Non-contacting speed sensor FAJ11 with signal amplifier, inductive-magnetic principle

Scan type:	Non-contacting Ferromagnetic materials Direction independent
Frequency range:	See diagram; 5 Hz...10,000 Hz depending from module and scan distance; under optimal conditions up to 15 kHz
Supply voltage:	9...32 VDC
Scan object - distance:	See diagram; Tooth wheel: Module ≥ m1.5; Tooth face width ≥ 5 mm (spur gear DIN867)
Degree of protection:	Housing: IP66/IP67 Connection Type A IP65; Type C, E, H, X: IP67
Material:	Sensor tube: Brass
Length:	60 ... 120 mm
Mounting:	Male thread M18x1 | M18x1,5 | 5/8" - 18 UNF
Output channels:	1
Output signal:	Square wave signal
Output stage:	Push-pull amplifier
Galvanic separation:	One channel

Speed Sensor FAJ11

Application range

Speed sensors of the FAJ11 series are especially designed for use in: Shipbuilding industry, transport technology and mechanical engineering. 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 FAJ11 series operate according to the inductive-magnetic principle.

The measuring element consists of 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 signal is proportional to the speed of movement (rotational speed). The inductive-magnetic principle is direction-insensitive.

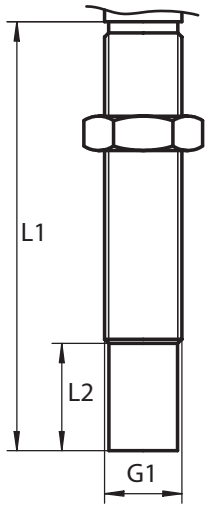
Specific features

- Robust housing: IP66/67
- Speed sensor with square wave output signal
- Excellent vibration and shock resistance
- High degree of EMC immunity for difficult electrical environment
- Variable lengths, threads and connections
- Detection of speed starting at 5 Hz
- Due to its design and its approvals especially suitable for shipbuilding industry

Dimensions, connections and drawings

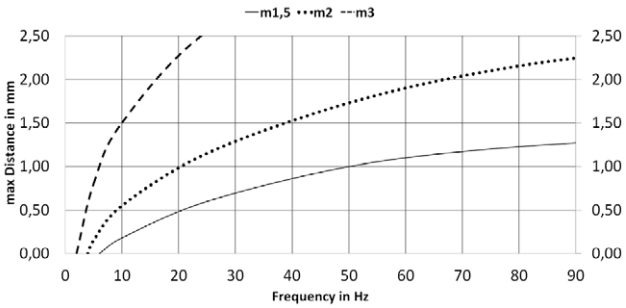
Unless specified differently all dimensions in the following drawings in [mm].

Dimensions and mounting drawing



Explanation to the illustration
Please note the possible combination of L1 and L2 for the nominal length in the type code.

L1: 60, 80, 100, 120 mm
L2: 5, 20, 40 mm
G1: M18x1; M18x1.5; 5/8“ – 18 UNF

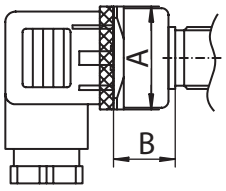


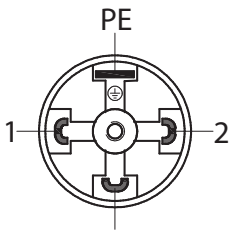
Explanation to the illustration
The left figure refers to the tooth wheel as scan object. The detection of the movement of very small tooth wheels (e. g. m1.5) is possible by reducing the distance between sensor and scanning object. The distance in relation to the lower measureable range is mentioned in the above illustration.

Connectors and electrical connection

All dimensions in the following figures in [mm] unless otherwise specified.

FA…-A: Connector DIN43650 A





A: Diameter 30 mm
B: Length 18 mm
1: $+U_B$
2: $-U_B$ (0V)
3: Signal Q
PE: Shielding

Note:
On delivery supplied with female connector.

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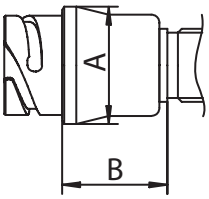
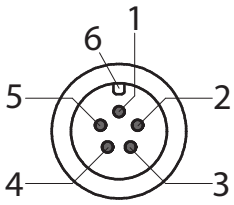
FA…-C: Connector MIL 14-5PN

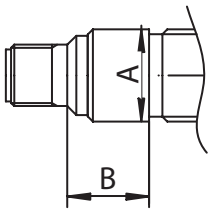


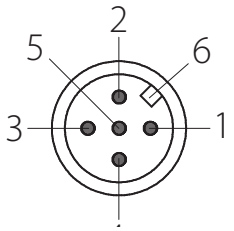


A: Diameter 29 mm
B: Length 26 mm
1: Shielding
2: -U_B (0V)
3: Signal Q
4: Signal Q
5: +U_B
6: Coding nib

Note:
On delivery without any female connector (accessories set ZL4-1A)

FA…-E: Connector Euro M12x1



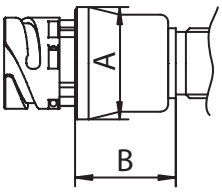


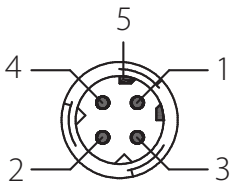
Optionally with degree of protection IP69K

