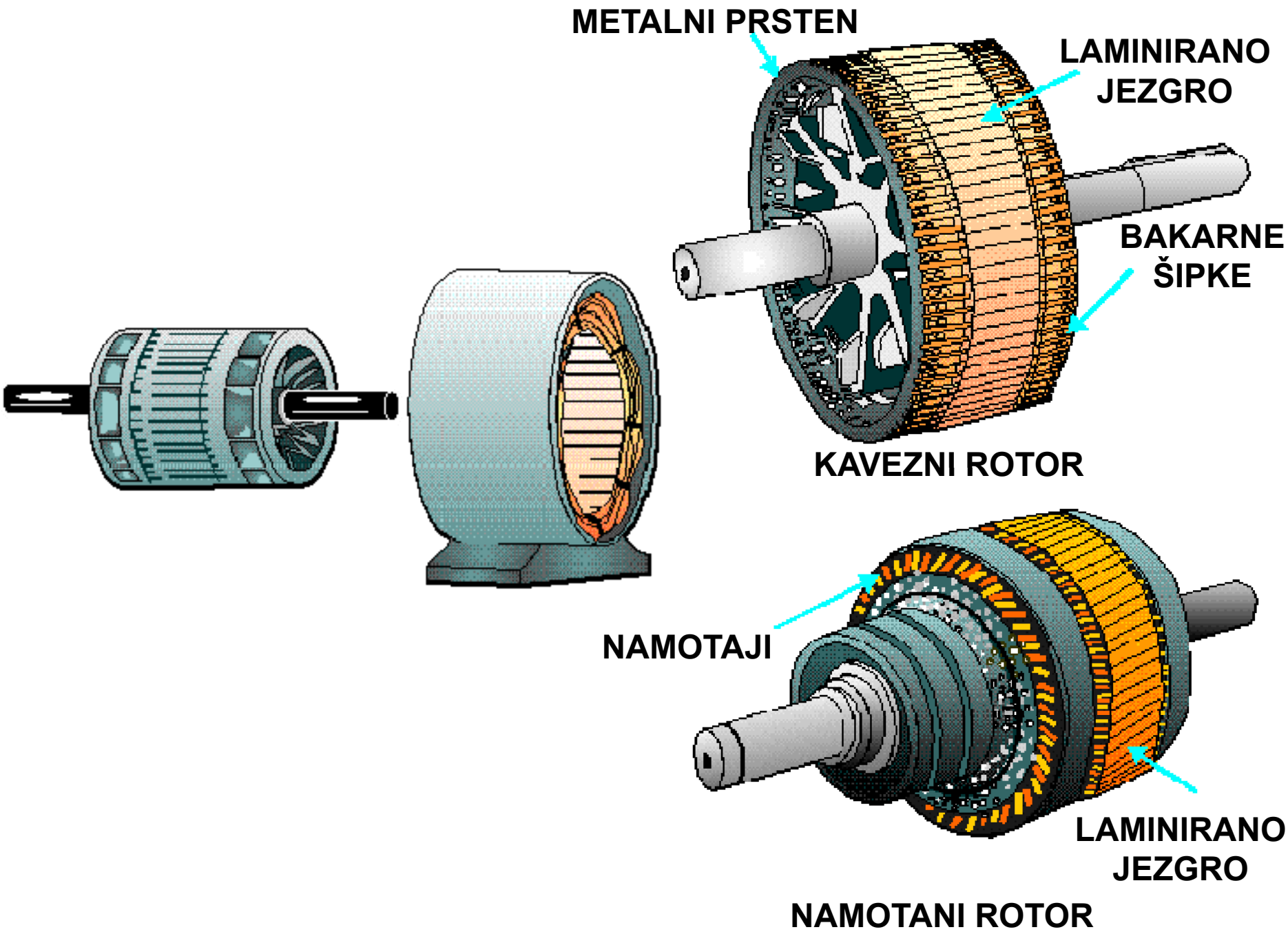
ELEKTROMOTORNI POGONI SA ASINHRONIM MOTOROM

Proučavamo samo pogone sa trofaznim motorom.

Najčešće korišćeni motor u elektromotornim pogonima.

