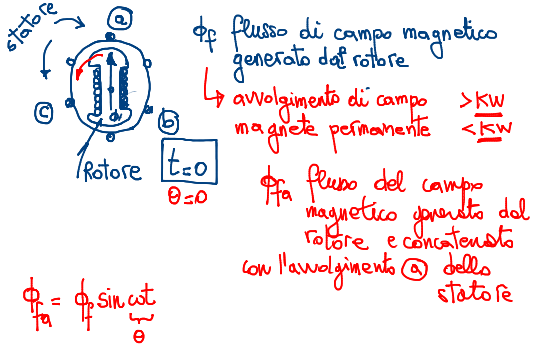


# MOTORE SINCRONO



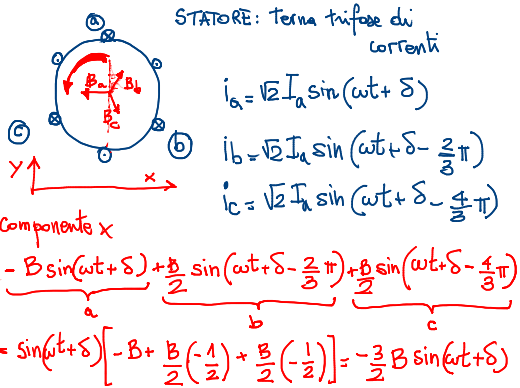
$$\phi_{fa} = \phi_f \sin \omega t$$

$e_{fa}$  forza elettromotrice indotta su (a)  
 $e_{fa} = N_s \frac{d\phi_{fa}}{dt} = N_s \omega \phi_f \cos \omega t$

$$E_{fa} = \frac{N_s \omega \phi_f}{\sqrt{2}}$$

$$\phi_{fb} = \phi_f \sin(\omega t - \frac{2}{3}\pi)$$

$$\phi_{fc} = \phi_f \sin(\omega t - \frac{4}{3}\pi)$$



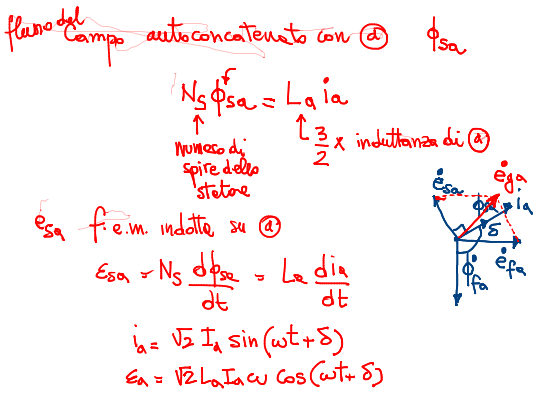
componente y

$$\frac{B\sqrt{3}}{2} \sin(\omega t + \delta - \frac{2}{3}\pi) - \frac{B\sqrt{3}}{2} \sin(\omega t + \delta - \frac{4}{3}\pi)$$

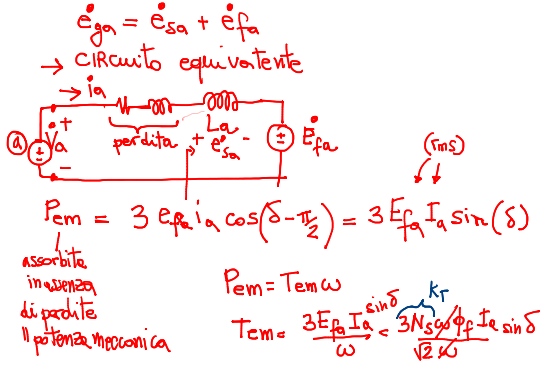
$$= \frac{B\sqrt{3}}{2} \left[ \sin(\omega t + \delta) \cos(-\frac{2}{3}\pi) + \cos(\omega t + \delta) \sin(-\frac{2}{3}\pi) - \sin(\omega t + \delta) \cos(-\frac{4}{3}\pi) - \cos(\omega t + \delta) \sin(-\frac{4}{3}\pi) \right]$$

$$\rightarrow \frac{B\sqrt{3}}{2} \cos(\omega t + \phi)$$

Campo rotante in senso antiorario con frequenza  $\omega$  e modulo  $\frac{\sqrt{3}}{2} B$ .



forza e.m. totale indotta su (a)



Coppia  $T_{em} = \frac{3}{2} N_s \phi_p I_a \sin \delta$

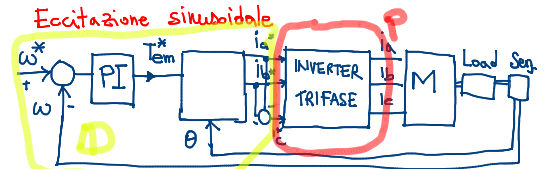
→  $T_{em}$  indipendente dalla velocità

→  $T_{em}$  è massima se  $\delta = \pi/2$



$t=0$   
 $\theta=0$

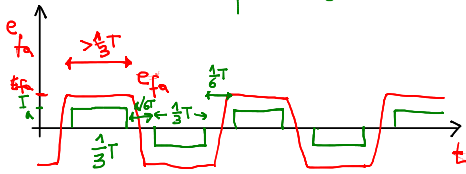
$i_a(t) = \sqrt{2} I_a \sin(\omega t + \delta)$   
 picco di  $i_a(t)$  quando  $\theta=0$   
 Ho bisogno di sensori per rilevare  $\theta$



$T_{em} = K_T \phi_p I_a \sin \delta = K_T \phi_p I_a \left[ \sin \delta = \frac{\pi}{2} \right]$

$I_a = \frac{T_{em}}{K_T \phi_p}$   
 $i_a = \sqrt{2} I_a \cos \theta$

Eccitazione trapezoidale



$P_{em}(t) = e_{fa}(t) i_a(t) = \begin{cases} E_{fa} I_a & \text{per } \frac{2}{3} T \\ 0 & \text{per } \frac{1}{3} T \end{cases}$

$P_{em}(t) = 2 E_{fa} I_a \rightarrow$  Potenza meccanica in assenza di perdite