

Non-contacting two-channel speed sensor type FA5 with aluminium flange housing and stainless steel sensor tube



Scanning type	Non-contacting
Measuring principle	Difference-Hall principle
Frequency range	0.2 ... 20,000 Hz
Supply voltage	9 ... 32 VDC or 2 x 9 ... 32 VDC
Scanning object	Ferromagnetic materials Toothed wheel: Module m1 to m3; tooth face width > 7 mm (spur gear DIN867) Hole: $\varnothing \geq 5$ mm, web ≥ 2 mm, depth ≥ 4 mm Groove: ≥ 4 mm, web ≥ 2 mm, depth ≥ 4 mm
Protection class	Housing: IP66/IP68 Connection: IP66/IP68
Material	Sensor tube: Stainless steel Adapter: Chromatised aluminium
Length	See customer drawing
Mounting	Flange mounting
Measuring channels	2 measuring channels or 2 galvanically isolated measuring channels or 2 measuring channels and 1 additional channel for rotation direction detection
Output signal and signal type	2 square wave signals or 2 square wave signals, 1 status signal
Output stage	Push-pull amplifier
Options	Inverted output signals; galvanically isolated output signals; status signal for direction of rotation detection



Drehzahlsensor FA5

Application range

Series FA[.]5 speed sensors are mainly used in the following areas: Transport technology. With a sensor tube made of stainless steel and a flange made of chrome-plated aluminium, the FA[.]5 is very robust. Our speed sensor type FA[.]52 made entirely of stainless steel is suitable for areas with a particularly high risk of corrosion.

The speed sensor measures the speed of ferromagnetic toothed wheels. Furthermore, they can be used for detecting movements of any ferromagnetic parts, e. g.:

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

Specific features

- Excellent vibration and shock resistance
- Robust and high quality housing: IP68 pressure-tight and individually tested at 5 bar (for details see technical data)
- Connection outlet straight or lateral; with protective tubing on request
- High degree of EMC immunity for difficult electrical environment
- Detection of very low speed (near zero speed)
- Due to its design and type approval according to DIN EN 50155 especially suitable for transport technology

Measuring principle

Series FA[.]5 speed sensors operate according to the difference-hall-effect principle.

Two closely spaced Hall elements are located on the sensor chip. The field of a magnet generates a constant voltage in the Hall elements. Ferromagnetic objects with an interrupted surface as they pass the Hall elements cause the Hall voltage to change. When the moving object covers only one Hall element, a differential voltage is generated to provide a measuring signal. The frequency of this measuring signal is proportional to the speed of movement (rotational speed). The difference-Hall principle is direction sensitive.

Overview speed sensors FA[..]5

Type	Measuring principle	Signal outputs	Signal form
FAHZ5	Difference-Hall	Two square wave signals, Q2 to Q1 is 90° phase shifted	
FAHS5	Difference-Hall	Two square wave signals, Q2 to Q1 is 90° phase shifted, one rotation direction signal	
FAHD5	Difference-Hall	Two square wave signals, galvanically isolated, Q2 to Q1 is 90° phase shifted	
FAHQ5	Difference-Hall	Two + Two inverted square wave signals, Q1 to Q2 and Q1_N to Q2_N are 90° phase shifted	

Dimensions, connections and drawings

Dimensions and mounting drawing

	<p>Explanation to the left illustration</p> <ul style="list-style-type: none"> A) Position pin 3 mm (installing position) acc. DIN1481-3 B) Length 29.5 mm C) Length 7 mm D) Length 42 mm E) Length 60 mm F) $\varnothing 9^{-0.5}$ mm G) Length 16 mm
	<p>Explanation to the left illustration</p> <ul style="list-style-type: none"> A) Borehole depth for position pin 3 mm (installing position) acc. DIN1481-3, borehole $\varnothing 4$ to 5 mm B) Borehole size M8-15 C) $\varnothing 26^{H10}$ mm D) Length $42^{\pm 0.2}$ mm E) Length 7 mm F) Length 16 mm

Recommended fixing: Hexagon socket screw DIN912 M8x20 with spring ring.

	<p>Explanation to the left illustration</p> <ul style="list-style-type: none"> A) Flange: Chromated aluminium (conductive) B) O-Ring seal 21 x 2.5 mm C) Sensor tube: Stainless steel D) Length 53...78 mm (depending from connection) L1) Nominal Length L1 see type code E) Length 10 mm F) Length 7 mm G) Length 3 mm H) $\varnothing 26^{d10}$ mm I) $\varnothing 16$ mm
	<p>Explanation to the left illustration</p> <ul style="list-style-type: none"> A) Flange: Chromated aluminium (conductive) B) O-Ring seal 21 x 2.5 mm C) Sensor tube: Stainless steel D) Length $37^{\pm 1}$ mm L1) Nominal Length L1 (see type code) E) Length 10 mm F) Length 7 mm G) Length 3 mm H) $\varnothing 26^{d10}$ mm I) $\varnothing 16$ mm J) Length 12 mm

Mounting position and scan object distance

Explanations to the left illustration

- A) Sensor housing
- B) Position pin for correct mounting position
- C) Tooth Wheel
- D) Recommended distance from scanning 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).

