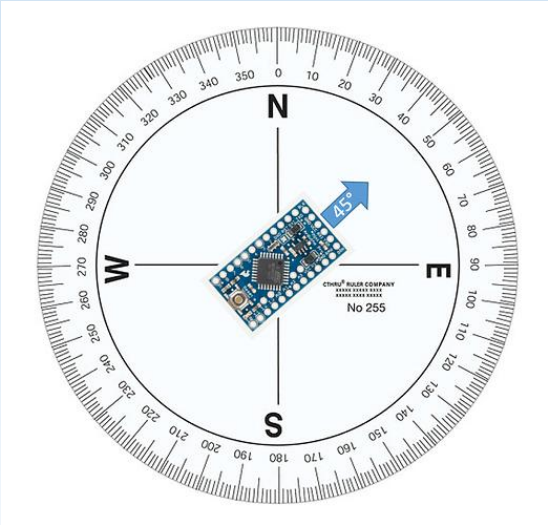
Rotation sensors

Rotation sensors (also called **rotational position** or **angular velocity sensors**)

They are used to measure **angular displacement**, **rotation speed**, or **angular acceleration** of a shaft, wheel, or object.

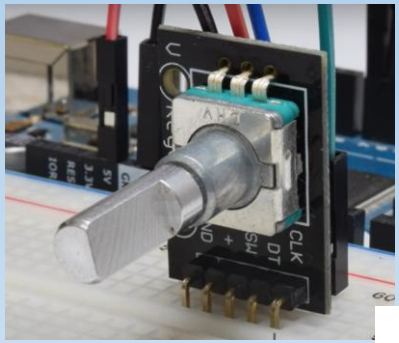
Vital in robotics, automotive systems, aerospace, industrial automation, and motion tracking.



