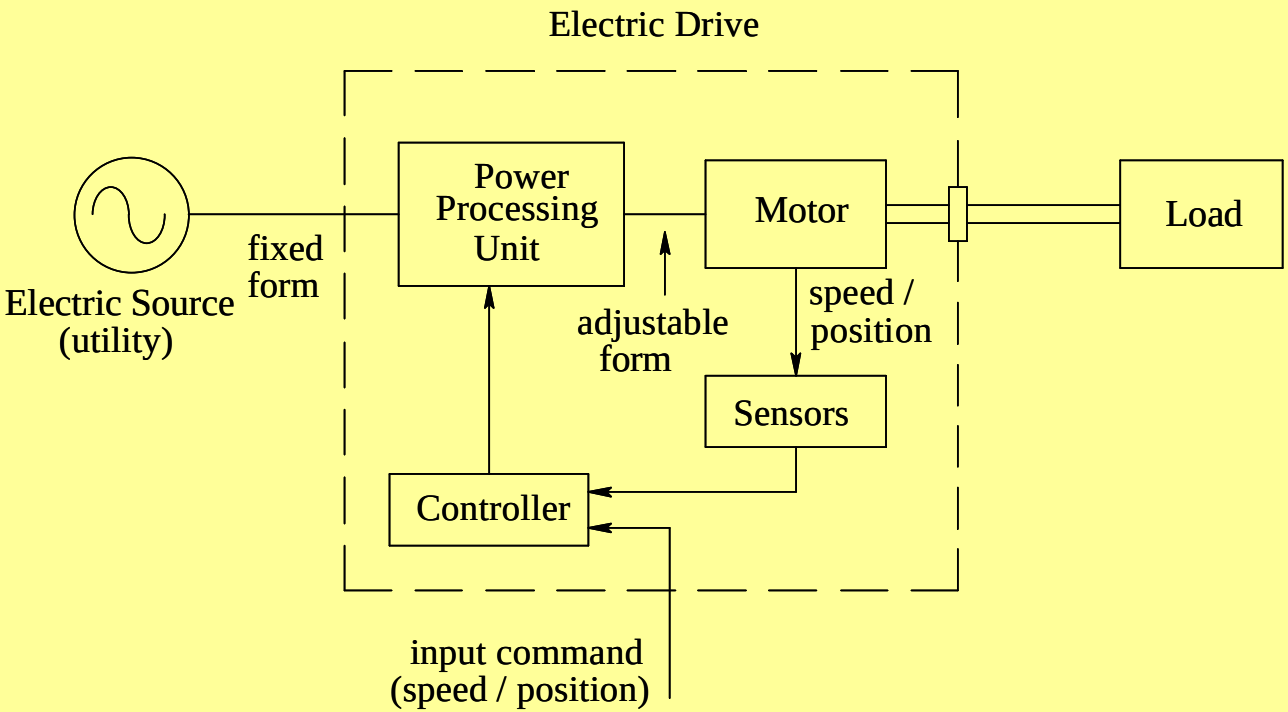
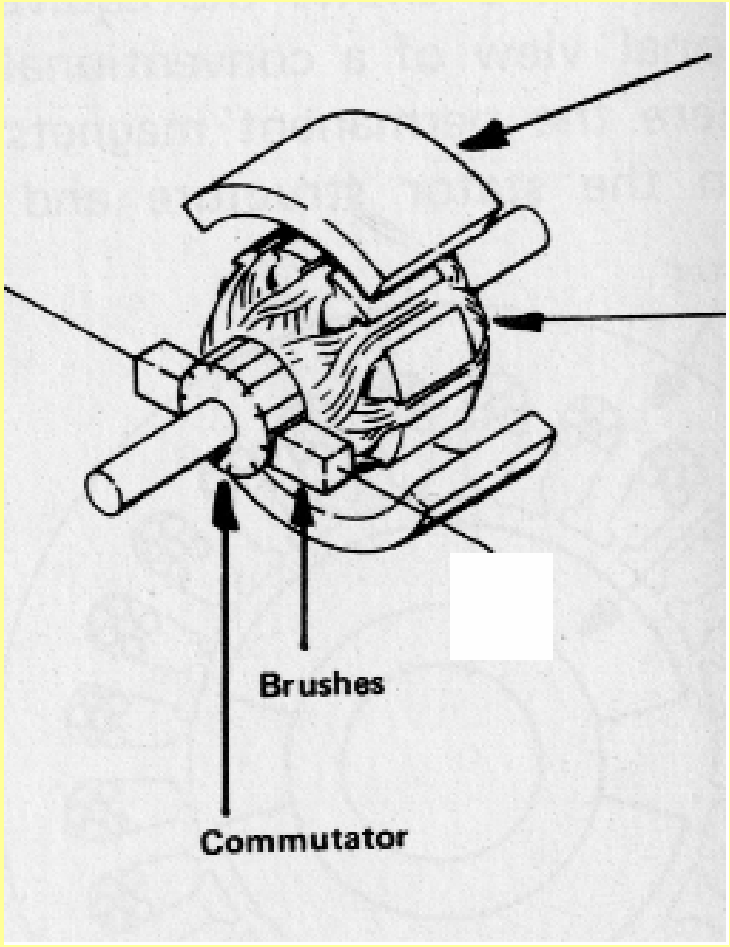
Converter Ratings in Various Applications

