

$$C = \frac{P(\tan \theta_1 - \tan \theta_2)}{\omega V_{RMS}^2}$$

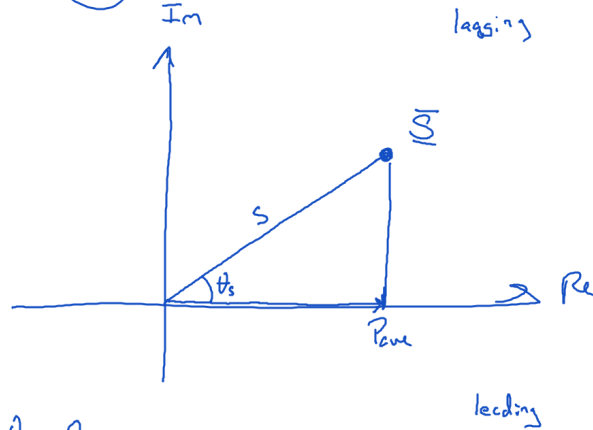


- a) Find PF
 b) Find P_{ave}
 c) Find C PF = 1

$$\underline{\underline{S}} = \underline{\underline{V}} \cdot \underline{\underline{I}}^*$$

$$I = \frac{V}{Z} = \frac{120}{8 + j18}$$

$$\underline{\underline{S}} = \underline{\underline{V}} \cdot \underline{\underline{I}}^*$$



$$\theta_s = \theta_v - \theta_i$$

- a) $PF = \cos(\theta_s)$
 b) $P_{ave} = \text{Re}\{\underline{\underline{S}}\}$

- c) $\downarrow$
 $P, \omega = 2\pi 60, V_{RMS} = 120 \angle 0^\circ, \theta_1 = \theta_s, \theta_2 = 0^\circ$
 $PF = 0.97$ ① $\theta_2 = \cos^{-1}(PF)$
 ② $P \cdot C$

Complex power Apparent power

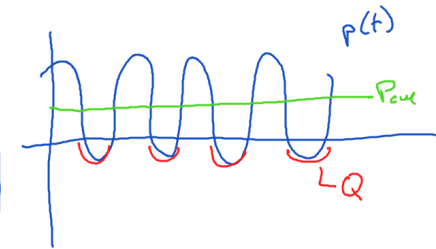
$\downarrow$ $\downarrow$

$\underline{\underline{S}} = S \angle \theta$ $\theta_s - \theta_i$

$= \underline{P_{ave}} + j \underline{Q}$

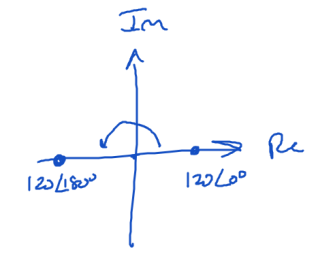
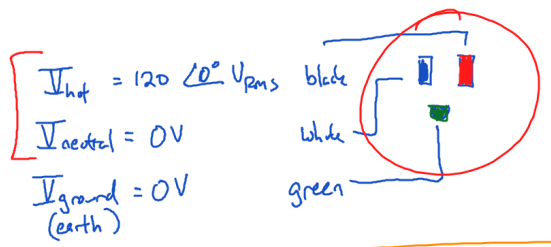
$\uparrow$ $\uparrow$

ave Pwr reactive power

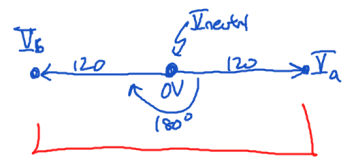
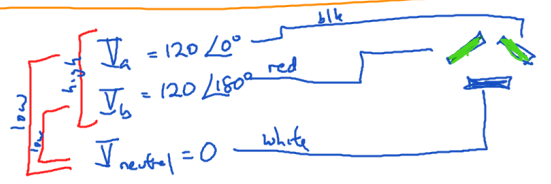