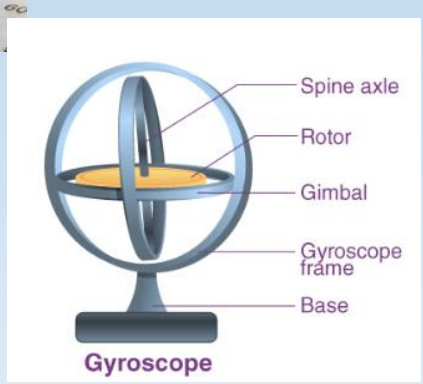
Rotation sensors

Main Types of Rotation Sensors

1.Rotary Encoders



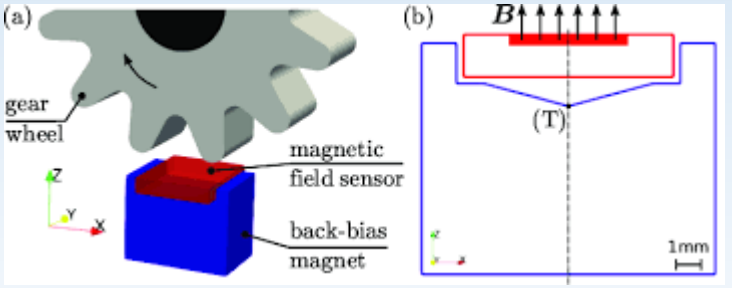
2.Gyroscopes



3.Potentiometric Rotary Sensors

4.Resolver Sensors

5.Magnetoresistive or Hall Effect Sensors



Rotation sensors

Main Types of Rotation Sensors

