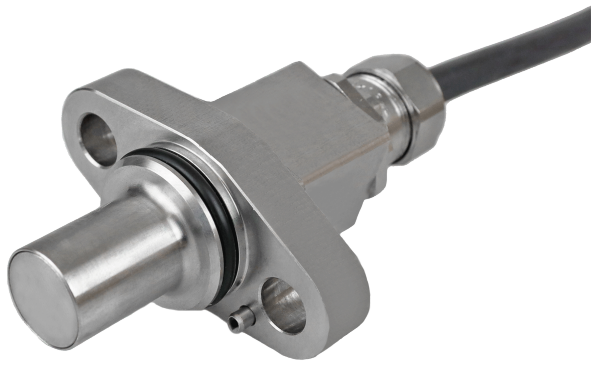
Speed sensors

FAH52

One/two-channel Hall-effect sensor in double-sided flange design



Product Features

- Typical applications: Rail Technology (Light & Heavy Rail) and Special Machinery (Mining)
- Frequency measurement with ferromagnetic scan objects using the Hall-effect principle
- Lifecycle-cost optimised: Wear- and maintenance-free due to non-contact scanning, high durability due to robust design
- Robust design for risk-free installation and extreme environmental conditions
- Reliable rotational direction detection or outage detection and monitoring

Technical Specifications	
Frequency range	0 ... 25 000 Hz
Type of signal output	Optional voltage or current output signal
Material	Housing + flange made of stainless steel
Degree of protection	Housing: IP66/IP68/IP69 Connection: IP66/IP68
Measuring channels	1 or 2 measuring channels
Output signals	2 square wave signals or 2 square wave signals + 1 status signal (outage or direction of rotation) or 2 square wave signals + 2 inverted square wave signals

EN 50155

ANTI-SKID

IP69

EN 45545

Dimensioned drawings and installation diagrams

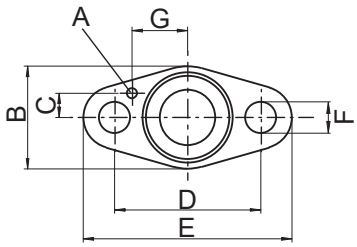


Fig.: Front view

A) Locator 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

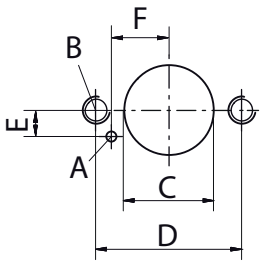


Fig.: Bore hole

A) Locator 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 mounting:
Hexagon socket head cap screw ISO 4762 M8x20 with spring washer.

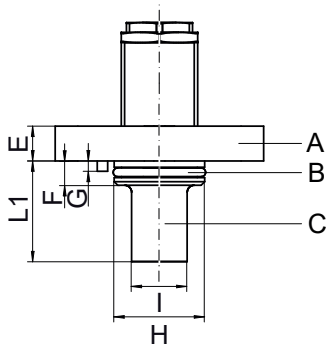


Fig.: Straight connection

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

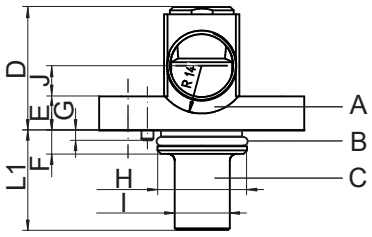


Fig.: Lateral connection outlet

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
J) Length 9 mm

Installation position and distance from scan object; definition of the direction of rotation

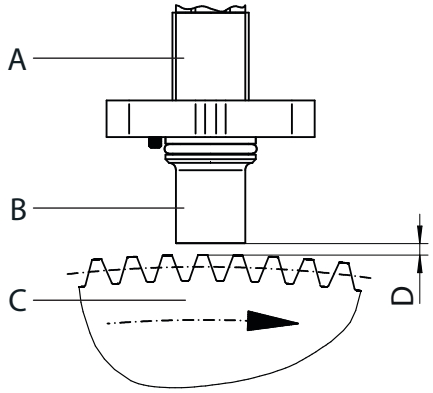
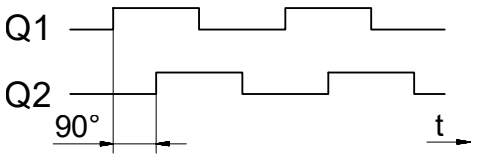


Fig.: Installation position and scan distance

A) Sensor housing (flange)
B) Sensor tube
C) Scan object
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 scan object).

