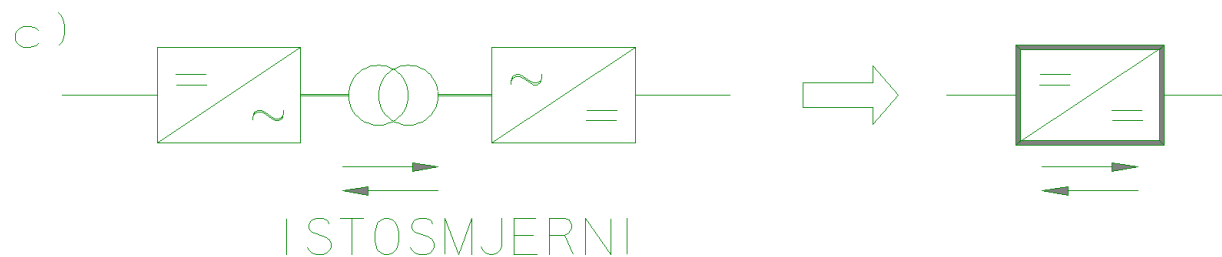
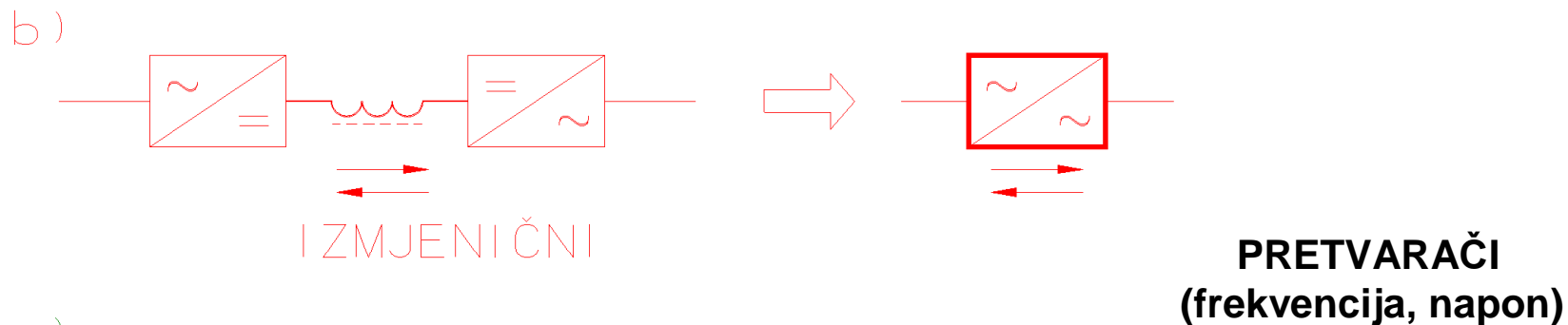
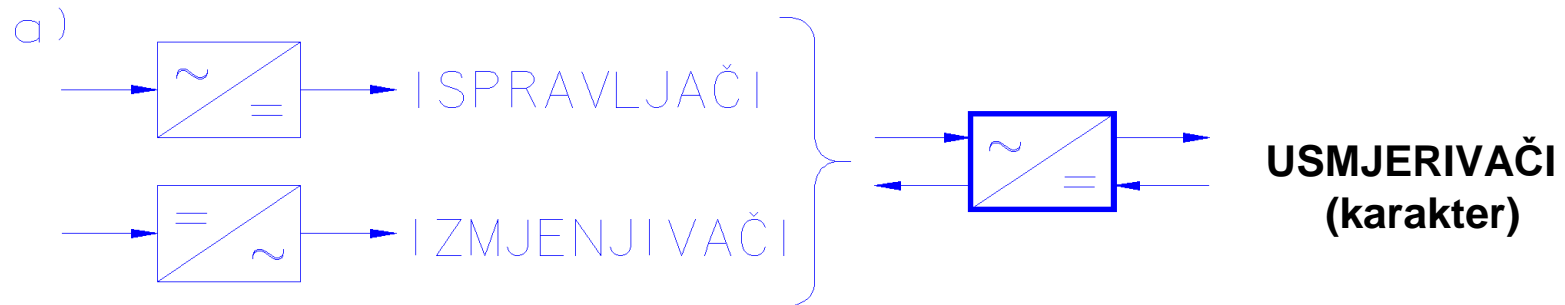


ENERGETSKA ELEKTRONIKA

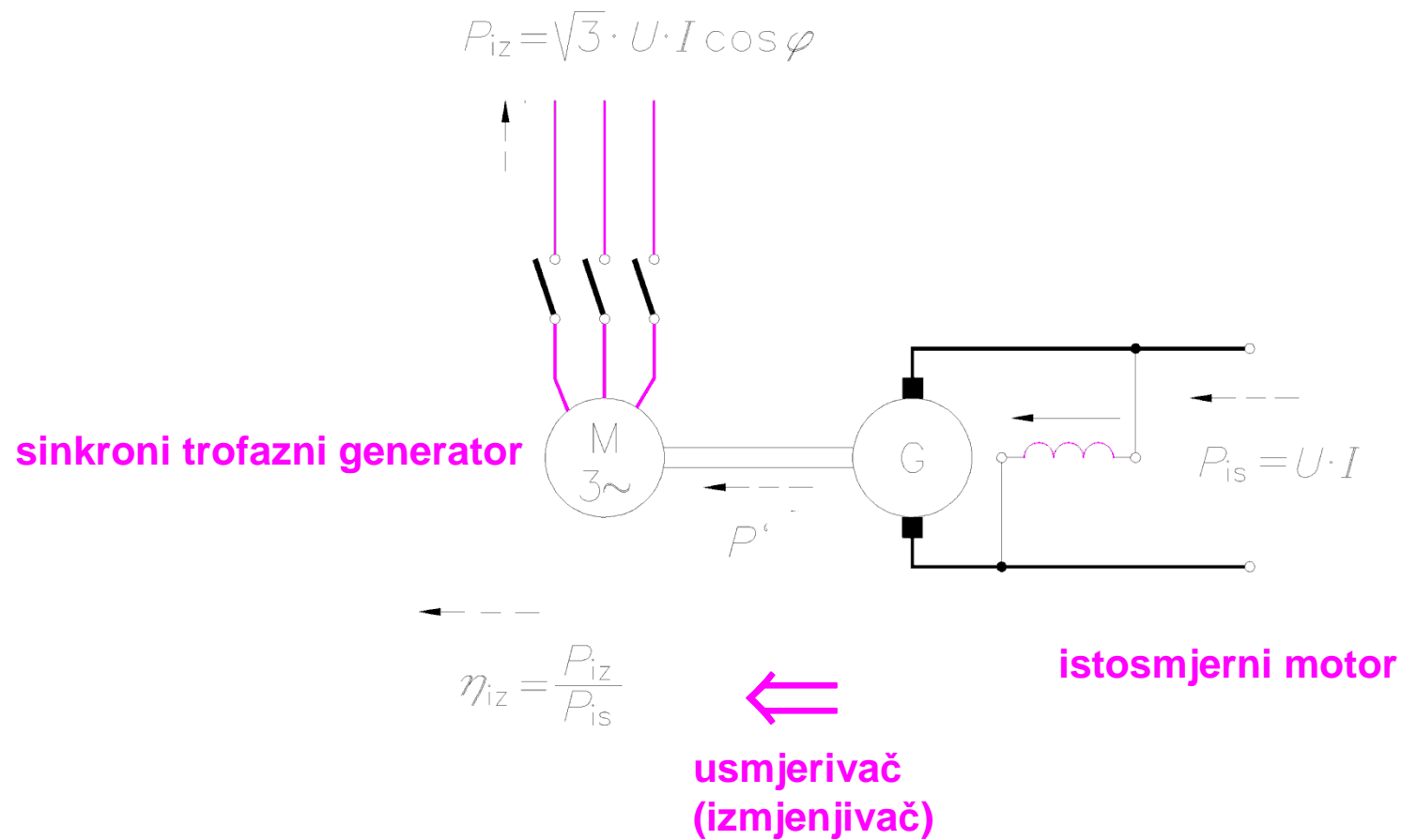
pretvaranje **raspoložive** električne energije u **potrebnu** (karakterom, naponom i frekvencijom)

