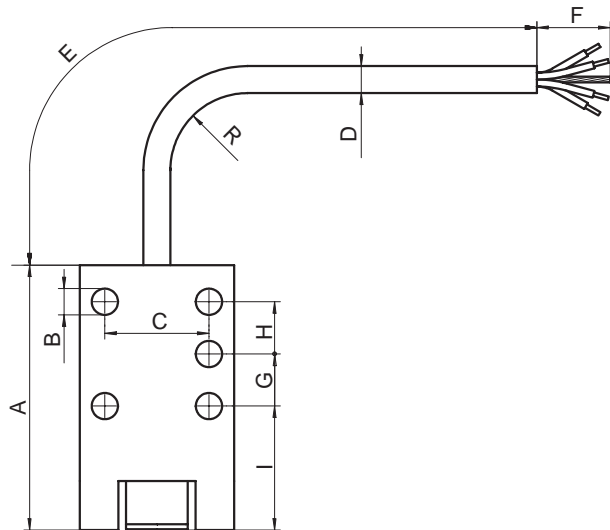
## Specific features

- Robust and high quality housing: IP68 pressure-tight and individually tested at 5 bar
- Speed sensor with two square wave signals, signals 90° offset
- Excellent vibration and shock resistance
- High degree of EMC immunity for difficult electrical environment
- Straight connection outlet
- Detection of very low speed (near zero speed)
- Due to its design especially suitable for transport technology

## Dimensions, connections and drawings

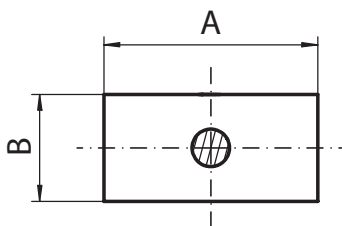
Unless specified differently all dimensions in the following drawings in [mm].

### Dimensions and mounting drawing



#### Explanation to the left illustration

- A) Length 68.7 mm
  - B) Diameter 6.8 mm
  - C) Length  $27^{\pm 0.1}$  mm
  - D) Cable diameter  $0.7^{\pm 0.5}$  mm
  - E) Variable cable length (see type code)
  - F) Length  $80^{\pm 10}$  mm
  - G) Length 13.5 mm
  - H) Length 13.5 mm
  - I) 32.2 mm
  - R) Bending radius max. 20 MIN

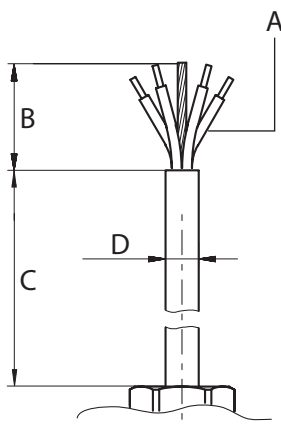


#### Explanation to the left illustration

- A) Length 40 mm
  - B) Length 20 mm

### Electrical connection

#### Electrical connection, standard -X, see type code

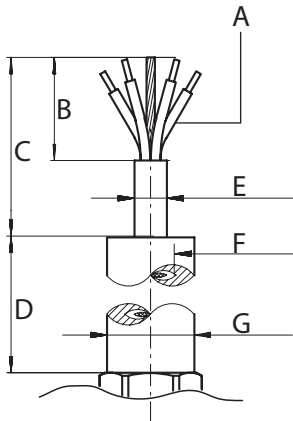


#### Explanation to the left illustration

- A) Wires 4 x  $0.33 \text{ mm}^2$  halogen-free
  - B) Length  $80^{\pm 10}$  mm
  - C) Length  $K1 \pm 5\%$  (K1 see customer drawing)
  - D) Diameter  $7^{\pm 0.5}$  mm

