

Displacement Sensor (5B)

- LVDT
- Synchro
- Resolver
- Position Sensitive Device (PSD)

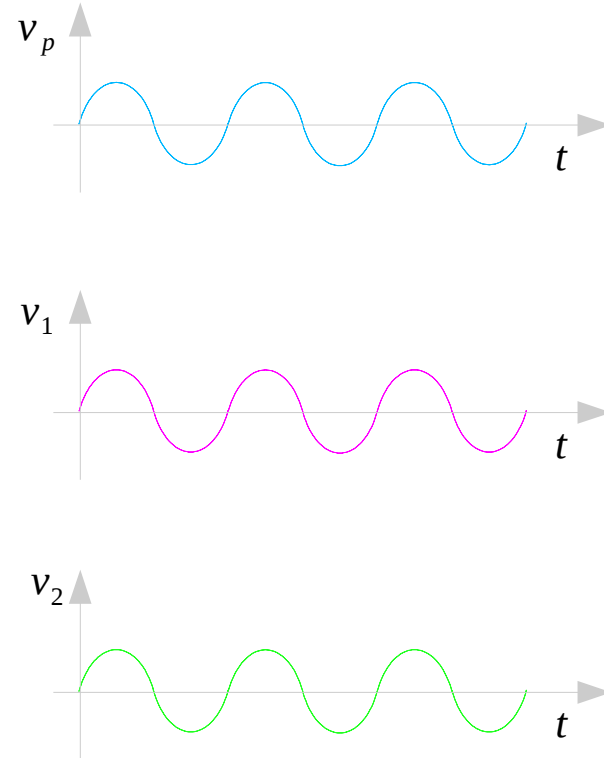
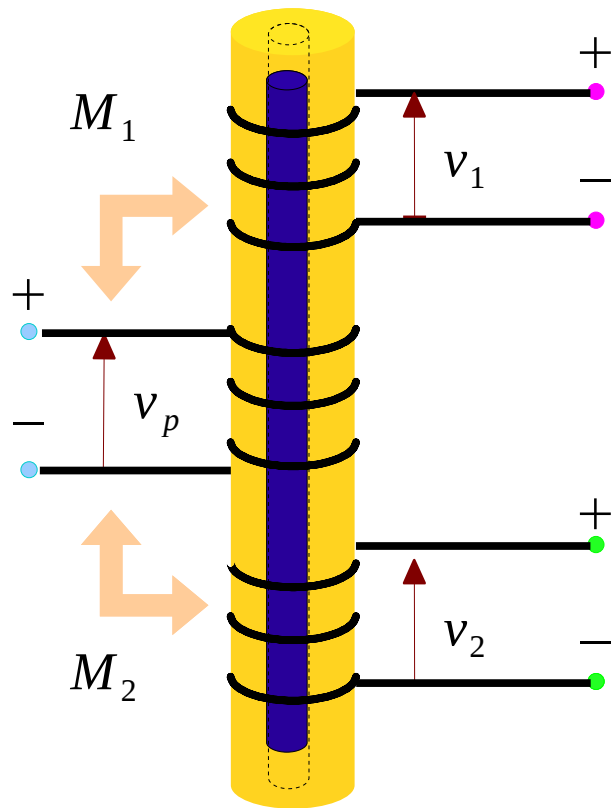
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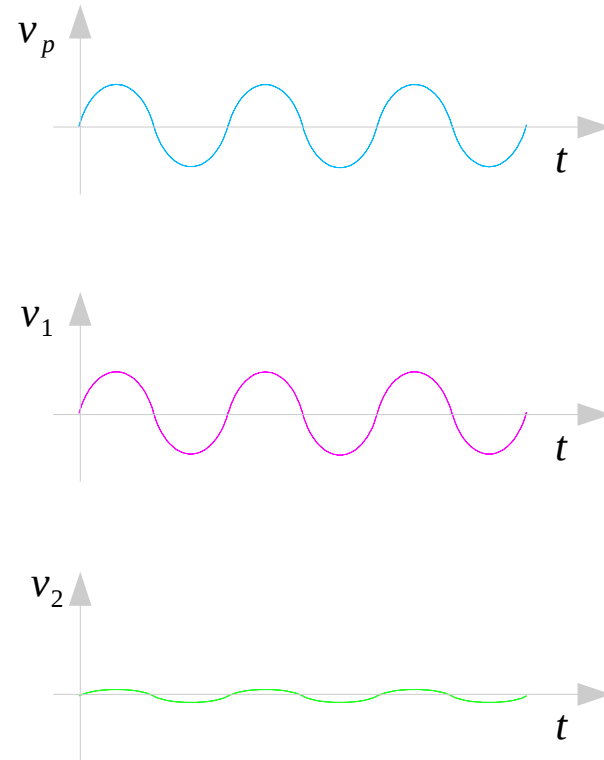
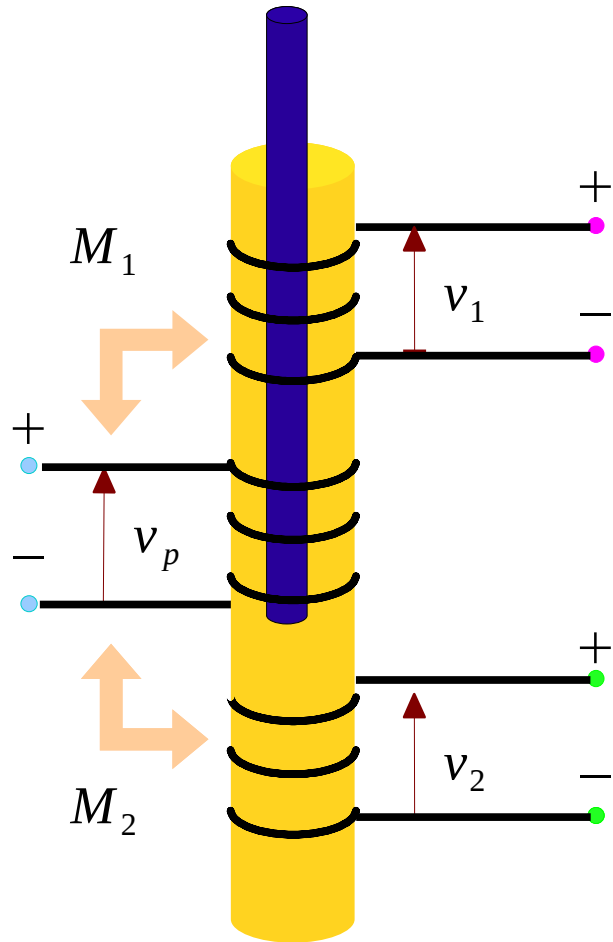
Please send corrections (or suggestions) to youngwlim@hotmail.com.