Single vs polyphase power

single phase power
residential < 30A



dual phase
residential $\geq 30A$
dryer, range

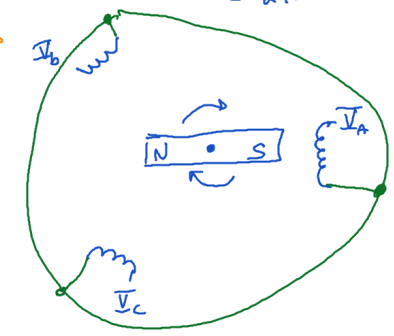
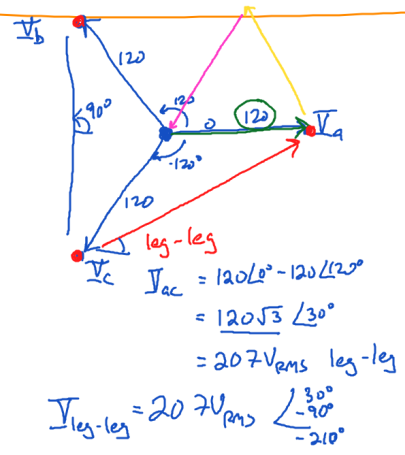
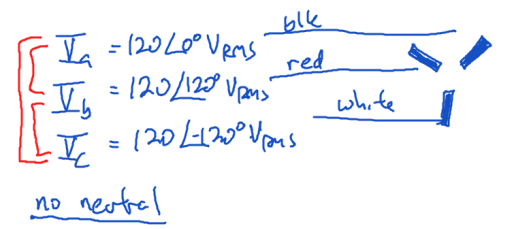


$$120 \angle 180^\circ = -120$$

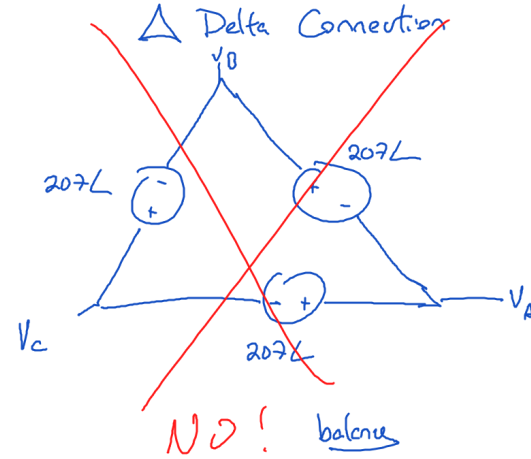
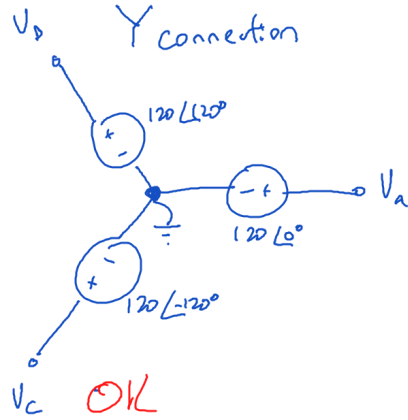
$$V_A - V_B = 120 \angle 0^\circ - 120 \angle 180^\circ$$

$$= 240^\circ$$

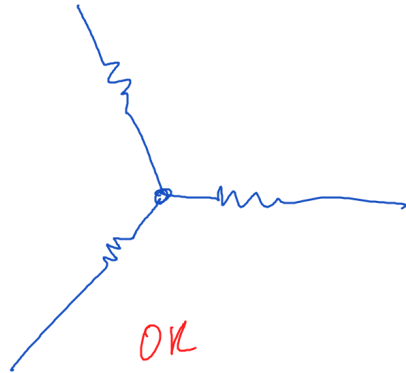
three phase
Commercial motors



Generator Connections



LOAD



√2 vs √3

$$\sqrt{2} : V_{\text{rms}} \cdot \sqrt{2} = V_{\text{max}}$$

$$\sqrt{3} : V_{\text{leg-leg}} = V_{\text{leg-neutral}} \sqrt{3}$$

$$V_n = 120 V_{\text{rms}} = 120\sqrt{2} \cos(2\pi 60t) \text{ V}$$

$$V_{ab} = 120\sqrt{3} V_{\text{rms}} = 120\sqrt{2}\sqrt{3} \cos(2\pi 60t) \text{ V}$$

single phase

polyphase