

Non-contacting speed sensor with signal amplifier, inductive-magnetic principle

- Cost-effective speed sensor with rectangular-pulse signal output
- Threaded brass sensor tube
- For ferromagnetic toothed wheels from module m2 (m1) up
- Frequency range from approx. 5 Hz to 10,000 Hz
- Push-pull output stage
- Loadable with 50 mA SINK and 20 mA LOAD
- High degree of EMC immunity for severe electrical environments
- Wide operating temperature range from -40 °C ... +105 °C
- Excellent vibration and shock resistance
- Face side is metal-enclosed
- Rugged construction, housing IP66 / IP67
- Choice of lengths, screw-in threads and electrical terminations



Non-contacting Speed Sensor of Series FAJ11...

Method of operation of the speed sensor

Non-contacting speed sensors of the FAJ11... series are basically designed for speed sensing. The rotation of ferromagnetic toothed wheels is sensed by means of a sensing coil and converted by a signal amplifier into a rectangular signal. The frequency of the rectangular signal is proportional to the speed. Apart from speed, the sensors are adapted to sense any movement of ferromagnetic parts. The rectangular signal lends itself to evaluation or transformation by a variety of devices.

Details of the speed sensor

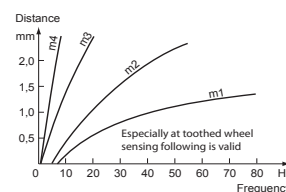
- Inputs may be generated by ferromagnetic toothed wheels, bolt heads - detects holes, openings or grooves in ferromagnetic parts
- Wear- and maintenance-free due to contactless sensing
- Wide temperature range through use of high-grade automotive-class components
- Resistant to oil spray and lubricants, even at elevated temperatures
- Requirements of the classification societies many times far exceeded
- Extensive electric snubber circuits integrated for protection
- Simple screw-in mounting by threaded sensor tube
- Up to 10 signal-processing NORIS devices can be connected
- Suitable measuring transducers and limit-value switches are available

Output of the speed sensor

The output signal is a noise-immune, rectangular signal whose frequency is proportional to the speed. The voltage range is within the load voltage and load-dependent. The geometry of the passing object determines the pulse duty factor. In the case of a toothed wheel, it corresponds to approx. 50%. The output circuit is a push-pull stage. Short circuit protection is provided by a 60 Ω PTC-resistor. Spurious pulses are intercepted by an internal varistor against minus. The push-pull output stage can be used as a NPN output (current sinking) as well as a PNP output (current sourcing). The output voltage is galvanically coupled to the load voltage.

Inductive-magnetic principle of the speed sensor

The measuring element is a sensing coil and an iron core with a permanent magnet mounted. Ferromagnetic objects with an interrupted surface as they pass the sensor cause the constant field of the magnet to be changed and induce a voltage in the sensing coil. The frequency of this voltage is proportional to the speed of movement (rotational speed). In the case of the induction principle, the level of the induced voltage is dependent on the rate at which the magnetic flux is changed (dynamic principle). This means that the detection of very slow movements or even of "standstill" is not possible. The lower limit frequency is the lower the more abrupt change in the geometry of the object passing the sensor and the shorter the distance between the object and the sensor. The recommended distance to the toothed wheel for module > m2 is 1.5 mm. At high frequencies, the inductivity of the sensing coil causes the induced voltage to be heavily dampened (reduced) so that evaluation is no longer possible. This results in a range of application from approx. 5 Hz to 10,000 Hz or, under optimum installation conditions (true running, low-vibration environment), up to 15,000 Hz. The capture of small toothed wheels up to module m1 is possible by distance decelerating (recommended 0.8 mm). Reversed for wide modules > m5 the recommended distance could be a couple of millimeters. The inductive-magnetic principle is direction-insensitive.



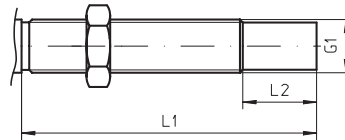
Installation and connecting information and trouble shooting, see separate leaflet

