

Non-contacting speed pick-up with signal amplifier, inductive magnetic principle

- Cost-efficient speed sensor with rectangular-pulse signal output
- For use in conjunction with ferromagnetic toothed wheels from module 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
- Mounting position is non-directional
- High degree of EMI immunity for severe electrical environments
- Wide operating temperature range from -25 °C ... +100 °C
- Pole-piece is metal-enclosed
- Rugged construction, class IP67 protection
- Choice of lengths, screw-in threads, and electrical terminations



Non-contacting speed pick-up of series FA1J..

Method of operation of FA1J.. speed pick-up

Non-contacting speed pick-ups of the FA1J.. family are designed primarily for speed sensing. The rotation of ferromagnetic toothed wheels is detected by a sensing coil and converted by a signal amplifier into a rectangular-pulse signal. The frequency of the rectangular signal is proportional to speed. Apart from speed, the pick-ups are adapted to detect any movement of ferromagnetic objects. The rectangular signal lends itself to evaluation and transformation by a variety of devices.

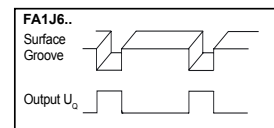
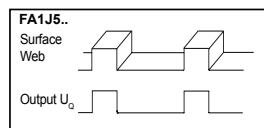
Details of the FA1J.. speed pick-up

- Inputs may be generated by ferromagnetic toothed wheels, screw heads, webs, - Detects holes, openings, grooves in ferromagnetic objects
- Wear and maintenance-free due to non-contacting sensing
- Wide temperature range through use of high-grade automotive-class components
- Resistant to oil spray and lubricants, even at elevated temperatures
- Extensive electric snubber circuits integrated for protection
- Simple screw-in mounting by threaded pick-up body
- Up to 10 signal-processing NORIS devices can be connected
- Suitable measuring transducers and limit-value switches are available

Output of FA1J.. speed pick-up

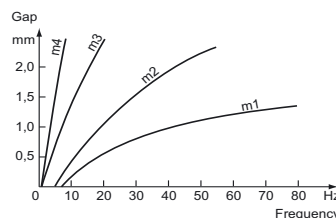
The output signal is a noise-immune, rectangular signal whose frequency is proportional to the speed. The voltage range is within the load voltage and load-dependent. The geometry of the passing object determines the pulse duty factor. In the case of a toothed wheel, it corresponds to approx. 50 %. The output circuit is a push-pull stage. Short circuit protection is provided by a 130 Ω NTC-resistor. Spurious pulses against ground (case) are intercepted by a varistor. The push-pull output stage can be used as an NPN output (current sinking), as well as a PNP output (current sourcing). The output voltage is electrically connected to the load voltage.

For general speed sensing, the phase angle of the output is irrelevant, and therefore, undefined. For event detection, e.g. OT-detection, there are special variants available (J5.. and J6...).



Inductive-magnetic principle of FA1J.. speed pick-up

The pulse-generating element is a sensing coil with an iron core and a permanent magnet mounted. Ferromagnetic objects with an interrupted surface as they pass the pick-up 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 (rpm). 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 bottom 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. 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. The resulting range of application extends from approx. 5 Hz to 10,000 Hz or, under optimum installation conditions (true running, low-vibration environment), up to 15,000 Hz. The inductive-magnetic principle is direction-insensitive.



Pulse generation using toothed wheels is illustrated in the drawing opposite

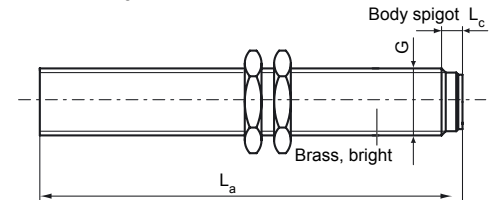
Installation and connecting information and trouble shooting, see separate leaflet

