SIEMENS

Differential Magnetoresistive Sensor

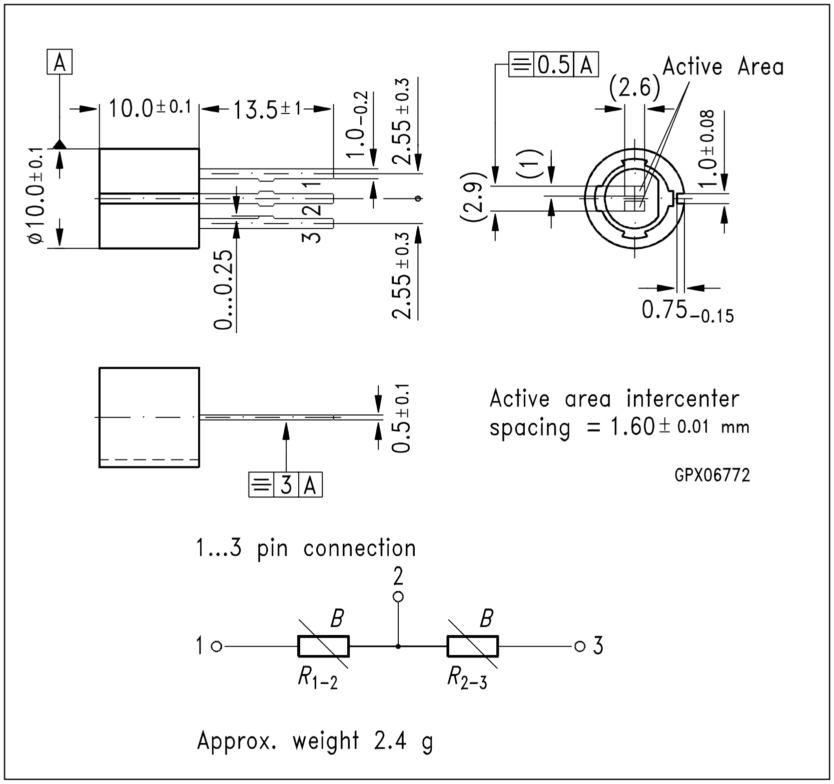
FP 210 L 100-22

Features

- High operating temperature
- High output voltage
- Robust cylindrical housing
- Biasing magnet build in
- Signal amplitude independent of speed
- Easily connectable

Typical applications

- Detection of speed
- Detection of position
- Detection of sense of rotation
- Angle encoder
- Linear position sensing



Dimensions in mm

Type	Ordering Code
FP 210 L 100-22	Q65210-L100-W4

The differential magnetoresistive sensor FP 210 L 100-22 consists of two series coupled L-type InSb/NiSb semiconductor resistors. The resistance value of the MRs, which are mounted onto an insulated ferrite substrate, can be magnetically controlled. The sensor is encapsulated in a plastic package with three in-line contacts extending from the base. The basic resistance of the total system in the unbiased state is 2×100 Ω. A permanent magnet which supplies a biasing magnetic field is built into the housing.

Maximum ratings

Parameter	Symbol	Value	Unit
Operating temperature	T_A	– 40/ +140	°C
Storage temperature	T_{stg}	– 40/ +150	°C
Power dissipation[1)]	P_{tot}	400	mW
Supply voltage[2)]	V_{IN}	7.5	V
Insulation voltage between terminals and casing	V_I	> 100	V
Thermal conductivity	G_{thA}	≥ 5	mW/K

Characteristics (T_A = 25 °C)

Nominal supply voltage	$V_{IN\,N}$	5	V
Total resistance, ($\delta = \infty$, $I \leq 1$ mA)	$R_{1\text{-}3}$	220…400	Ω
Center symmetry[3)] ($\delta = \infty$)	M	≤ 10	%
Offset voltage[4)] (at $V_{IN\,N}$ and $\delta = \infty$)	V_0	≤ 130	mV
Open circuit output voltage[5)] ($V_{IN\,N}$ and δ = 0.2 mm)	$V_{out\,pp}$	> 1000	mV
Cut-off frequency	f_c	> 20	kHz