- Voltage and Current Ratings in Converters in:
  - Electric Drives
  - UPS
  - Power Systems

Adjustable-Speed Drive:



DC MOTORS



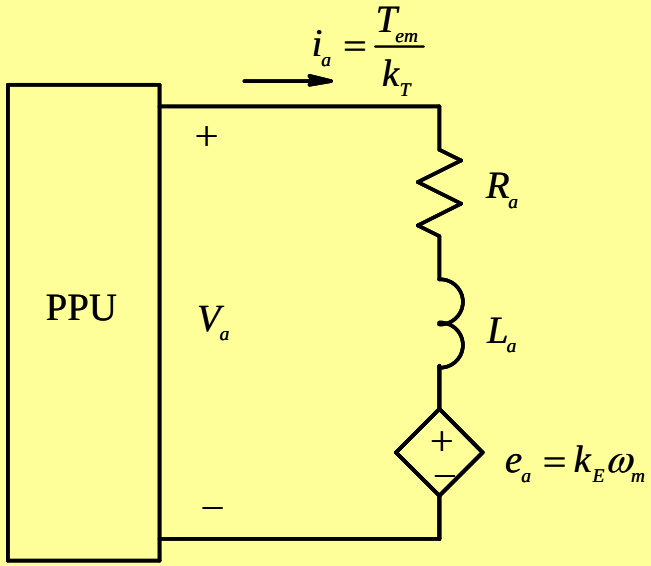
stator magnets

rotor winding

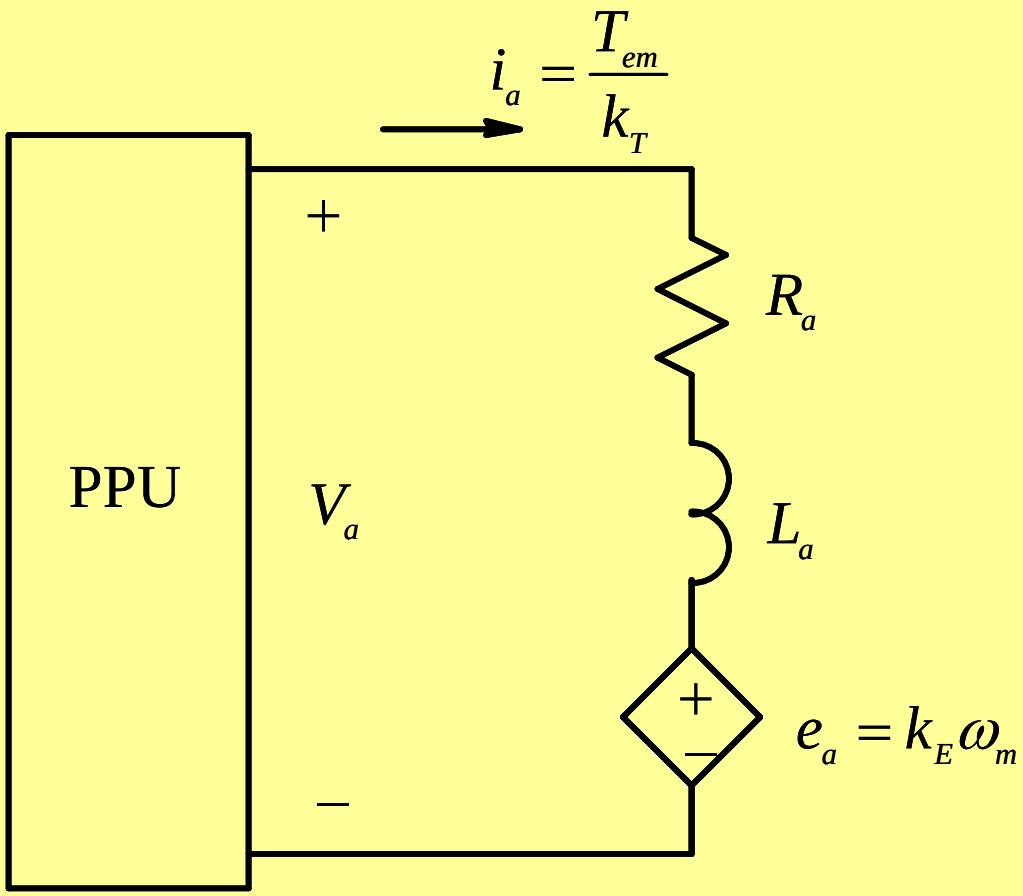
