

MAGNETIC FIELD SENSOR

Description D024



Figure 1. The Magnetic Field Sensor

Short description

The box of the magnetic field sensor contains a Hall-element which is sensitive to the strength of a magnetic field. The element has been mounted near the end of the box. A collar shows the position, see figure 2. By this positioning the sensor is suited to measure the fields in coils. The sensor is less suited to measure the field in slit-shaped cavities. If the field lines are perpendicular to the collar (longitudinal to the housing), the output voltage of the sensor has the highest value. The sensor has two ranges:

- from -100 to + 500 mT (0-3 V);
- from -10 to 50 mT (0-3V).

Without field the output is 0.5V.

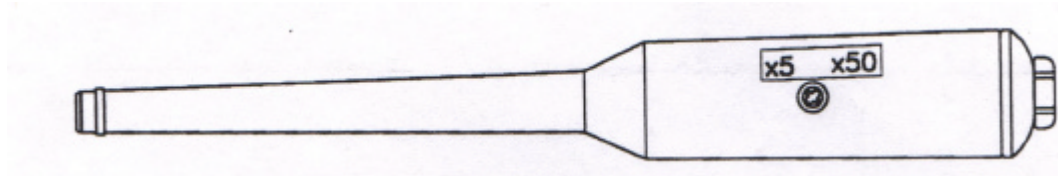


Figure 2. The Magnetic Field Sensor.

Left: the collar marks the position of the Hall-element.

Right: switch for altering the amplification factor.

The position of the switch in the housing determines the amplification rate of the signal. In both positions the output signal is between 0 and 3V. If the amplification rate is 50x, the sensitivity is 10x higher than in the position 5x. The switch can be turned over with the supplied trimming tool or with a small screwdriver.

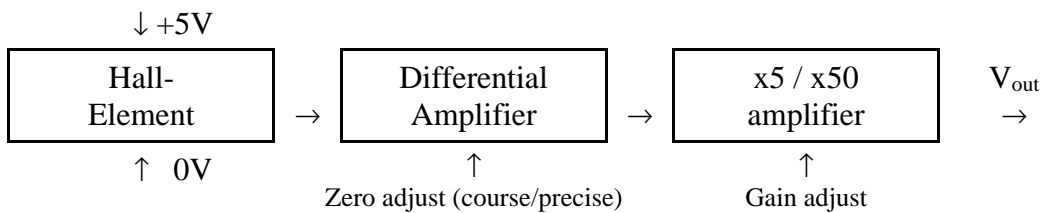


Figure 3. Block scheme of the magnetic field sensor.

The magnetic sensor is delivered with a BT-plug and can be connected to the following interfaces:

- UIA/UIB through Measuring console (via 0520 adapter)
- CoachLab
- CoachLab II
- SMI (via 0520 adapter)
- Texas Instruments CBL™ data-logger.

There is an adapter (art. 0520) to connect sensors with BT-plugs to 4-mm inputs.

Suggestion for experiments

- Measurements of magnetic field near a permanent magnet.
- Measurements of magnetic field near a current-carrying wire.
- Measurements of magnetic field at opening of a solenoid.

Calibration

The diagram of figure 4 shows the magnetic field strength that has been measured in the middle of a long coil.

Coil: $l = 15$ cm; $\varnothing = 2,0$ cm; $N = 23$ windings per cm; $I = \pm 2$ A max.