osnovne funkcije



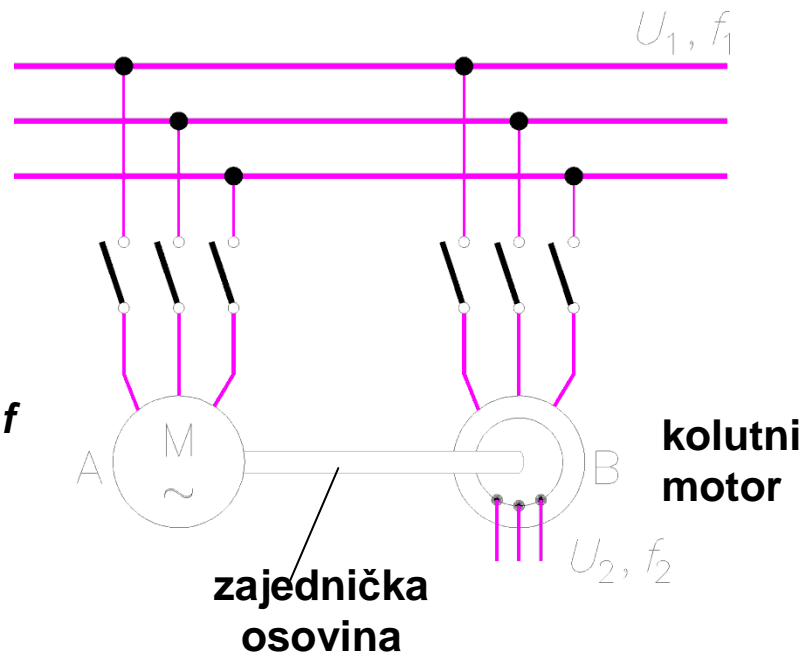
ROTACIJSKI PRETVARAČI

Motorgenerator - dva stroja



Frekvencijski pretvarač

A asinkroni motor - približna f
A sinkroni motor - točna f



USMJERAVANJE STRUJE

usmjerivačko djelovanje - mogućnost ionizacije molekula

- kombinacija metala
- vakuum
- plinom ili parama punjene cijevi
- elektroliti
- poluvodiči

ISPRAVLJAČI

Neregulirani

vrijeme vođenja struje kroz korištenu komponentu **nepromjenjivo**

napon (struju) određuju

- izvor napajanja
- korišteni spoj
- otpor trošila

komponente

diode - vakuumske
- punjene plinom ili parama
poluvodičke

Regulirani

vrijeme vođenja struje kroz korištenu komponentu **promjenjivo**

napon (struju) određuju

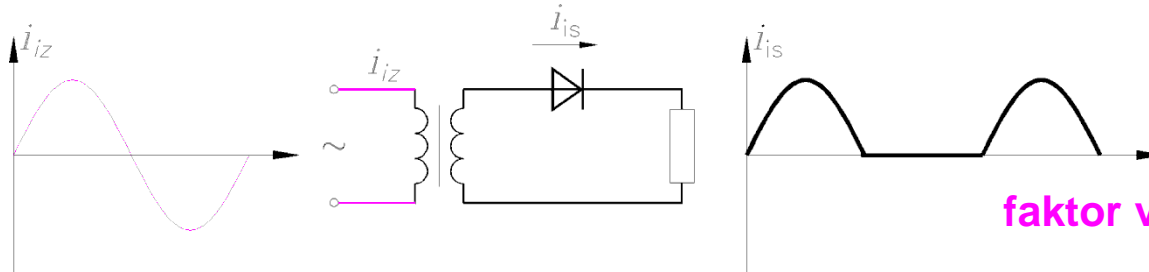
- izvor napajanja
- korišteni spoj
- otpor trošila
- vrijeme vođenja

