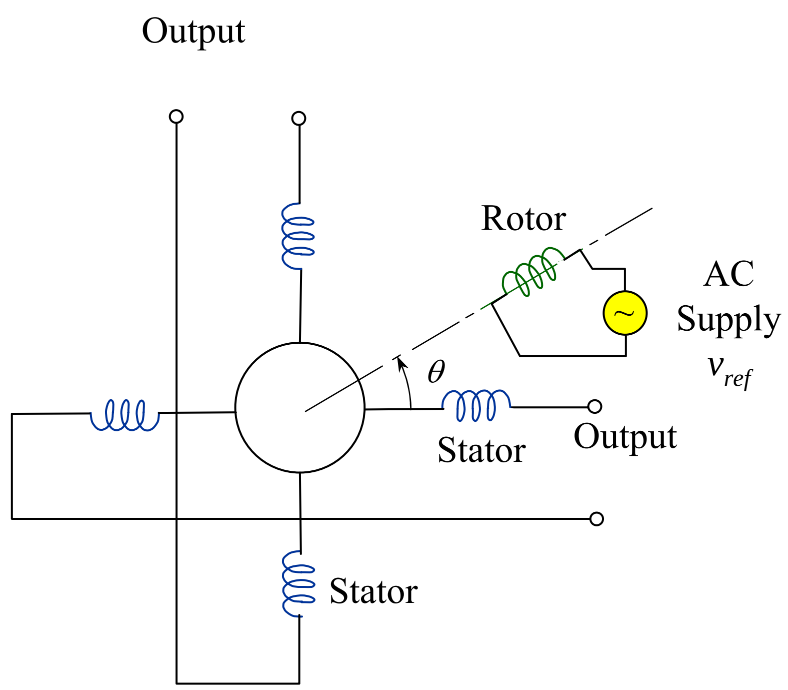
Resolver

- Mutual induction transducer for measuring angular displacements



- Rotor has the primary winding and is energized by the supply voltage
- Stator has two sets of windings placed 90^0 apart

Supply voltage $v_{ref} = v_a \sin \omega t$

Induced Voltages $v_{o1} = a v_{ref} \cos\theta$ $v_{o2} = a v_{ref} \sin\theta$

The induced quadrate signals are

$$v_{o1} = a v_a \cos\theta \sin\omega t \qquad v_{o2} = a v_a \sin\theta \sin\omega t$$

Multiply each quadrature signal by v_{ref} to get

$$v_{m1} = v_{o1} v_{ref} = a v_a{}^2 \cos\theta \sin^2 \omega t = \frac{1}{2} a v_a{}^2 \cos\theta \left[1 - \cos 2\omega t\right]$$

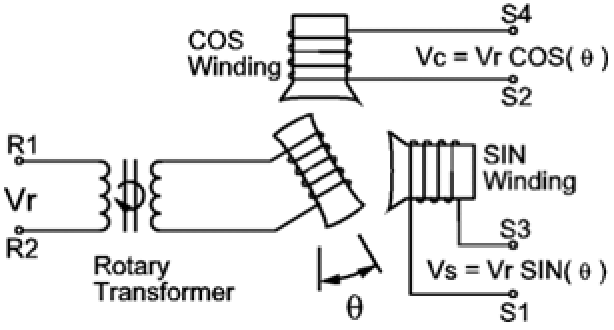
$$v_{m2} = v_{o2} v_{ref} = a v_a{}^2 \sin\theta \sin^2 \omega t = \frac{1}{2} a v_a{}^2 \sin\theta \left[1 - \cos 2\omega t\right]$$

Low pass filter to obtain

$$v_{f1} = \frac{1}{2} a v_a{}^2 \cos\theta \qquad v_{f2} = \frac{1}{2} a v_a{}^2 \sin\theta$$

Advantages

- Fine resolution and high accuracy
- Low output impedance
- Small size (10mm diameter)



Limitations

- Nonlinear output signals
- Bandwidth limited by supply frequency
- Slip rings and brushes would be necessary if multiple rotations to be measured (a brushless resolver can eliminate this)