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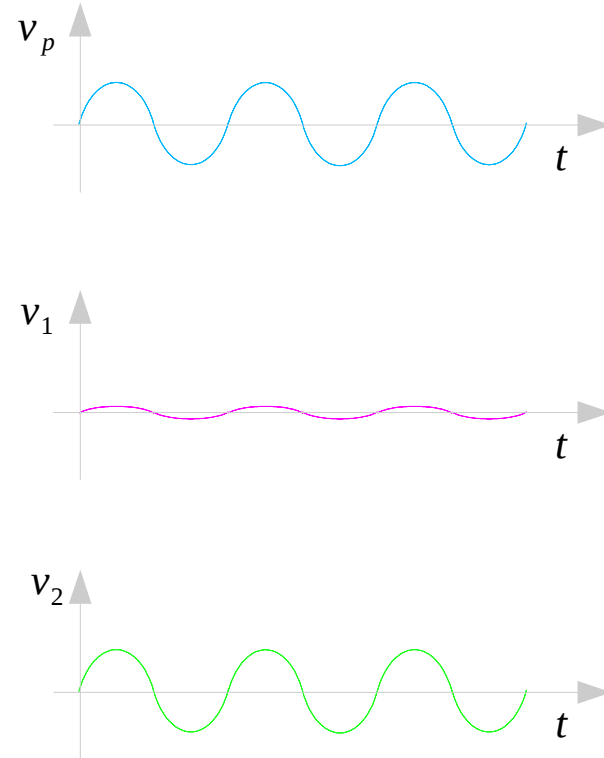
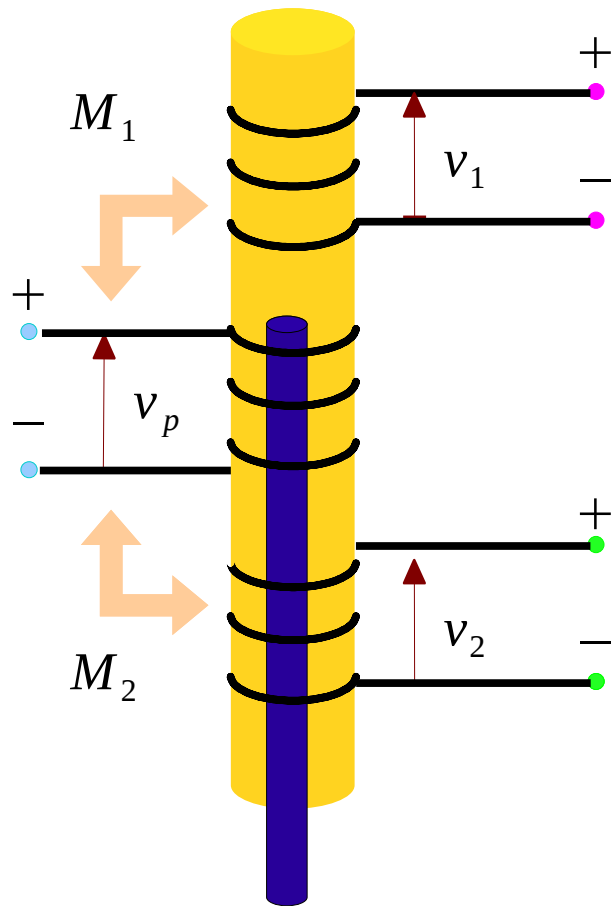
LVDT Sensor - center position