DC-Machine Equivalent Circuit

$$v_a = e_a + R_a \mathrm{i}_a + L_a \frac{di_a}{dt}$$

$$\frac{d\omega_m}{dt} = \frac{1}{J_{eq}}(T_{em} - T_L)$$



Operating Principles of DC Machines

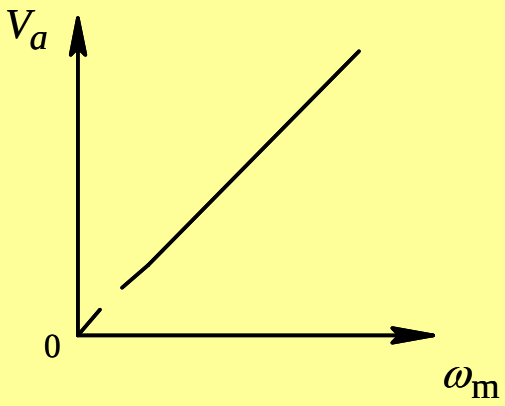


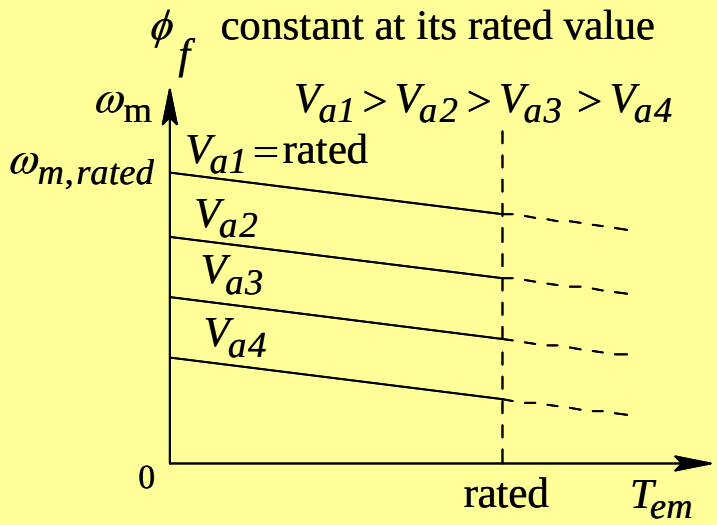