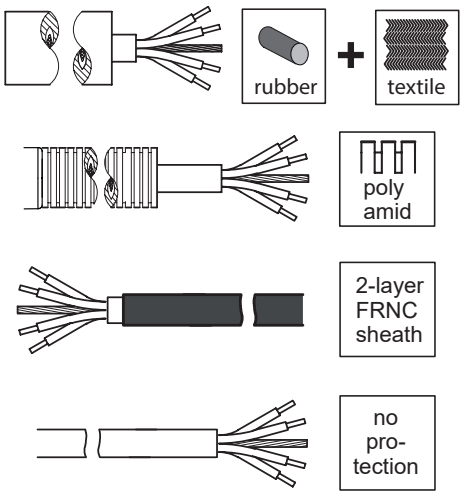


Custom configurations

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

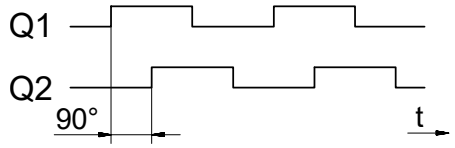
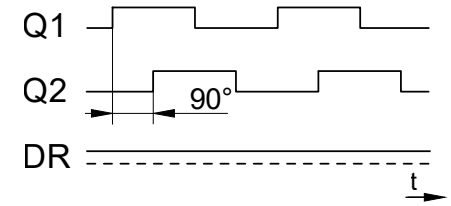
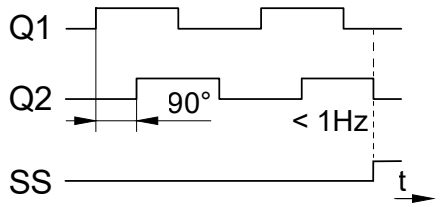
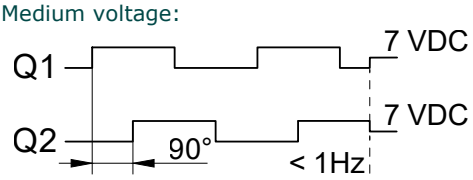
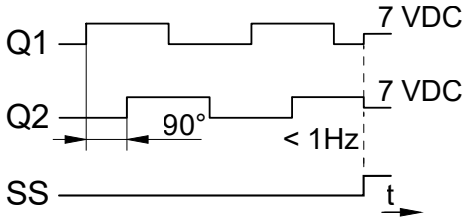
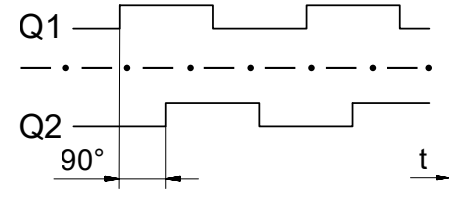
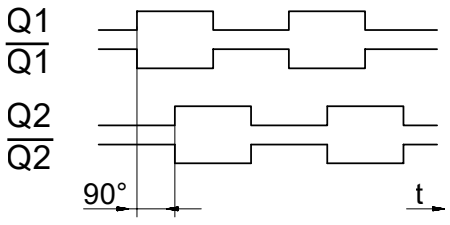
- Custom flange geometry, e.g. sensor tube length
- Customer-specific connector cable design (cross-section, ready-to-use cable length)
- Freely selectable connector plug
- Custom adjustment of status output: detection of outage or direction of rotation (clockwise or anticlockwise)
- Signal output: Voltage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

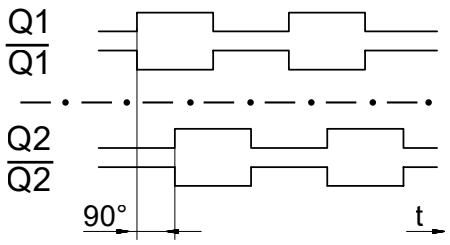
Conductor protection types

	**Rubber protective tube with textile fibre reinforcement** – flexible under mechanical impact, resistant to stone impact	**XGT**
	Corrugated polyamide pipe – protects against moderate mechanical force, e.g., occasional stone impact	**XP**
	Reinforced conductor cable jacket – additional FRNC (Flame Retardant, Non-Corrosive) outer sheath for resistance to mechanical impacts or climatic conditions (e.g., temperature fluctuations)	**XV**
	No conductor protection – applications without stone impact or other mechanical force	**X**

Signal outputs in speed sensors with Hall principle

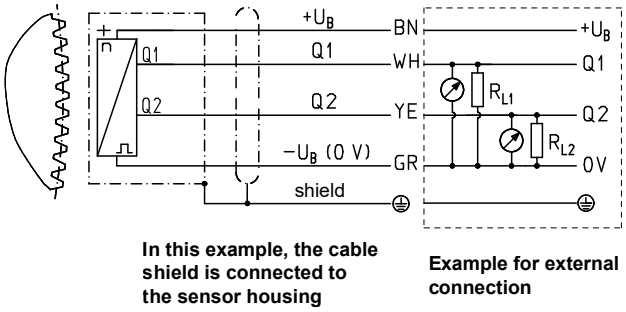
Unless stated otherwise, the sensors mentioned here have voltage signal outputs.