LVDT Sensor - top position

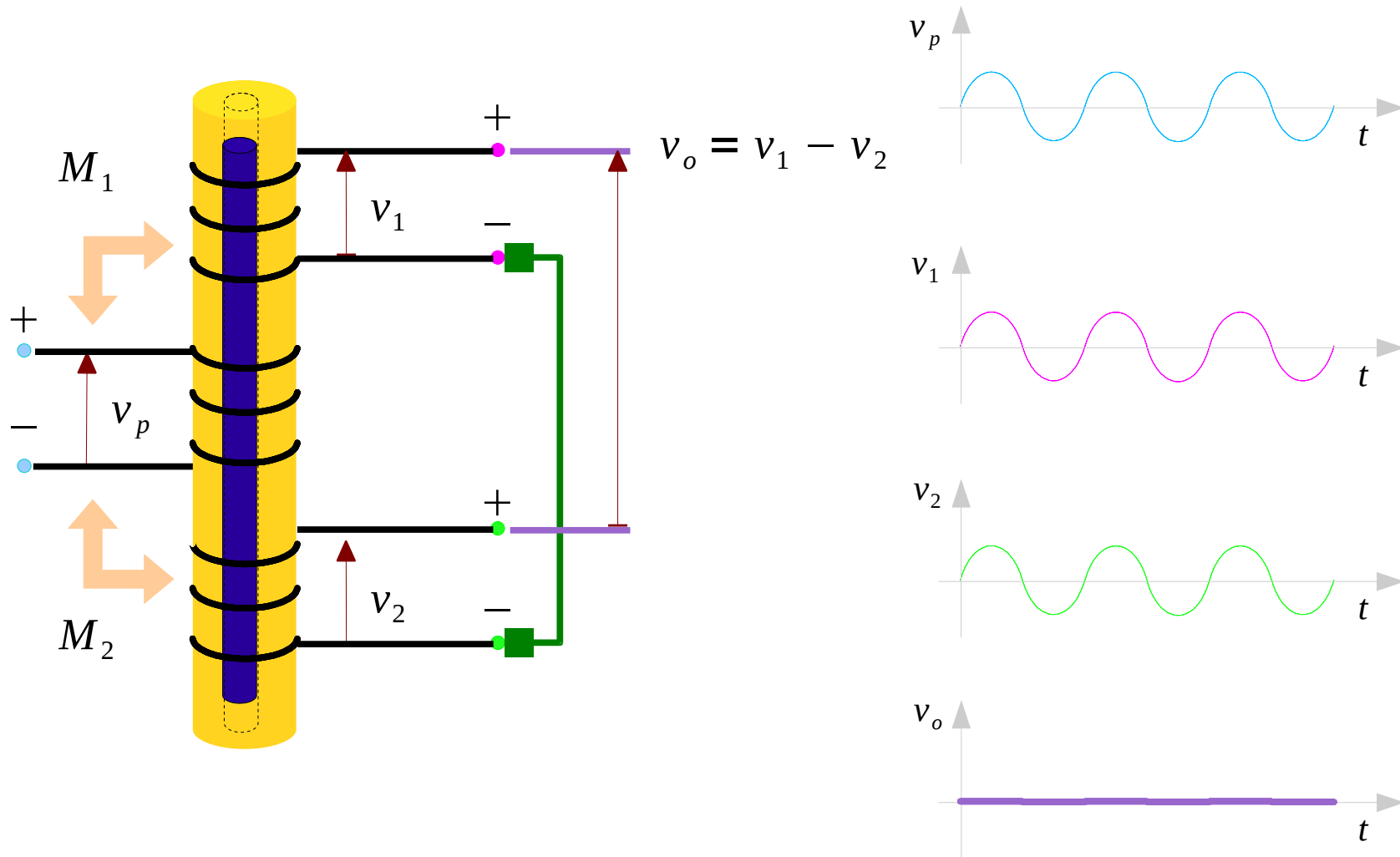


LVDT Sensor - bottom position



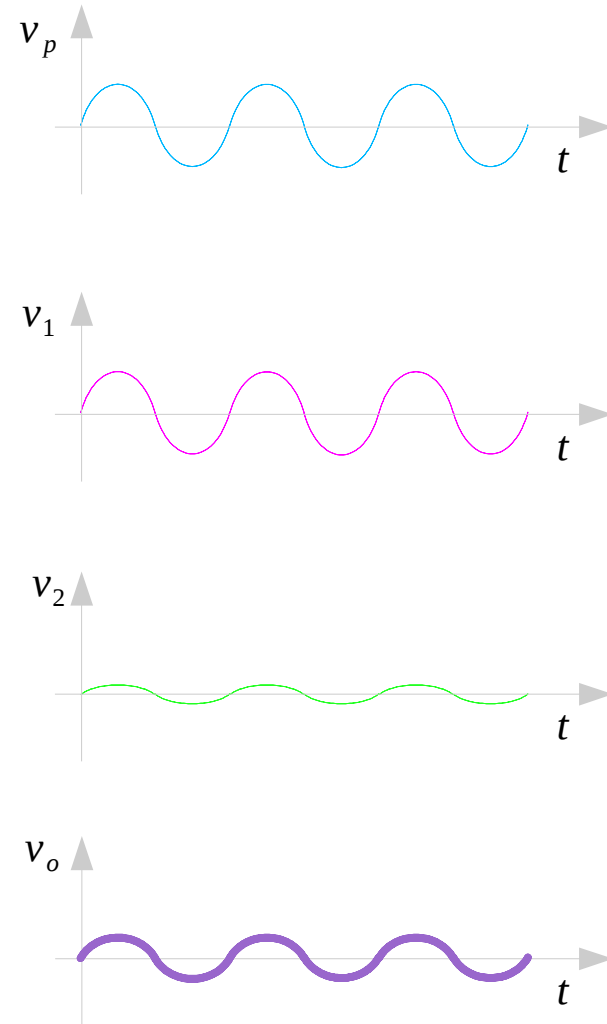
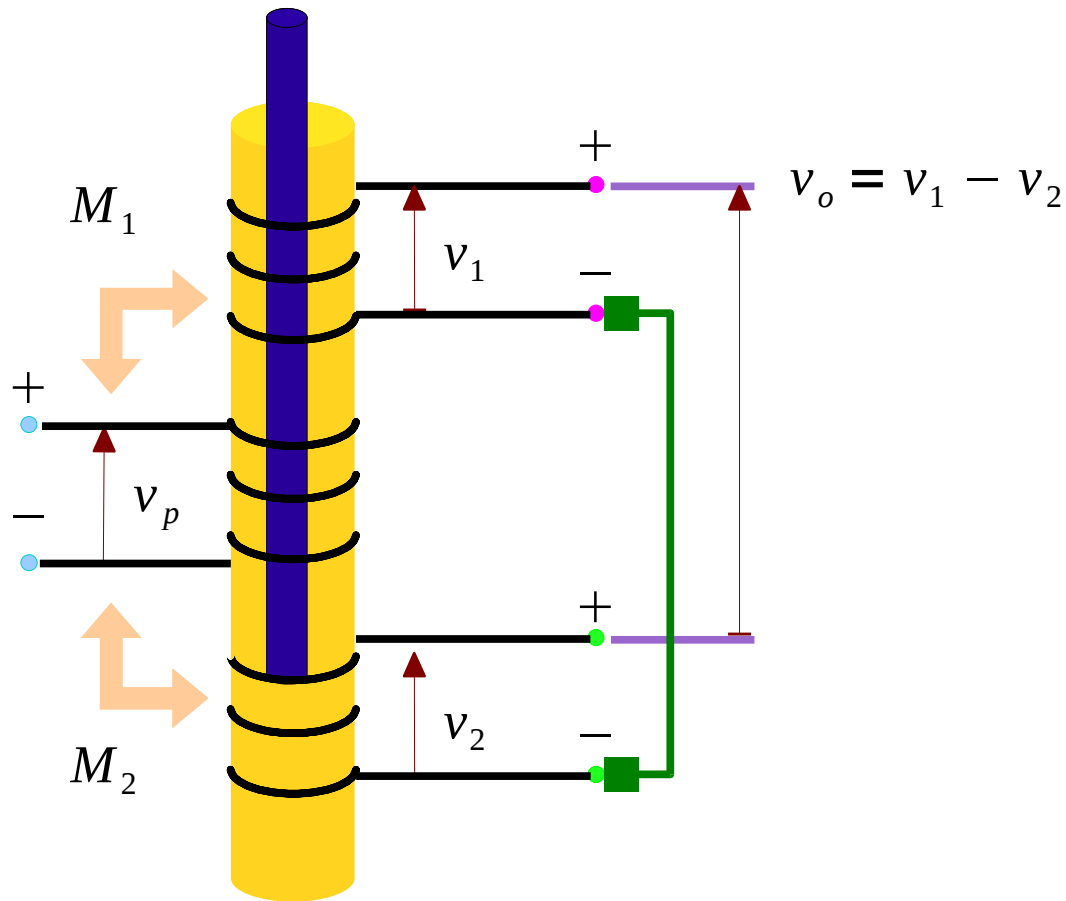
LVDT Sensor – center position