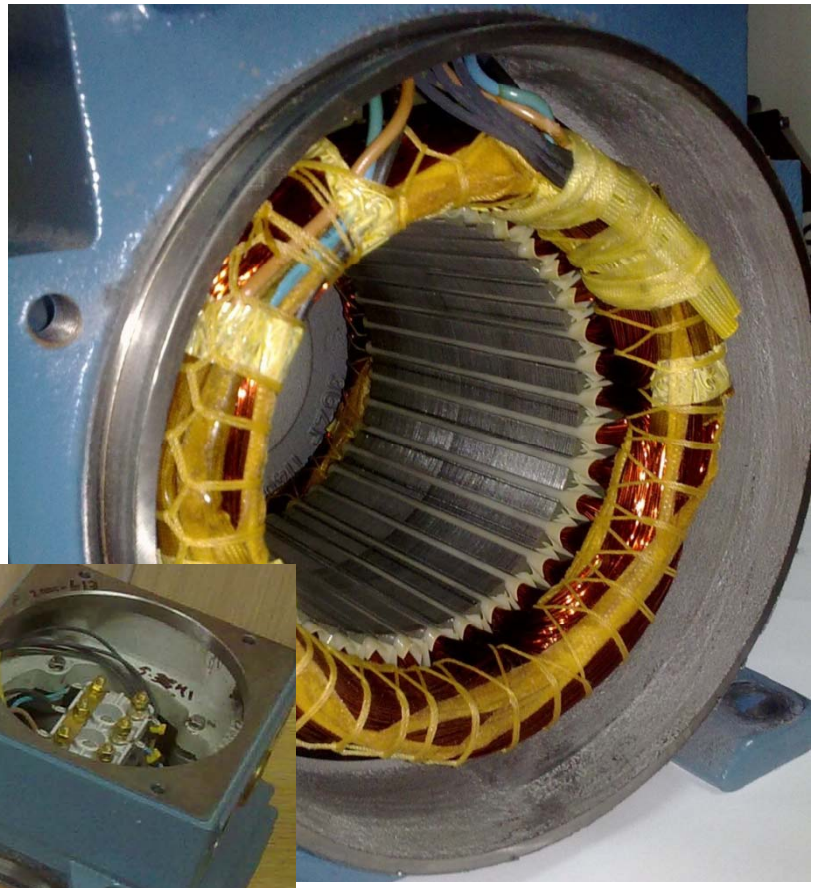
Asinhroni motor:

- jednostavna konstrukcija;
- mala cena;
- visoka energetska efikasnost.