Type	Signal outputs	Signal waveform
FAH52 **FAHJ52**	A square wave signal; FAH: Voltage signal output FAHJ: Current signal output	
FAHZ52	Two square wave signals, Q2 to Q1 phase shift by 90°	
FAHS52	Two square wave signals, Q2 to Q1 phase offset by 90°, and ■ a direction of rotation signal ■ or an outage signal ■ or a 7 V status level of Q1 and Q2 during outage (~medium voltage) ■ or a 7 V status level of Q1 and Q2 during outage (~medium voltage) and an additional outage signal output	Direction of rotation:  Outage signal:  Medium voltage:  Medium voltage + outage signal: 
FAHI52 **FAHD52**	Two galvanically isolated square wave signals Q2 to Q1 phase offset by 90°, type FAHD with voltage signal output, 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°	

Type	Signal outputs	Signal waveform
FAHR52	Two square wave signals + two inverted square wave signals, Q1 to Q2 and Q1 to Q2 phase shift by 90°, galvanic isolation Q1 and Q1 to Q2 and Q2.	

Types of signal output

Voltage signal output

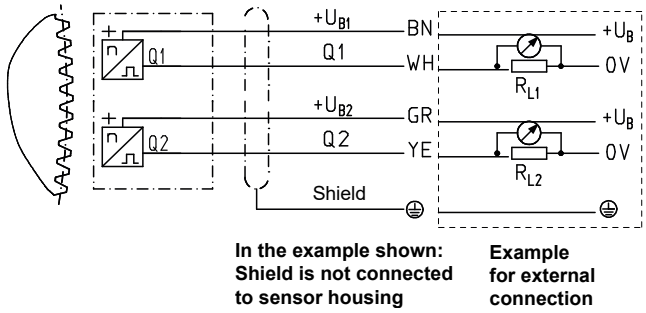


1: Connection example: FAHZ with voltage signal

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. This allows a high interference immunity to be achieved under any operating conditions.

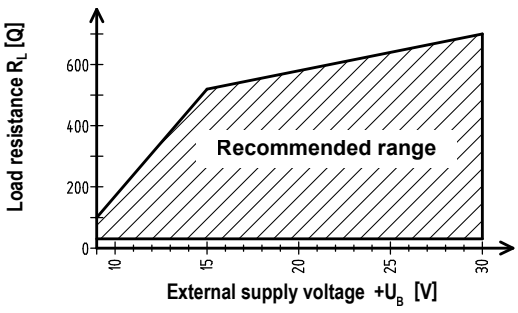
Current signal output



2: Example of connection: FAHI with low-side-load

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 drop in voltage 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).



3: Load resistor diagram: current signal output FAx

Load resistor range of the current signal output

The recommended load resistor RL depends on the external supply voltage +UB. By default, the sensors are designed for the following load resistance range:

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

Technical data

Electrical connection	
Supply voltage	**FAH52, FAHZ52, FAHS52, FAHQ52:** 9 ... 32 VDC **FAHD52, FAHR52:** 2 x 9 ... 32 VDC **FAHI52:** 2 x 9 ... 30 VDC **FAHJ52:** 9 ... 30 VDC
Nominal voltage	**FAHJ52, FAHS52, FAHQ52, FAHZ52:** 15 VDC **FAHD52, FAHR52, FAHI52:** 2 x 15 VDC
Current consumption	**FAHZ52, FAHS52, FAHQ52, FAHR52, FAHD52:** < 20 mA (without output signal current) **FAHI52:** 2 x 8.2 mA / 14.4 mA (depending on signal level) **FAHJ52:** 1 x 8.2 mA / 14.4 mA
Reverse voltage protection	Yes
Overvoltage protection	Yes
Recommended conductor length	< 100 m
Conductor cross-section	Standard: 0.33 mm², shielded

