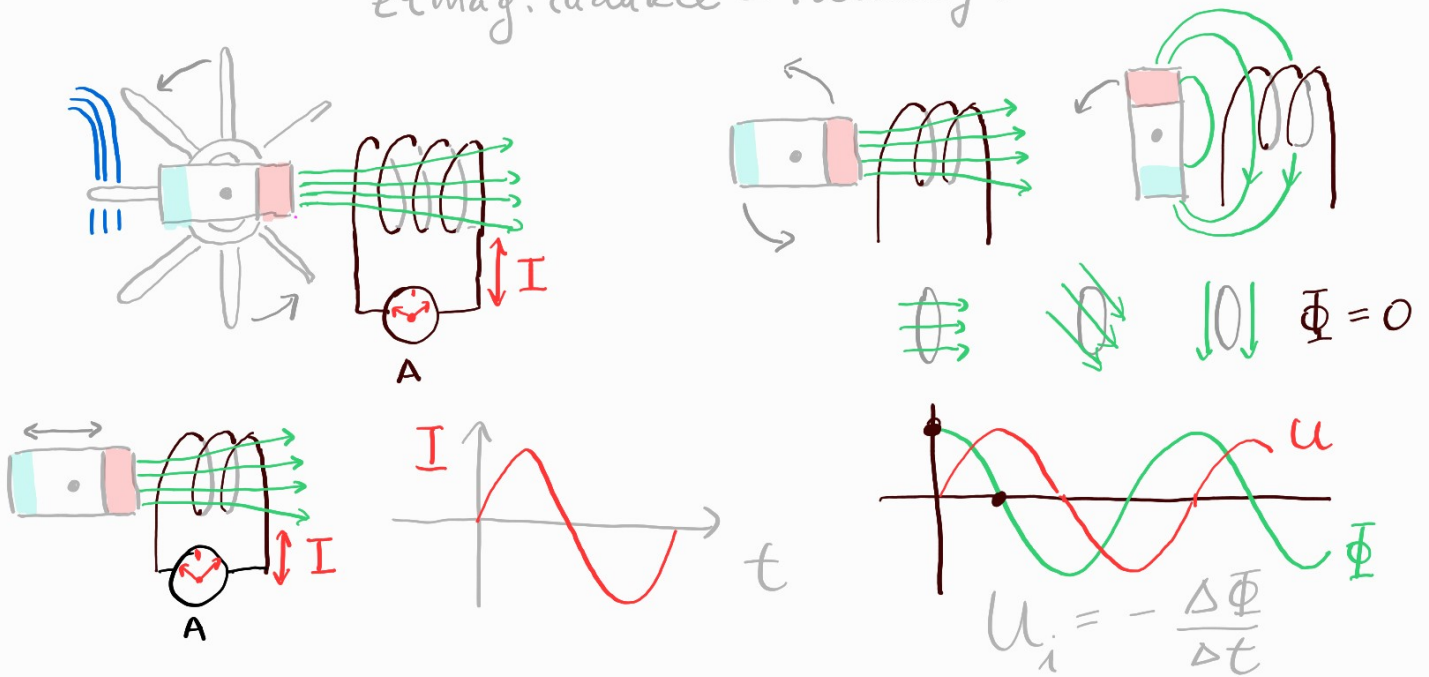
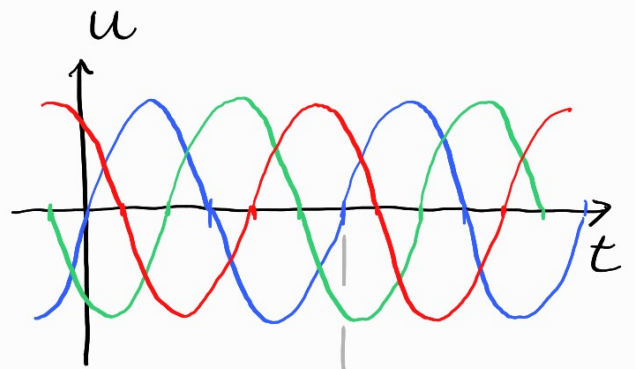
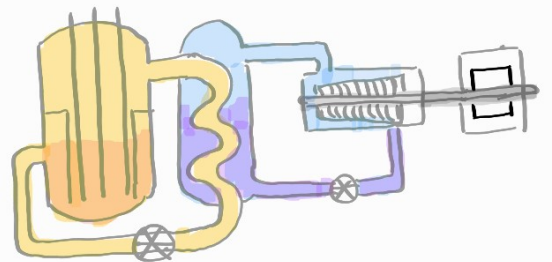
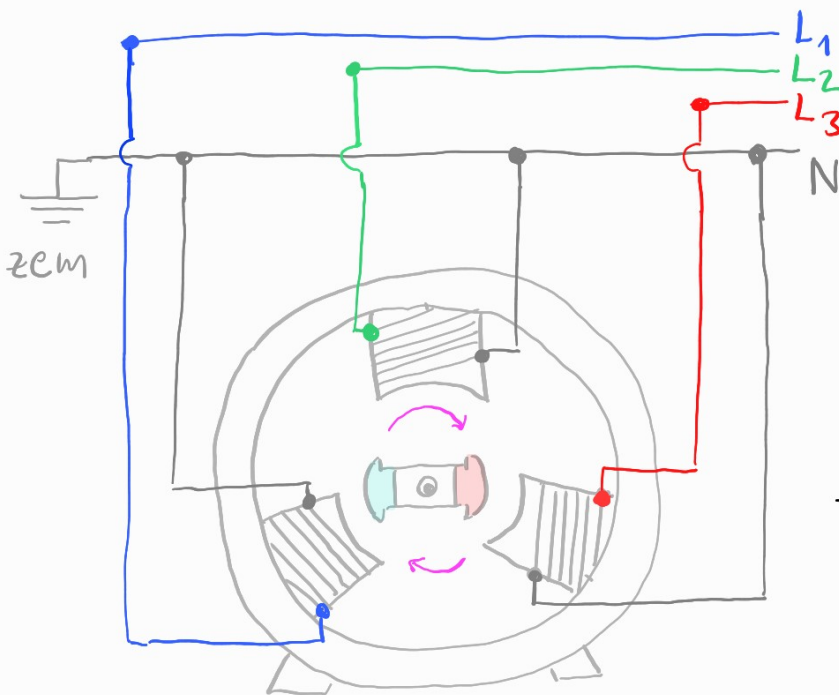


Generátor střídavého proudu (alternátor)