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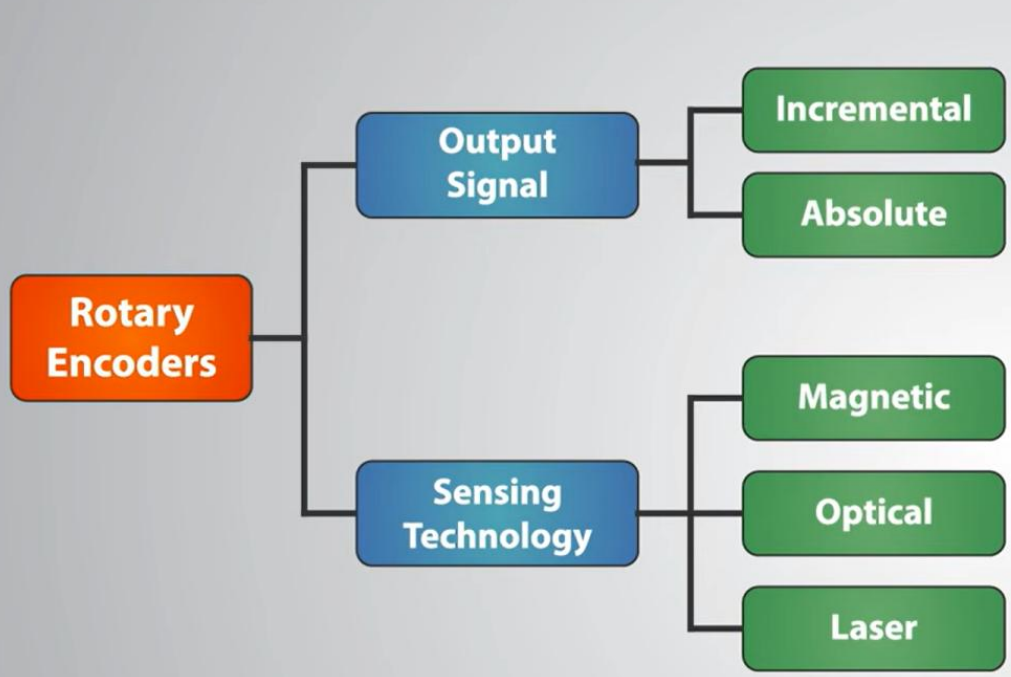

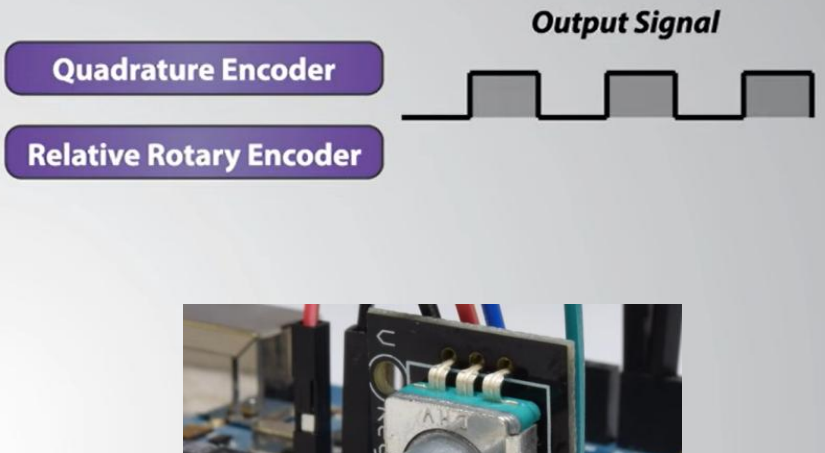

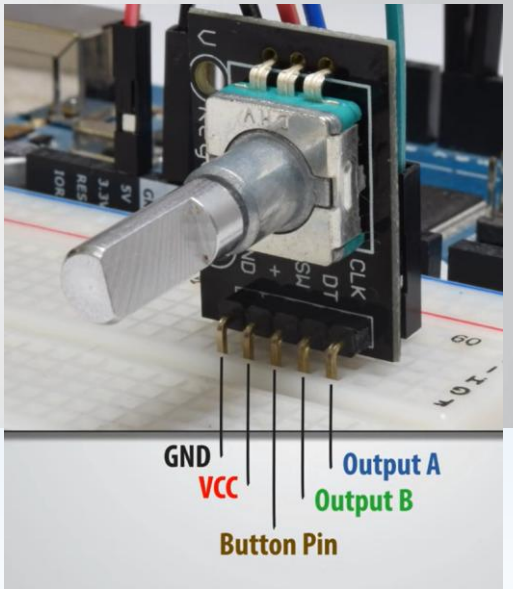

Rotation sensors

Main Types of Rotation Sensors

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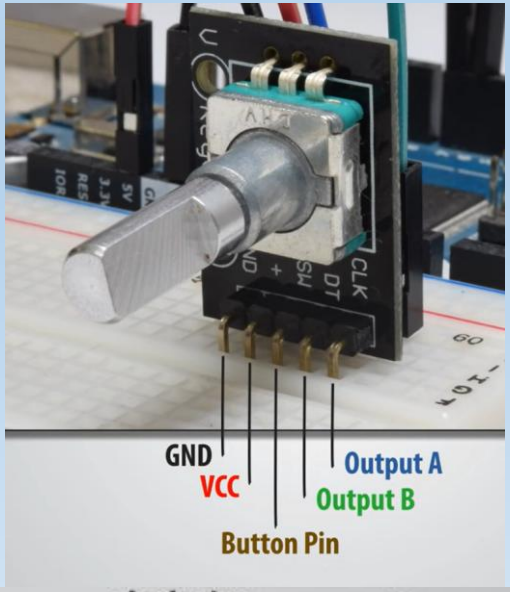