Series opposition connection



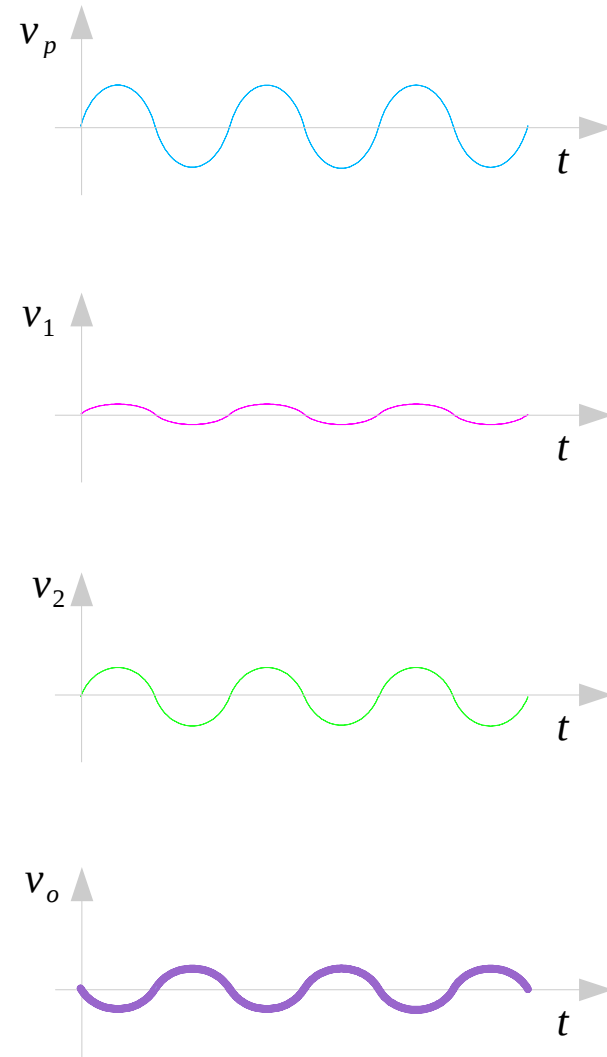
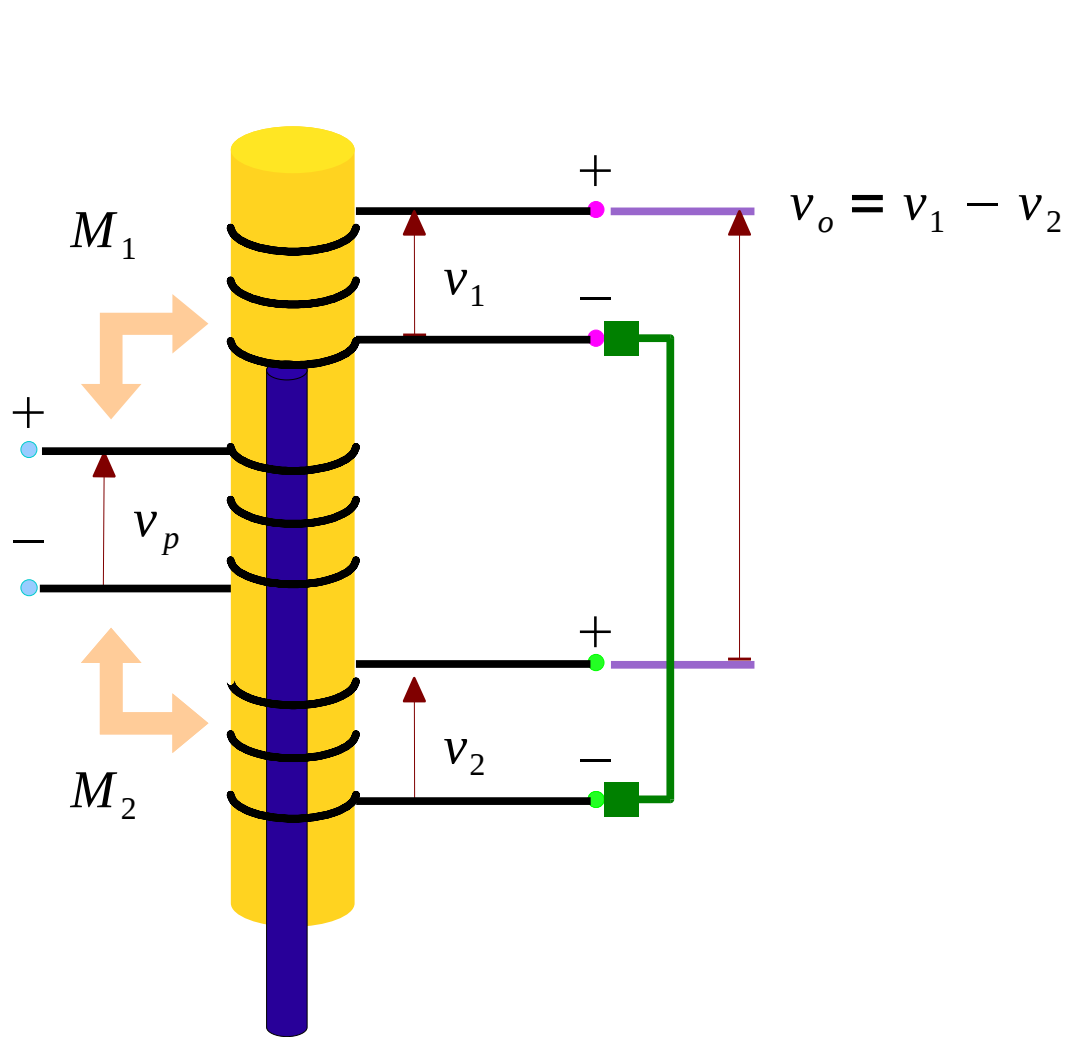
LVDT Sensor - top position

Series opposition connection



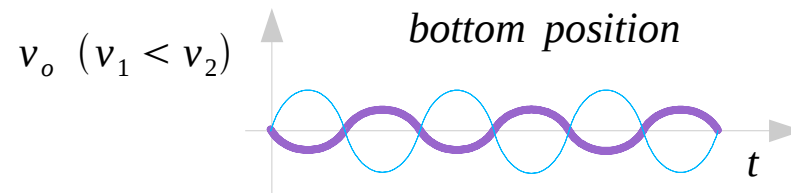
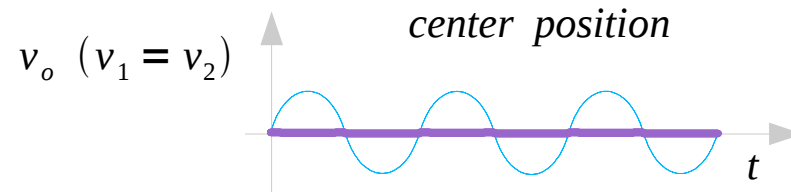
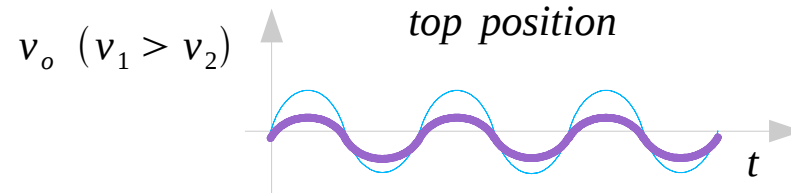
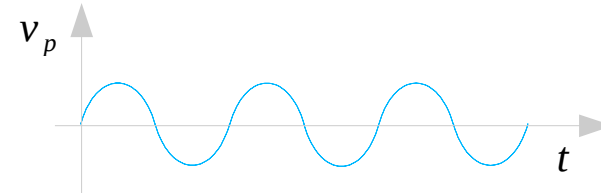
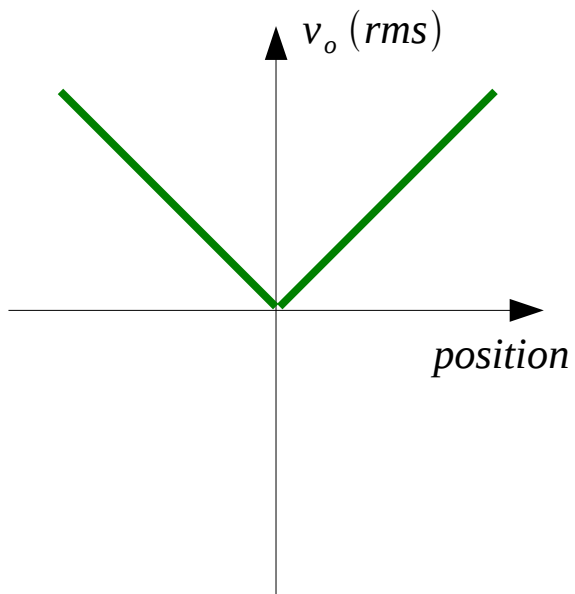
LVDT Sensor – bottom position