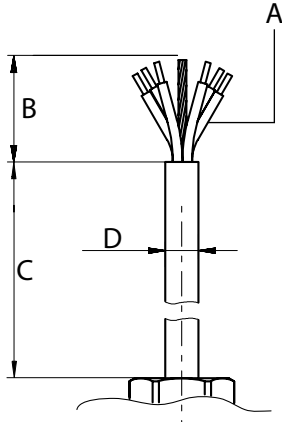
Connection type -X, -XGS, -XP	FAHZ5	FAHS5	FAHD5	FAHQ5
Cable with 4 wires	X	-	-	-
Cable with 6 wires	-	X	X	X

Connection cable type -X for sensors with 4 connecting wires

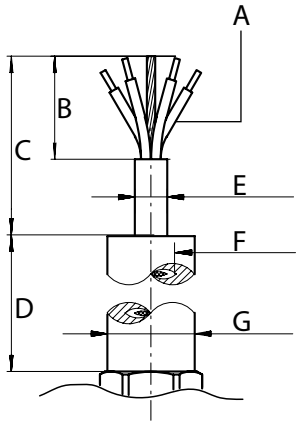
Explanation to the left illustration

- A) Wires 4 x 0.33 mm² halogen-free
- B) Length 80 ^{±10} mm
- C) Length K1 ^{±5%} (K1 see customer drawing)
- D) Ø 7 ^{±0.5} mm

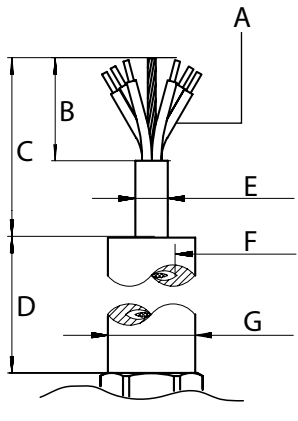
Connection cable type -X for sensors with 6 connecting wires

	<p>Explanation to the left illustration</p> <p>A) Wires 6 x 0.33 mm² halogen-free B) Length 80 ±¹⁰ mm C) Length K1 ±^{5%} (K1 see customer drawing) D) Ø 7 ±^{0.5} mm</p>
---	---

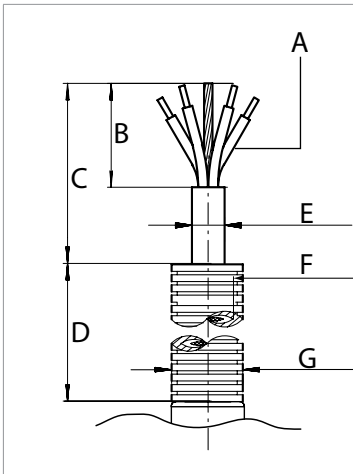
Connection cable type -XGS[...], -XGT[...] (protective tubing steel or textile reinforced) for sensors with 4 connecting wires

	<p>Explanation to the left illustration</p> <p>A) Wires 4 x 0.33 mm² 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>
--	---

Connection cable type -XGS[...], -XGT[...] (protective tubing steel or textile reinforced) for sensors with 6 connecting wires

	<p>Explanation to the left illustration</p> <p>A) Wires 6 x 0.33 mm² 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>
---	---

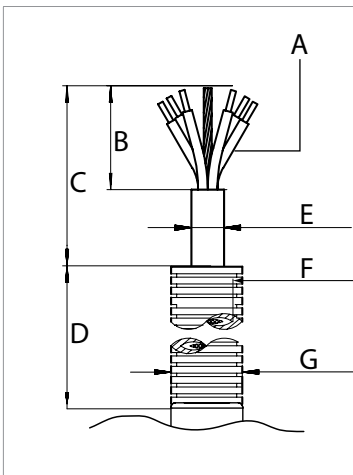
Connection cable type -XP[.] (polyamide protective tubing) for sensors with 4 connecting wires



Explanation to the left illustration

- A) Wires 4 x 0.33 mm² 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 6 connecting wires



Explanation to the left illustration

- A) Wires 6 x 0.33 mm² 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 _s +
Green	U _s - (0V)
White	Signal Q1
Yellow	Signal Q2
Shield	Ground