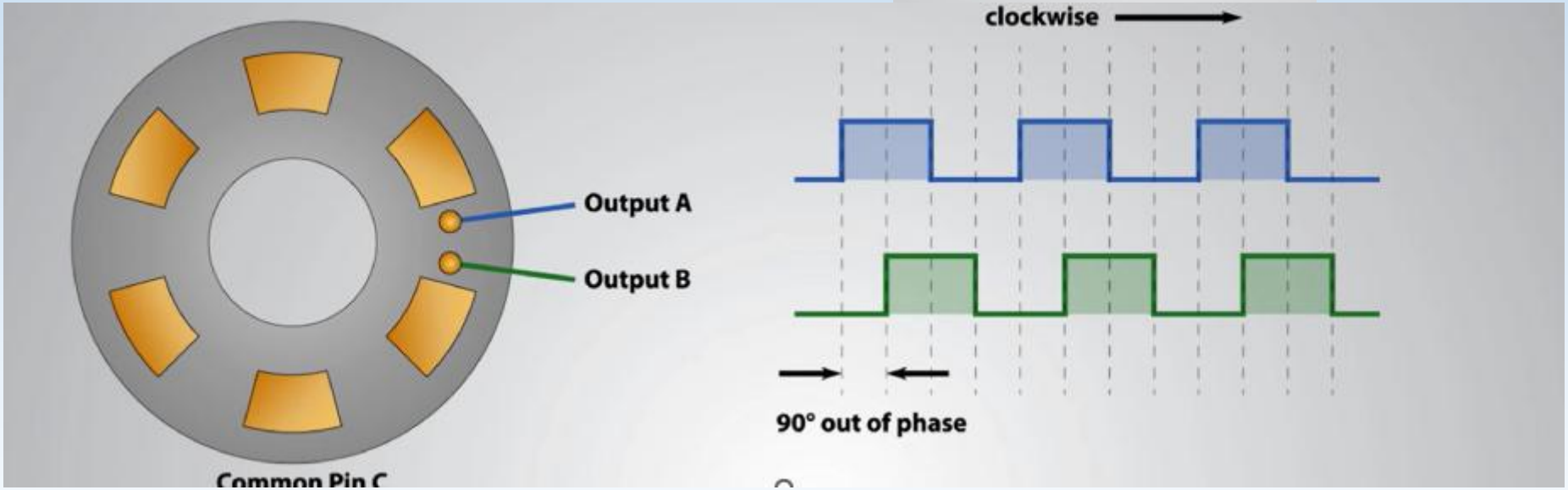

Rotation sensors

Main Types of Rotation Sensors

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