Series opposition connection



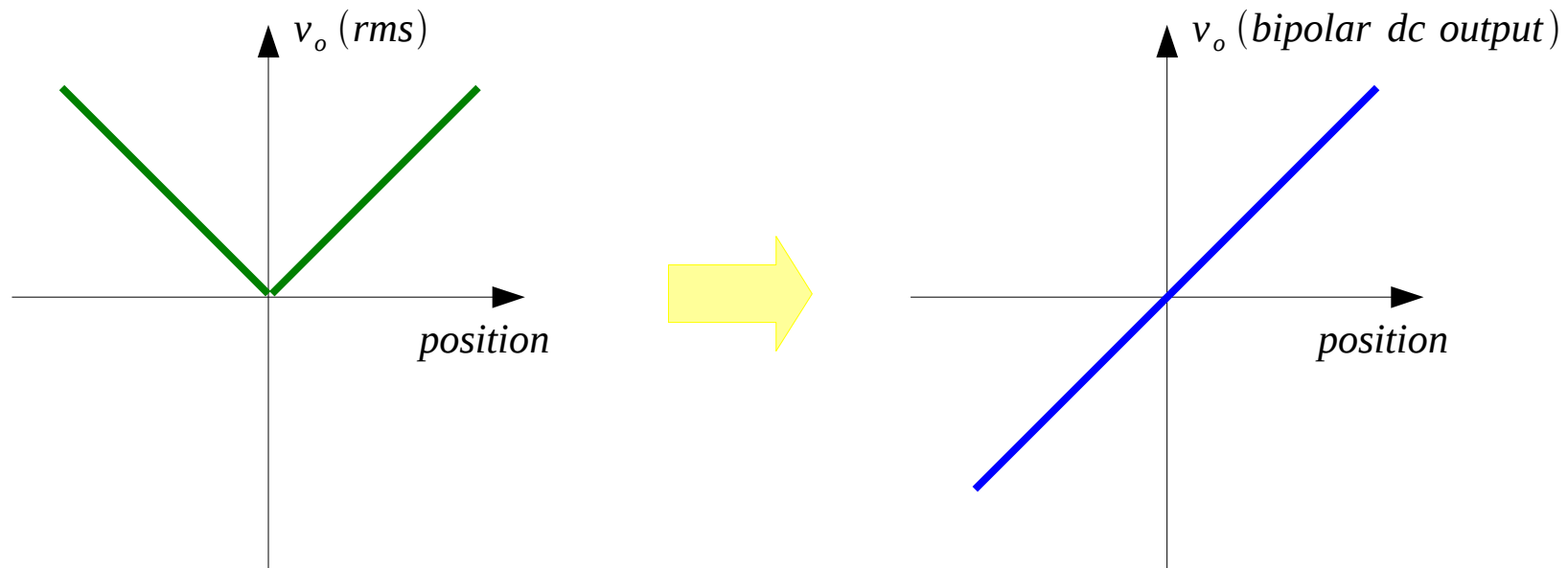
LVDT Sensor – amplitude only

Series opposition connection



LVDT Sensor – phase considered

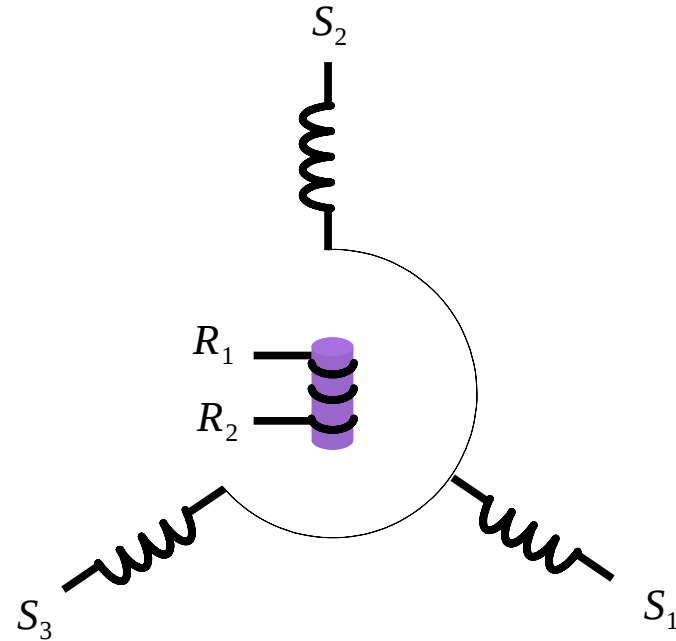
- Series opposition connection
- Phase sensitive detector
- OP Amp and Filter



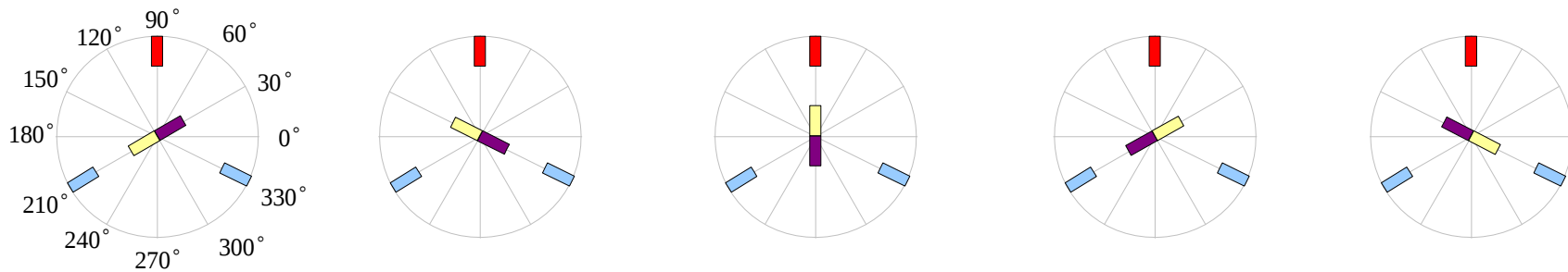
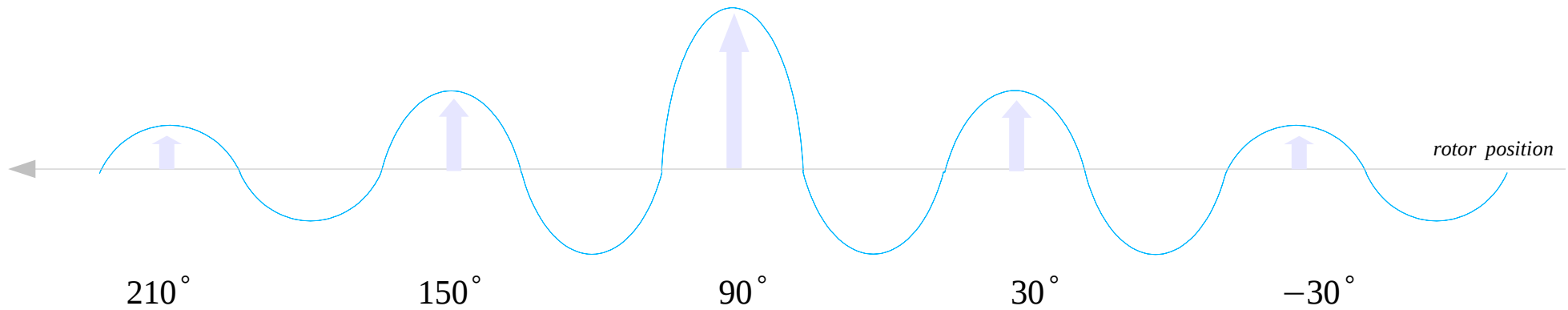
Synchro