komponente

“triode” - vakuumske
- punjene plinom ili parama
- poluvodičke

Neregulirani ispravljači

Poluvalno ispravljanje jednofaznog napona



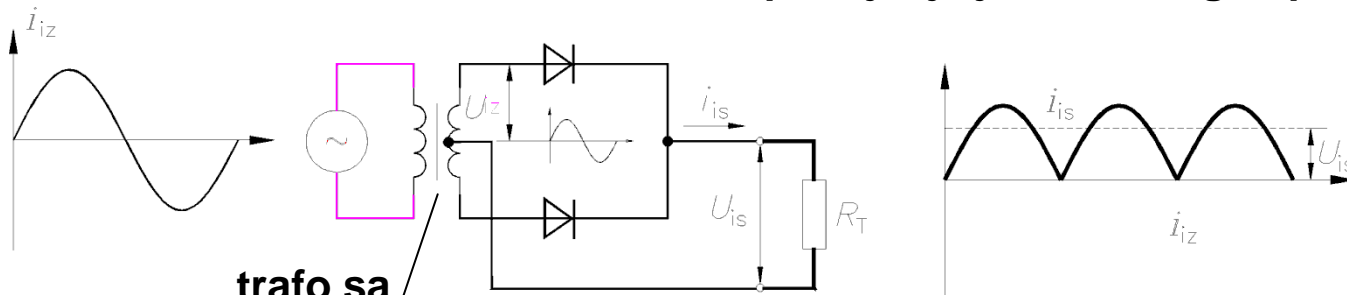
$$U_{is} = U_{sr} = 0,45 \cdot U_{iz}$$

$$U_e = \frac{U_m}{2} = \frac{\sqrt{2}U_{iz}}{2} = \frac{U_{iz}}{\sqrt{2}}$$

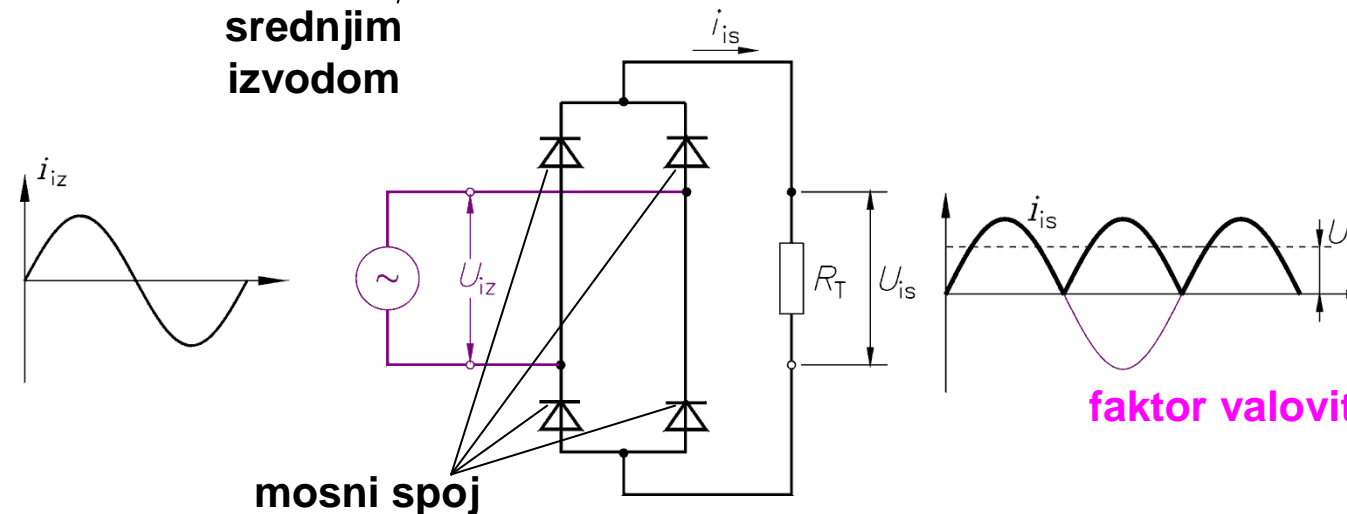
faktor valovitosti

$$K_v = \sqrt{K_0^2 - 1} = 1,21$$

Punovalno ispravljanje jednofaznog napona



trafo sa
srednjim
izvodom



mosni spoj

$$U_{is} = U_{sr} = \frac{2}{\pi} \cdot U_m$$

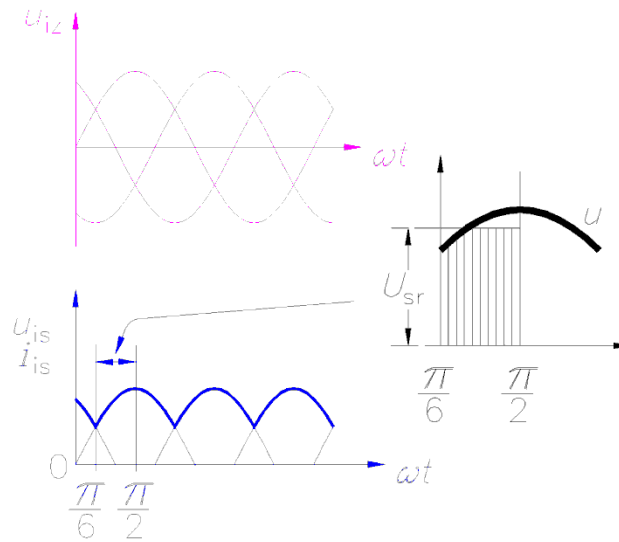
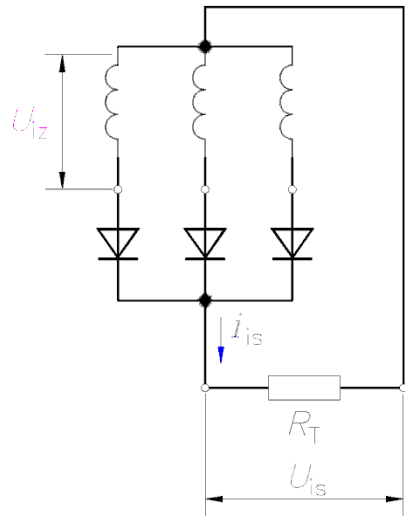
$$= \frac{2\sqrt{2}}{\pi} \cdot U_{iz} = 0,90 \cdot U_{iz}$$

$$U_e = \frac{U_m}{\sqrt{2}} = \frac{\sqrt{2}U_{iz}}{\sqrt{2}} = U_{iz}$$

faktor valovitosti

$$K_v = \sqrt{K_0^2 - 1} = 0,48$$

Poluvalno ispravljanje trofaznog napona

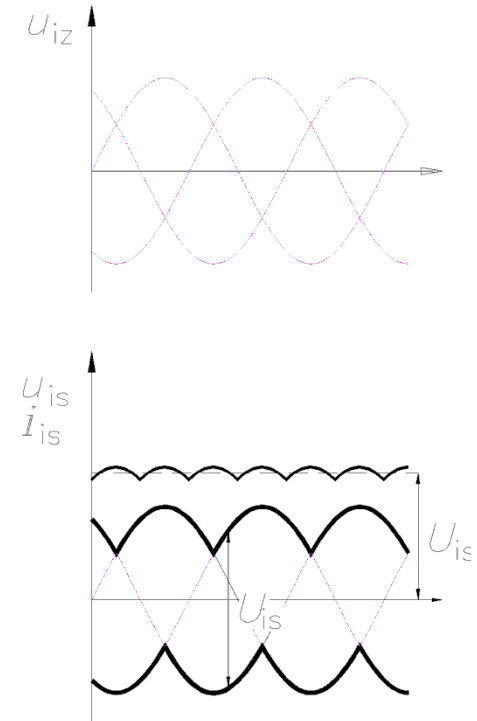
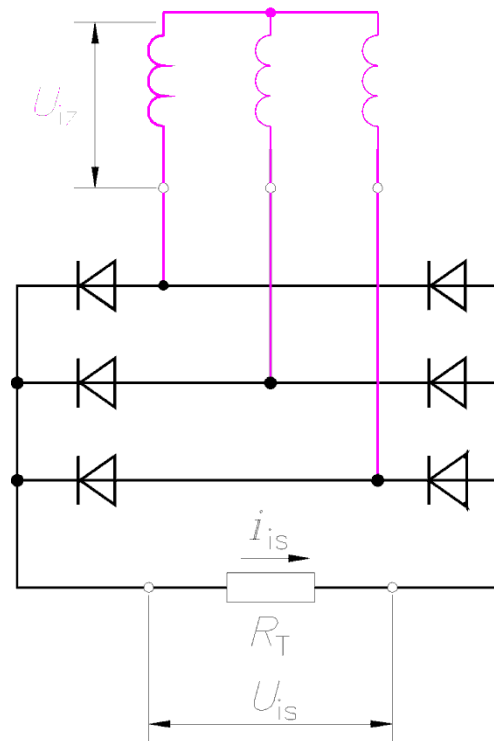