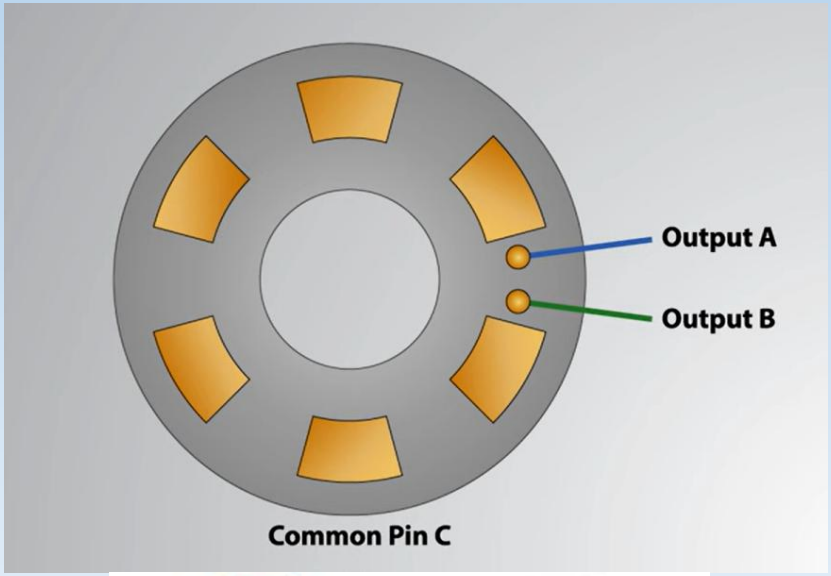
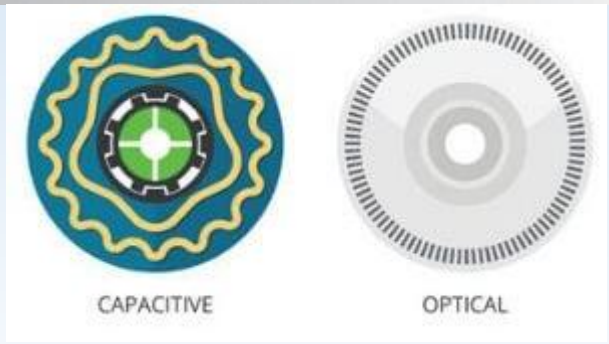
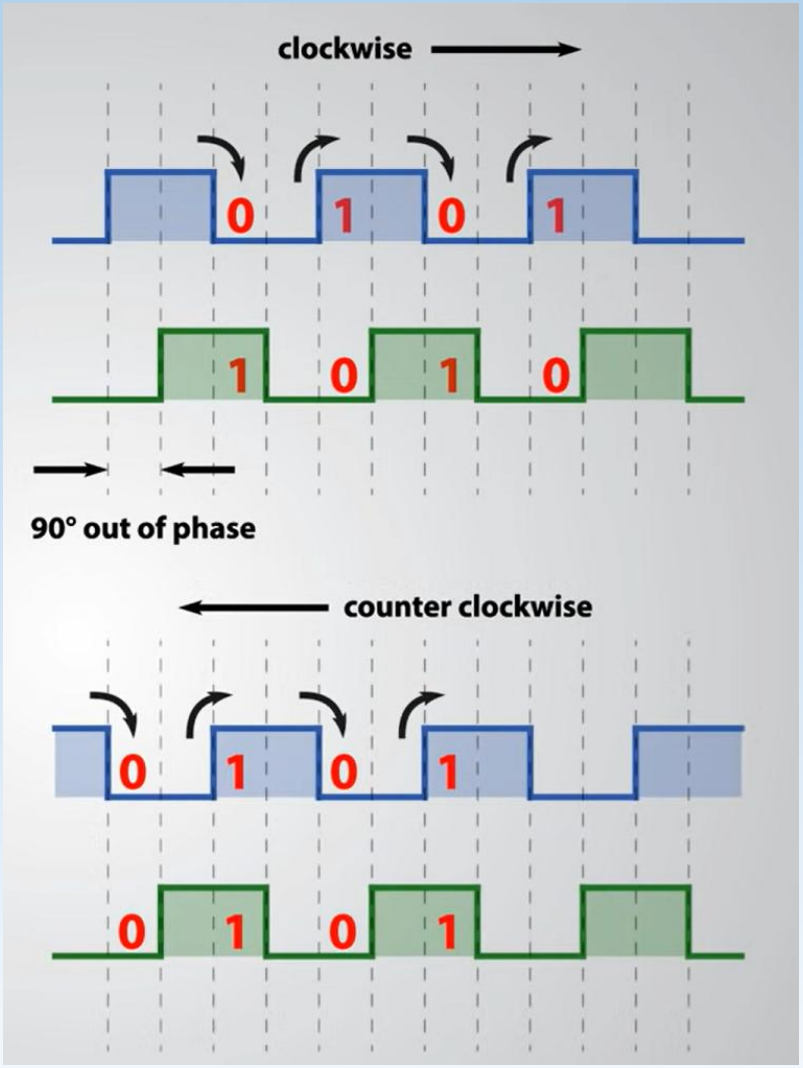