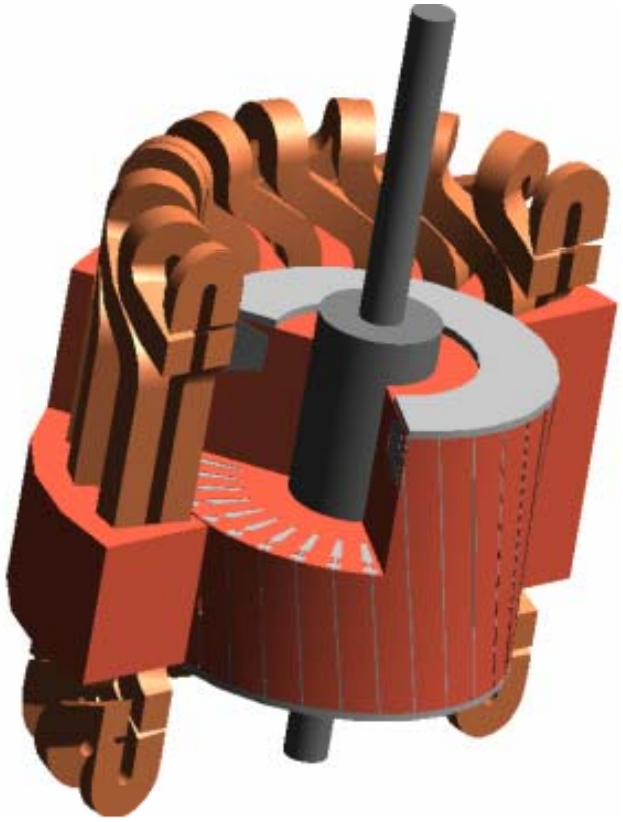

METALNI PRSTEN
LAMINIRANO JEZGRO
BAKARNE ŠIPKE
KAVEZNI ROTOR
NAMOTAJI
LAMINIRANO JEZGRO
NAMOTANI ROTOR

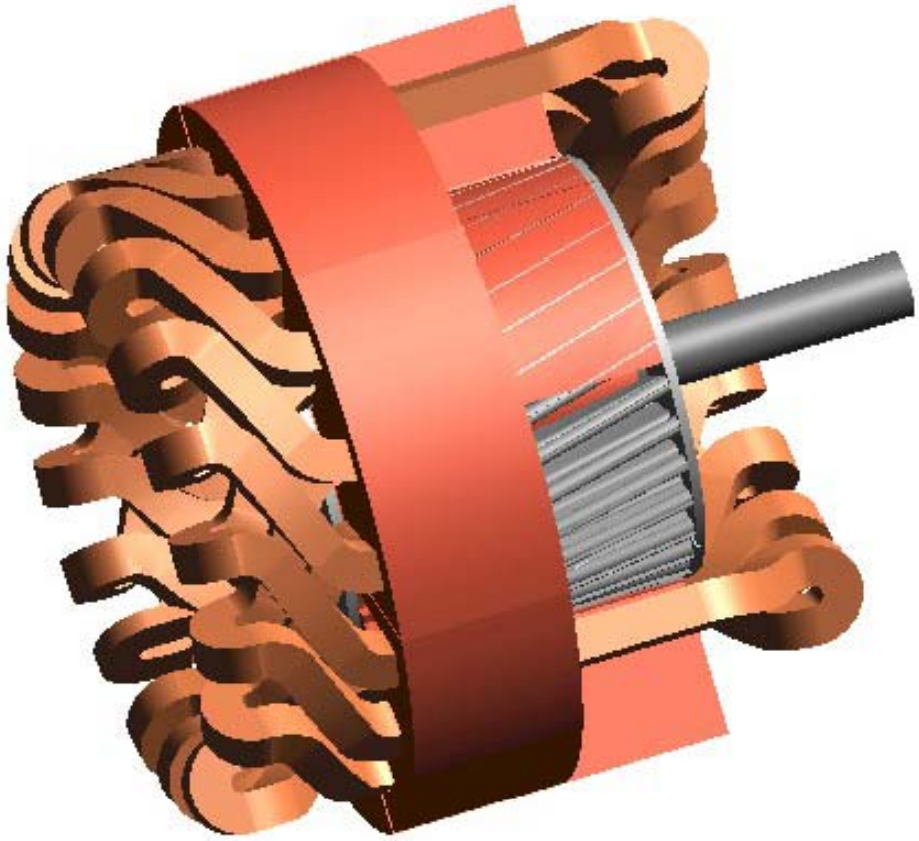
Motor sa kaveznim rotorom

Stator



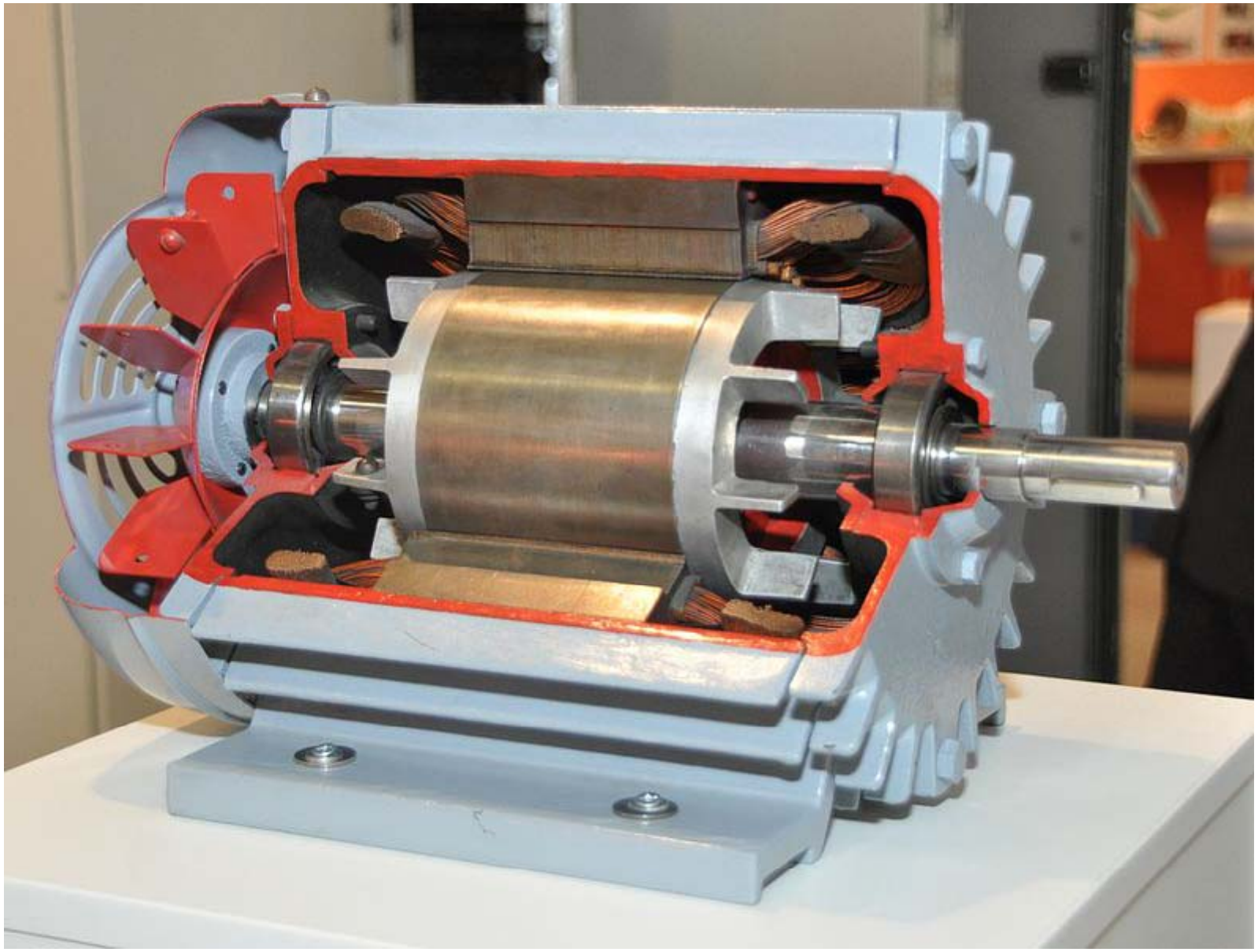