$$U_{is} = U_{sr} = 1,17U_{iz}$$

$$U_e = 0,84U_m = 0,84\sqrt{2}U_{iz}$$

faktor valovitosti $K_v = \sqrt{K_0^2 - 1} = 0,18$

Punovalno ispravljanje trofaznog napona



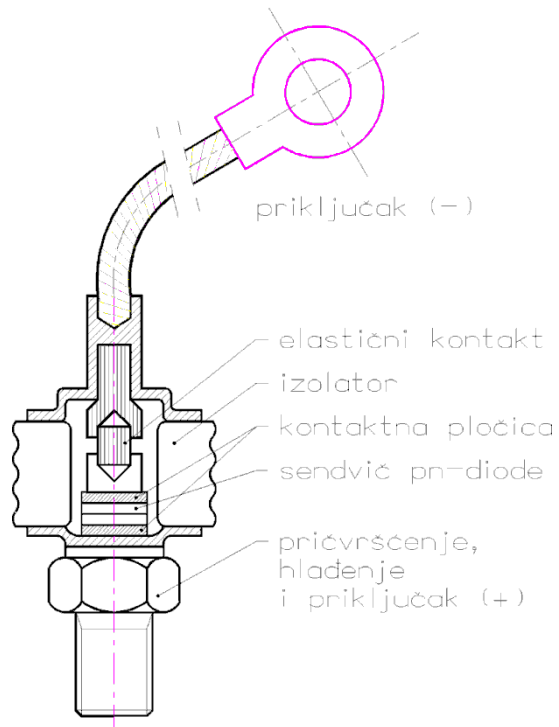
faktor valovitosti $K_v = \sqrt{K_0^2 - 1} = 0,042$