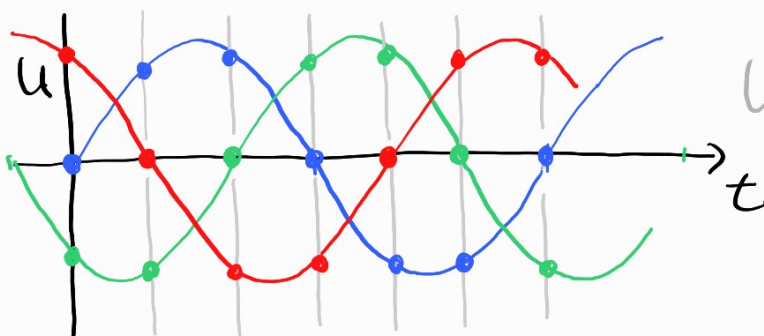
elmag. indukce - Faradayův zákon



Generátor / Alternátor

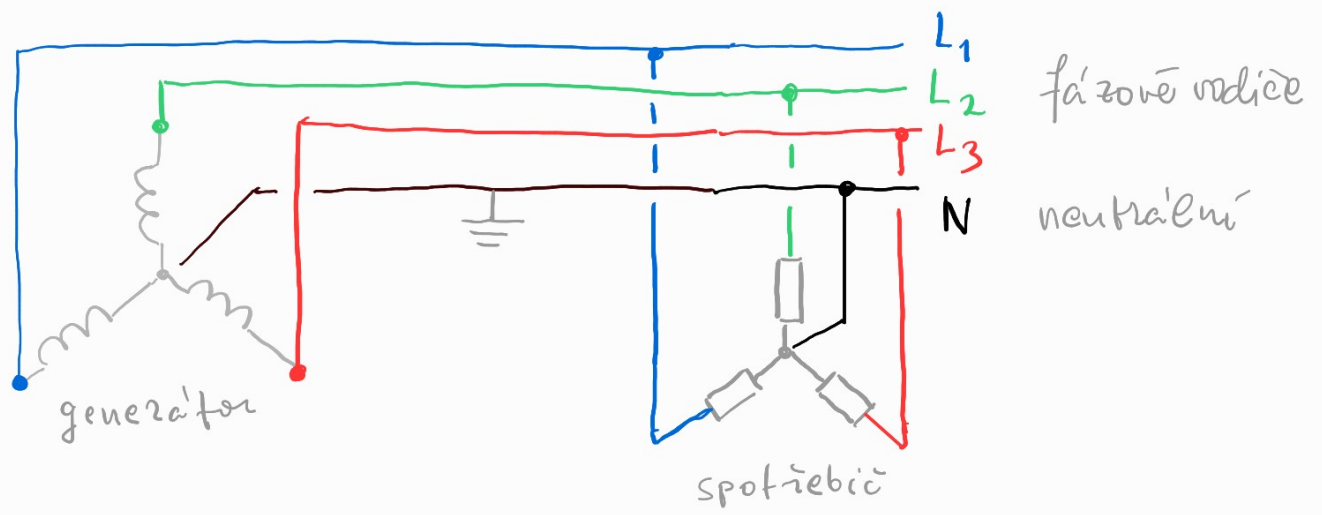


$T = 20 \text{ ms}$ $f = 50 \text{ Hz}$

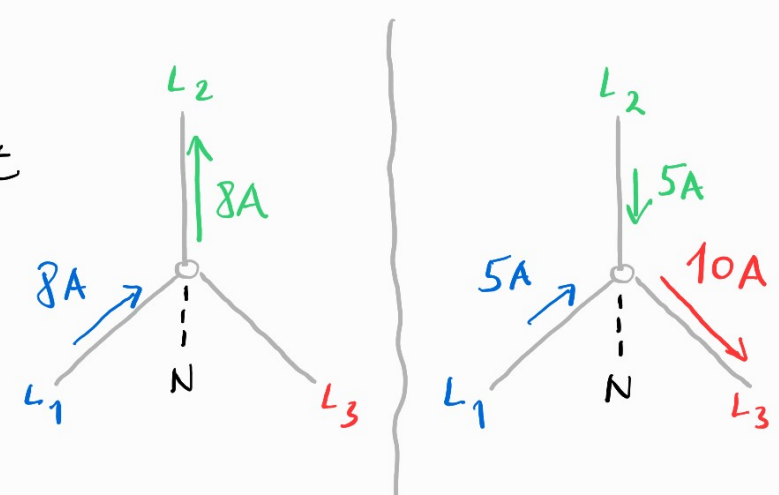
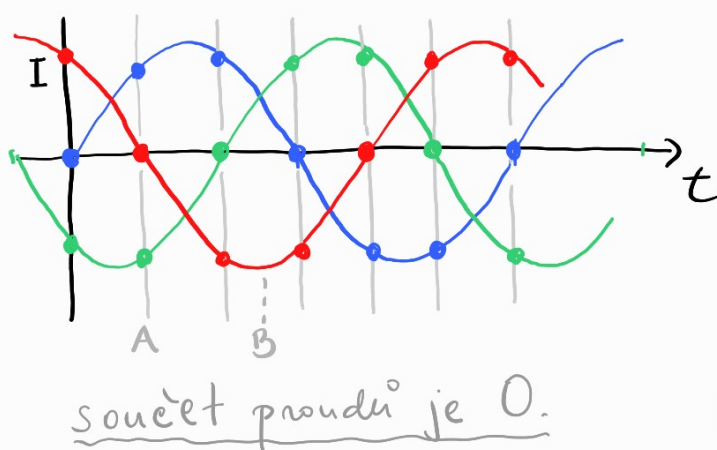


$u(t) = u_m \sin(100\pi t + \varphi_0)$

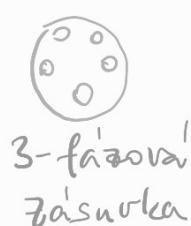
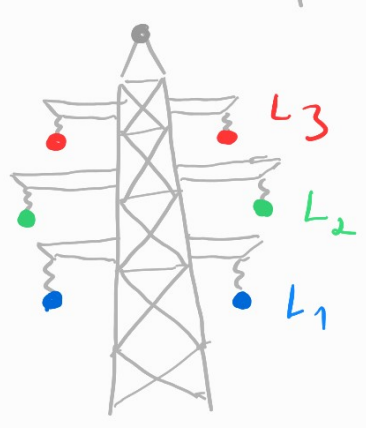
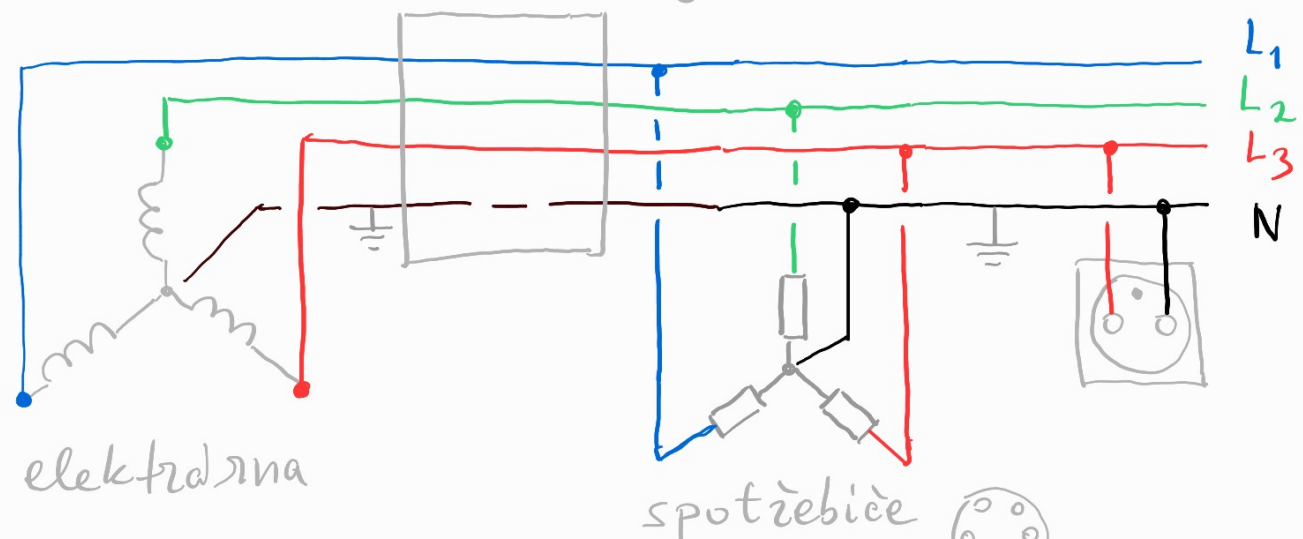
$\Delta\varphi = 120^\circ = \frac{2\pi}{3}$