Technical Data

Series FA1J..	
Operating voltage	$U_o=10 \dots 32 \text{ V/DC}$, $U_R=24 \text{ V/DC}$
Ripple	$< 5\% U_o$
Reverse voltage protection	Integrated
Overvoltage	2.5 times U_R up to 2 ms
Voltage drops	100% up to 10 ms
Power consumption without load	Approx. 15 mA (24 V/DC) + switching current
Measuring principle	Inductive magnetic
Frequency range	Approx. 5 Hz up to 10,000 Hz (decided by module and air gap) at optimum settings up to 15,000 Hz
Scannable objects	Ferromagnetic materials in motion: toothed wheels $> m1$, holes $\varnothing > 4 \text{ mm} / d > 4 \text{ mm}$, webs and grooves $w > 4 \text{ mm}$
Air gap	0.2 ... 3 mm and more, decided by module
Output circle	Push-pull output stage
Output signal	Rectangular-pulse electrically connected with the operating voltage
Output resistance	Series resistance: 130 Ω
Output level	High: ca. $U_o - 2.0 \text{ V} / 1 \text{ mA}$, $U_o - 2.5 \text{ V} / 5 \text{ mA}$, $U_o - 3.5 \text{ V} / 10 \text{ mA}$ Low: ca. $+1.2 \text{ V} / 1 \text{ mA}$, $+1.8 \text{ V} / 5 \text{ mA}$, $2.6 \text{ V} / 10 \text{ mA}$
Output current	NPN (Sink) 50 mA, PNP (Load) 20 mA, permanent-short-circuit proof
Rise time	$\geq 10 \text{ V}/\mu\text{s}$
Recommended cable length	1,000 m / 1 kHz @ 0.5 mm ² screened
Vibration resistance	DIN IEC60068-T2-6 4g @ 25 ... 100 Hz, amplitude 1.6 mm @ 2 ... 25 Hz
Shock resistance (impact)	DIN IEC60068-T2-27 300 m/s ² @ 18 ms
Climatic test	DIN IEC60068-T2-1/-2/-30
Operating temperature	-25 °C ... +100 °C
Shelf temperature	-45 °C ... +85 °C
Humidity	RH 96% maximum
Insulation test	$> 60 \text{ V}$ (Protection devices)
ESD	IEC61000-4-2 +/- 8 kV
Electromagnetic field	IEC61000-4-3 10 V/m f=10 kHz ... 2000 MHz, 80% AM @ 1 kHz
Burst	IEC61000-4-4 +/- 2 kV supply +/- 1 kV sensor
Surge	IEC61000-4-5 sym. +/- 1 kV ($R_f = 2 \Omega$) asym. +/- 2 kV ($R_f = 12 \Omega$)
HF-susceptibility	IEC61000-4-6 3 V _{pp} f=10 kHz ... 100 MHz, 80% AM @ 1 kHz
NF-susceptibility	IEC60553 3 V _{pp} 0.05 ... 10 kHz
Interference field intensity	Basis CISPR 16-1, 16-2 reduced characteristic
Protection class	Housing: DIN EN60529 IP67 Connection: DIN EN60529 FA2J-A-...: IP65, FA2J-C-... and FA2J-E-...: IP67
Pressure resistance	Measuring tip up to 5 bar
Mounting	Screw-in by threaded pick-up body
Installed position	Any
Installed wise	Direction-insensitive
Material	Head: aluminium, body: brass
Weight	Approx. 100 ... 300 g (decided by connection and length)
Standard supply	CE requirements complied with, approved by GL, LR, ABS, DNV, BV (up to 145 mm)

Other Data

Sensor body



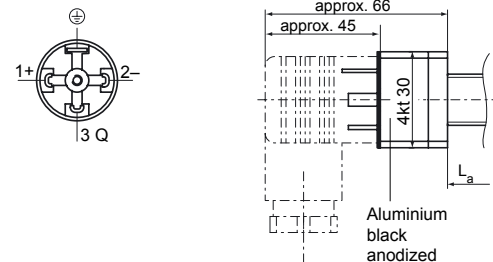
Preferred dimensions: Body length L_a in mm

- Add L_a to type code
- Bodies between 30 mm and 200 mm
- Up to 500 mm possible in some cases
- As the length increases, sensors are liable to be subjected to vibrations. We recommend lengths up to 145 mm.

L_a	L_c
70	5
90	25
115	15
125	70
145	90

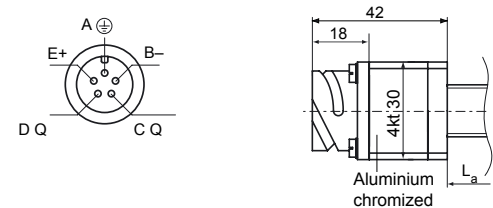
FA1.-A-.. Termination: DIN43650-A

Supplied with female connector.



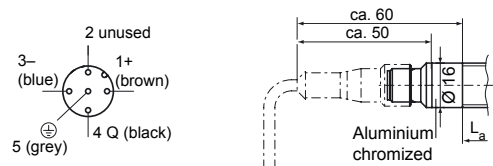
FA1.-C-.. Termination: Cannon 14-5PN VG95234

Delivered without female connector, use accessories ZL4-1A.



FA1.-E-.. Termination: Euro M12x1

Delivered without female connector, use accessories ZL4-2A.



Type key / variants

Device codes

FA	Non-contacting speed pick-up
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Type series

1	Type cylindric with threaded body, body material brass
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Measuring principle

J	Inductive magnetic, not defined phasing
J5	Inductive magnetic, defined phasing web Q-high
J6	Inductive magnetic, defined phasing groove Q-high

Tube thread (others by inquiry)

3	M16x1.5	4	M18x1	5	M18x1.5
8	G 1/4	10	5/8 " 18 UNF		

Electrical connection

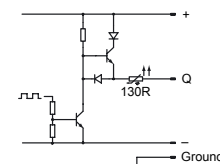
A	DIN43650-A pin connector, 3 terminals + PE (solenoid valve 30 x 30)
C	Cannon 14-5PN VG95234 pin connector, 5 terminals
E	EURO M12 x 1, pin connector, 5 terminals, gold-plated

Tube length (L_a)

...	According to customer requirements from 30 mm up to approx. 500 mm Preferred length: 70, 90, 115, 125, 145 (see table)
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FA 1 J -5 A -70 (FA1J-5A-70)

Elementary circuit diagram (push-pull output stage)



NPN- or PNP inputs may be connected.

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