Energetska poluvodička dioda

troslojna - (N⁺ N⁻) P⁺

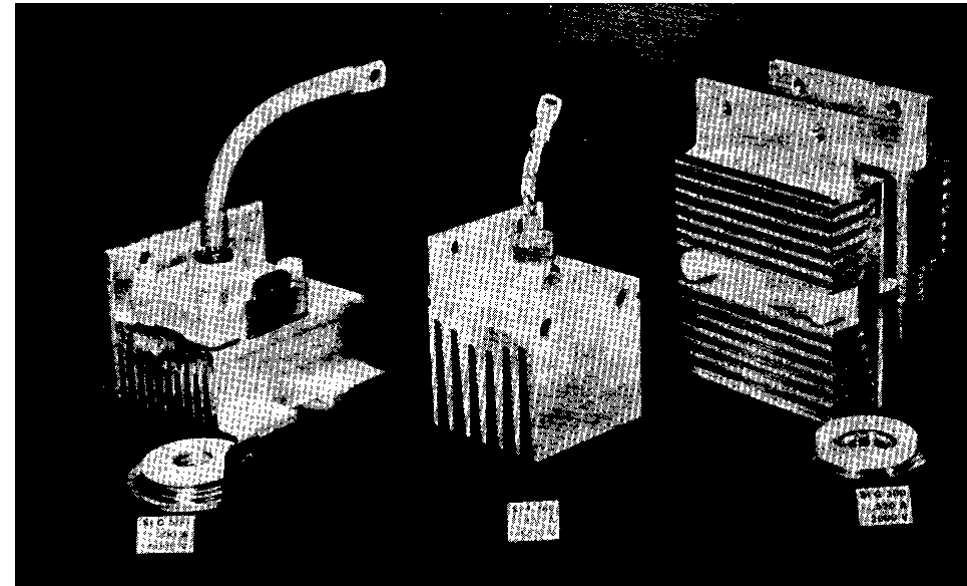
VOĐENJE: mali pad U ; velika gustoća I

ZAPOR: veliki probojni U ; mala I

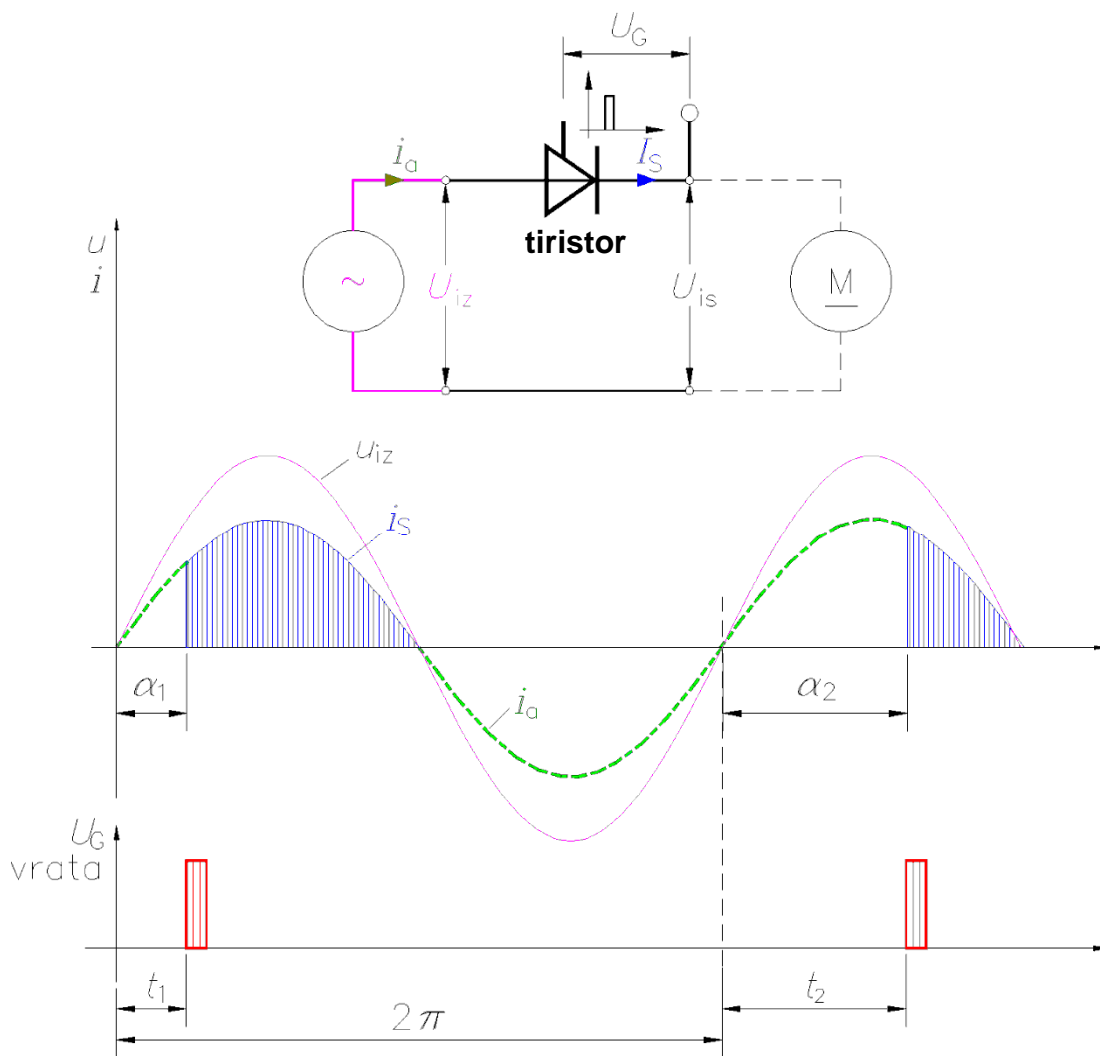


struje $> 10^3\text{A}$

hlađenje - zrakom
- vodom
- tekućim plinom



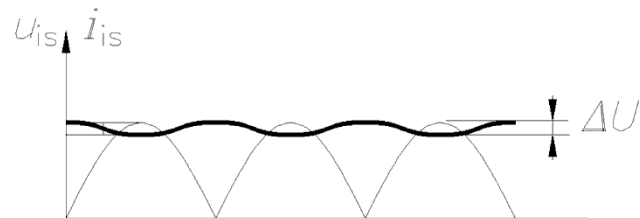
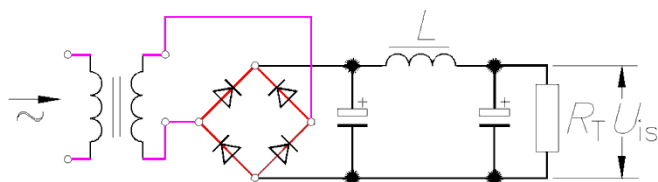
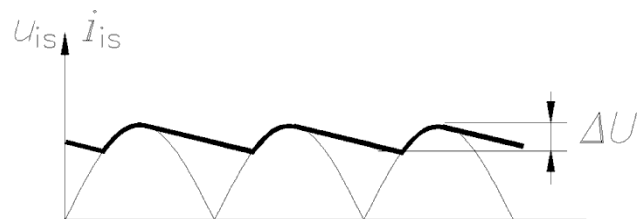
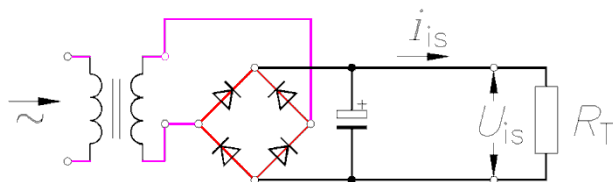
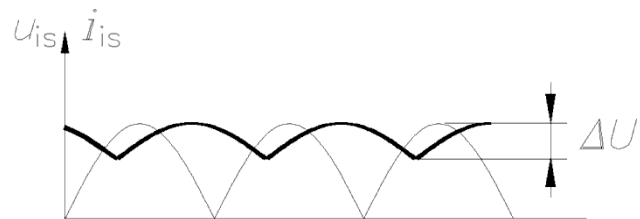
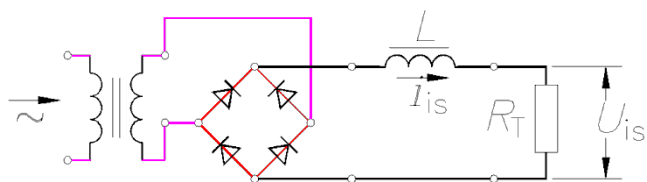
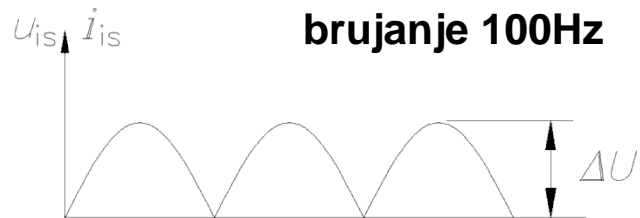
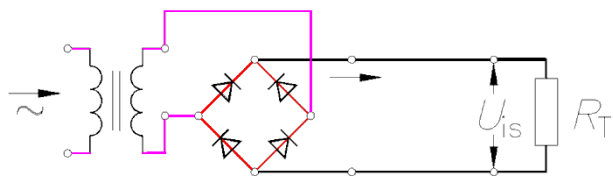
Regulirani ispravljači