- Rotor – primary coil
- Stator – 3 secondary coils (120 deg apart)

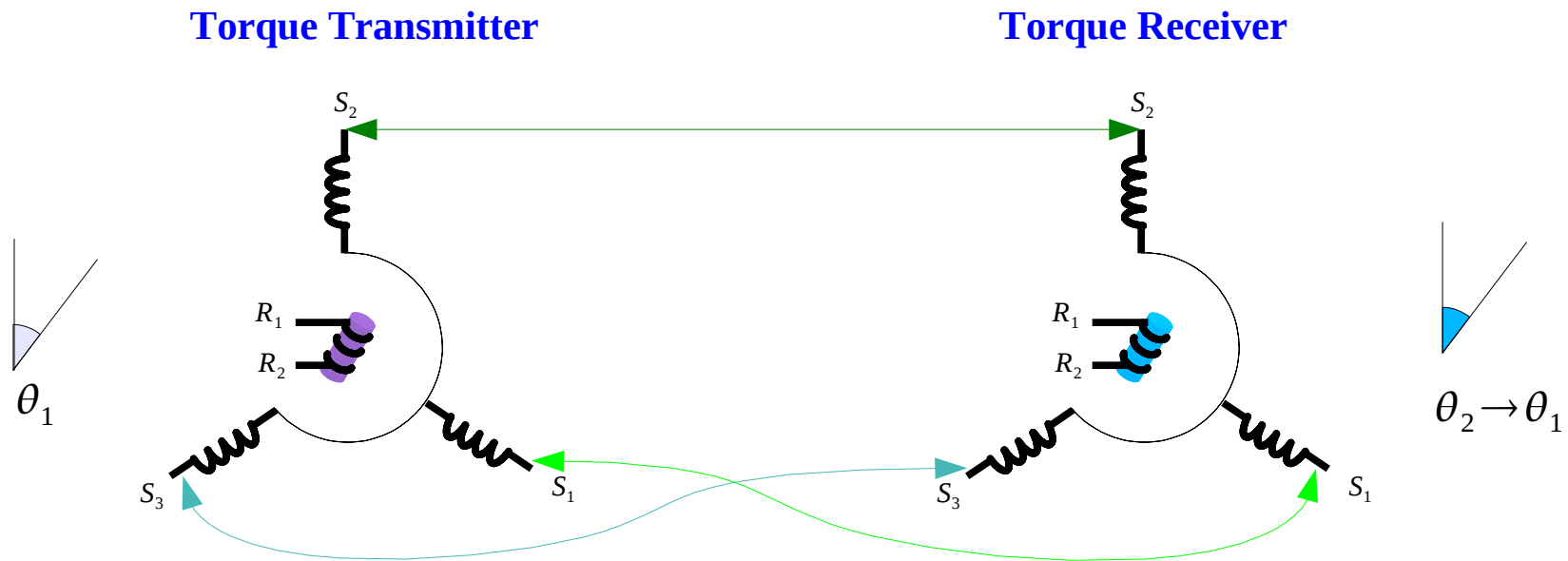
The voltage at S_i depends on the position of the rotor and its voltage



Synchro Operation (1)