($B = 2.89 \cdot 10^{-3} I$ T; B is max. ± 6 mT)

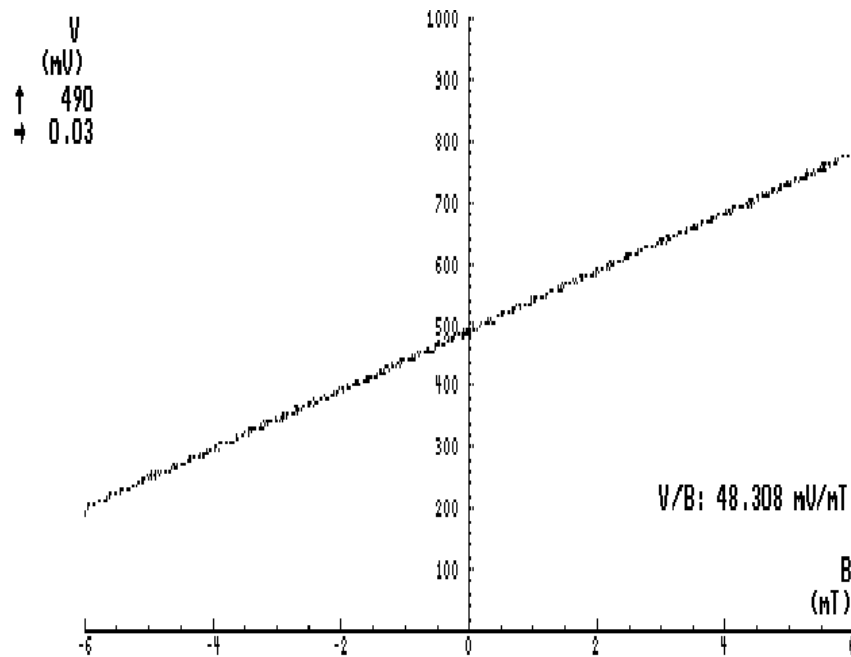


Figure 4. Calibration graph of the magnetic field sensor, amplified 50 x.

The current in the windings of the coil has been measured through the voltage over a resistor of 0.50 Ohm (amplified 2 x with the signal amplifier).

See figure 5.

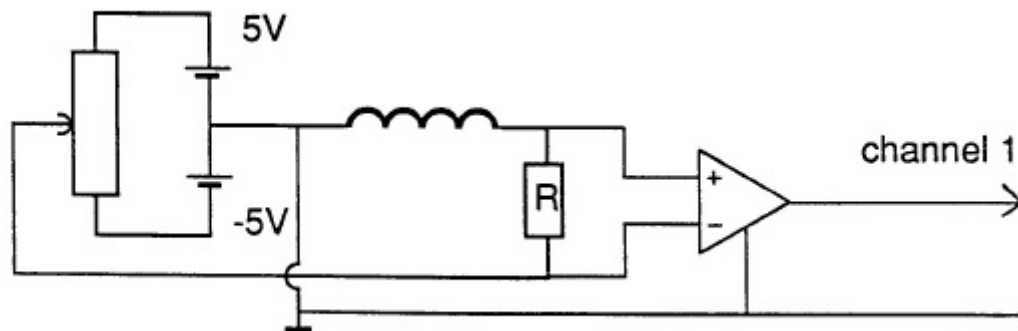



Figure 5. Circuit for the measurement of the current.

The name of the magnetic field sensor in the sensor library of Coach 5 program is **Magnetic sensor (024&bt) (CMA)**. The sensor has two calibrations between -10..50 mT, and between -100..500 mT.

Technical data

Sensitivity x5	5.00 mV/mT ($\pm 5\%$)
Sensitivity x50	50.0 mV/mT ($\pm 5\%$)
Output voltage	0 - 3 V
Range x5	-100 to +500 mT
Resolution x5 using 12 bit 5V A/D converter	0.25 mT
Range x50	-10 to +50 mT
Resolution x50 using 12 bit 5V A/D converter	0.025 mT
Amplification Offset	x5 or x50 In the absence of a magnetic field the output voltage is 0.50 volt. Differences of 10 mV (x5 position) to 100 mV (x50 position) can occur, for instance because of temperature effects. Take these differences into account when interpreting the results of measurements.
Housing total Narrow end	Length = 19 cm Diameter = 3 cm Length = 10 cm Diameter = 0.8 cm
Connection	 BT (British Telecom) plug

The range is limited by a maximum output voltage of 3 V.

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