Connection assignment for type FA[.]S

Colour	Explanation
Brown	U _s +
Green	U _s - (0V)
White	Signal Q1
Yellow	Signal Q2
Grey	Status output for direction of rotation detection
Pink	NC
Shield	Ground

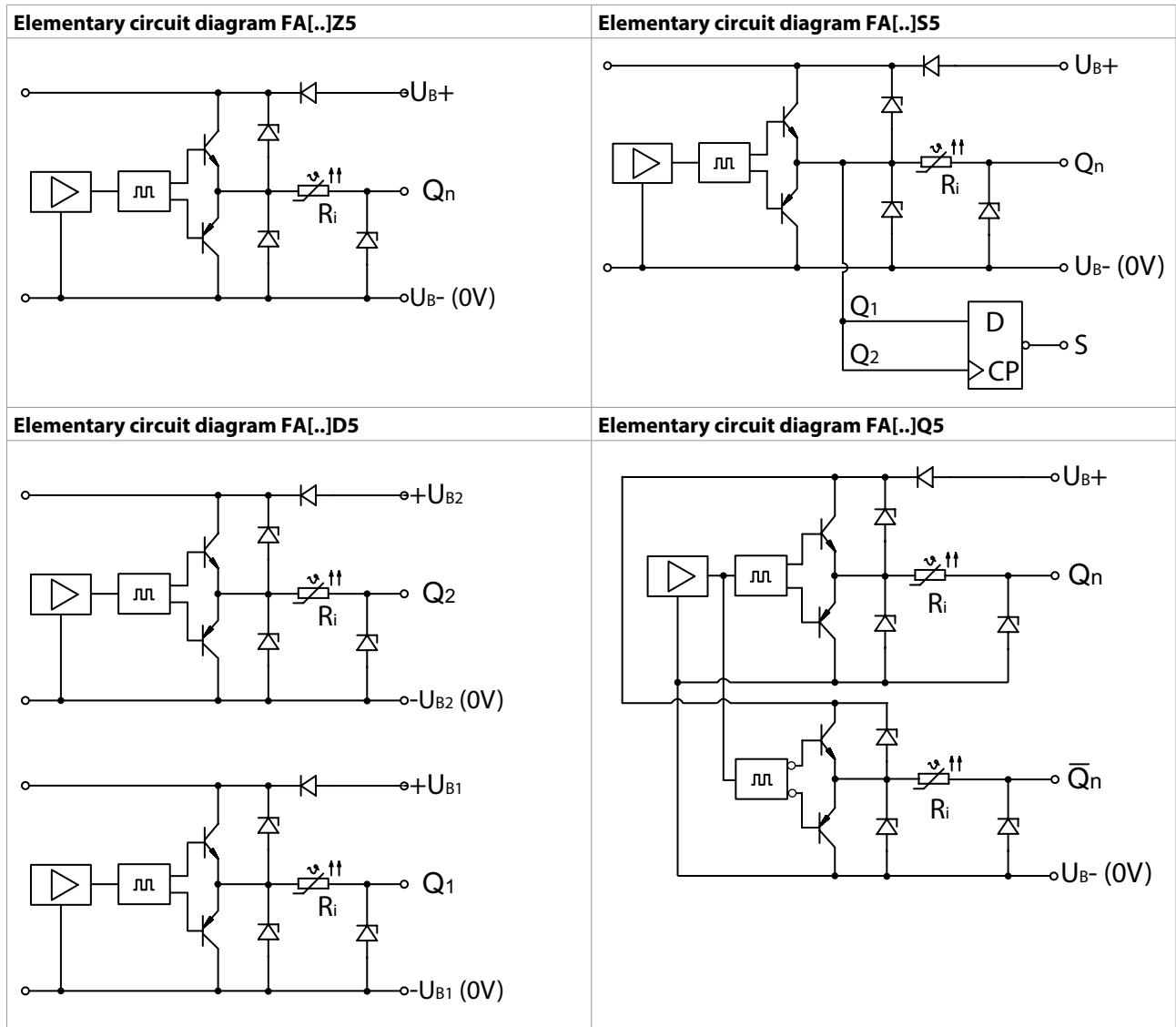
Connection assignment for type FA[...D]

Colour	Explanation
Brown	Sensor 1: U _{S1} +
Green	Sensor 1: U _{S1} - (0V)
White	Sensor 1: Signal Q1
Pink	Sensor 2: U _{S2} +
Grey	Sensor 2: U _{S2} - (0V)
Yellow	Sensor 2: Signal Q2
Shield	Ground

Connection assignment for type FA[...Q]

