

University of Maribor

Faculty of Electrical Engineering and Computer Science

FERI

5. SLOVENSKA FOTOVOLTAIČNA KONFERENCA
SLO-PV 2014

MIKRO-RAZSMERNIK ZA SONČNE MODULE (MICRO-INVERTER FOR PHOTOVOLTAIC MODULES)

Primož Sukič, Katarina Dežan, Ernest Belič, Gorazd Štumberger

Ljubljana, 2. september 2014

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Povzetek

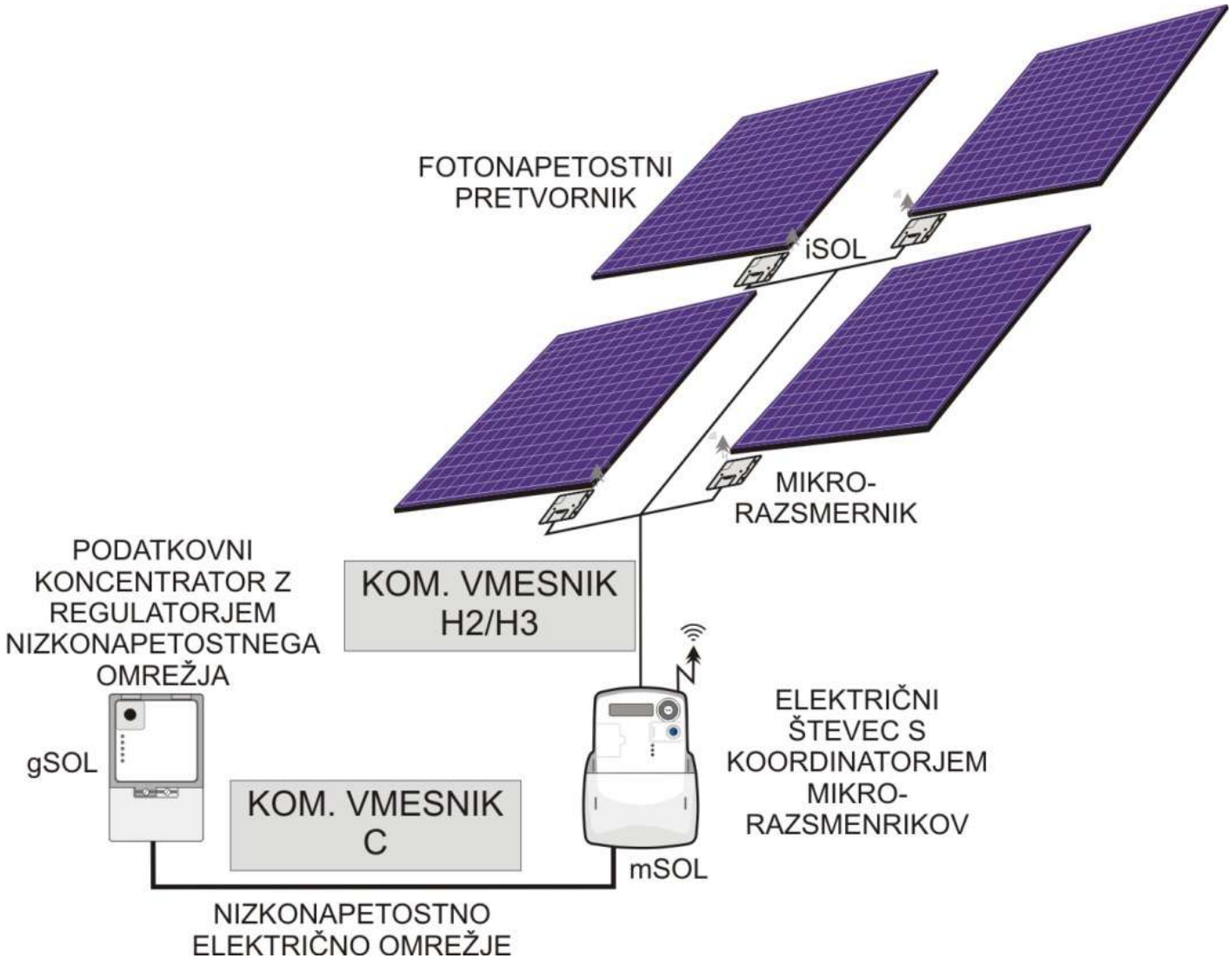
- Prispevek predstavlja projekt ''Mikro-razsmernika za sončne panele'', sofinanciran s strani ARRS (L2-5489)
- Partnerji projekta so:
  - UM FERI (raziskovalna organizacija)
  - TECES (raziskovalna organizacija)
  - ISKRAEMECO (industrijski partner)
  - LETRIKA (industrijski partner)
  - UNIVERZA ROVIRA I VIRGILI (Tarragon, Španija, zunanji partner)