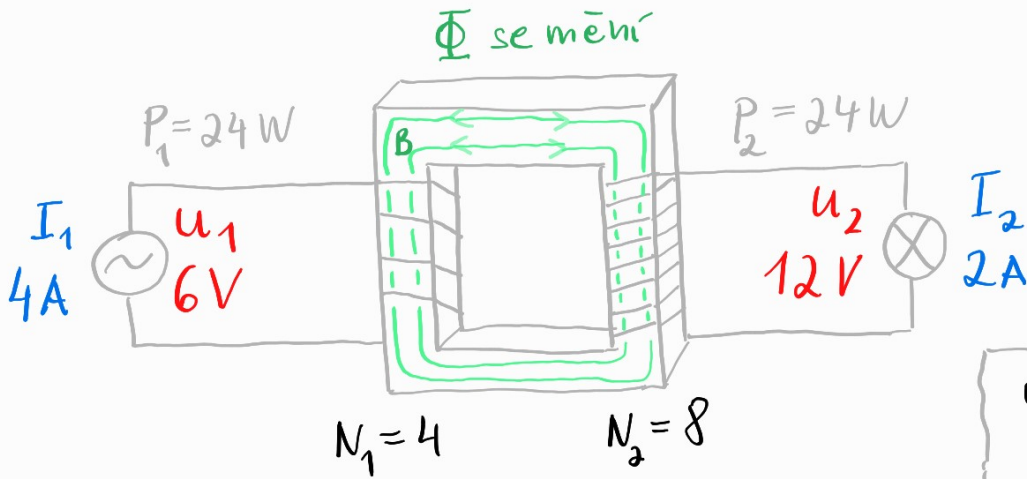
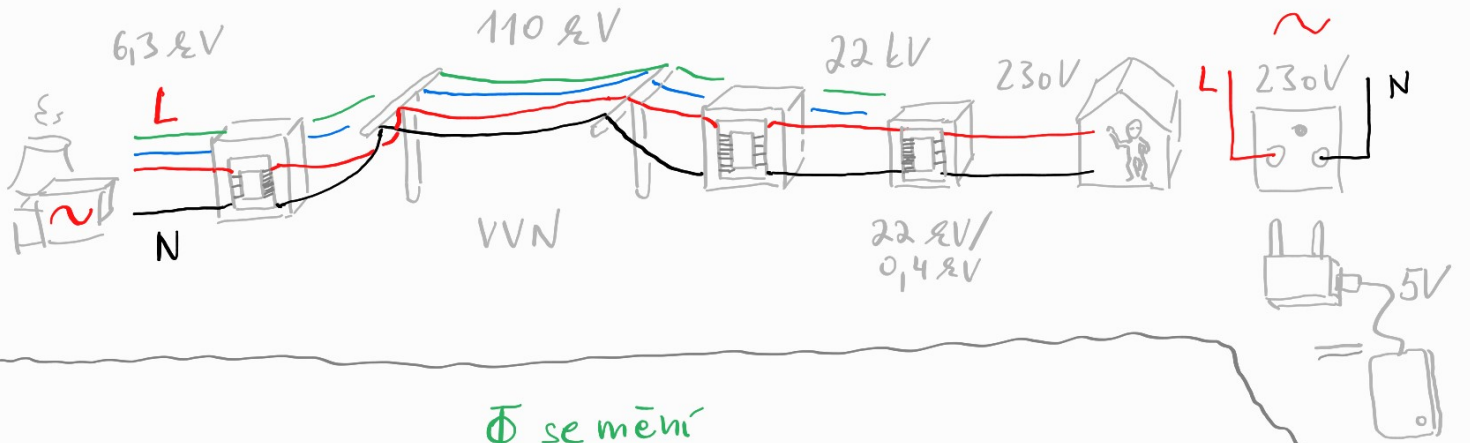
L_1
 L_2
 L_3
 N
fázové vodiče
neutrační



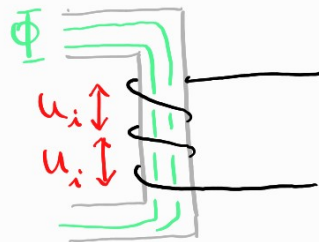
rozvody transformátory



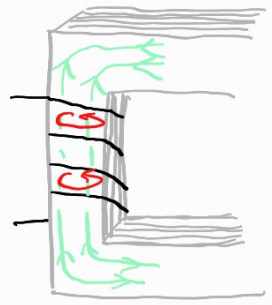
Transformátor



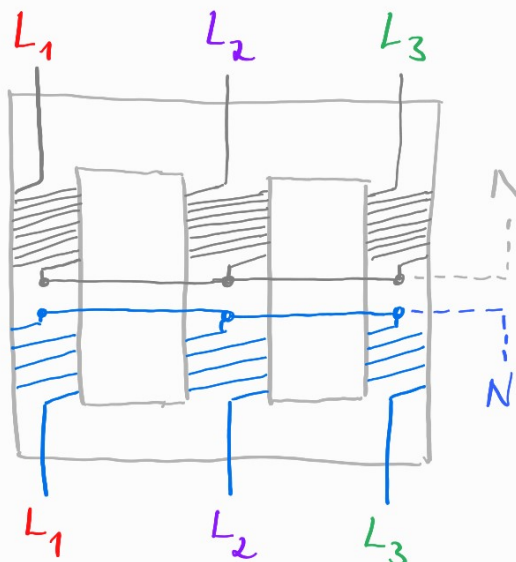
$$U_i = - \frac{\Delta \Phi}{\Delta t}$$



účinnost?
> 99%

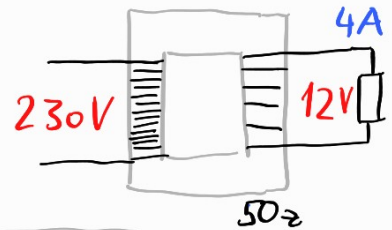


3-fázový



Př: Kolik závitů primár. když transformují z 230V na 12V a sekundár má 50 z?
 Jaký proud primárem, když sekundárem teče 4A?

$$\begin{array}{l} U_1 = 230V \\ U_2 = 12V \end{array} \quad \begin{array}{l} N_1 = ? \\ N_2 = 50 \end{array} \quad \begin{array}{l} I_1 = ? \\ I_2 = 4A \end{array}$$



$$\frac{N_1}{N_2} = \frac{U_1}{U_2} = \frac{I_2}{I_1}$$

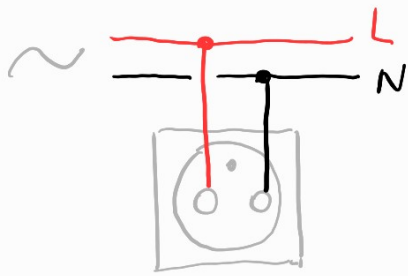
$$N_1 = 50 \cdot \frac{230}{12}$$

$$I_1 = 4A \cdot \frac{12}{230}$$

$$\doteq \underline{960} \text{ z}$$

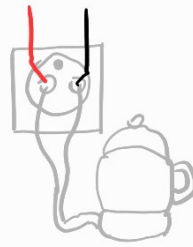
$$\doteq \underline{0,21A}$$

Časový průběh AC, efektivní hodnota



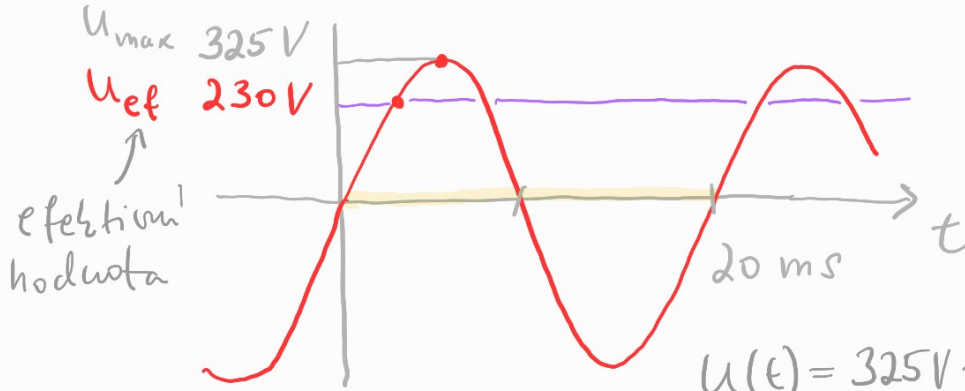
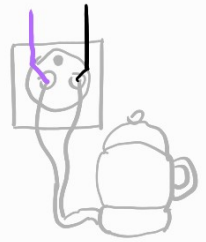
max 325 V