A: Diameter 18 mm
B: Length 16 mm
1: +U_B
2: not used
3: -U_B (0V)
4: Signal Q
5: Shielding
6: Coding nib

Note:
On delivery without any female connector (accessories set ZL4-2A)

FA…-H: Connector DIN72585 Bajonette

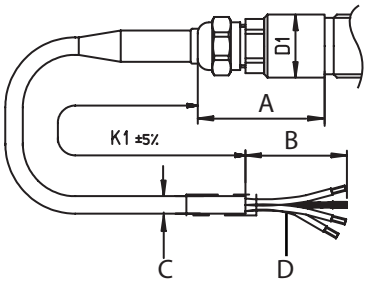




A: Diameter 29 mm
B: Length 26 mm
1: +U_B
2: -U_B (0V)
3: Signal Q
4: Shielding
5: Coding nib

Note:
On delivery without any female connector (accessories set ZL4-5)

FA…-X: Cable end



A: Approx. 40 mm
B: 80 ± 10 mm
C: Ø 5 ± 0.5 mm
D: 3 x 0.38 mm²
D1: Approx. 18 mm
K1: Cable sheath ± 5 %

Brown: +U_B
Green: -U_B (0V)
White: Signal Q
Shielding

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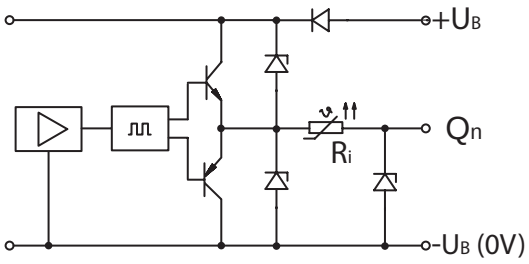
Elementary circuit diagram



Push-pull output stage

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

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Technical data

Electrical connection	
Supply voltage U_S	9...32 VDC
Nominal voltage U_{NOM}	24 VDC
Current consumption I_S	< 6 mA (without output current PNP)
Reverse voltage protection	Yes
Over voltage protection	Yes
Connection	DIN 43650A, Mil14-5PN, Euro M12x1, DIN 72585 or cable end (see customer drawing)
Recommended cable length	< 100 m
Used cable cross section	0.38 mm^2, shielded

Electrical output	
Output channels	1
Output signal	Square wave signal
Output stage	Push-pull amplifier
Continuous short circuit prot.	Yes
Galvanic separation	One channel
Output level ULow	≤ 0.8 V @ 24 VDC, 10 mA, 24 °C
Output level UHigh	≥ UB-1.5 V @ 24 VDC, 10 mA, 24 °C
Output current (Sink) I_L	max. -50 mA
Output PNP (Load) I_L	max. 50 mA
Rise time	≥ 10 V/µs
Internal resistance	45 Ω

Signal acquisition	
Measuring principle	Inductive magnetic
Scan type	Non-contacting
Scan object - material	Ferromagnetic materials Tooth wheel: Module ≥ m1.5; tooth face width ≥ 5 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	See diagram
Frequency range	See diagram; 5 Hz...10,000 Hz depending from module and scan distance; under optimal conditions up to 15 kHz
Phase-shift	No

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Environmental influences	
Operating temperature T_O	-40...+120 °C
Storage temperature T_S	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/IP67 Connection Type A IP65; Type C, E, H, X: IP67
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/s² @ 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), 3 Veff
EMI - emission	CISPR 16-1, CISPR 16-2 EMC2
Insulation voltage	500 VAC, 50 Hz @ 1 min
Further standards	not specified

Mech. Quantities	
Material	Adapter: Chromalised aluminium Sensor tube: Brass
Mounting	Male thread M18x1 | M18x1,5 | 5/8" - 18 UNF
Length	60 ... 120 mm
Installation position	Any
Installation mode	Direction independent
Weight	L1 = 100 ... 300 g (depending from connection and length)
Pressure resistance	5 bar (measuring tip)

Other	
Approvals	CE, ABS, BV, DNV, GL, LR

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.

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Type code FAJ11

Type code structure					
FAJ11-	**02**	**15-**	**-A**	**-S0**	**Example: FAJ11-0215-A-S0**
	Nominal length L1 and L2 of the sensor tube				
		Thread type			
			Electrical connection		
				Shielding	

Type code FAJ11-…					
Nominal length	**02**	L1 = 60 mm, L2 = 5 mm			✹
	03	L1 = 80 mm, L2 = 5 mm			✹
	04	L1 = 100 mm, L2 = 20 mm			
	05	L1 = 120 mm, L2 = 40 mm			
Thread type		**13**	M14x1		
		22	M16x1.5		
		15	M18x1		✹
		23	M18x1.5		✹
		88-	5/8" – 18 UNF		
Electrical connection			**-A**	DIN43650-A, pin connector, 3 terminals + PE (solenoid valve30x30)	✹
			-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)	
			-X03	Cable end with sheath length 0.5 m	
			-X05	Cable end with sheath length 2.0 m	✹
			-X06	Cable end with sheath length 3.0 m	
			-X07	Cable end with sheath length 5.0 m	
			-X08	Cable end with sheath length 7.5 m	
			-X09	Cable end with sheath length 10.0 m	
Shielding				Without code: Shielding is attached to the sensor housing	✹
			-S0	Shielding is not attached to the sensor housing	
FAJ11-	_ _	_ _	**-**_ _	-_	**Example: FAJ11-0215-A (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.

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