Measuring arrangements

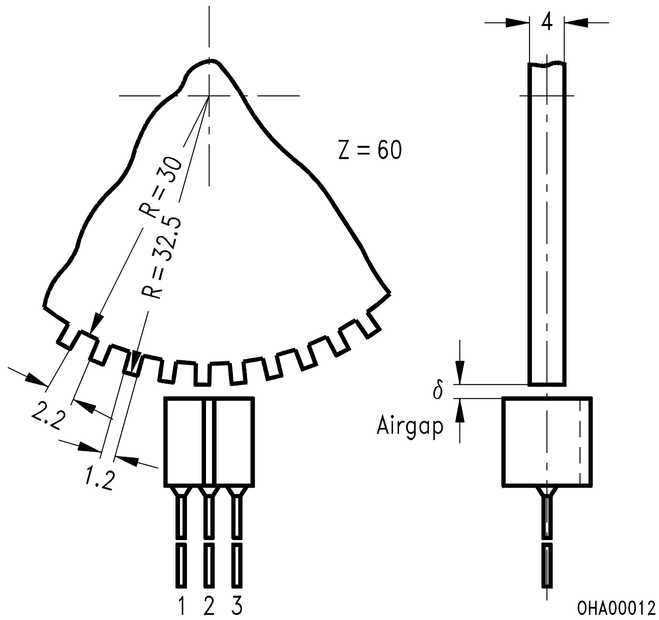
By approaching a soft iron part close to the sensor a change in its resistance is obtained. The potential divider circuit of the magneto resistor causes a reduction in the temperature dependence of the output voltage V_{OUT}.

1) Corresponding to diagram $P_{tot} = f(T_A)$
2) Corresponding to diagram $V_{IN} = f(T_A)$
3)
$$M = \frac{R_{1-2} - R_{2-3}}{R_{1-2}} \times 100\% \text{ for } R_{1\text{-}2} > R_{2\text{-}3}$$
4) Corresponding to measuring circuit in **Fig. 2**
5) Corresponding to measuring circuit in **Fig. 2** and arrangement as shown in **Fig. 1**

1. Digital revolution counting

For digital revolution counting, the sensor should be actuated by a magnetically soft iron toothed wheel. The tooth spacing should correspond to about twice the magneto resistor intercenter spacing (see **Fig. 1**).

The two resistors of the sensor are supplemented by two additional resistors in order to obtain the sensor output voltage as a bridge voltage V_{OUT}. The output voltage V_{OUT} without excitation then is 0 V when the offset is compensated.



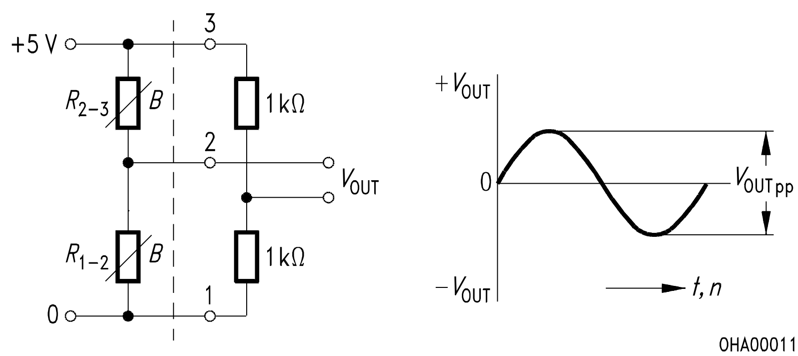


Fig. 1
Schematic representation of a toothed wheel actuating an FP 210 L 100-22

Fig. 2
Measuring circuit and output voltage V_{out} waveform

2. Linear distance measurement

To convert small distances into a proportional electric signal, a small soft iron part of definite width (e.g. b = 1.8 mm) is moved over the face of the sensor.

Proportional signals for distances up to 1.5 mm can be obtained in this way. The sinusoidal output signal gives a voltage proportional to distance in the zero crossover region (see **Fig. 3**).

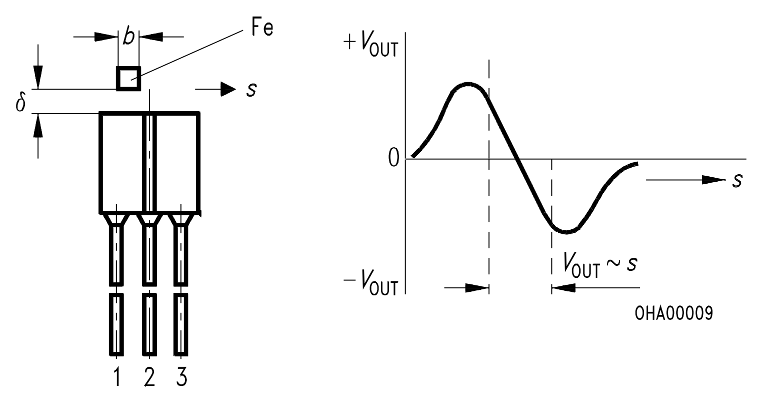
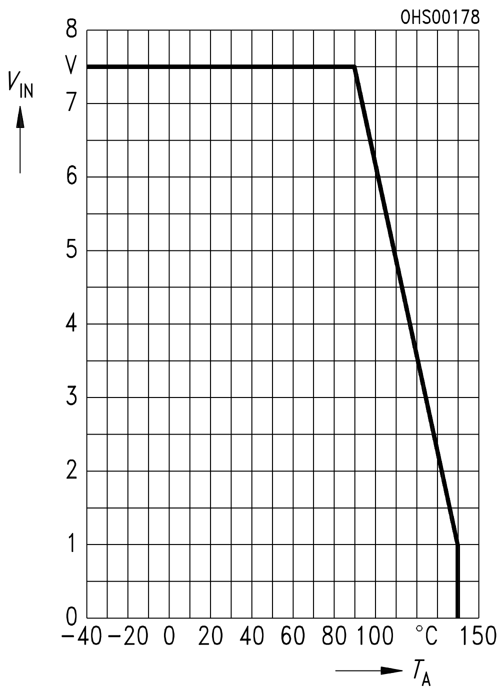