Rotor





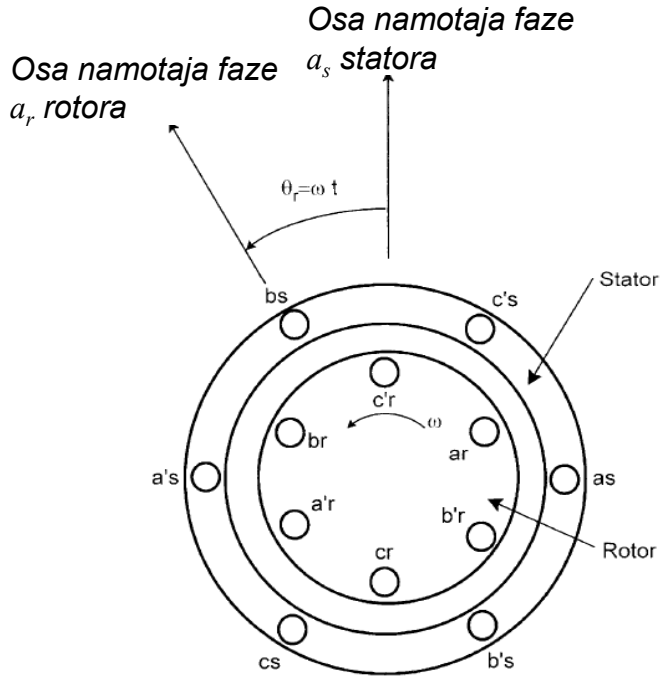
ROTOR ASINHRONOG MOTORA NAJČEŠĆE IMA ZAKOŠENE ŽLEBOVE DA BI SE MINIMIZIRALE PULSACIJE MOMENTA

POPREČNI PRESEK ASINHRONOG MOTORA



PRINCIP RADA ASINHRONOG MOTORA

Obrtno polje trofaznog namotaja:

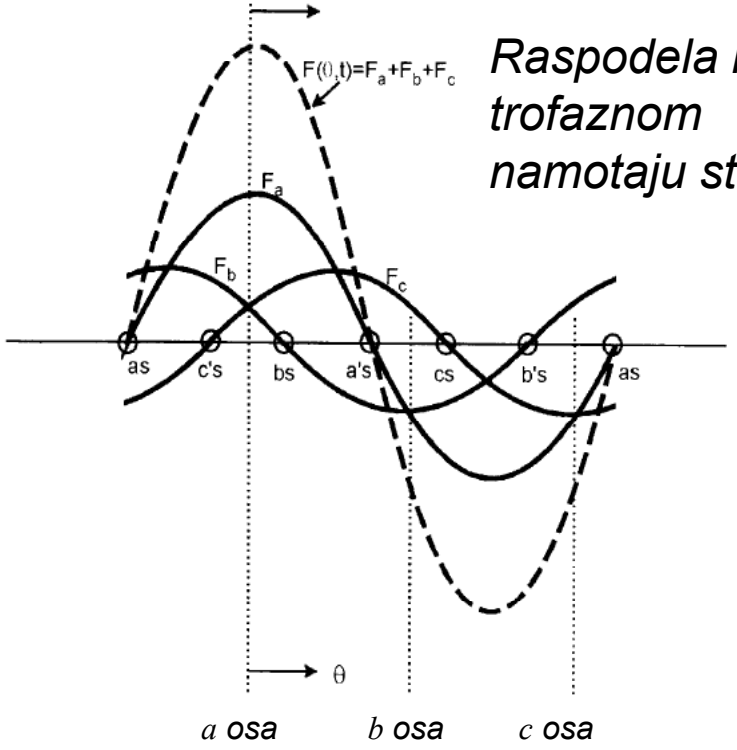


$$i_a = I_m \cos(\omega_s t)$$

$$i_b = I_m \cos\left(\omega_s t - \frac{2\pi}{3}\right) \qquad (1)$$

$$i_c = I_m \cos\left(\omega_s t + \frac{2\pi}{3}\right)$$

U trenutku t=0, $i_a = I_m,\ i_b = -I_m/2,\ i_b = I_m/2$



Raspodela mps u trofaznom namotaju statora.

U funkciji ugla θ, prostorna raspodela trentne vrednosti mps po obimu statora je:

$$F_a(\theta) = N i_a \cos(\theta)$$

$$F_b(\theta) = N i_b \cos\left(\theta - \frac{2\pi}{3}\right) \qquad (2)$$

$$F_c(\theta) = N i_c \cos\left(\theta + \frac{2\pi}{3}\right)$$

Zamenom (2) u (1), dobija se:

$$F(\theta,t) = NI_m\left[\cos\omega_s t\cdot\cos\theta + \cos\left(\omega_s t - \frac{2\pi}{3}\right)\cdot\cos\left(\theta - \frac{2\pi}{3}\right) + \cos\left(\omega_s t + \frac{2\pi}{3}\right)\cos\left(\theta + \frac{2\pi}{3}\right)\right],$$

odnosno:

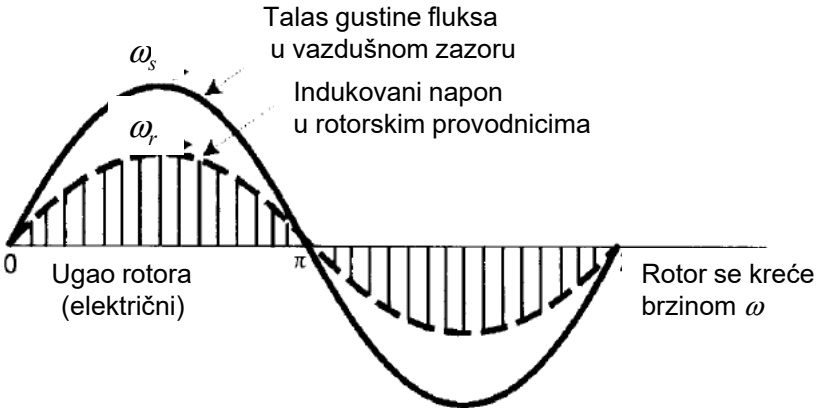
$$F(\theta,t) = \frac{3}{2}NI_m\cos(\omega_s t - \theta) \qquad (3)$$

Jednačina (3) pokazuje da se maksimalna vrednost sinusidalno raspodeljene mps (magnetopobudne sile) 3/2 NI_m obrće u vazdušnom zazoru sinhronom brzinom ω_s. U slučaju dvopolne mašine $F(\Theta, t)$ napravi jedan obrtaj (krug) u periodi promene struje. To znači da mašina sa P pari polova ima sinhronu brzinu obrtanja od

