

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...32 VDC
Scan object - distance:	0.2 ... 3 mm; recommended: 1.0 ± 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: IP66/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 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
- Impulse bands for plain shafts (accessories)

Measuring 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.

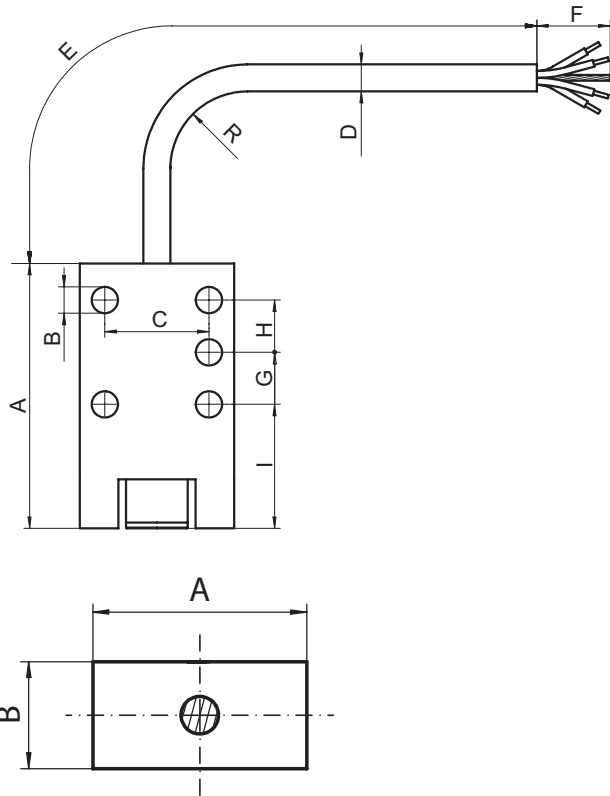
Specific features

- Robust and high quality housing: IP68 pressure-tight and individually tested at 5 bar (see technical data)
- 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

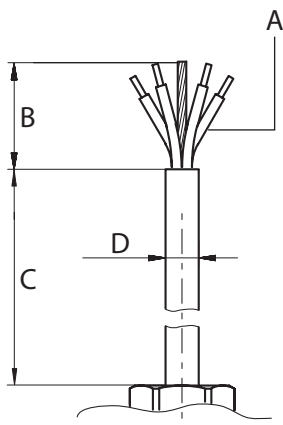
- A) Length 68.7 mm
 B) Diameter 6.8 mm
 C) Length $27^{\pm 0,1}$ mm
 D) Cable diameter $0.7^{\pm 0,5}$ mm
 E) Variable cable length (see type code)
 F) Length $80^{\pm 10}$ mm
 G) Length 13.5 mm
 H) Length 13.5 mm
 I) 32.2 mm
 R) Bending radius max. 20 MIN

Explanation to the left illustration

- A) Length 40 mm
 B) Length 20 mm

Electrical connection

Electrical connection, standard -X, see type code

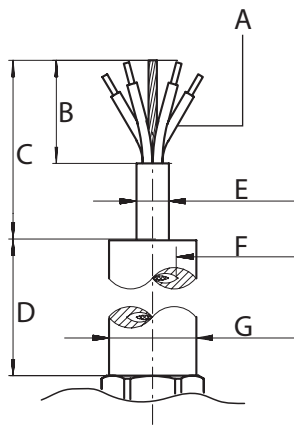


Explanation to the left illustration

- A) Wires 4 x 0.33 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 -XGS[..], -XGT[..] (protective tubing), see type code

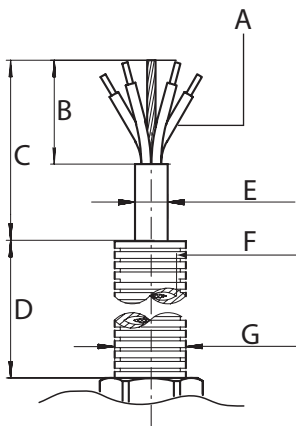


Explanation to the left illustration

- A) Wires 4 x 0.33 mm² 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 FAH[..]5...-XGS[..], -XGT[..]