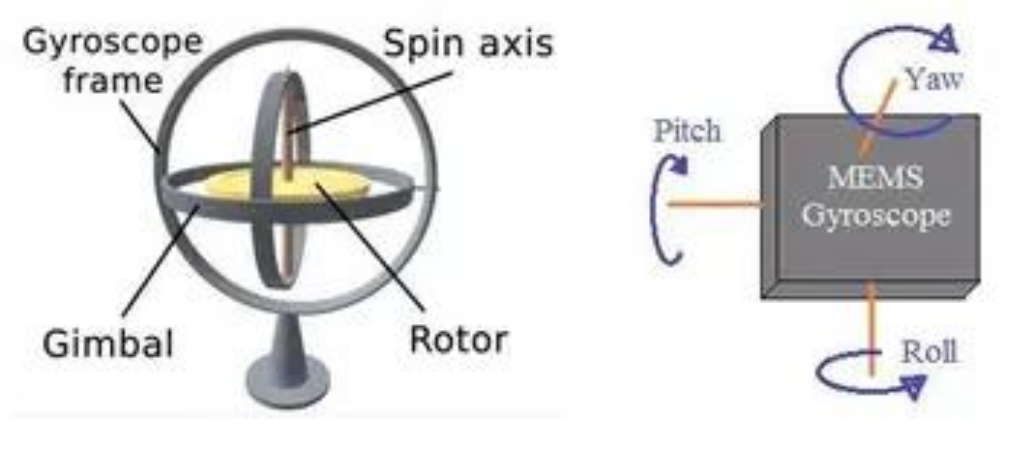


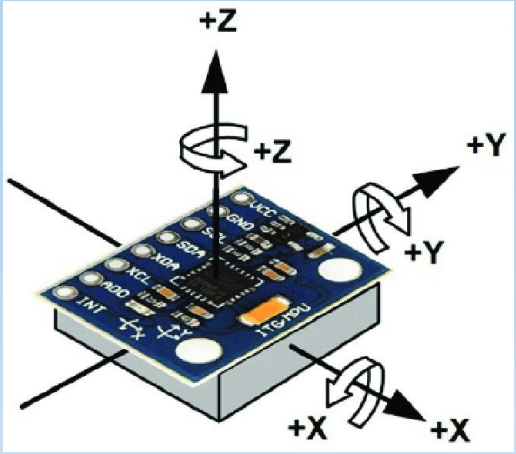


Rotation sensors

Main Types of Rotation Sensors

2. Gyroscopes





Gyroscope sensors are also called as Angular Rate Sensor or Angular Velocity Sensors.

Gyroscope sensor is a device that can measure and maintain the orientation and angular velocity of an object.

These can measure the tilt and lateral orientation of the object whereas accelerometer can only measure the linear motion.

These sensors are installed in the applications where the orientation of the object is difficult to sense by humans.

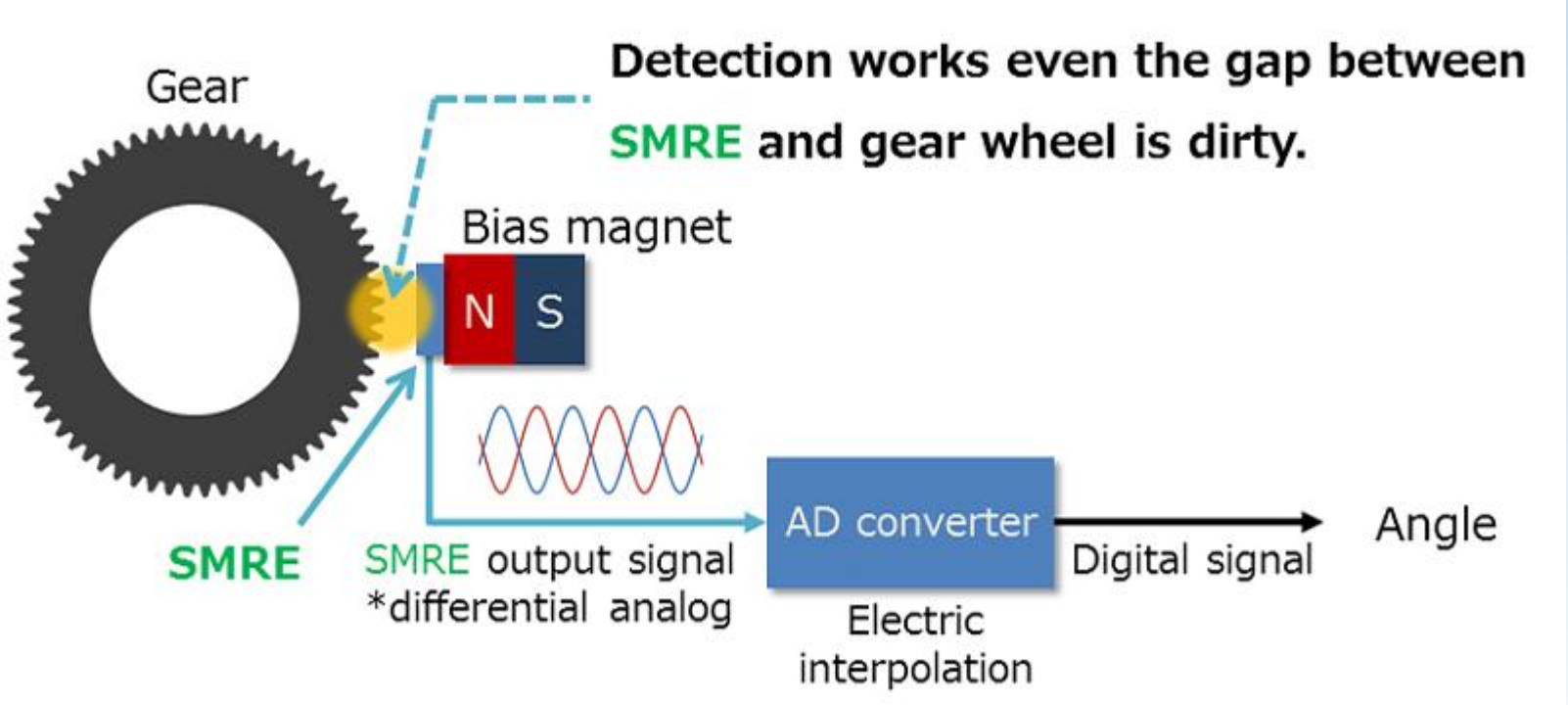
Measured in degrees per second, angular velocity is the change in the rotational angle of the object per unit of time.