$$k_T = k_E$$

Torque-Speed Characteristics

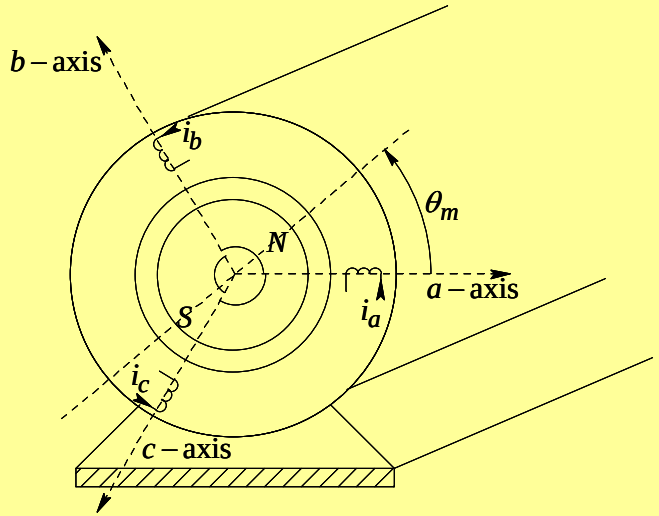
$$V_a = k_E \omega_m + R_a I_a$$

$$I_a = \frac{T_{em} (= T_L)}{k_T}$$

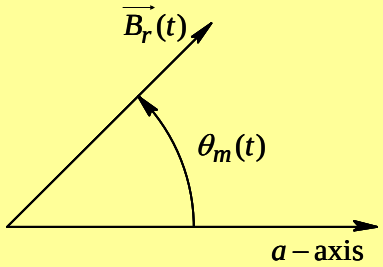




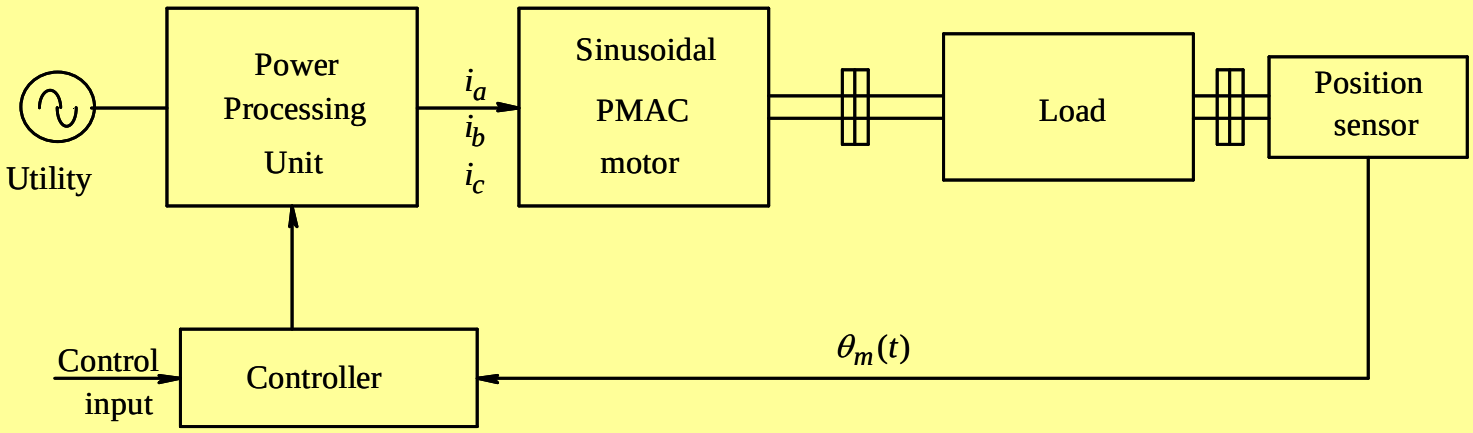
PERMANENT-MAGNET AC MACHINES