α 0-180°

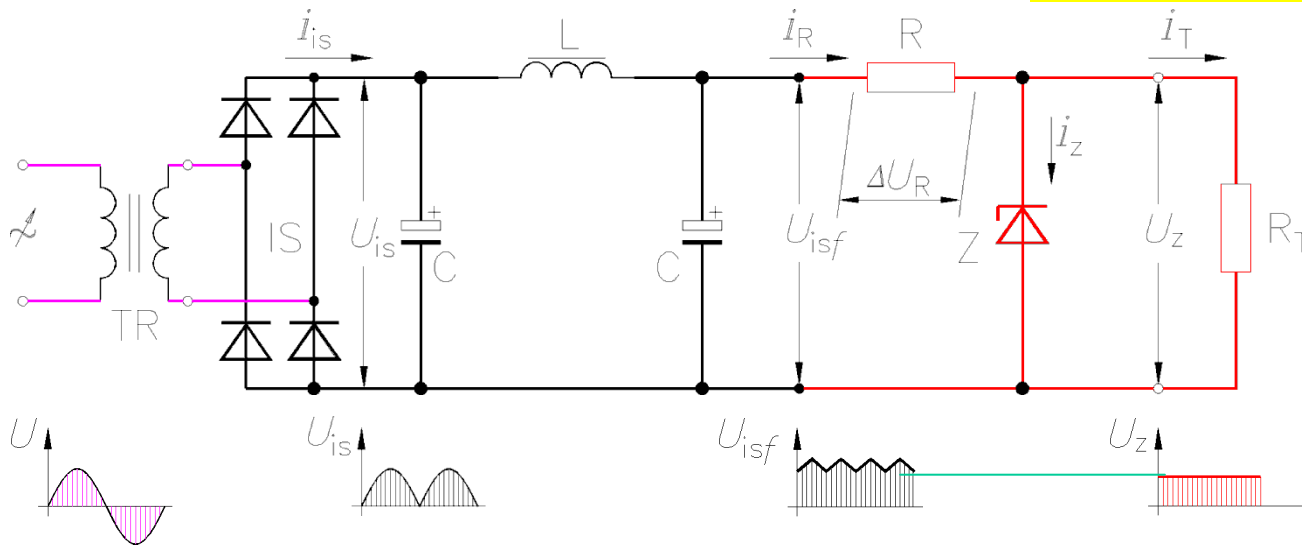
$$U_{is} = \frac{2\sqrt{2}}{\pi} U \cdot \cos^2 \frac{\alpha}{2}$$

FILTRIRANJE ISPRAVLJENOG NAPONA



STABILIZACIJA NAPONA I STRUJE

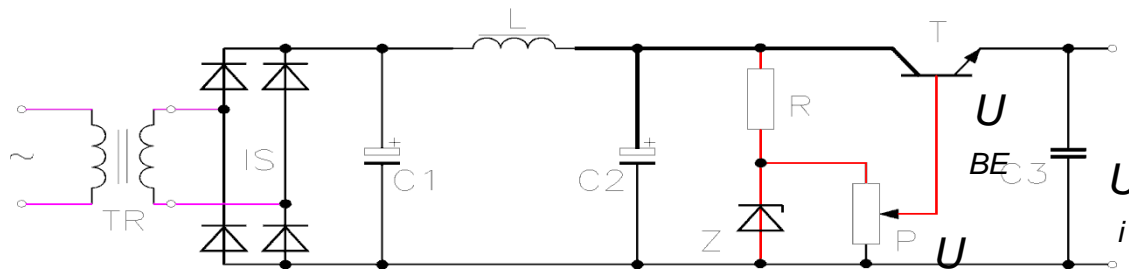
Stabilizacija napona Z diodom



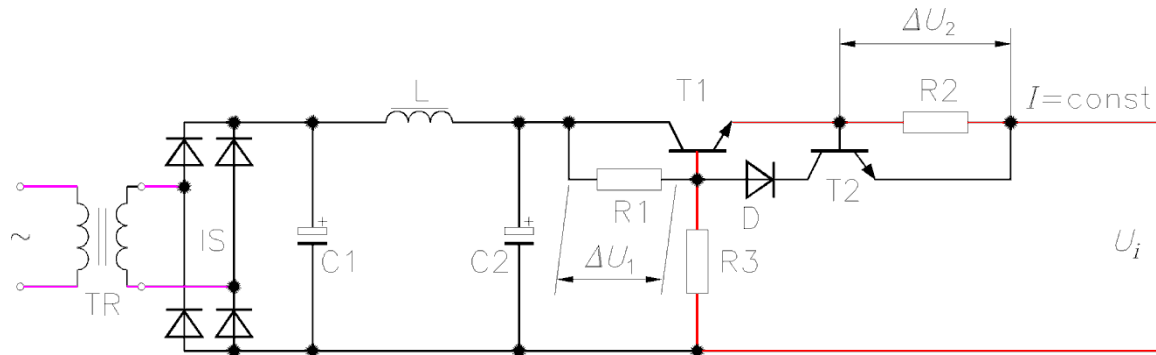
$$U_{isf} = U_Z + \Delta U_R = U_Z + i_R \cdot R$$