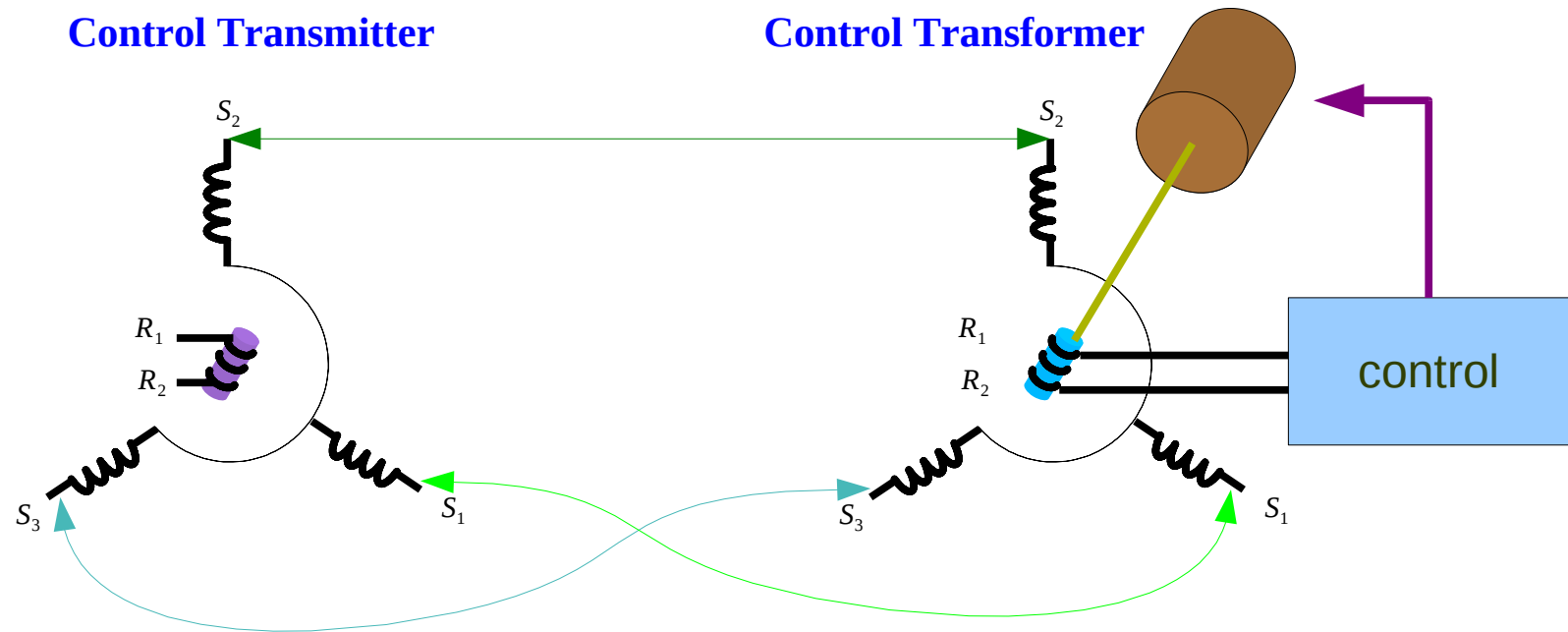


Torque Synchro



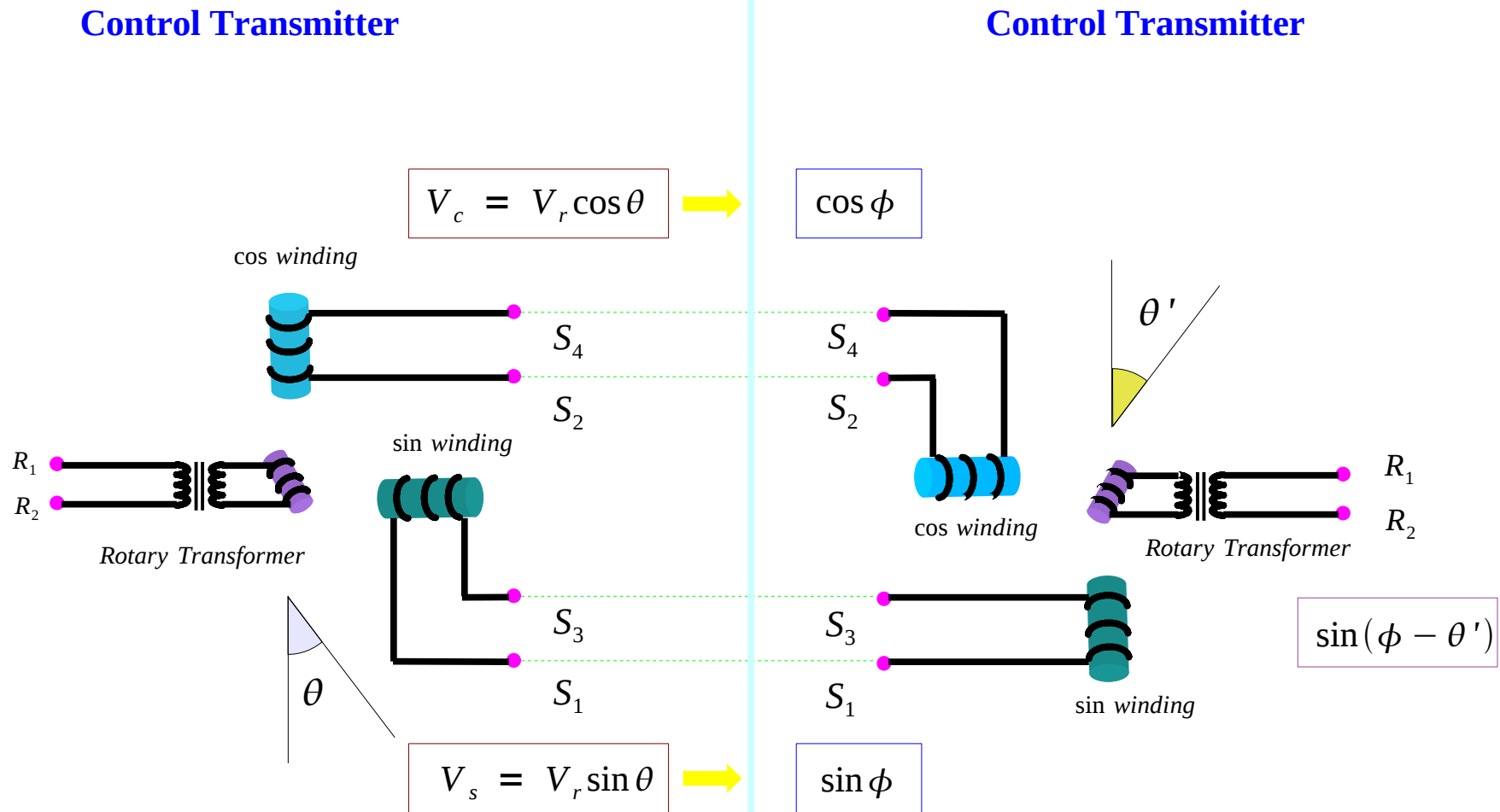
- *Transmit the angular displacement*
- θ_2 follows θ_1