Electrical output	
Measuring channels	**FAHZ52, FAHQ52:** 2 measuring channels **FAHS52:** 2 measuring channels **FAHD52, FAHI52, FAHR52:** 2 galvanically isolated measuring channels **FAH52, FAHJ52:** 1 measuring channel
Output signals	**FAHZ52, FAHI52, FAHD52:** 2 square wave signals **FAHS52:** 2 square wave signals, 1 status signal **FAHQ52, FAHR52:** 2 square wave signals, 2 inverted square wave signals **FAH52, FAHJ52:** 1 Rechtecksignal
Output driver	**Voltage signal output:** Push-pull output stage **Current signal output:** current regulation
Duration - short-circuit resistance	Yes
Galvanic isolation	Only types **FAHD**, **FAHI, FAHR**
Output level Low	**Sensors with voltage signal output:** Per output: ≤ 0.8 V @ 15 VDC, 10 mA, 24°C **Sensors with current signal output:** Per output: 8.2 mA +/- 4% @ 15 VDC, RL = 475 Ω, 24°C
Output level High	**Sensors with voltage signal output:** Per output: ≥ +UB - 1.6 V @ 15 VDC, 10 mA, 24 °C **Sensors with current signal output:** Per output: 14.4 mA +/- 4% @ 15 VDC, RL = 475 Ω, 24 °C
Output current (sink) (voltage signal outputs)	Per output: max. -50 mA [1]
Output current (load) (voltage signal outputs)	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.	

Signal detection		
Measuring principle	Hall-effect principle	
Frequency type	Standard	F0
Frequency range	0,2 ... 20 000 Hz	0 ... 25 000 Hz
Scanning object	Ferromagnetic materials, Toothed wheel: Module m1 to m3 (other sizes on request) Tooth face width > 7 mm (spur gear DIN 867) Bore hole: Ø ≥ 5 mm, web ≥ 2 mm, depth ≥ 4 mm Groove: ≥ 4 mm, web ≥ 2 mm, depth ≥ 4 mm	
	optimised for scanning measurement objects with symmetrically interrupted surfaces, e.g., toothed wheels and pulse gears	optimised for scanning measurement objects with symmetrically interrupted surfaces, e.g., toothed wheels and pulse gears
Distance scan object	0.2 ... 3 mm; recommended: 1.0 ± 0.5 mm for m1.5 ... m3 | 0.7 ± 0.4mm @ m1...m1.25	
Duty cycle	50 % ± 10 %	
Phase shift	90° +/- 10 % @ m1.5...m3 | 90° +/- 15 % @ m1...m1.25	

Environmental influence	
Operating temperature	-40 … +120 °C
Storage temperature	Recommended: -25 ... +70 °C; max.: -40 ... +105 °C (max. peak values within 30 days/ year at relative humidity from 5...95 %)
Degree of protection	Housing: IP66/IP68/IP69 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
Interference immunity	IEC 61000-4-2, Lev. 3 (ESD) IEC 61000-4-3, 10 V/m (HF - field) IEC 61000-4-4, Lev. 3 (Burst) IEC 61000-4-5, Lev. 2 (Surge) IEC 61000-4-6, 10 Veff (HF - conducted) IEC 61000-6-2 IEC 60553, 3 Veff (LF - conducted)
Interference emission	IEC 61000-6-4, EN 55011
Insulation	500 VAC, 50 Hz @ 1 min (≥ 2 kV for FAH[..] upon request)
Other standards	EN 50155, EN 50121-3-2, EN 45545, EN 55016 EMC A

Mechanical properties	
Material	Flange: Stainless steel Measuring surface: Stainless steel
Mounting	Via flange housing
Length	See customer drawing
Installation position	Determined by rotational direction definition; defined by fixing pin
Weight	≥ 190 g (depends on connection)
Pressure resistance	5 bar (measuring surface)

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.	

Part code FAH52									
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						
		R	4 Output signal (voltage), galvanically isolated						
Design, material			**52-**	Flange, stainless steel sensor tube					
Nominal length				**11-**	L1 = 29 mm				
Connection outlet						No identifier: straight connection outlet			
					S	Lateral connection outlet			
Conductor protection						**X**	Standard conductor end (without protective tube)		
						XV	Double conductor cable jacket, FRNC		
						XP	Corrugated pipe, polyamide		
						XGT	Protective tube, reinforced with textile fibres		
Jacket length							**05-**	Jacket length 2 m, halogen-free	
							07-	Jacket length 5 m, halogen-free	
							08-	Jacket length 7.5 m, halogen-free	
							09-	Jacket length 10 m, halogen-free	
Module (adjustment of the sensor to your gear module at the factory)									No identifier: Module m2
								M10	Module m1
								M12	Module m1.25
								M15	Module m1.5
								M25	Module m2.5
								M30	Module m3
Frequency type									No identifier: "Frequency type, standard"
									F0 Frequency type F0 (starting at 0 Hz)
Shielding									No identifier: Shield applied to sensor housing
									S0 Shield applied to sensor housing
FA	_ _	_ _	_ _-	_ _-	_ _	_ _	_ _-	_ _	_ _ **Example: FAHZ52-11-X07**

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 above mentioned standards thanks to our type-approved modular kits.

Imprint/Disclaimer

Noris Automation GmbH

Muggenhofer Straße 95

90429 Nuremberg

Germany

Errors and omissions excepted!