

Speed Sensors

Series 89100

Code:	89100 EN
Delivery:	ex stock/ 5 weeks
Warranty:	24 months



- Measured distances between 0 ... 13 mm and 0 ... 610 mm
- High output voltage
- No power supply necessary
- High sensitivity
- No wearing mechanical parts

Application

Speeds in a straight path can easily be measured to an accuracy of 1% with the speed sensors in the 89100 series. They are used for shock absorber tests, filling checks, vibration investigations in buildings and machines, and in servo-controlled systems. In addition, they are suitable for taking measurements on reciprocating pumps, for determining the creep rates and insertion speed of hydraulic presses, as measuring transducers for computers and as signal sources for seismographs.

To match the needs of a wide range of measurement tasks, many types of speed sensors having varying sensitivities are available, including those with unbreakable magnetic cores. The sensors are universally applicable. They can be used over wide temperature ranges and can operate in hydraulic oil as well as in other non-corrosive liquids. The wide range of measurements (the ratio of the smallest to largest measurable speeds 400,000 : 1), high resolution and absence of hysteresis are further advantages. The output of the speed sensor is not electrically connected to the housing. This provides optimum conditions for connecting to the subsequent electronics.

Description

If a magnet is moved through a coil then, in accordance with Faraday's law and Lenz's law, a voltage is induced in the coil, proportional to the speed of the magnet and to its field strength. The speed sensors in this series operate according to this principle of magnetic induction.

If the north and south poles of a magnet move axially in a coil, they induce voltages equal in magnitude but opposite in vector, and the resulting output voltage is therefore zero. In order to avoid this effect, the coil is divided into two parts wound in opposite directions, so that the north pole generates a voltage in one half and the south pole generates one in the other half. The coils are connected in series. The addition of the individual voltages gives an output signal that is proportional to the linear speed. It is also possible to access the voltages in the two individual coils.

The maximum speed is limited by the maximum permitted output voltage of 500 V. At the other end, the minimum measurable speed is determined by the sensitivity and the noise background of the subsequent electronics. If any interfering voltages are induced by strong alternating current fields, they can be eliminated through additional screening.

Technical Data

Electrical Values

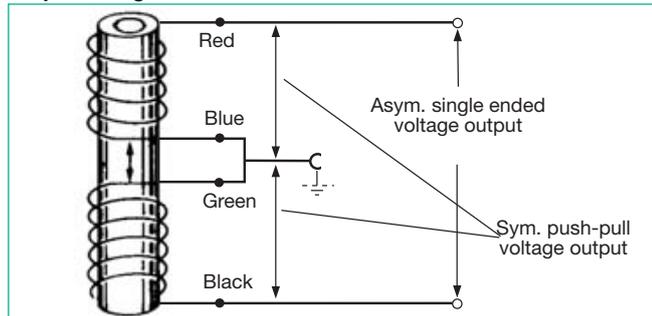
Model*	Nominal Deflection of the Magnetic Core [mm]	Max. Deflection [mm]	Output Voltage (without Load, Nominal) [mV per cm/s]	V _{max} [m/s]	Impedance (Coils in Series) R [kΩ]	L [H]	Frequency Response (Load = 10 x R) [Hz]	Frequency Response (Load = 100 x R) [Hz]
89100-000	13	33	50	100	2.0	0.085	350	1500
89101-000	25	48	35	143	2.5	0.065	600	1500
89111-000	25	58	200	25	13.0	1.6	120	600
89112-000	50	86	200	25	19.0	2.9	100	500
89113-000	76	107	200	25	25.0	3.2	120	500
89114-001	100	140	100	50	32.0	4.0	120	400
89122-001	152	203	60	83	11.5	1.9	95	450
89123-001	228	280	60	83	17.0	2.8	95	450
89124-001	305	381	60	83	22.0	3.7	95	450
89125-001	420	470	60	83	29.0	5.1	90	430
89126-001	508	559	60	83	34.0	6.2	90	430
89127-001	610	660	60	83	42.0	7.3	90	430