AC ~



230 V

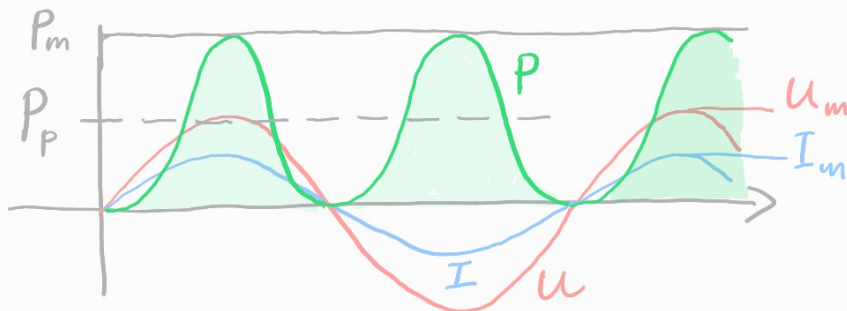
= DC



$$P = U \cdot I$$

$$U(t) = 325 \text{ V} \cdot \sin(100\pi t + \varphi_0)$$

Vztah mezi U_{ef} a U_{max}



průměrnou výkon

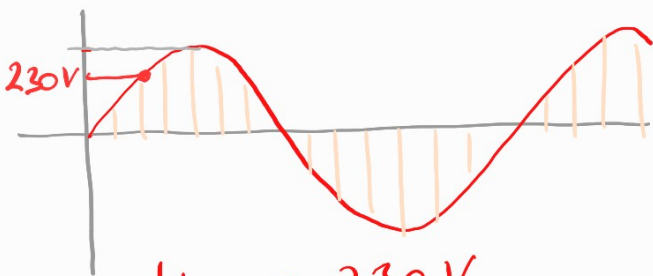
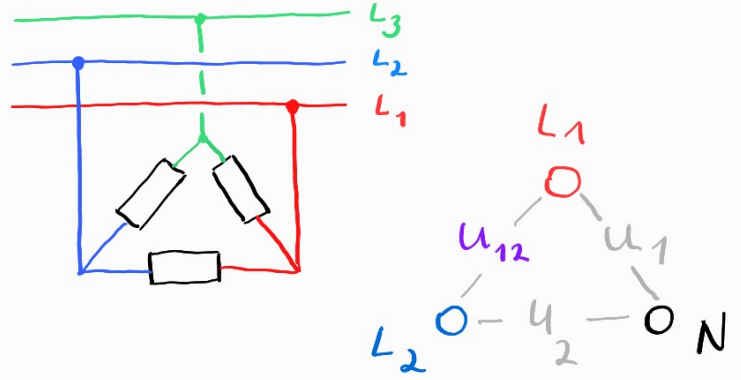
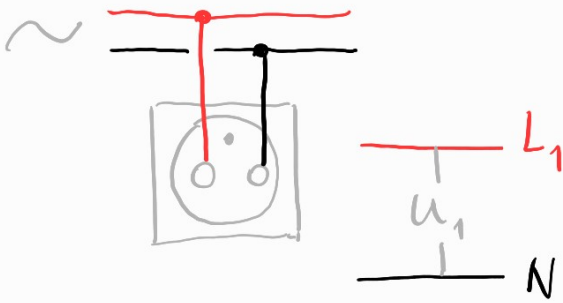
$$P_P = \frac{P_m}{2} = \frac{U_m I_m}{2}$$

$$= \frac{U_m}{\sqrt{2}} \cdot \frac{I_m}{\sqrt{2}}$$

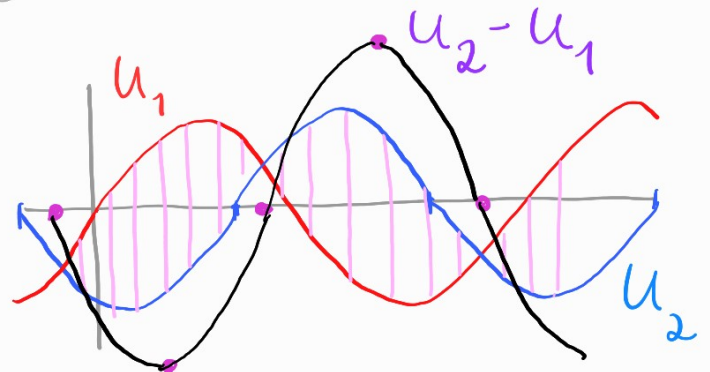
$$= U_{ef} \cdot I_{ef}$$

$$U_m = \sqrt{2} \cdot U_{ef}$$

Fázové a sdružené napětí

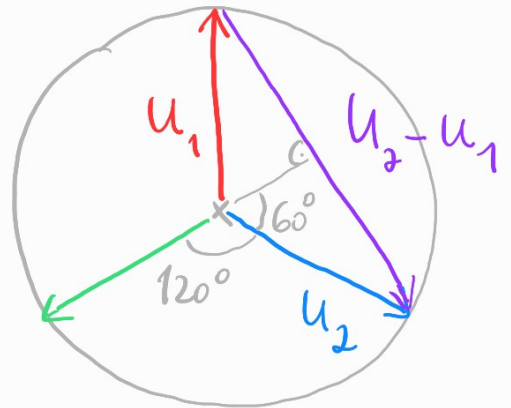


$U_{ef} = 230V$
FÁZOVÉ NAPĚTÍ



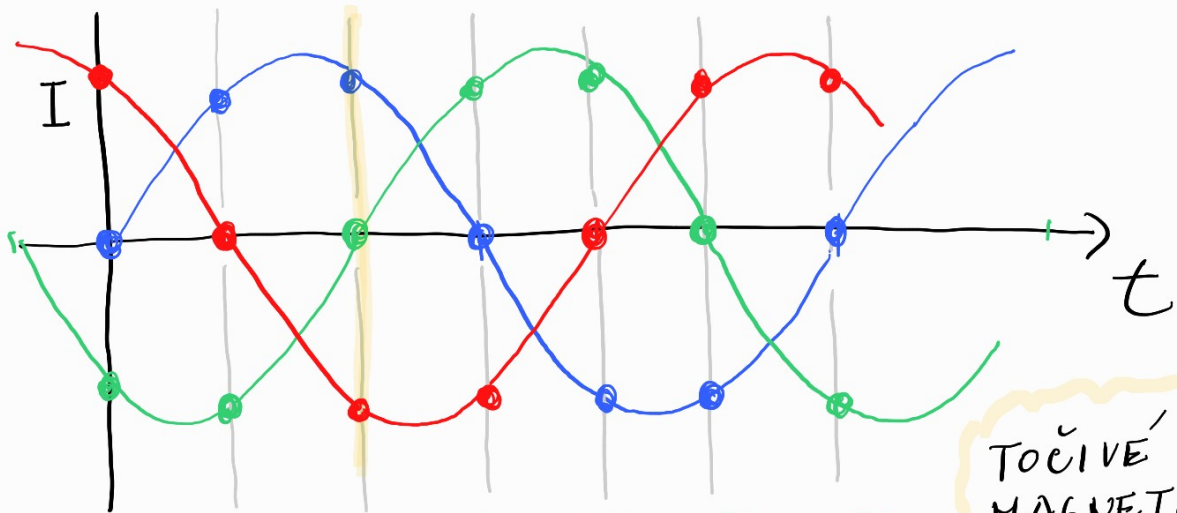
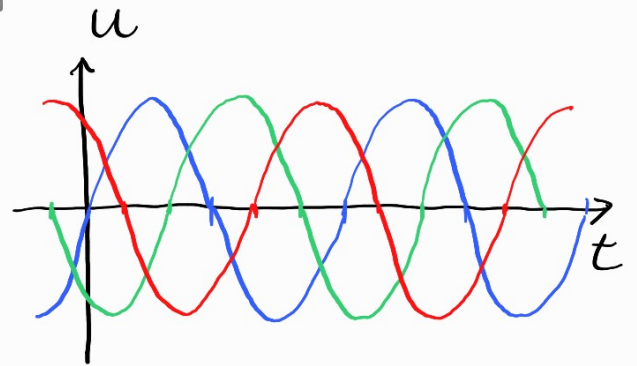
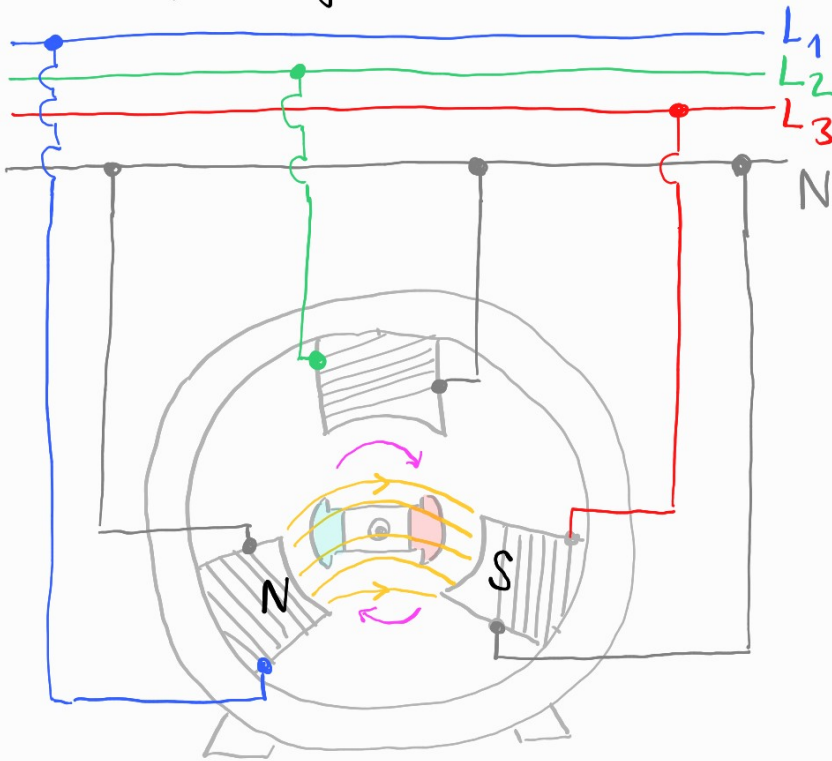
$U_{ef} = \sqrt{3} \cdot 230 \approx 400V$
SDRUŽENÉ NAPĚTÍ