Fig.: Cable type standard FAHZ5...-X

**Electrical connection -XG[..] (textile protection tube), see type code**

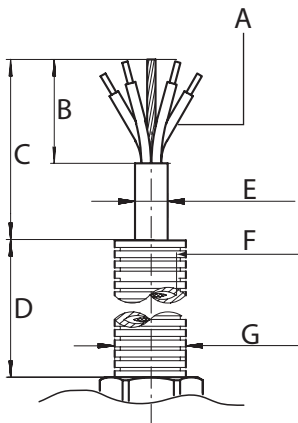


**Explanation to the left illustration**

- A) Wires 4 x 0.33 mm<sup>2</sup> halogen-free
- B) Length 80 ±10 mm
- C) Length 200 mm
- D) Length K1 ± 5% (K1 see customer drawing)
- E) Diameter 7 ±0.5 mm
- F) Inner diameter 7.9 ±0.5 mm
- G) Outer diameter 15 ±0.5 mm

**Fig.: Cable type standard FAHZ5...-XG[..]**

**Electrical connection -XP[..] (polyamid protection tube), see type code**



**Explanation to the left illustration**

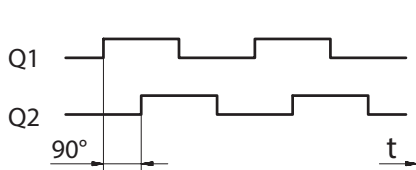
- A) Wires 4 x 0.33 mm<sup>2</sup> halogen-free
- B) Length 80 ±10 mm
- C) Length 200 mm
- D) Length K1 ± 5% (K1 see customer drawing)
- E) Diameter 7 ±0.5 mm
- F) Inner diameter 9.6 ±0.5 mm
- G) Outer diameter 13 ±0.5 mm

**Fig.: Cable type polyamid protection tube FAHZ5...-XP[..]**

**Connection assignment**

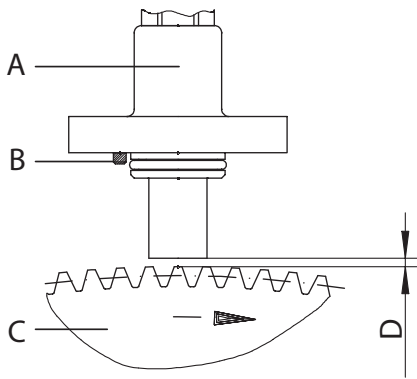
Colour	Explanation
Brown	+ U <sub>B</sub>
Green	- U <sub>B</sub> (0V)
White	Signal Q1
Yellow	Signal Q2
Shielding	Ground

**Mounting position and scan object distance**



**Explanation to the left illustration**

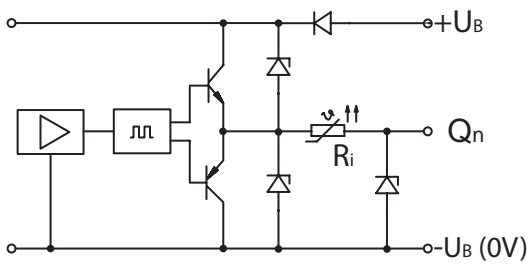
- Q1 Signal 1 (white)
- Q2 Signal 2 (yellow), 90° phase shift to Q1



**Explanations to the left illustration**

- A) Sensor housing
- B) Position pin for correct mounting position
- C) Tooth Wheel
- D) Recommended distance from scanning object  $1.0 \pm 0.5$  mm

**Elementary circuit diagram**



**Push-pull output stage**

**Note:**  
NPN- and PNP-inputs can be connected.

## Technical data

Electrical connection	
Supply voltage $U_s$	8...24 VDC
Nominal voltage $U_{\text{NOM}}$	15 VDC
Current consumption $I_s$	< 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	
Output channels	2 channels
Output signal	2 x square wave signals, level approx. UB
Output stage	Push-pull amplifier
Continuous short circuit prot.	Yes
Galvanic separation	No
Output level U <sub>Low</sub>	≤ 1.2 V @ 24 VDC, 10 mA, 24 °C
Output level U <sub>High</sub>	≥ UB-2.2 V @ 24 VDC, 10 mA, 24 °C
Output current (Sink) $I_L$	max. -50 mA
Output PNP (Load) $I_L$	max. 20 mA
Rise time	≥ 10 V/μs
Internal resistance	60 Ω

