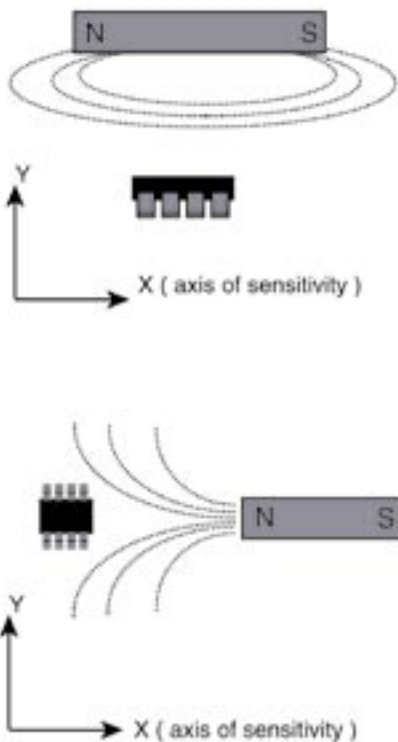


## GMR sensors

### Displacement and proximity sensors

GMR sensors exhibit excellent linearity and repeatability, and their high sensitivity allows them to be used to provide displacement information of actuating components in machinery and linear displacement transducers. These sensors have been used to resolve displacements down to one micron.

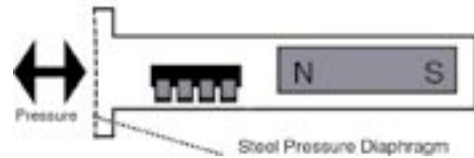
A typical application for GMR sensors is proximity detection. While this can be done using other technologies the sensitivity of the GMR device allows a greater design freedom when specifying mechanical tolerances and magnet strengths.



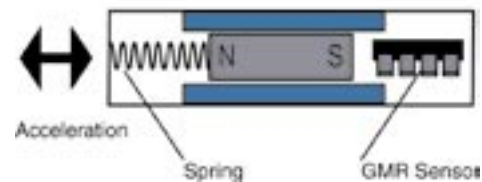
Typical applications include:

- displacement sensors
- accelerometers
- pneumatic cylinders
- artificial limbs
- micromovement sensors
- pressure sensors
- vehicle detection

### Sample pressure sensor implementation

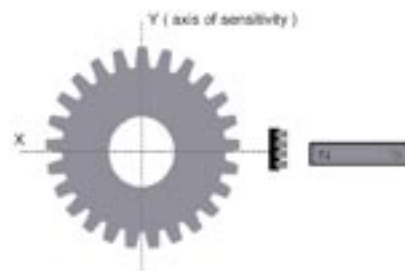


### Accelerometer implementation



### Speed sensor

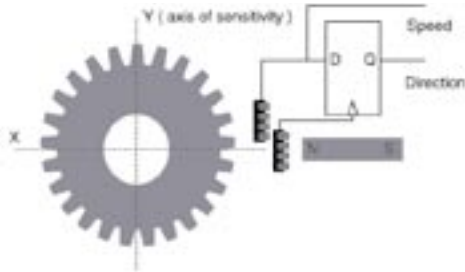
GMR sensors offer a rugged low cost solution to rotational reference detection. Unlike some other sensors GMR has DC operation which gives it an advantage over variable reluctance devices.



### Speed and direction sensing

The addition of another sensor permits the direction of rotation to be sensed as well as the speed. The second sensor must be located to be 90° out of phase to the first. This can be detected using a standard D-type flip flop circuit.

## GMR (continued)



Typical applications include:

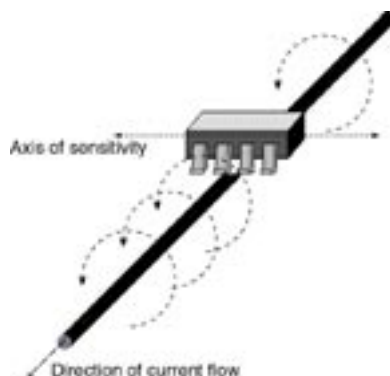
- rotary encoders
- flowmeters

## Current detection

GMR magnetic field sensors can effectively sense the magnetic field generated by a current. The sensor can measure current without having to break the circuit, and is isolated from the circuit.

$$H(\text{Oe}) = \left( \frac{I(\text{A})}{5 r(\text{cm})} \right) \text{ Field A distance } r \text{ from the centre of a wire}$$

AA002-02	Board	Wire	Wire
Current to chip (m)	0.000762	0.001461	0.00254
Current (A)	1	1	1
H (Oe)	2.61	1.36	0.78
Sensitivity (mV/V/Oe)	4	4	4
Current sensitivity (mV/V/Oe)	10.44	5.45	3.13



Typical applications include:

- live wire detection
- isolated current detection

Other GMR applications include:

- currency detection (magnetic ink detection on bank notes)
- unexploded ordnance (checking for anomalies in background magnetism of soil)
- geophysical survey
- medical
- Earth's magnetic field sensing

## CONVERSION FACTORS

A/cm	Amps per centimetre
A/m	Amps per metre
G	Gauss
Oe	Oersted
T	Tesla
mT	milli Tesla
nT	nano Tesla
Wb	Weber

To convert	Into	Multiply by
A/cm	Oe	1.256
A/m	Oe	1.256 x 10 <sup>-2</sup>
G	Oe	1 (when $\mu_0=1$ )
G	T	10 <sup>-4</sup>
G	mT	10 <sup>-1</sup>
G	nT	10 <sup>5</sup>
G	Wb/cm <sup>2</sup>	10 <sup>-8</sup>
G	Wb/m <sup>2</sup>	10 <sup>-4</sup>