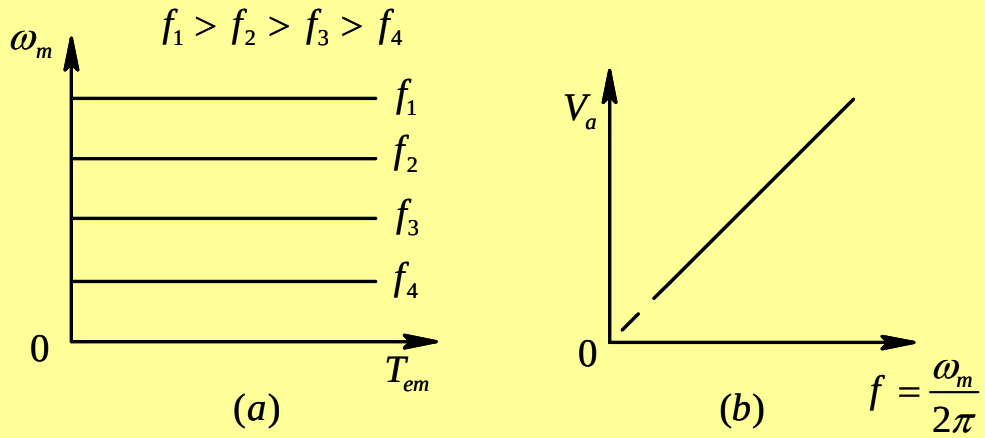
(a)



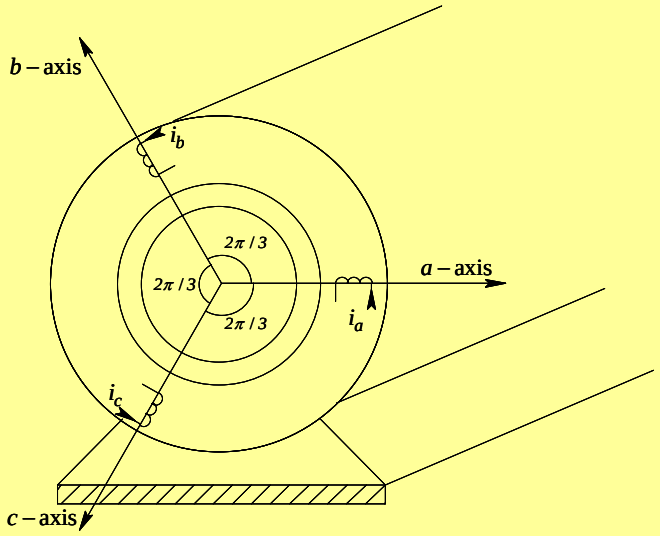
(b)



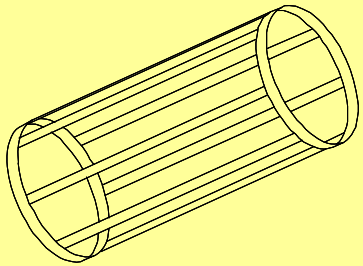
PMAC Torque-Speed Characteristics



Induction Machines

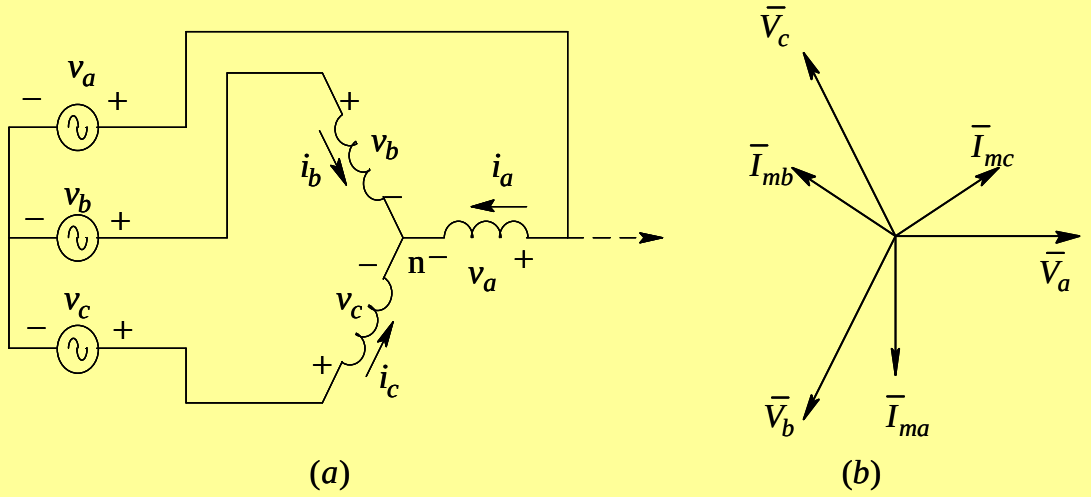


(a)