fázorový diagram

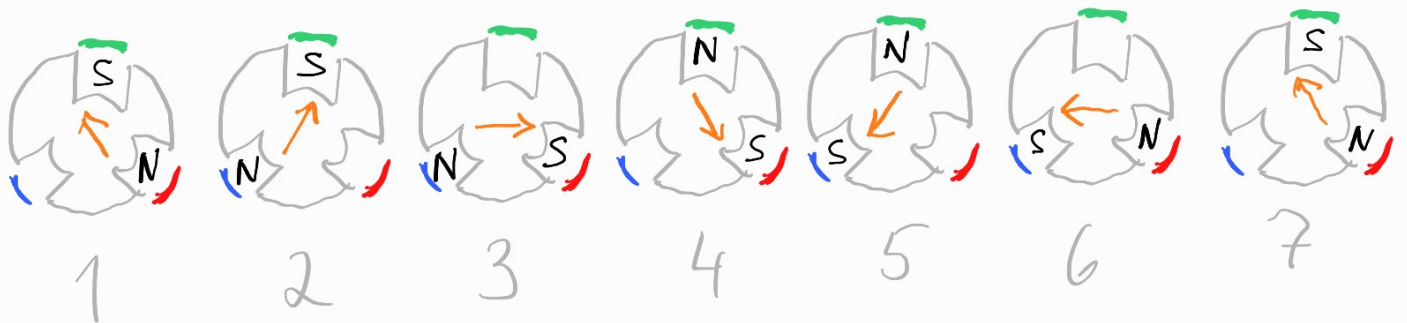
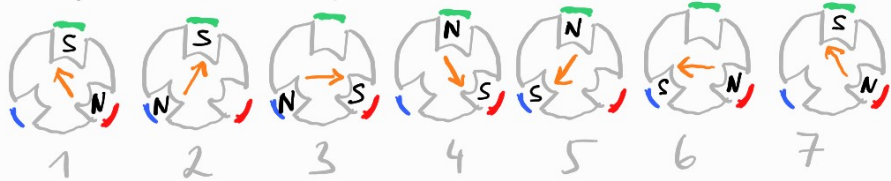


$$|U_2 - U_1| = U_2 \cdot \sin 60^\circ \cdot 2 = U_2 \cdot \frac{\sqrt{3}}{2} \cdot 2 = U_2 \cdot \sqrt{3}$$

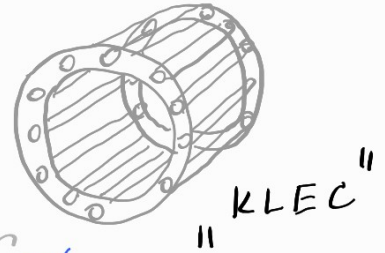
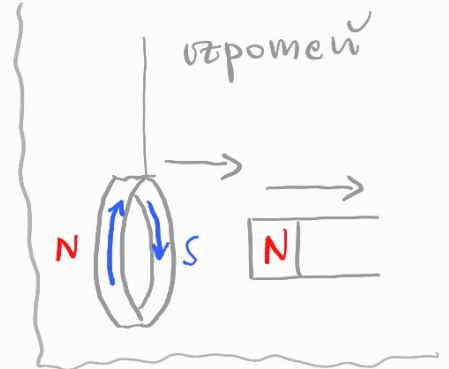
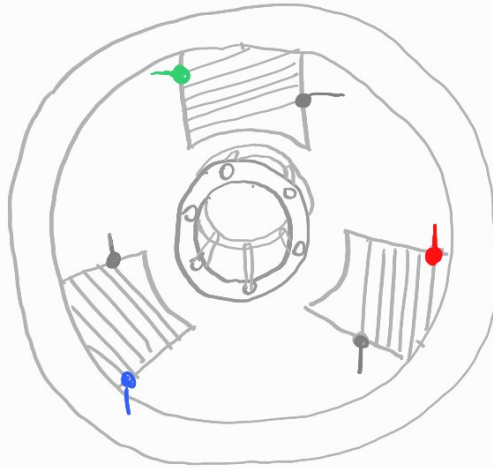
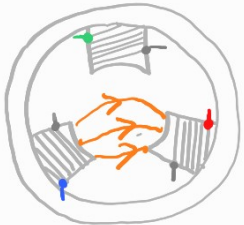
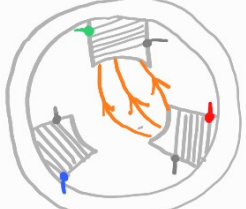
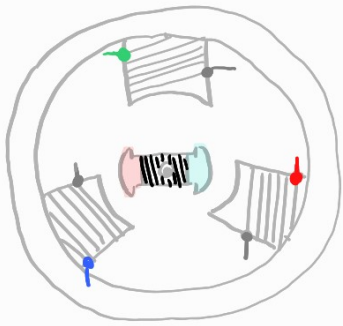
Trifázový AC elektromotor (asynchronní)



TOČIVÉ
MAGNETICKÉ
POLE



3-fázový INDUKČNÍ motor



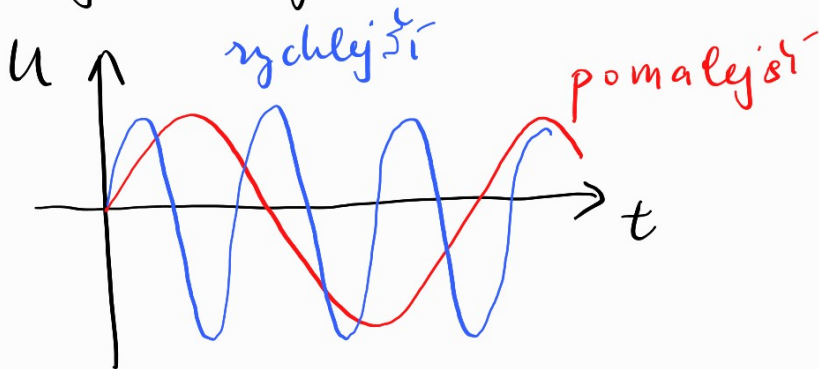
ASYNCHRONNÍ

SKLUZ
~ 5%

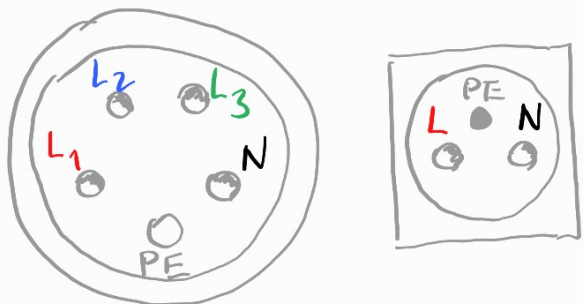
rotace rotoru
trochu pomalejší
než rotace mag. pole