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

Elementary circuit diagram



General technical data

Electrical connection	
Supply voltage	See specific technical data
Nominal voltage	See specific technical data
Current consumption	See specific technical data
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	
Measuring channels	See specific technical data
Output signal and signal type	See specific technical data
Output stage	Push-pull amplifier
Continuous short circuit protection	Yes
Galvanic isolation	See specific technical data
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: $\geq \text{UB}-1.6 \text{ V @ } 15 \text{ VDC, } 10 \text{ mA, } 24 \text{ }^\circ\text{C}$
Output current NPN (Sink)	Per output: max. -50 mA
Output current PNP (Load)	Per output: max. 50 mA
Internal resistance Ri	See specific technical data
Rise time	$\geq 10 \text{ V}/\mu\text{s}$

Signal acquisition	
Measuring principle	Difference-Hall principle
Frequency range	0.2 ... 20,000 Hz
Scanning object - distance	0.2 ... 3 mm; recommended: $1.0 \pm 0.5 \text{ mm}$
Scanning object	Ferromagnetic materials Toothed wheel: Module m1 to m3; tooth face width > 7 mm (spur gear DIN867) Hole: $\varnothing \geq 5 \text{ mm}$, web $\geq 2 \text{ mm}$, depth $\geq 4 \text{ mm}$ Groove: $\geq 4 \text{ mm}$, web $\geq 2 \text{ mm}$, depth $\geq 4 \text{ mm}$
Phase shift	$90^\circ \pm 10\% \text{ @ } m1.5\dots m3 \mid 90^\circ \pm 15\% \text{ @ } m1\dots m1.25$
Duty cycle	$50\% \pm 10\%$

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 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 (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
Further standards	DIN EN 50155, DIN EN 45545

Mechanical properties	
Material	Sensor tube: Stainless steel Adapter: Chromatised aluminium
Mounting	Flange mounting
Length	See customer drawing
Installation position	Preset with direction of rotation definition, with position pin defined
Weight	100 ... 300 g (depending on connection and length)
Pressure resistance	5 bar (measuring area)

Specific technical data

Technical data for electrical connection and output

Sensors with two output signals (galvanically connected)

FAHZ[...]	
Supply voltage	9 ... 32 VDC
Nominal voltage	15 VDC
Current consumption	< 20 mA (without output current PNP)
Internal resistance Ri	45 Ω
Measuring channels	2 measuring channels
Output signal and signal type	2 square wave signals
Galvanic isolation	No

Sensors with two galvanically isolated output signals

FAHD[...]	
Supply voltage	2 x 9 ... 32 VDC
Nominal voltage	2 x 15 VDC
Current consumption	2 x <10 mA (without output current PNP)
Internal resistance Ri	50 Ω
Measuring channels	2 galvanically isolated measuring channels
Output signal and signal type	2 square wave signals
Galvanic isolation	Yes

Sensors with two output signals and status output

FAHS[...]	
Supply voltage	9 ... 32 VDC
Nominal voltage	15 VDC
Current consumption	< 20 mA (without output current PNP)
Internal resistance Ri	45 Ω
Measuring channels	2 measuring channels and 1 additional channel for rotation direction detection
Output signal and signal type	2 square wave signals, 1 status signal
Galvanic isolation	No

Sensors with two output signals und two inverted output signals

FAHQ[...]	
Supply voltage	9 ... 32 VDC
Nominal voltage	15 VDC
Current consumption	< 20 mA (without output current PNP)
Internal resistance Ri	45 Ω
Measuring channels	2 measuring channels
Output signal and signal type	2 square wave signals not inverted, 2 square wave signals inverted
Galvanic isolation	No

Type code

Type code structure										
FA	H	Z	5-	11-	S	X	07-	M30-	S0	Example: FAHZ5-11-SX07-M30S0
Measuring principle										
Measuring principle supplement										
Construction type and material										
Nominal length L1 of the sensor tube										
Connection outlet										
Electrical connection										
Cable length										
Module										
Shield										

Type code FA[...5]										
Measuring principle	H	Difference-Hall								☀
Measuring principle supplement	Z	2 output signals (voltage)								☀
	D	2 output signals (voltage), galvanically isolated								
	S	2 output signals (voltage) + Status output channel for direction of rotation detection								
	Q	4 output signals (voltage, 2 + 2 inverted)								☀
Construction type and material		5-	Flange, chromatised aluminium, stainless steel sensor tube							☀
Nominal length		11-	L1 = 29 mm							☀
Connection outlet			Without code: straight cable outlet							☀
		S	Lateral cable 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							
			05-	Sheath length 2.0 m, halogen-free						
Sheath length		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: Module m2							☀
		M25-	Module m2.5							
		M30-	Module m3							
Shield			Without code: Shield attached to the sensor housing							☀
		S0	Shield not attached to the sensor housing							
FA	--	--	--	--	--	--	--	--	--	Example: FAHZ5-11-X07 (Preferred type)

Special types

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

Preferred types

Features marked with a ☀ symbol at the end of the line 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.