Mechanical Values

* Sensors with ending -001 use an unbreakable magnetic core

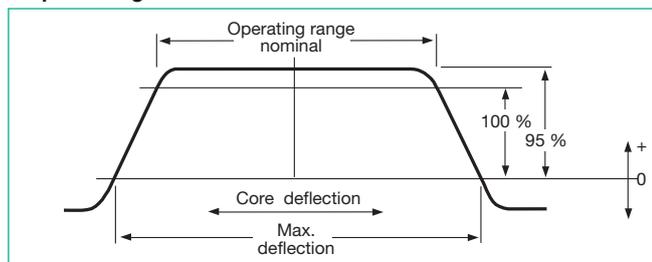
Sensor (Including the Magnetic Core)						Substitution Core				
Model	CA [mm]	LA [mm]	+ 0.000/-0.13 ø A [mm]	ø B min [mm]	Weight [g]	Core Identifier	LC [mm]	ø C [mm]	Thread T	Weight [g]
89100-000	34.0	80.5	9.5	3.30	20	89M00-000	60.5	3.18	1-72 NF	3.5
89101-000	47.7	107.7	9.5	3.30	25	89M00-001	76.2	3.18	1-72 NF	4.5
89111-000	57.2	128.5	15.9	4.83	110	89M00-002	88.9	4.75	4-40 NC	11
89112-000	82.6	179.3	15.9	4.83	150	89M00-003	114.3	4.75	4-40 NC	15
89113-000	108.0	230.1	15.9	4.83	200	89M00-004	133.4	4.75	4-40 NC	17
89114-001	136.7	287.2	15.9	4.83	240	89M00-013	152.4	4.75	4-40 NC	21
89122-001	193.8	401.6	19.0	7.62	420	89M00-014	215.9	5.84	4-40 NC	51
89123-001	282.1	579.4	19.0	7.62	610	89M00-015	279.4	5.84	4-40 NC	66
89124-001	358.6	736.6	19.0	7.62	815	89M00-023	362.0	5.84	4-40 NC	88
89125-001	472.9	965.2	19.0	7.62	1120	89M00-024	476.3	5.84	4-40 NC	121
89126-001	561.8	1143.0	19.0	7.62	1355	89M00-025	565.2	5.84	4-40 NC	147
89127-001	663.4	1346.2	19.0	7.62	1515	89M00-028	666.75	5.84	4-40 NC	156

Output wiring



The speed sensors can be operated single ended or with a push-pull output. The wiring connections for each are shown in the drawing. It is also possible to connect them in parallel (connect the red wire to the green, the blue to the black). This reduces the source impedance of the coils to 1/4 and the output voltage to half of the values given in the table above.

Output voltage



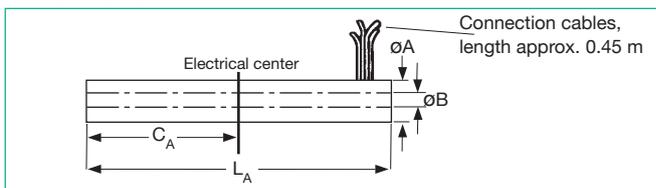
Output voltage based on core deflection, for constant speed.

Frequency response

The frequency range of the speed sensor is determined by its impedance and the electrical load presented to its output (see table again).

The output voltage drops at constant speed with increasing frequency. The frequency range is defined as the frequency range in which the output voltage does not fall below 99 % of the value for constant speed. Within the frequency range, the measurement error is less than 1%.

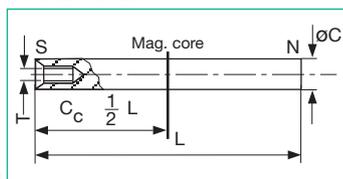
Dimensions



Internal threads on both ends:

depth approx. 3 mm
at model 89100 / 89101

depth approx. 5 mm
at model 89111
up to 89127



Magnetic material
at models
-000-: Alnico V
at models
-001-: Cunife I

Non-linearity: nominally 1% within the frequency response

Environmental conditions

Range of operating temperature: - 45 °C up to 95 °C

Temperature error:

If the output is loaded by a load resistor R_L having a value one hundred times that of the coil impedance concerned, the following error results for the output voltage:

0.025%/K nom. for sensors with final numbers 000

0.09%/K nom. for sensors with final numbers 001

Under the above conditions, the temperature error is caused exclusively by the properties of the magnetic core.

Order Information

1. Speed sensor, deflection 50 mm **Model 89112-000**

2. Speed sensor, deflection 228 mm, with plug-in connection **Model 89123-001-V001**

Option

Sensor with electrical plug-in connection, 5 pin, inclusive mating connector, only for models 89122 up to 89127 (refer to Order Information)