- ŽÁDNÉ POKYBLIVÉ KONTAKTY
 - SAMOSTARTUJÍCÍ
- spolehlivý
— "bezúdržbový"

Regulace rychlosti otáček

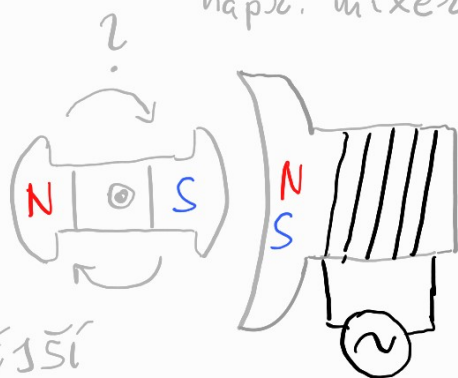


3-fázová zásuvka



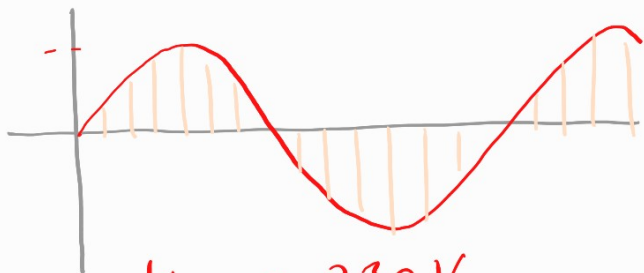
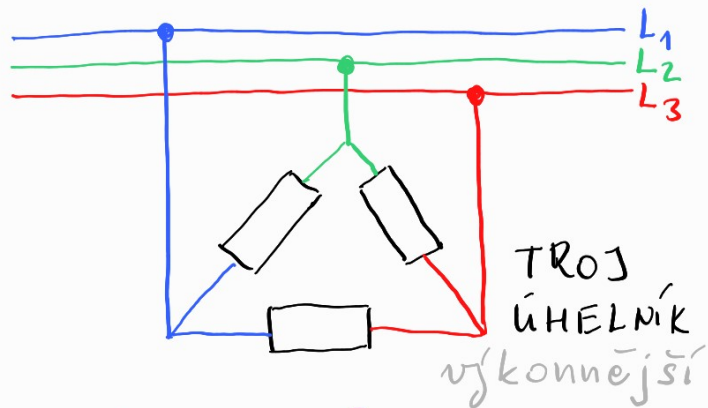
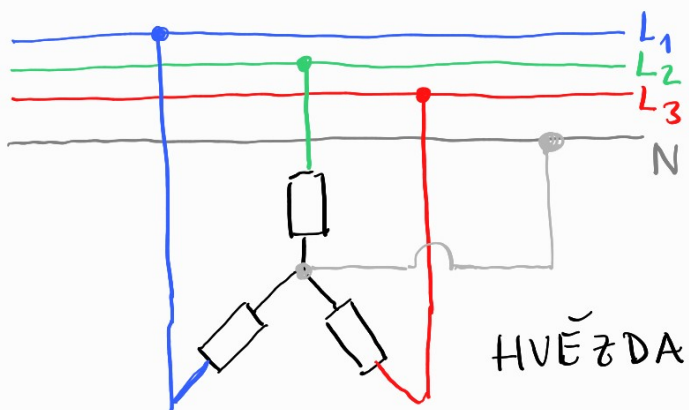
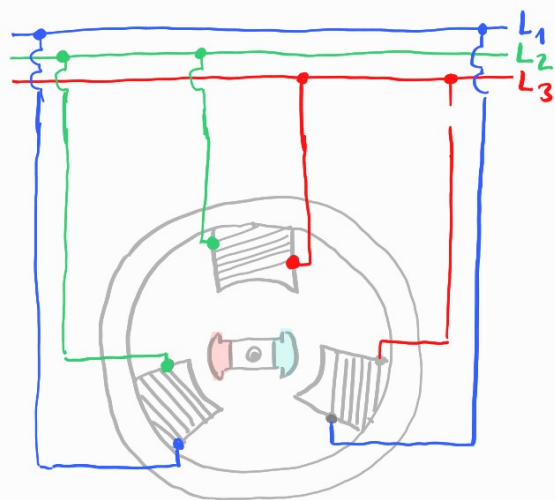
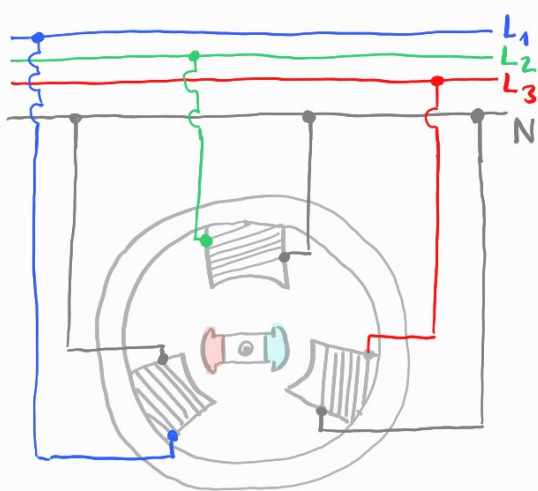
JEDNOFÁZOVÝ ELEKTROMOTOR

např. mixér

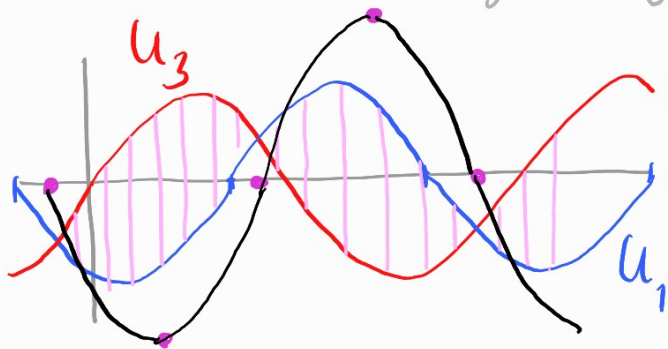


SLOŽITĚJŠÍ

VYŽADUJE STARTÉR...



$U_{ef} = 230V$
FÁZOVÉ NAPĚTÍ



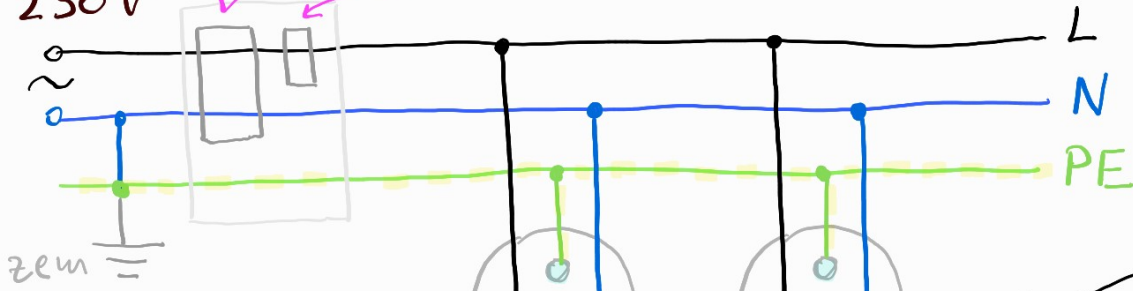
$U_{ef} = \sqrt{3} \cdot 230 \approx 400V$
SDRUŽENÉ NAPĚTÍ