Rotation sensors

Main Types of Rotation Sensors

Magnetoresistive or Hall Effect Sensors

- Use changes in magnetic field to detect rotation.
- Often used in automotive crankshaft/camshaft position sensors.



Rotation sensors

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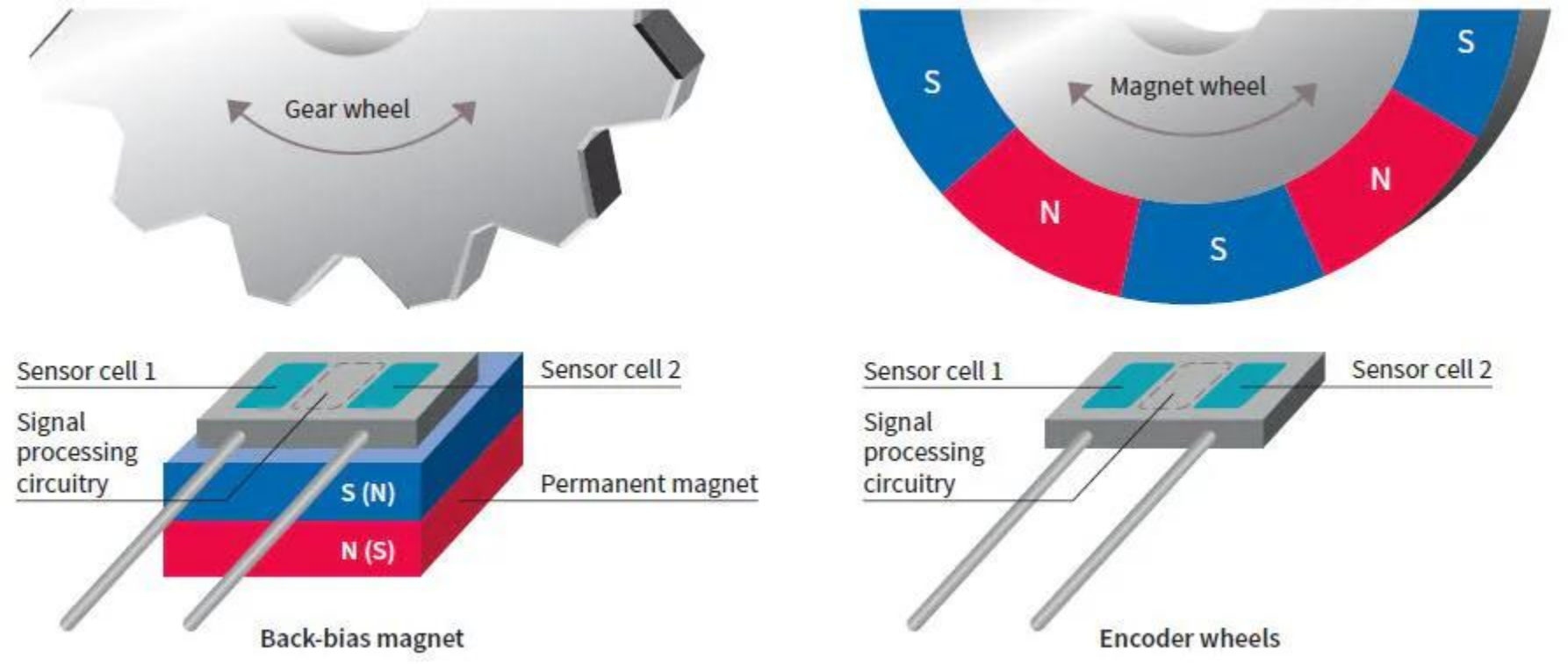
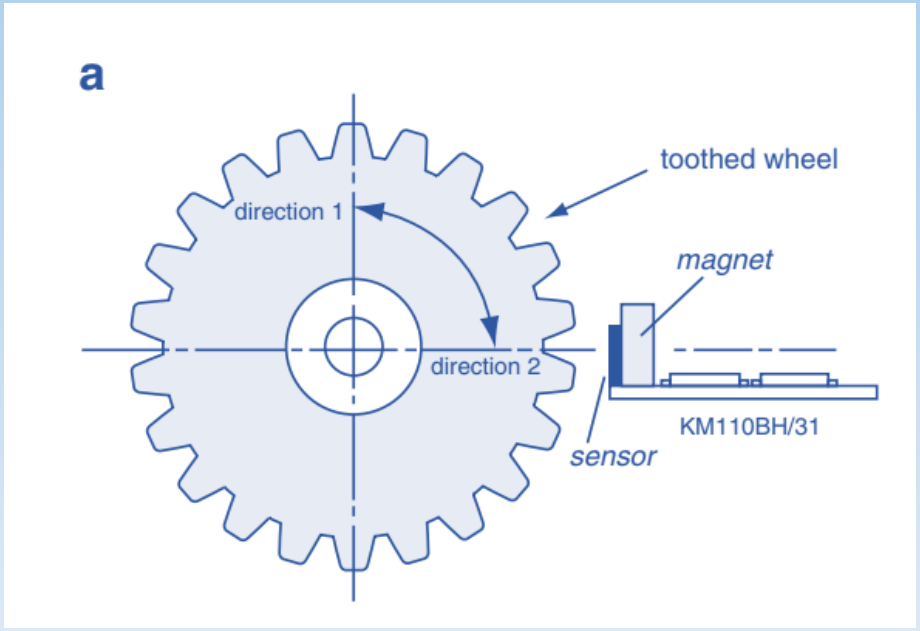
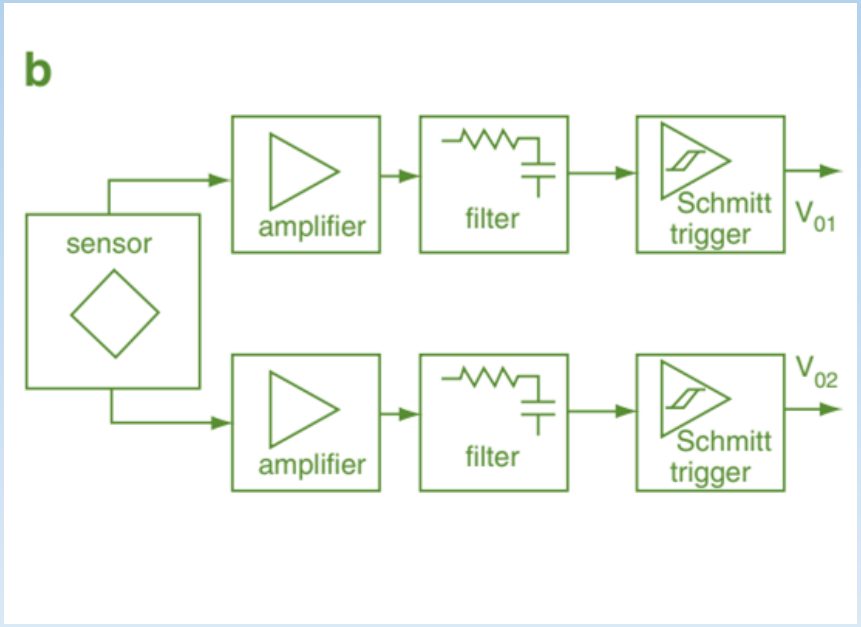