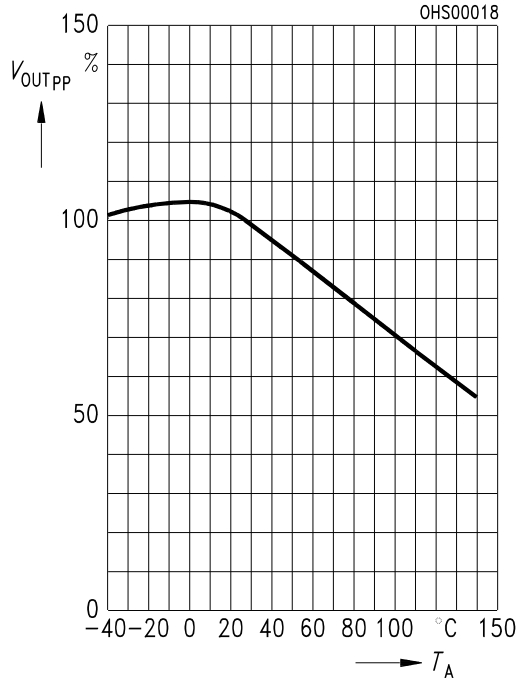
Fig. 3
Arrangement for analogue application

Maximum supply voltage versus temperature

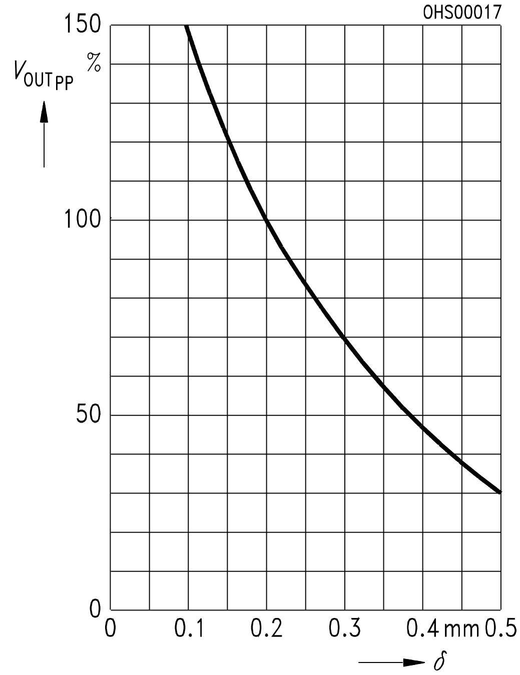
$V_{IN} = f(T_A)$, $\delta = \infty$



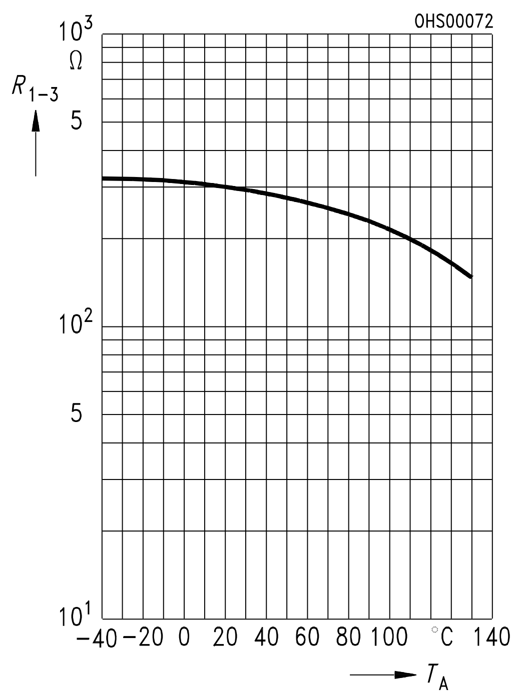
Output voltage (typical) versus temperature $V_{OUTpp} = f(T_A)$, δ = 0.2 mm
V_{OUTpp} at T_A = 25 °C ≙ 100%



Output voltage (typical) versus airgap $V_{OUTpp} = f(\delta)$, T_A = 25 °C
V_{OUTpp} at δ = 0.2 mm ≙ 100%



Total resistance (typical) versus temperature
$R_{1\text{-}3} = f(T_A)$, $\delta = \infty$



Max. power dissipation versus temperature
$P_{tot} = f(T_A)$, $\delta = \infty$