Elektrina doma

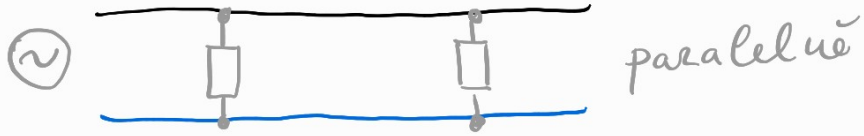
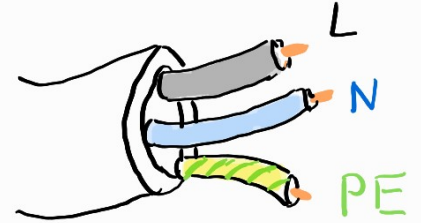
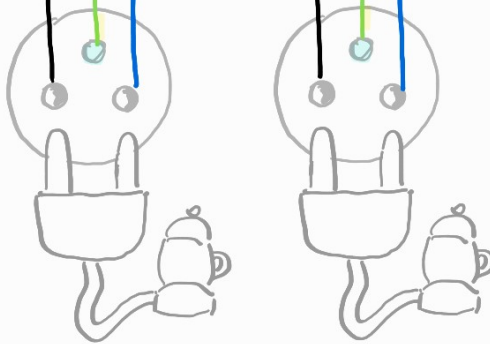
JEN ILLUSTRACE

PROUDOVÝ CHRÁNIČ ($I_L \neq I_N$)
JISTIČ (I_L moc velký, např. > 16A)

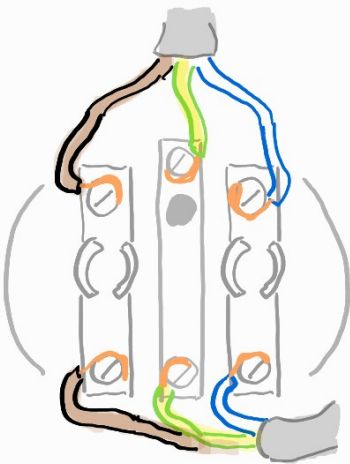
230V



fázovka

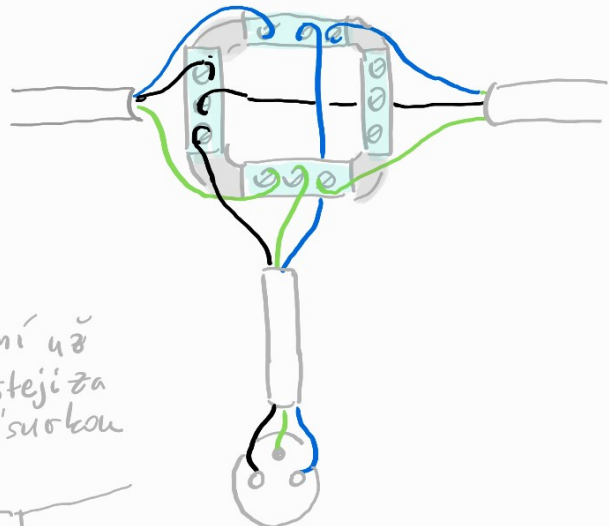


ZÁSUVKA

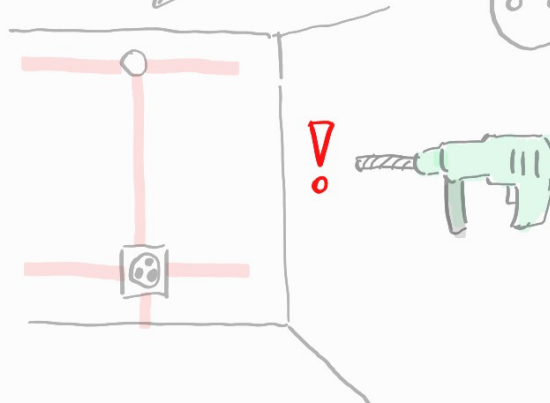


hyní častěji
bez črnbové
svorky

SVORKOVNICE (VĚNEČEK)



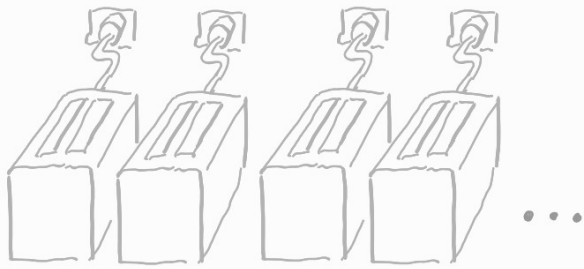
hyní už
častěji za
zásuvkou



JEN ILLUSTRACE

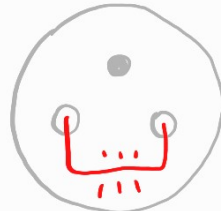
Nebezpečné stavy

přetížení, nadproud

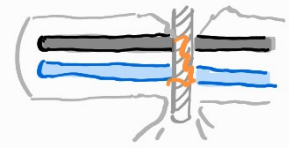


např. $I = 30\text{ A}$
JISTIČ

ZKRAT

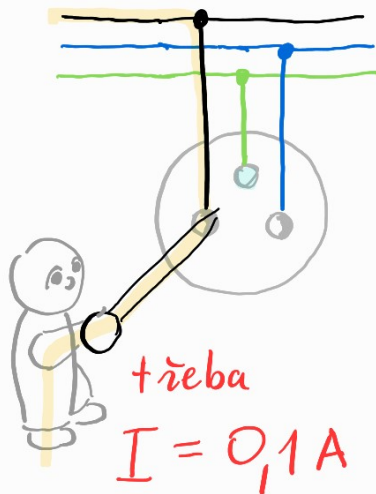


zkrat



zkrat

např. $I > 100\text{ A}$
JISTIČ



třeba
 $I = 0,1\text{ A}$

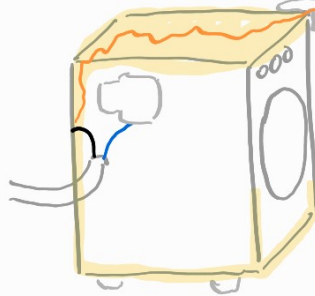
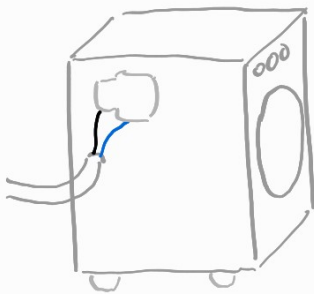
WRONG WAY!

→ PROUDOVÝ CHRÁNIČ

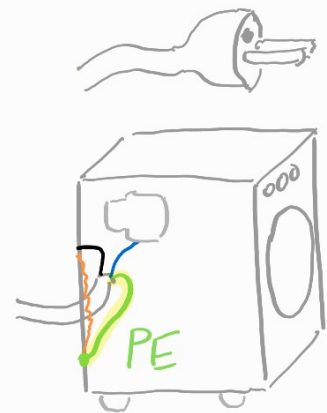
$$R_{\text{tělo}} \approx 2000\ \Omega$$