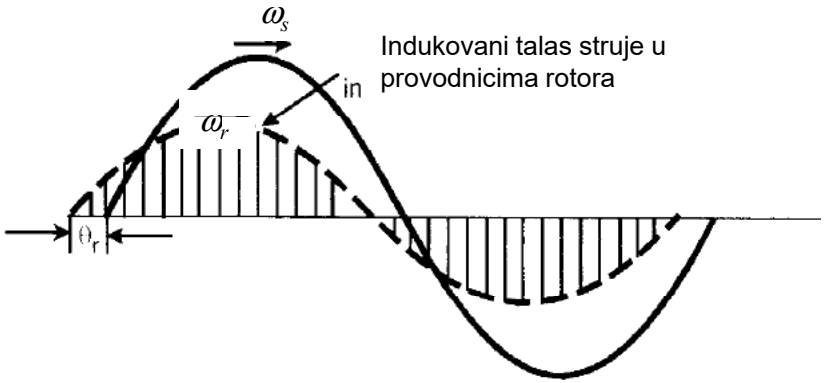
$$n_s = \frac{60 f_s}{P},$$

gde je n_s – sinhrona brzina (mehanička), f_s – učestanost u [Hz], a P – broj pari polova.

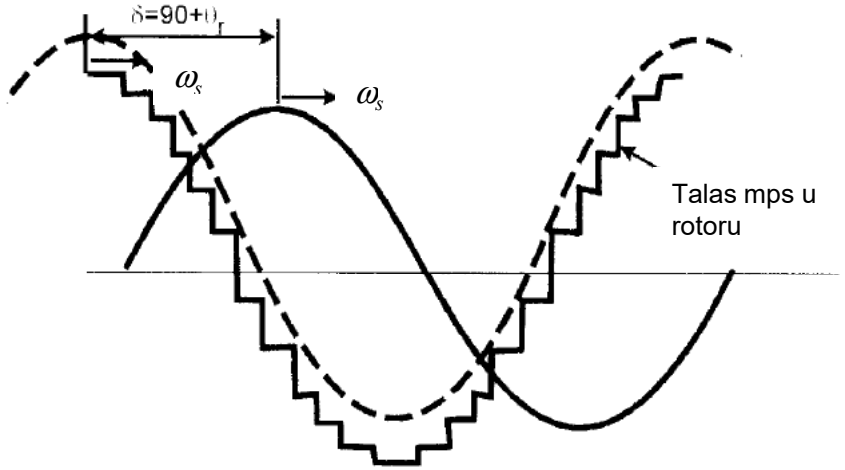
Proizvodnja momenta interakcijom između fluksa u zazoru i mps rotora



a) Indukcija napona u rotoru



b) Indukcija struje u rotoru



c) Indukcija talasa mps u rotoru

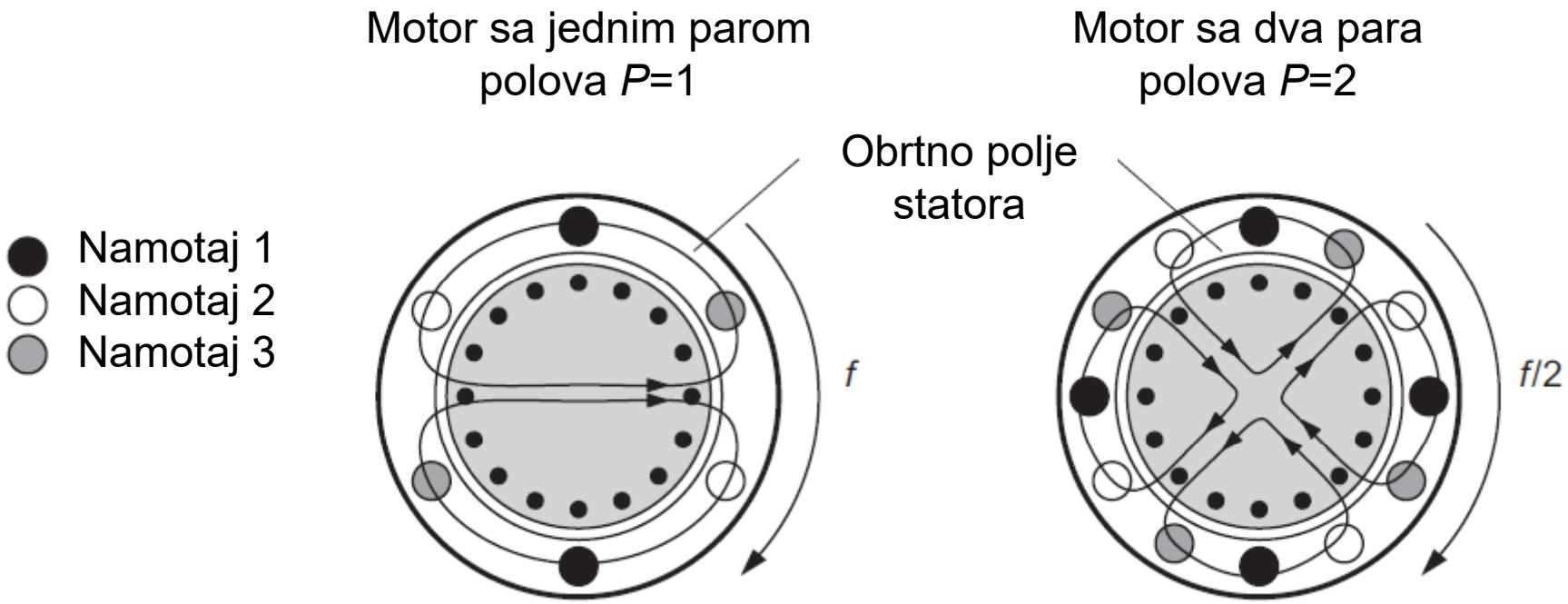
$$m_e = \pi \frac{P}{2} l r B_p F_p \sin\delta$$