Technical Data

Series FAJ11...		
General	Supply voltage	U_{nom} 24 V/DC, range 8 ... 32 V/DC $\pm 10\%$ harmonic content
	Current consumption	Approx. 4 mA @ 24V/DC + switching current (max. 20 mA)
	Reverse voltage protection	Integrated
	Over voltage protection	Integrated
Input	Measuring principle	Inductive-magnetic
	Frequency range	Approx. 5 Hz ... 10,000 Hz (dependent from module and distance) under optimum installation conditions up to 15,000 Hz
	Scan object	Ferromagnetic toothed wheel: >2, tooth face width >5 mm (spur gear DIN867); Hole: $\varnothing > 5$ mm, web >2 mm, depth >4 mm; Groove: >4 mm, web >2 mm, depth >4 mm
Output	Distance	0.2 ... 3 mm and more, recommended 1.5 mm ± 0.5
	Output circuit	Push-pull output stage
	Output signal	NORIS standard signal, square wave, level approx. U_{sup} , galvanically coupled with supply voltage
	Output level	High: approx. $U_{sup} - 1.5$ V @ 1 mA, $U_{sup} - 1.8$ V @ 5 mA, $U_{sup} - 2.2$ V @ 10 mA Low: approx. $U_{sup} + 0.5$ V @ 1 mA, $U_{sup} + 0.8$ V @ 5 mA, $U_{sup} + 1.2$ V @ 10 mA
	Output resistance	Series resistance R_s ; 60 Ω
Environmental influences	Switching current	NPN (SINK) 50 mA, PNP (LOAD) 20 mA, permanent short-circuit proof
	Rise time	≥ 10 V/ μ s
	Operating temperature	-40 ... +105 °C
	Climatic test	DIN IEC 60068-T2-1/-2/-30
	Vibration resistance	DIN IEC 60068-T2-6: 10 g @ 5 ... 2,000 Hz (Sinus) DIN EN 61373: 30 g _{eff} @ 20 ... 500 Hz (Random)
	Shock resistance	DIN IEC60068-T2-27: 1,000 m/s ² @ 6 ms
	Degree of protection	EN 60529: housing IP66 / IP67; connection A IP65, connection C/E/H/X IP67
	ESD	IEC 61000-4-2: ± 6 kV/CD; ± 8 kV/AD
	HF-interference immunity	IEC 61000-4-3: 10 V/m f=80 MHz ... 2,000 MHz, 80% AM @ 1 kHz
	Burst	IEC 61000-4-4: ± 2 kV/PL; ± 1 kV/DL
	Surge	IEC 61000-4-5: ± 0.5 kV/DM ($R_g = 2 \Omega$); ± 1 kV/DM ($R_g = 42 \Omega$); ± 1 kV/CM ($R_g = 12 \Omega$)
	Other	Conducted HF-interference
Conducted LF-interference		IEC 60553: 3 V _{eff} 0.05 ... 10 kHz
Interference emission		CISPR 16-1, 16-2: EMC2
Insulation voltage		500 V/AC, 50 Hz @ 1 min
Storage temperature		Recommended -25 ... +70 °C (possible -40 ... +105 °C)
Mounting		Screw-in by threaded sensor tube
Pressure resistance		Measuring tip up to 5 bar
Electrical connection		See drawing
Recommended cable length		1,000 m / 1 kHz @ 0.5 mm ² screened
Installation position		Any
Installation mode	Direction-insensitive	
Material	Adapter: aluminium chromalized, sensor tube: brass	
Weight	Approx. 100 ... 300 g (dependent to connection and length)	
Approvals	CE; ABS, DNV, GL, LR	

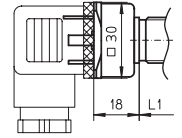
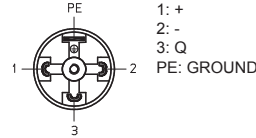
Dimensions, Connection, Diagram

Sensor tube



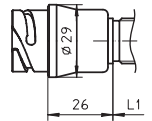
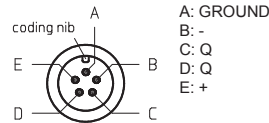
Terminal DIN43650 A: type FAJ11-xxxx-A

Supplied with female connector



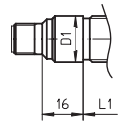
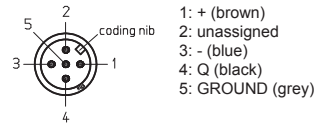
Terminal Mil 14-5PN: type FAJ11-xxxx-C

Supplied without female connector (accessory set ZL4-1A)



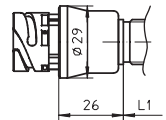
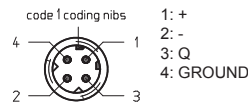
Terminal Euro M12x1: type FAJ11-xxxx-E

Supplied without female connector (accessory set ZL4-2A)



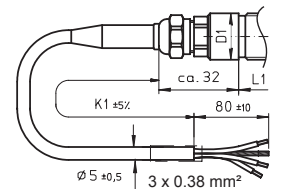
Terminal DIN72585 Bajonette: type FAJ11-xxxx-H

Supplied without female connector (accessory set ZL4-5)

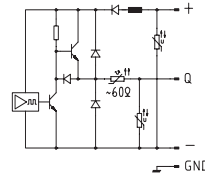


Terminal cable jumper: type FAJ11-xxxx-X

brown: +
green: -
white: Q
Shielding: GROUND



Elementary circuit diagram (push-pull output stage)



NPN- or PNP inputs may be connected.

Type Key / Standard Variants

FAJ11-02 15-X03 (-) (FAJ11-0215-X03)
1 2 3 * 5 * *Pos. 4, 6 not applicable for series FAJ11...

1	Device and series (basic versions, other on customer request available)
FAJ11	Non-contacting speed sensor, inductive-magnetic principle, series cylindrical with threaded brass sensor tube, plug socket and sensor socket aluminium chromalized, electronic integrated in sensor tube

2	Nominal length (drawing L1, L2)	3	Thread type (drawing G1)
02	L1=60 mm, L2=5 mm	15	M18x1
03	L1=80 mm, L2=5 mm	23	M18x1,5
04	L1=100 mm, L2=20 mm	88	5/8" - 18 UNF
05	L1=120 mm, L2=40 mm		

5	Electrical connection
A	DIN43650-A pin connector, 3 terminals + PE (solenoid valve 30 x 30)
C	Mil 14-5PN VG95234 pin connector, 5 terminals
E	EURO M12x1, pin connector, 5 terminals, contact gold-plated
H1	DIN72585 Bajonette pin connector, 4 terminals, coding 1 (BK)
X..	Cable jumper with jacket length (drawing K1) (standard: X03=0.5m; X05=2.0m; X06=3.0m; X07=5.0m; X08=7.5m; X09=10.0m)

NORIS
AUTOMATION

NORIS Automation GmbH
Muggenhofer Strasse 95
90429 Nürnberg
GERMANY

Tel.: +49 911 3201-0
Fax: +49 911 3201-150
info@noris-automation.com
www.noris-automation.com