Rotation sensors

Magneto resistive or Hall Effect Sensors





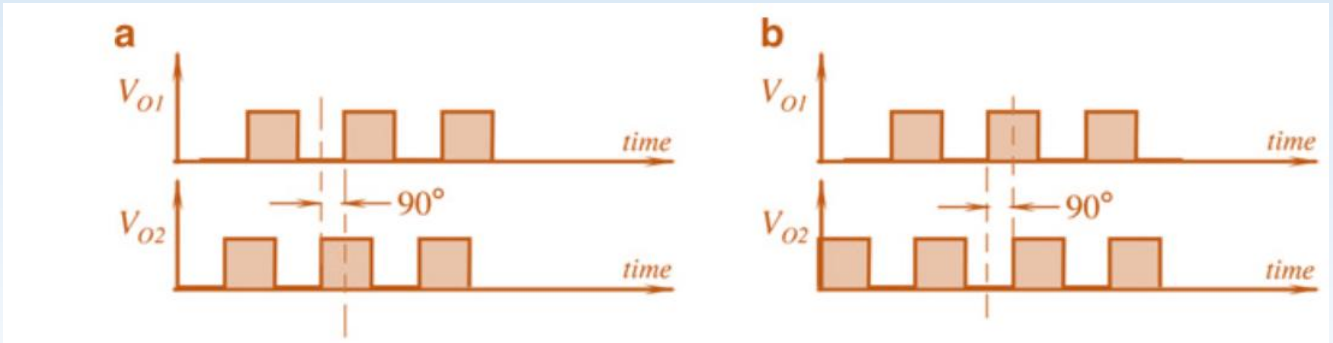


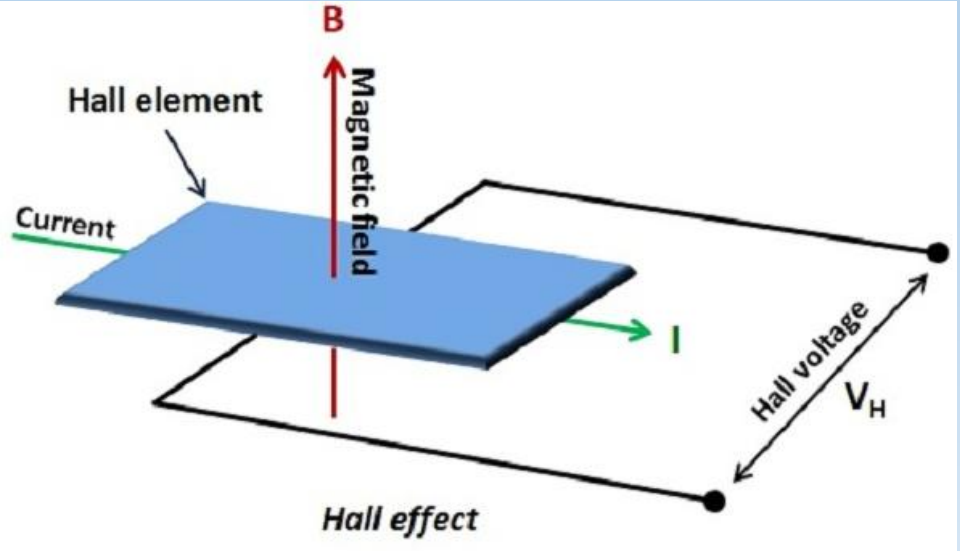
Fig. 7.26 Output signal from the amplifiers for direction 1 (**a**) and 2 (**b**)

Rotation sensors

Magneto resistive or Hall Effect Sensors

In 1879 Edwin Hall discovered that

Hall Effect



When a current carrying conductor or semiconductor is placed in a transverse magnetic field a voltage will be developed perpendicular to both current and magnetic field.

Current **SEMICONDUCTOR/ CONDUCTOR** → **MAGNETIC FIELD** → **VOLTAGE**

Rotation sensors

Main Types of Rotation Sensors

Potentiometric Rotary Sensors

- Analog sensors using variable resistors to detect angle.
- Simple and cost-effective, but less durable.
- *Applications*: Joysticks, control knobs.

Resolver Sensors

- Electromechanical analog sensors; work like rotary transformers.
- Offer high reliability in harsh environments.
- *Applications*: Aerospace, defense, heavy industry.