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



Explanation to the left illustration

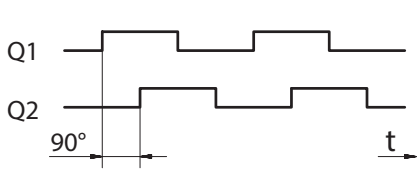
- A) Wires 4 x 0.33 mm² halogen-free
- B) Length 80 ±¹⁰ mm
- C) Length 200 mm
- D) Length K1 ± 5% (K1 see customer drawing)
- E) Diameter 7 ±^{0.5} mm
- F) Inner diameter 9.6 ±^{0.5} mm
- G) Outer diameter 13 ±^{0.5} mm

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

Connection assignment

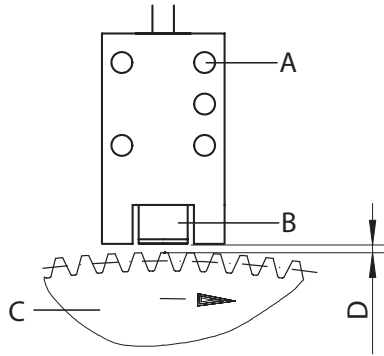
Colour	Explanation
Brown	+ U _B
Green	- U _B (0V)
White	Signal Q1
Yellow	Signal Q2
Shielding	Ground

Mounting position and scan object distance



Explanation to the left illustration

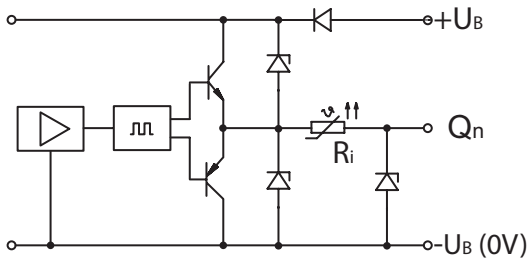
Q1 Signal 1 (white)
 Q2 Signal 2 (yellow), 90° phase shift to Q1



Explanations to the left illustration

A) Mounting position defined by boreholes
 B) Sensor tube
 C) Tooth wheel
 D) Recommended distance from scanning object 1.0^{±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_B	8...32 VDC
Nominal voltage U_{NOM}	15 VDC
Current consumption I_B	< 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 ² , shielded

Electrical output	
Output channels	2 channels
Output signal	2 x square wave signals, level approx. U_B
Output stage	Push-pull amplifier
Continuous short circuit prot.	Yes
Galvanic separation	No
Output level U_{Low}	$\leq 1.2 \text{ V @ } 24 \text{ VDC, } 10 \text{ mA, } 24 \text{ }^\circ\text{C}$
Output level U_{High}	$\geq U_B - 2.2 \text{ V @ } 24 \text{ VDC, } 10 \text{ mA, } 24 \text{ }^\circ\text{C}$
Output current (Sink) I_L	Per channel: max. -50 mA
Output PNP (Load) I_L	Per channel: max. 20 mA
Rise time	$\geq 10 \text{ V}/\mu\text{s}$
Internal resistance	60 Ω

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

Environmental influences

Operating temperature T _B	-40 ... 105 °C (+120 °C for a short time)
Storage temperature T _L	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: IP66/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 ² @ 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: Stainless steel Sensor tube: Stainless steel
Mounting	Flange mounting
Length	See drawing
Installation position	Preset with direction of rotation definition, with mouting position defined
Installation mode	Direction-sensitive
Weight	100 ... 300 g (depending on 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 has to be verified.

Type code FAHZ53

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

Type code FAHZ53...						
Nominal length	13-	L1 = 29 mm				*
Connection outlet		Without code means: straight outlet				*
Electrical connection	X	Cable end standard (without protective tubing)				*
	XGS	Cable end, protective tubing, steel reinforced				
	XGT	Cable end, protective tubing, textile reinforced				
	XP	Cable end, protective tubing, polyamide				*
Cable 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	-M10	Module M1				
	-M12	Module M1.25				
	-M15	Module M1.5				
		Without code means module M2				*
	-M25	Module M2.5				
Shielding	-M30	Module M3				
		Without code: Shielding is attached to the sensor housing				*
	S0	Shielding is not attached to the sensor housing				
FAHZ53 -	-	-	-	-	-	Example: FAHZ53-13-X07 (preferred type)

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.