$$i_T \leq i_R - i_{Zmin}$$

Stabilizacija napona tranzistorima

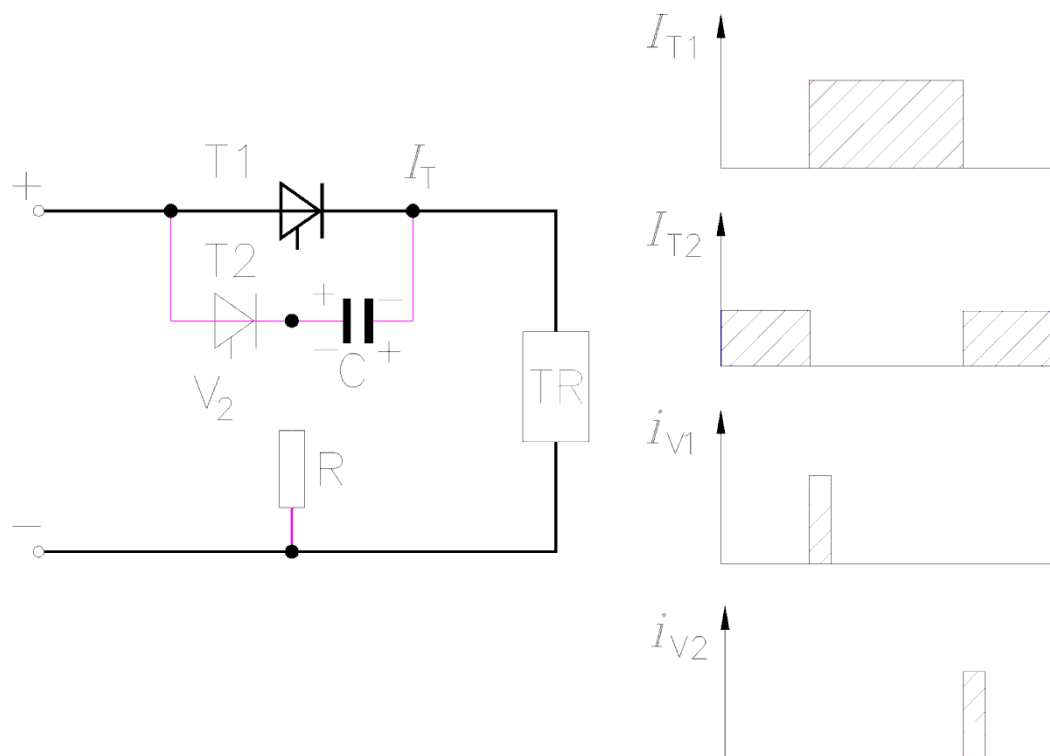


Stabilizacija struje tranzistorima

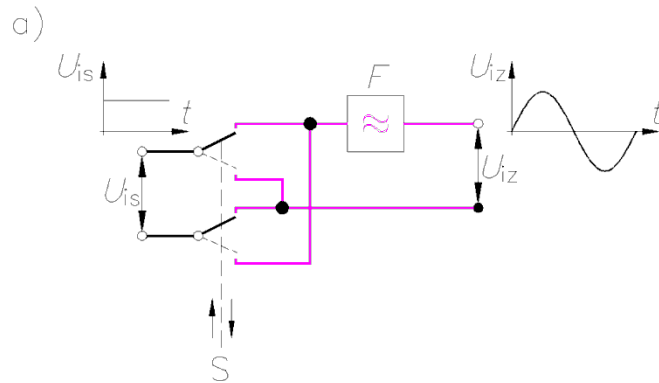


REGULACIJA I UPRAVLJANJE ISTOSMJERNOG IZVORA

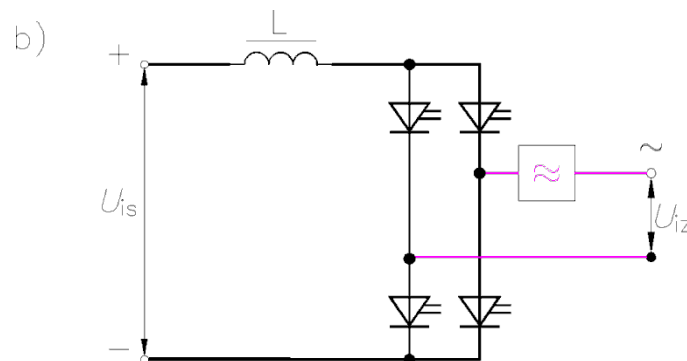
upravljanje tiristorom kod
reguliranih izvora u
istosmjernom strujnom krugu



IZMJENJIVAČI ISTOSMJERNOG NAPONA U IZMJENIČNI



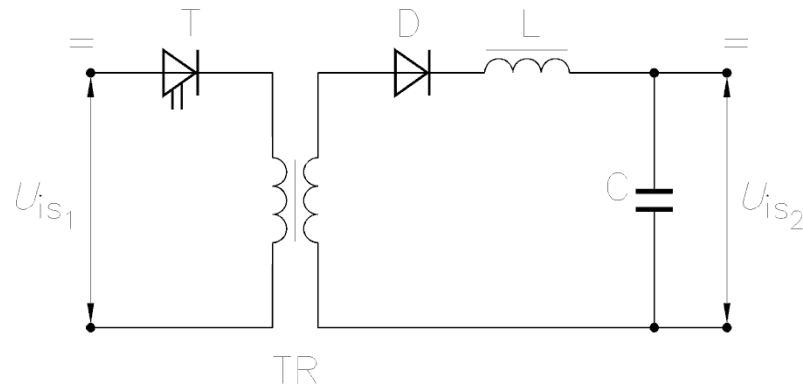
mehanička preklopka i filtriranje
 f ovisi o brzini preklapanja



četiri isklopiva tiristora za
istosmjernu struju u
mosnom spoju i filtriranje

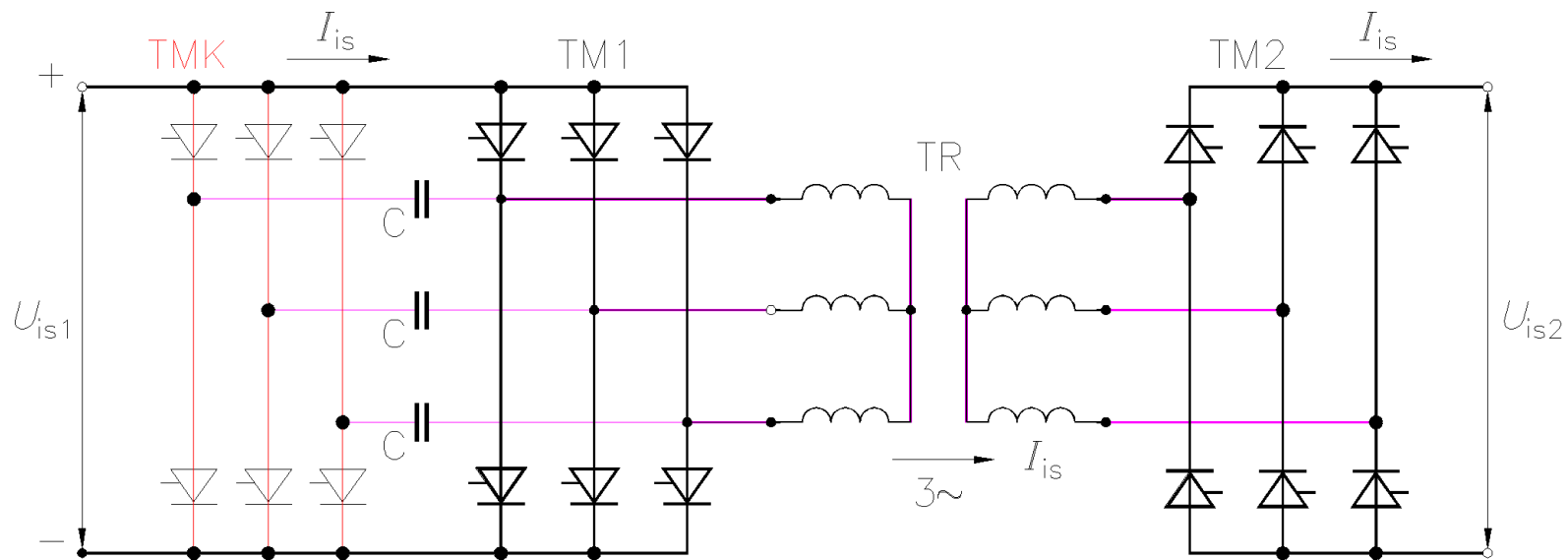
PRETVARANJE STRUJE

Istosmjerni pretvarači (DC-DC pretvarači)

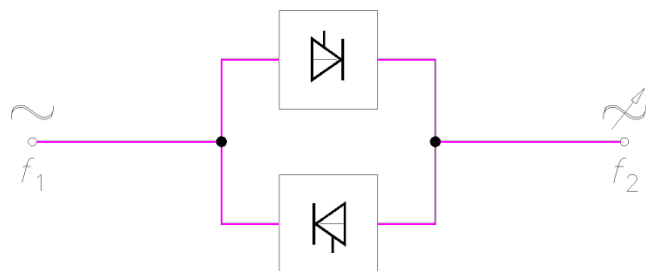


potreban napon veći
od raspoloživog napona izvora
PEX, mjerna i regulacijska tehnika