(b)

Principles of Induction Motor Operation



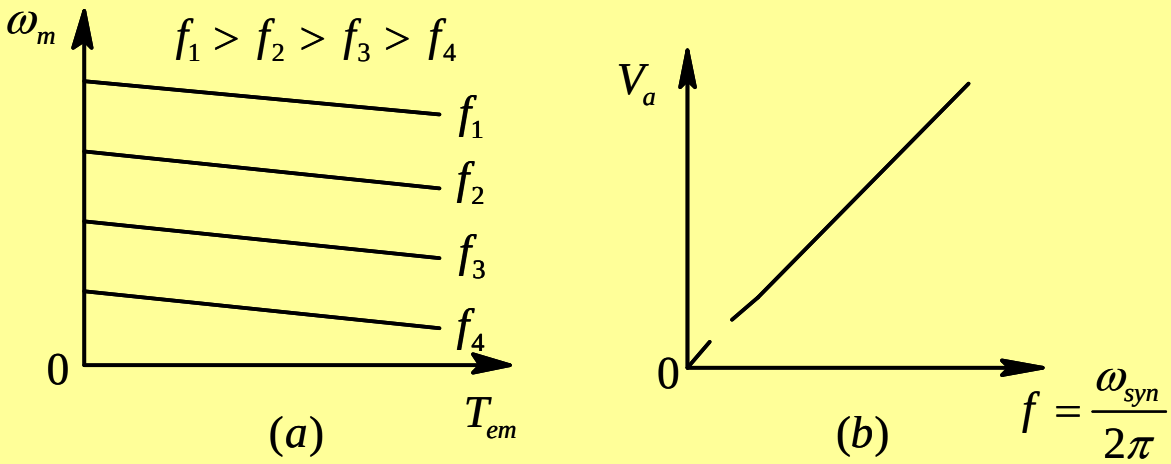
(*a*) (*b*)

$$\bar{V}_a = V_{rms} \angle 0^o, \quad \bar{V}_b = V_{rms} \angle -120^o, \text{ and } \quad \bar{V}_c = V_{rms} \angle -240^o$$