Control Synchro



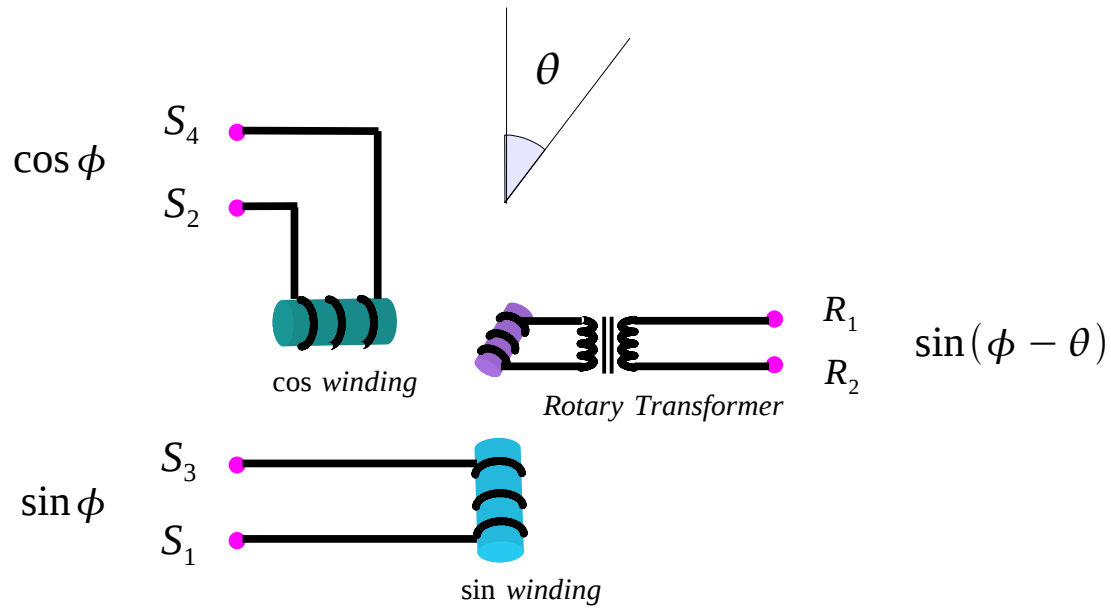
- *Servomechanism*

Resolver

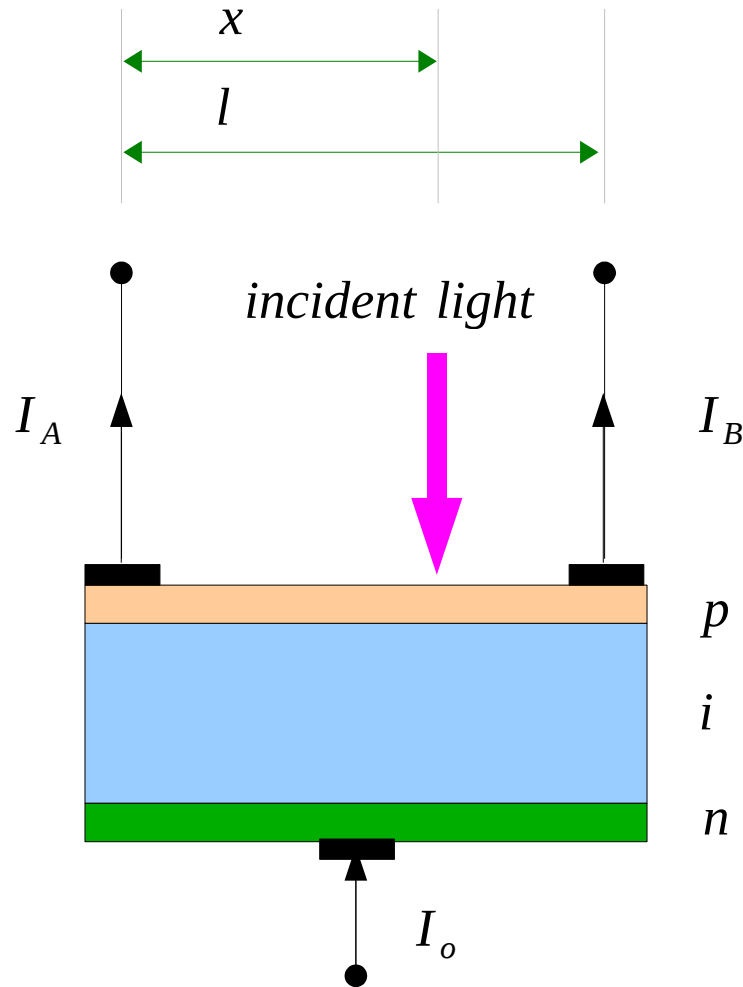


Resolver (2)

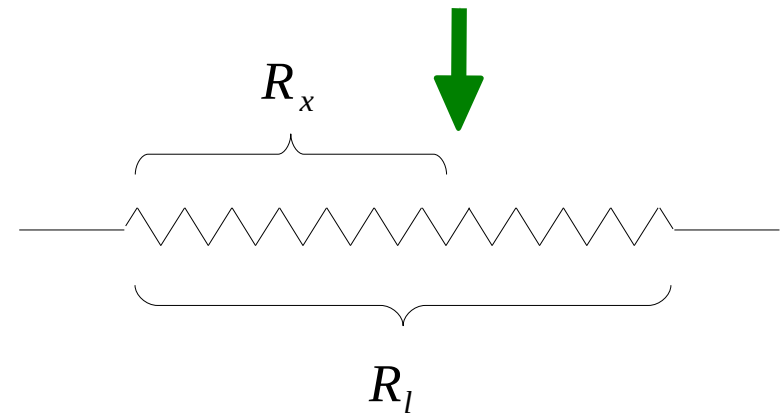
Control Transmitter



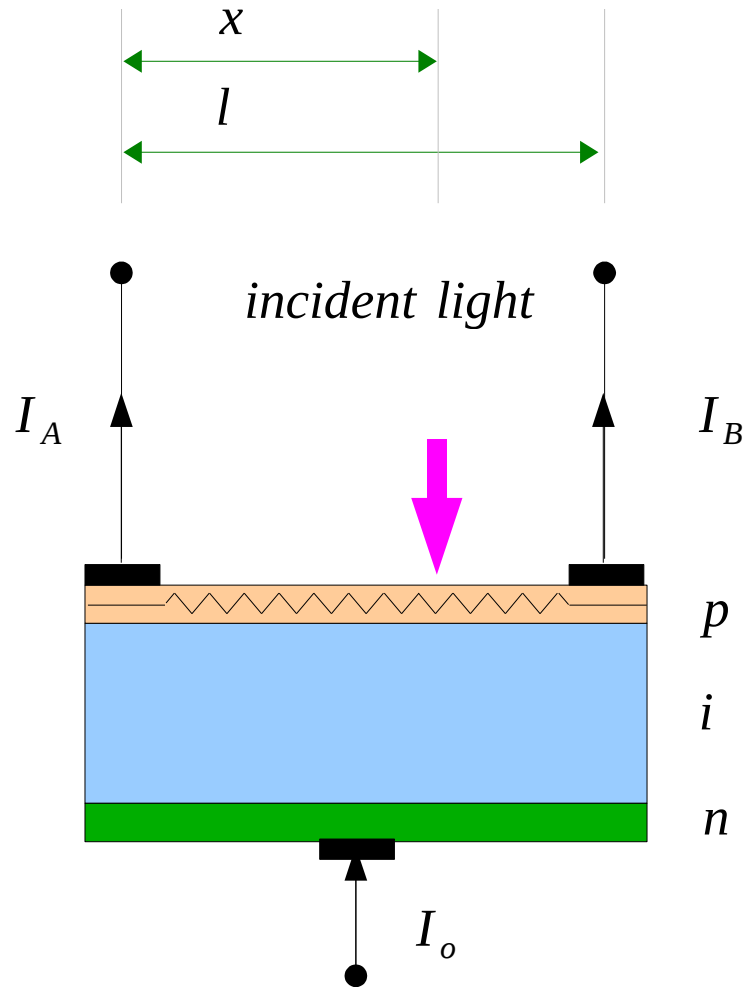
1-D Position Sensitive Device (1)



$$x : l = R_x : R_l$$



1-D Position Sensitive Device (2)



$$x : l = R_x : R_l$$

$$\frac{I_A}{I_o} = \frac{R_l - R_x}{R_l} = \frac{l - x}{l}$$

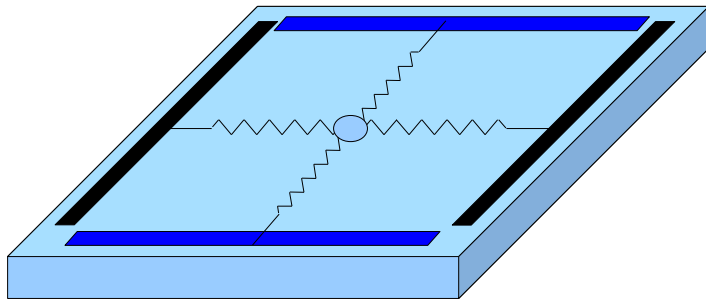
$$\frac{I_B}{I_o} = \frac{R_x}{R_l} = \frac{x}{l}$$

$$P_1 = \frac{I_A}{I_o} - \frac{I_B}{I_o} = \frac{I_A - I_B}{I_A + I_B}$$

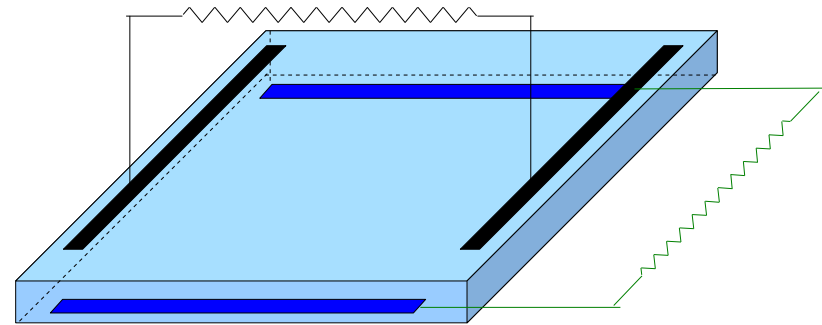
$$P_1 = \frac{l - x}{l} - \frac{x}{l} = 1 - \frac{2x}{l}$$

2-D PSD Sensor

one side



double side



References

- [1] <http://en.wikipedia.org/>
- [2] Nam Ki Min, Sensor Electronics, Dong-il Press
- [3] www.ni.com
- [4] www.rpde.com
- [5] www.amci.com