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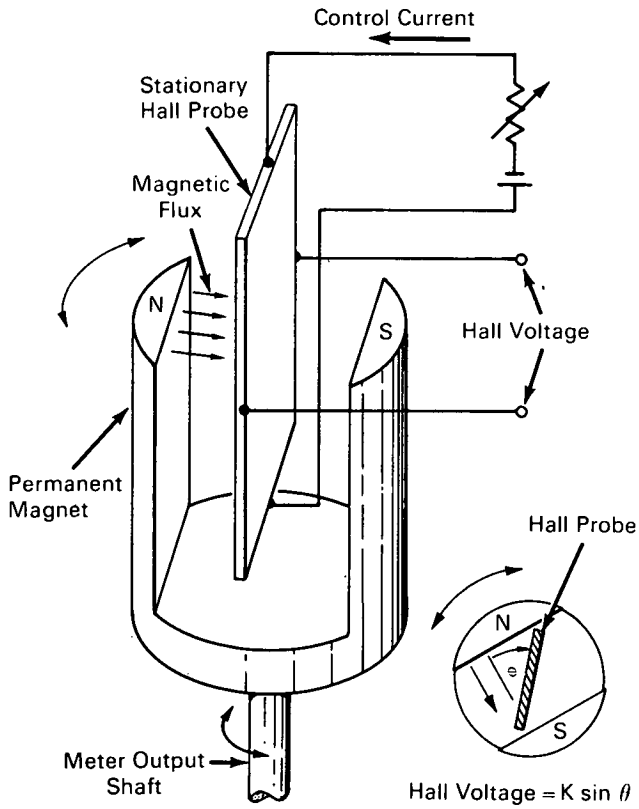
Brief 70-10298

# NASA TECH BRIEF



## Hall Effect Transducer Gives Electrical Output Proportional to Meter Shaft Rotation




A transducer based on an application of the Hall Effect has been designed to produce output voltages directly proportional to small rotary shaft displacements, such as in mechanical differential-pressure meters. A primary advantage of this electrical output transducer for measuring angular displacements is that it does not introduce frictional contact between stationary and moving parts. As in the case of other mechanical-to-electrical transducers, the output of the Hall Effect transducer can be transmitted (by wire or telemeter) to any desired location for display, storage, or computer processing.

As shown in the schematic, a Hall probe (a plate of an appropriate conductor or semiconductor) is rigidly suspended between the poles of a permanent magnet which is fixed to the meter output shaft. Thus, the Hall probe remains stationary as the magnet and shaft rotate together. With a constant control current supplied to contacts at the ends of the probe, the output voltage (Hall voltage) generated between contacts on the sides of the probe will be directly proportional to the sine of the angular displacement or rotation of the meter shaft.

Since the sine of the angle and its measure in radians rapidly approach equality for small angles, the voltage output and meter shaft rotation for angles ranging from 0 to about 6° may be accepted as being directly proportional. A voltmeter connected to the Hall transducer output could then be calibrated to give direct readings of meter shaft rotation (corresponding to differential pressure or other physical magnitude proportional to meter shaft rotation) on a linear scale extending over about $\pm 6°$.

### Notes:

1. The principle of this transducer would be generally applicable to any meter with a rotary shaft that responds to changes in a physical magnitude.
2. With appropriate shaping of the magnetic field between the magnetic poles, or the use of a specially designed Hall probe, the voltage output linearity of the transducer can be extended to a much larger range of shaft rotations (approximately $\pm$ 30°).

(continued overleaf)

The transducer can be used for measurement of angles up to ± 90°, where nonlinear outputs are acceptable.

3. No additional documentation is available. Specific questions, however, may be directed to:

   Technology Utilization Officer
   Langley Research Center
   Hampton, Virginia 23365
   Reference: B70-10298

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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