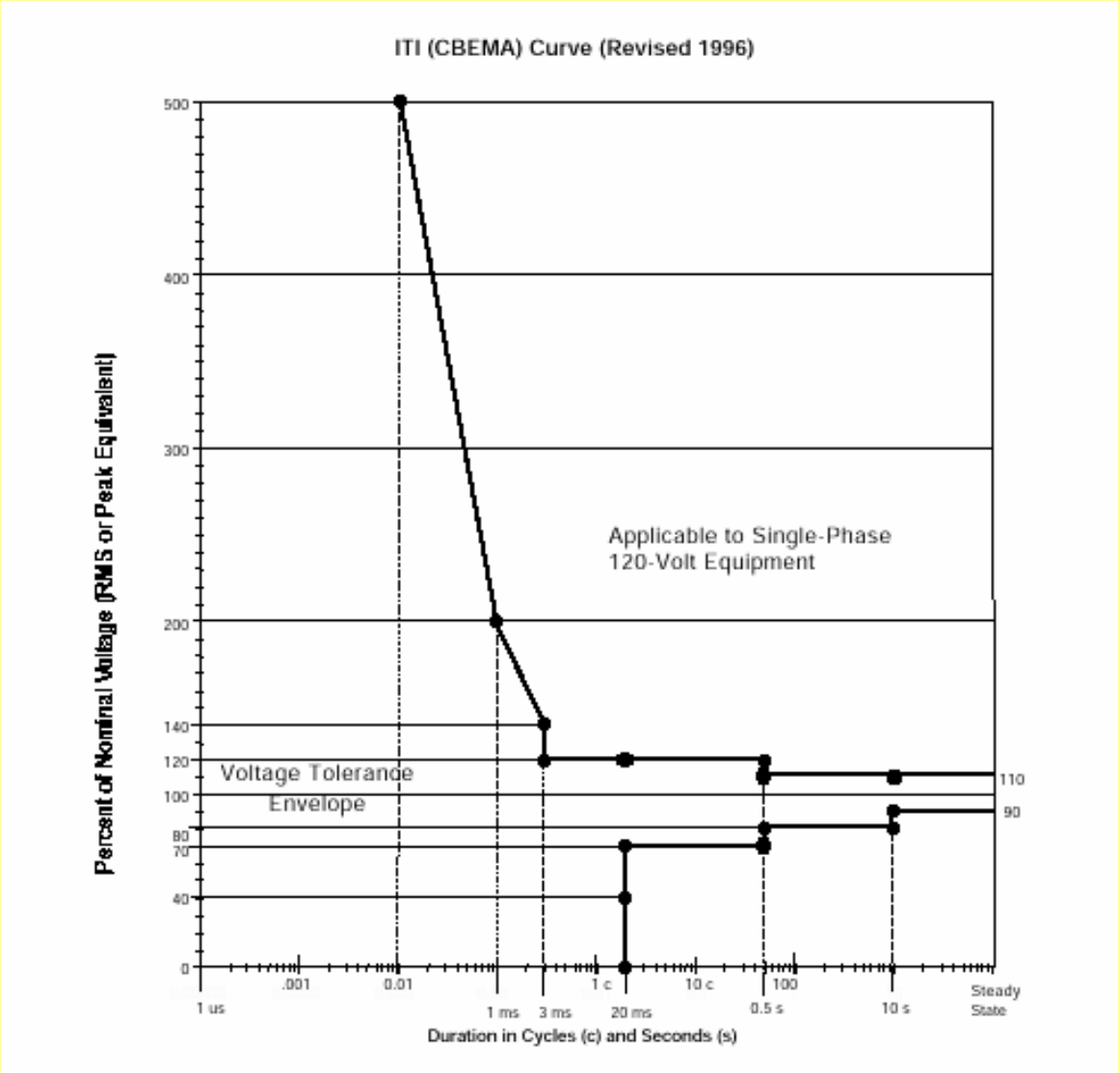
$$\bar{I}_{ma} = \mathrm{I}_m \angle -90^o, \quad \bar{I}_{mb} = \mathrm{I}_m \angle -210^o, \text{ and } \quad \bar{I}_{mc} = \mathrm{I}_m \angle -330^o$$

$$\omega_{syn} = 2\pi f \qquad \omega_{syn} = \frac{2\pi f}{p/2} \quad \text{for a } p\text{-pole machine}$$

$$\textit{slip speed} \quad \omega_{slip} = \omega_{syn} - \omega_m \qquad \textit{slip frequency} \quad f_{slip} = \frac{\omega_{slip}}{\omega_{syn}} f$$

