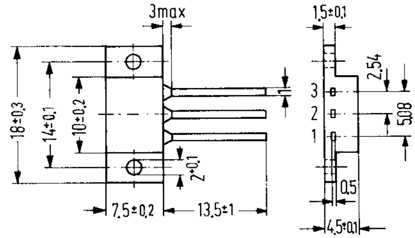
Magneto resistor differential sensor

The magneto resistor differential sensor FP 200 L 100 is composed of two magnetically biassed magneto resistors made of "L" material and having a basic resistance – without bias – of approximately 125 Ω each. Both are wired as potential dividers and incorporated and potted in an aluminium case to protect them against mechanical stress.

The magneto resistor differential sensor FP 200 L 100 may be used as a zero switch. Within the linear range, it then shows a voltage variation of about 1.3 V/mm. Moreover, this magnetically controllable sensor may be applied as a direction dependent, contactless switch, for the measurement of angles, and a analog converter of small displacements into electrical signals.

Type	Order number
FP 200 L 100	Q 65200-L 100-W



Dimensions in mm Weight approx. 1.5 g

Maximum ratings (T_{case} = 25 °C)		FP 200 L 100	
Operating voltage	V_{1-3}	10	V
Insulation voltage between system and case	V_I	100	V
Electrical load of the individual system (R_{1-2} and R_{2-3}, resp.)	P_{tot}	400	mW
Total system (R_{1-3})	P_{tot}	600	mW
Operating temperature	T	−40 to +125	°C
Storage temperature	T_S	−40 to +130	°C
Thermal conduction constant (system to air)	G_{thamb}	≧10	mW/K

Characteristics (T_{amb} = 25 °C)			
Total resistance (air gap $\delta = \infty$)	R_{1-3}	1000	Ω
Tolerance of R_{1-3}	R_{1-3}-Tol.	+400, −300	Ω
Open-circuit output voltage [1]) (face flux ~2 µWB; δ = 0.5 mm; V_B = 8 V)	V_{opp}	4 (>3.5)	V
Cut-off frequency of V_{opp} [1])	f_g	>7	kHz
Centre symmetry $M = \frac{R_1 - R_2}{R_1} \times 100\%$ for $R_1 > R_2$	M	<10	%

[1]) In accordance with measuring arrangement shown above.

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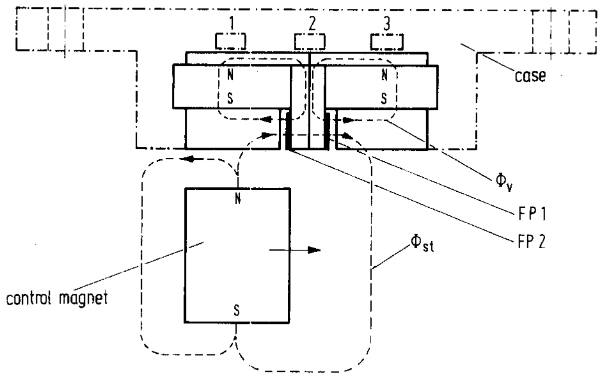
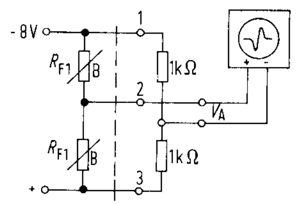
This sensor system is controlled by means of a permanent magnet. With the arrangement shown in the following drawing the magnetic flux ϕ_{st} of the control magnet will increase the flux ϕ_V of the right-hand magneto resistor produced by the magnetic bias (terminals 2 – 3) and weaken that of the left-hand magneto resistor (terminals 1 – 2). The resistance value of MR 1 thus rises while that of MR 2 decreases. Moving the control magnet to the right will reverse the operation.

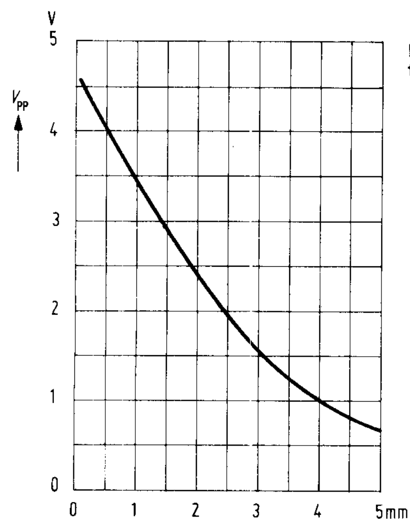


Control of the sensor by means of a bar magnet.

Circuit diagram:

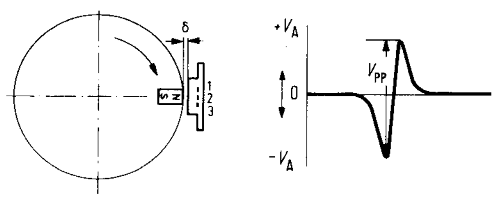


To measure the output signal, the two magnetically biassed magneto resistors of the sensor are supplemented by two additional resistors to form a bridge.
The curve shows the peak value of the output signal as a function of the air gap width δ. These values were determined with a control magnet Alnico 450 (dimensions $4 \times 4 \times 6$ mm; face flux $\sim 2\ \mu$Wb) at a supply voltage of 8 V and an ambient temperature $T_{amb} = 25\ °C$. The measuring arrangement and the shape of the output voltage to be expected is schematically shown below.



Peak value of the bridge voltage V_{pp} as a function of the air gap width δ; $V_{pp} = f(\delta)$

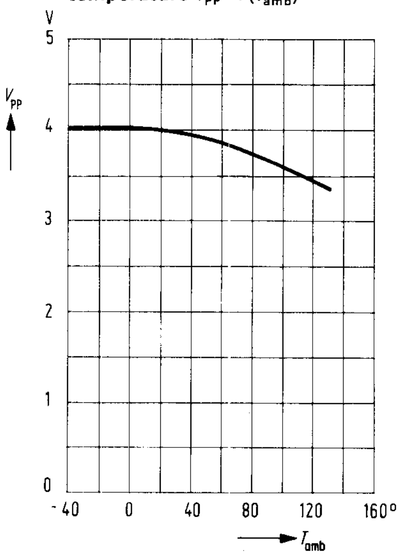
Measuring arrangement and schematic shape of the bridge voltage V_{App}



By wiring the two magneto resistors as potential dividers a low temperature dependence of the signal voltage V_{PP} is ensured. The curve shown in the following graph was determined with a control magnet Alnico 450 at an air gap δ of 0.5 mm and a constant supply voltage of 8 V.

When the magneto resistor differential sensor is operated at higher temperatures attention has to be paid to the fact that, at a constant supply voltage, the maximum permissible power dissipation for each magneto resistor system is not exceeded. The graph below shows the total resistance R_{1-3} of the sensor as a function of the temperature.

Output voltage V_{PP} as a function of ambient temperature $V_{PP}=f(T_{amb})$



Total resistance R_{1-3} as a function of temperature $R_{1-3}=f(T_{amb})$