$$I = \frac{U}{R} = \frac{230\text{ V}}{2000\ \Omega} \approx 0,1\text{ A}$$

ZEMNÍ OCHRANNÝ VODIČ



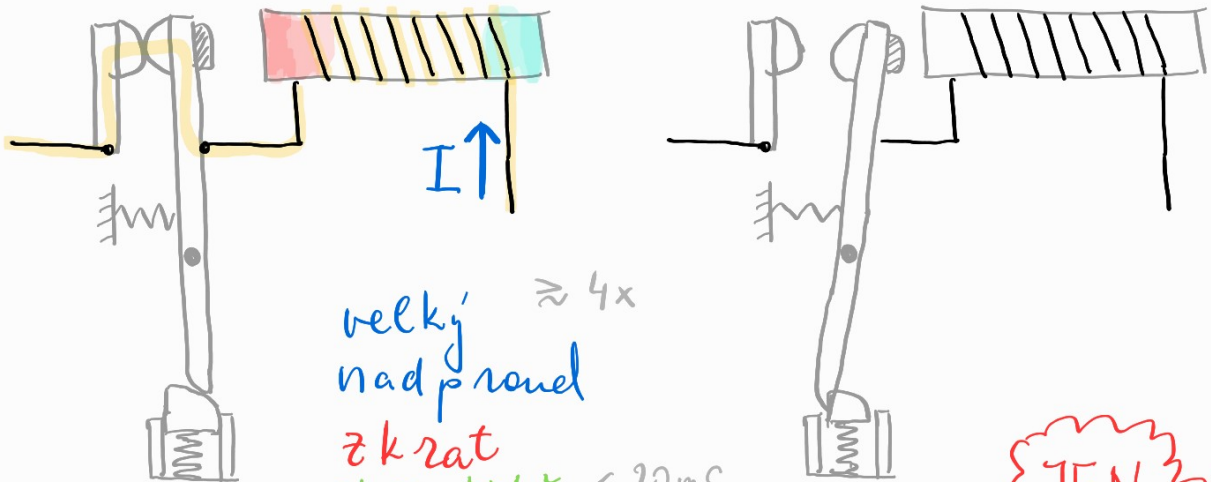
třeba
 $0,1\text{ A}$



VYPÍNA
CHRÁNIČ NEBO
I JISTIČ

JISTIČ

Rychlá elektromagnetická ochrana



velký $\approx 4x$
nadproudek
zkřat
okamžitě $\lesssim 20ms$

JEN
ILUSTRACE

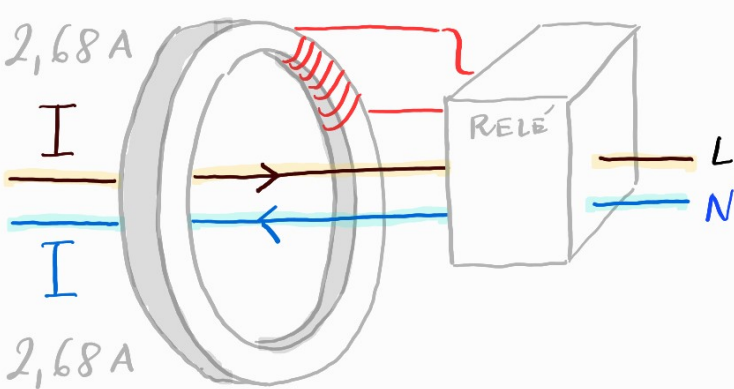
bimetal - „pomalá ochrana“ (tepelná)



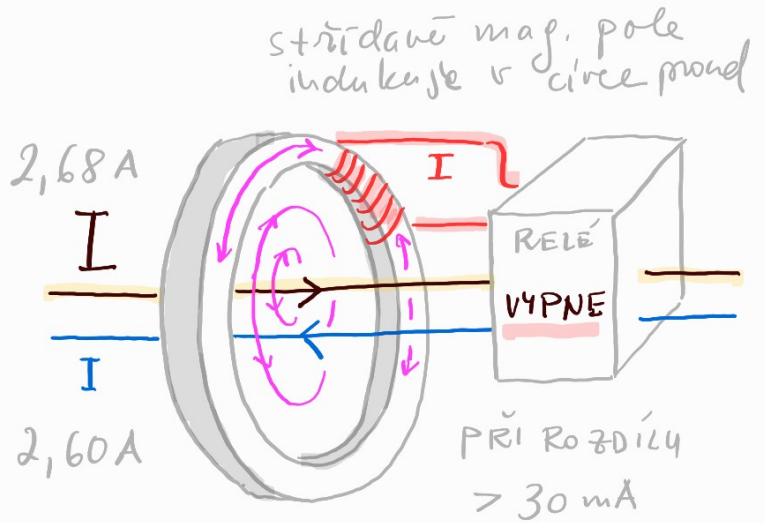
nadproudek po delší dobu
příliš mnoho spotřebičů
- velká zátěž

bimetalový
proužek se
zabírá tím
ohne

PROUDOVÝ CHRÁNIČ



mag. pole L a N
se vyruší

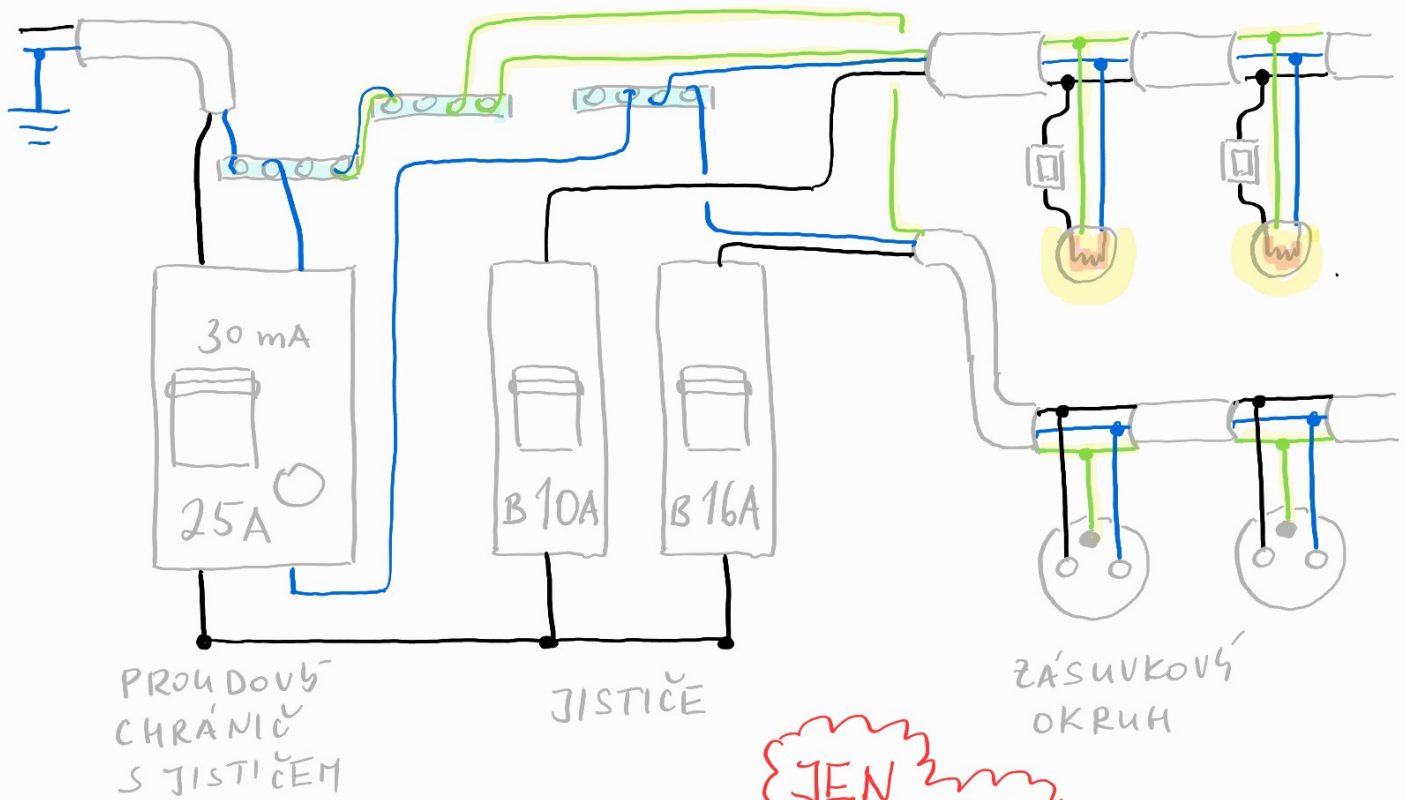


střídavé mag. pole
indukuje v cívkce proud

PŘI ROZDÍLU
 $> 30mA$

RYCHLEJŠÍ NEŽ SMRT
"
 $\lesssim 20ms$

Rozvaděč



JEN
ILUSTRACE