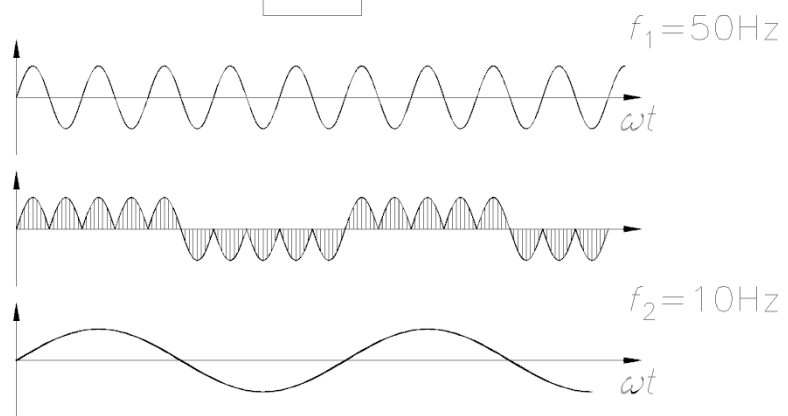
energetski istosmjerni pretvarači (trofazni)



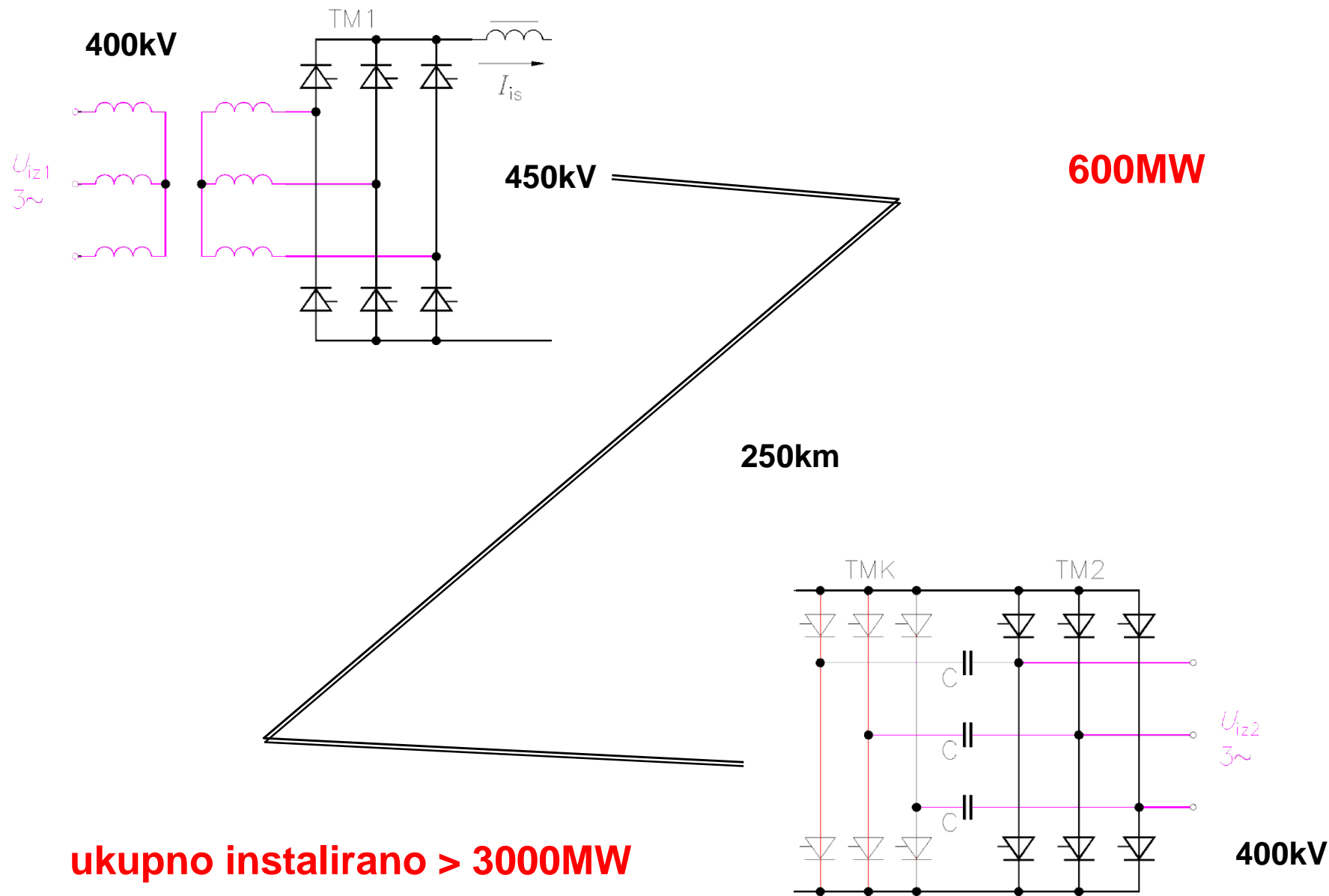
Izmjenični pretvarači



Jednofazni (djelitelji frekvencije)



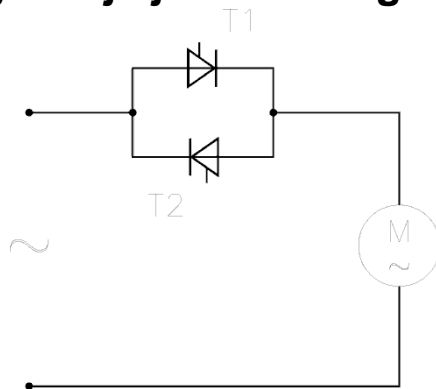
Prijenos električne energije kabelima na velike udaljenosti



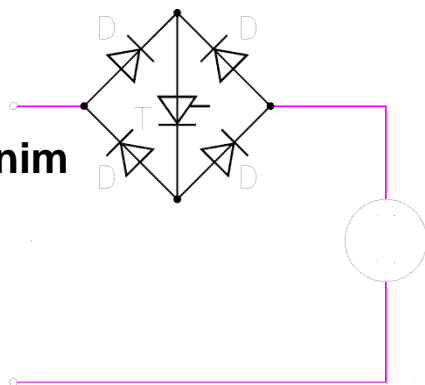
REGULACIJA I UPRAVLJANJE IZMJENIČNOG NAPONA

upravljanje i regulacija jednofaznog napona

s dva tiristora



s diodnom mosnim spojem i jednim tiristorom



s tirakom