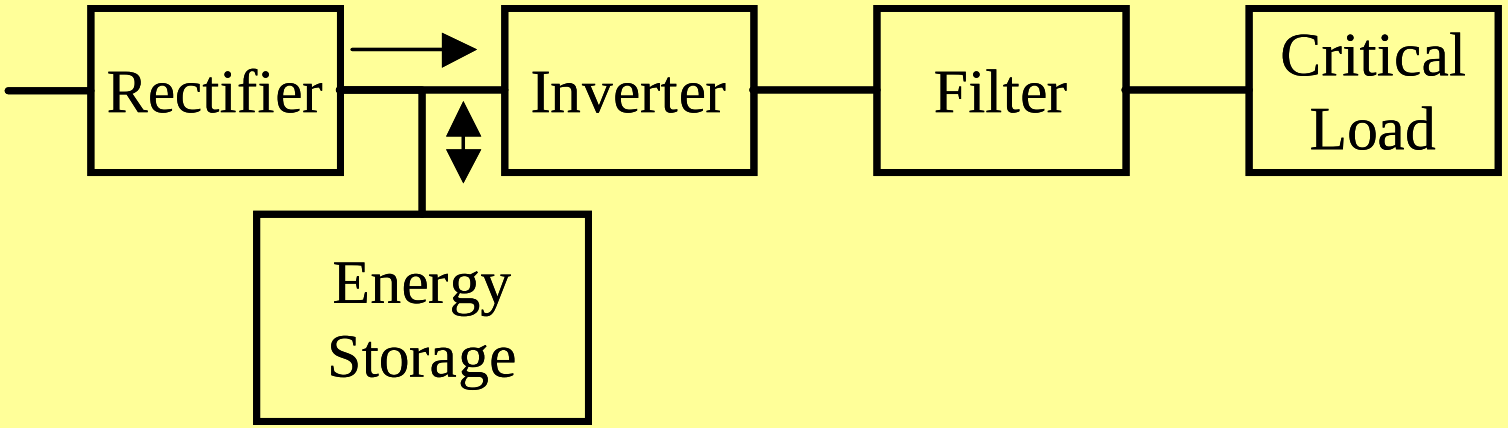


UNINTERRUPTIBLE POWER SUPPLIES (UPS)

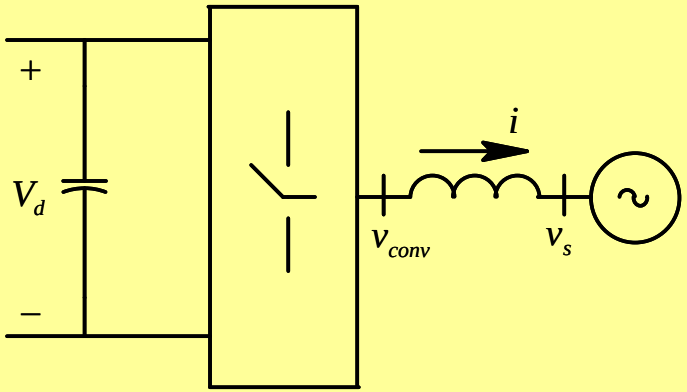


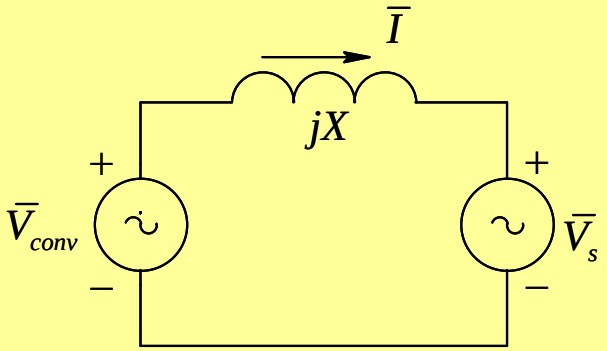
CBEMA Curve

UNINTERRUPTIBLE POWER SUPPLIES (UPS)

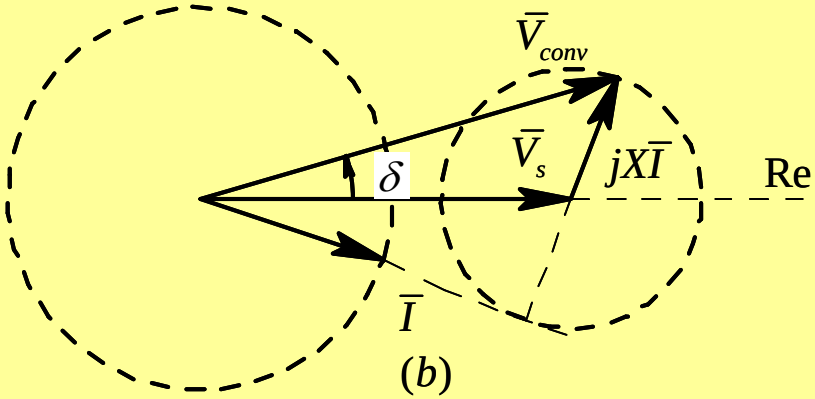


UTILITY APPLICATIONS OF SWITCH-MODE POWER ELECTRONICS





(a)



(b)

Summary

- Converter Voltage and Current Ratings in
  - Electric Drives
  - UPS
  - Utility Applications