Gde je *l*-aksijalna dužina mašine, *r*-poluprečnik, B_p – maksimalna vrednost gustine fluksa u zazoru, F_p – maksimalna vrednost mps rotora,

$\delta = \frac{\pi}{2} + \theta_r$ - ugao momenta

$$m_e = \frac{3P}{2} \Psi_m I_r \sin\delta$$

Asinhroni motor sa većim brojem pari polova:

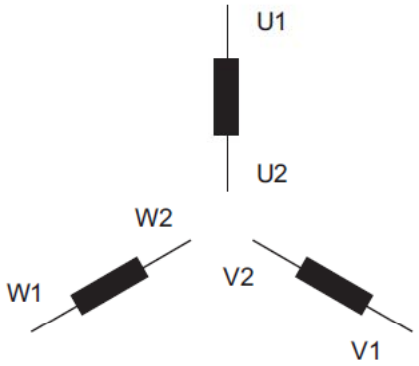


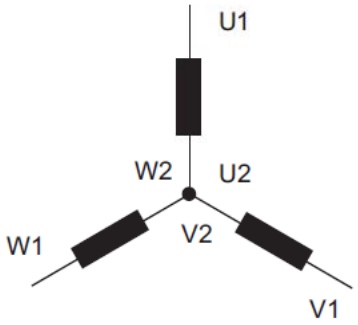
Raspored namotaja za različit broj pari polova

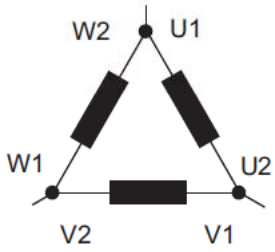
Sinhrona brzina za različit broj pari polova

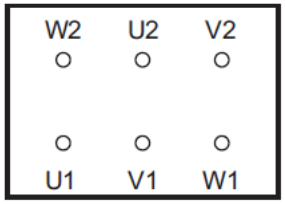
p	1	2	3	4
n_s[o/min]	3000	1500	1000	750

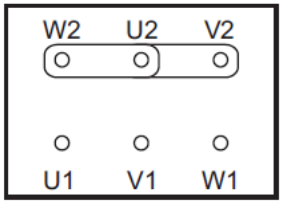
Način povezivanja namotaja statora AM-a

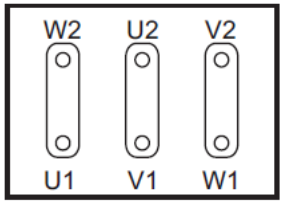












Priključna kutija

Veza u zvezdu

Veza u trougao

Povezivanje namotaja statora u zvezdu i trougao

Nazivni (nominalni) podaci na natpisnoj pločici

Nazivna snaga	22 kW
Nazivna brzina	1450 o/min
Nazivna frekvencija	50 Hz
Nazivni napon	400/690V // Δ / Y
Nazivna struja	44/25.5 A

Priključna kutija