Signal acquisition	
Measuring principle	Difference-hall-effect principle
Scan type	Non-contacting
Scan object - material	Ferromagnetic materials Tooth wheel: Module ≥ m1 to m3; tooth face width > 7 mm (spur gear DIN867) Hole: Ø ≥ 5 mm, web ≥ 2 mm, depth ≥ 4 mm Groove: Ø ≥ 4 mm, web ≥ 2 mm, depth ≥ 4 mm
Scan object - distance	0.2 ... 3 mm; recommended: 1.0 ± 0.5 mm
Frequency range	0.2 ... 20,000 Hz
Phase-shift	90° ± 10% @ m1.5...m3   90° ± 15% @ m1...m1.25

**Environmental influences**

Operating temperature T <sub>o</sub>	-40 ... 105 °C (+120 °C for a short time)
Storage temperature T <sub>s</sub>	Recommended: -25 ... +70 °C; max.: -40 ... 105 °C (max. limit values within 30 days per year @ relative humidity 5...95%)
Degree of protection	Housing: IP66/IP68 Connection Type X IP67; Type XG/XP IP68
Vibration resistance	DIN IEC 60068-T2-6, 10 g @ 5...2000 Hz (Sinus) DIN EN 61373, 30 g @ 20...500 Hz (Random)
Shock resistance	DIN IEC 60068-T2-27, 1000 m/s <sup>2</sup> @ 6 ms
Climatic test	DIN IEC 60068-T2-1/-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 (HF - line-bound), 10 Veff IEC 60553 (NF - line-bound), 10 Veff
EMI - emission	CISPR 16-1, CISPR 16-2 EMC2
Insulation voltage	500 VAC, 50 Hz @ 1 min
Further standards	DIN EN 50155, DIN EN 45545

**Mech. Quantities**

Material	Adapter: Chromalised aluminium Sensor tube: Stainless steel
Mounting	Flange mounting
Length	See drawing
Installation position	Preset with direction of rotation definition, with position pin defined
Installation mode	Direction-sensitive
Weight	100 ... 300 g (depending from connection and length)
Pressure resistance	5 bar (measuring tip)

**Other**

Approvals	CE
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**Approvals**

The specified approvals are only valid for the technical data of standard products described in this document. In case of customized-products technical deviations are possible. In this case the validity of the according approvals is to be verified.

## Type code FAHZ53

Type code structure						
<b>FAHZ53-</b>	<b>13-</b>	<b>X</b>	<b>07</b>	<b>-M10</b>	<b>S</b>	<b>Example: FAHZ53-13-X07-M10S</b>
	Nominal length L1 of the sensor tube					
	Without code: straight connection outlet					
	Electrical connection					
	Cable length					
	Module					
	Shielding					

Type code FAHZ53...						
<b>Nominal length</b>	<b>13-</b>	L1 = 29 mm				✱
<b>Connection outlet</b>		Without code means: straight outlet				✱
<b>Electrical connection</b>		<b>X</b>	Cable end standard (without protection tubing)			✱
<b>Cable 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</b>		<b>-M10</b>	Module M1			
		<b>-M12</b>	Module M1.25			
		<b>-M15</b>	Module M1.5			
			Without code means module M2			✱
		<b>-M25</b>	Module M2.5			
<b>Shielding</b>		<b>-M30</b>	Module M3			
			Without code: Shielding is attached to the sensor housing			✱
		<b>S</b>	Shielding is not attached to the sensor housing			
<b>FAHZ53 -</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>Example: FAHZ53-13-X07 (preferred type)</b>

### Preferred types

Features marked with a ✱ symbol at the end of the line (see previous table) are preferred features. If you select a preferred feature for each placeholder, the device is specified as preferred type. Preferred types are available quickly from stock. Other types will be delivered according to scheduled appointments.

### Special types

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