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Povzetek

- Cilji projekta
- Razvoj mikro-razsmernika (iSOL)
  - Brez elektrolitskih kondenzatorjev in integracijo funkcij
  - Sposoben sprejeti reference generacijo jalove moči in morebitno redukcijo delovne moči
- Razvoj sistema vodenja skupine mikro-razsmernikov (mSOL)
  - Komunicira z mikro-razsmerniki in sistemom vodenja NN omrežja preko pametnega števca
  - Generira reference za P in Q posameznih mikro-razsmernikov
- Razvoj sistema vodena nizkonapetostnega omrežja(gSOL)
  - Se izvaja na podatkovnem koncentratorju
  - Komunicira s števci preko PLC (Power Line Communication)
  - Določa reference P in Q za posamezne skupine mikro-razsmernikov (mSOL)

Komponente projekta: iSOL, mSOL in gSOL



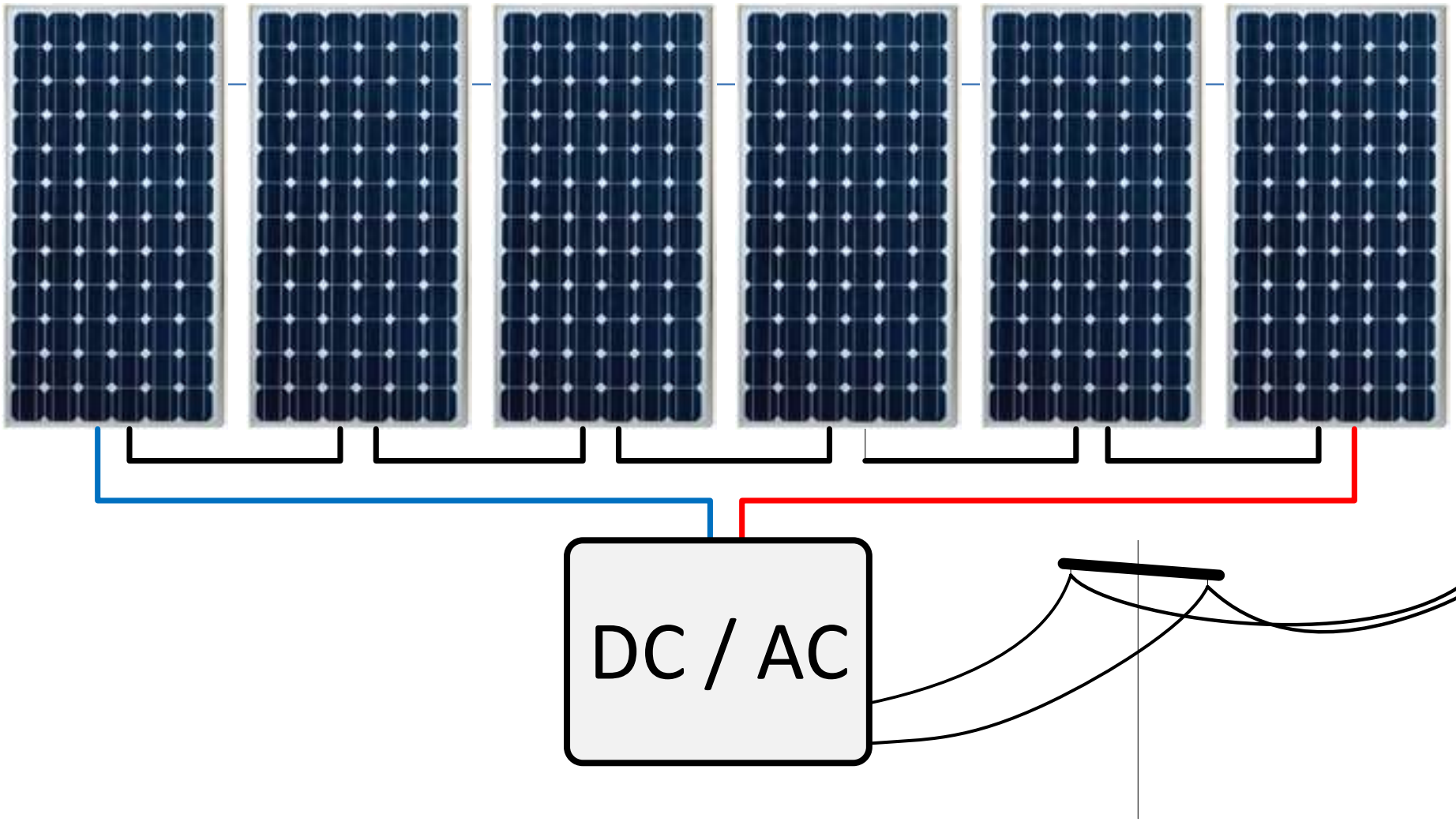
Objekt s PV moduli z mikro-razsmerniki in sistemom vodenja skupine mikro-razsmernikov

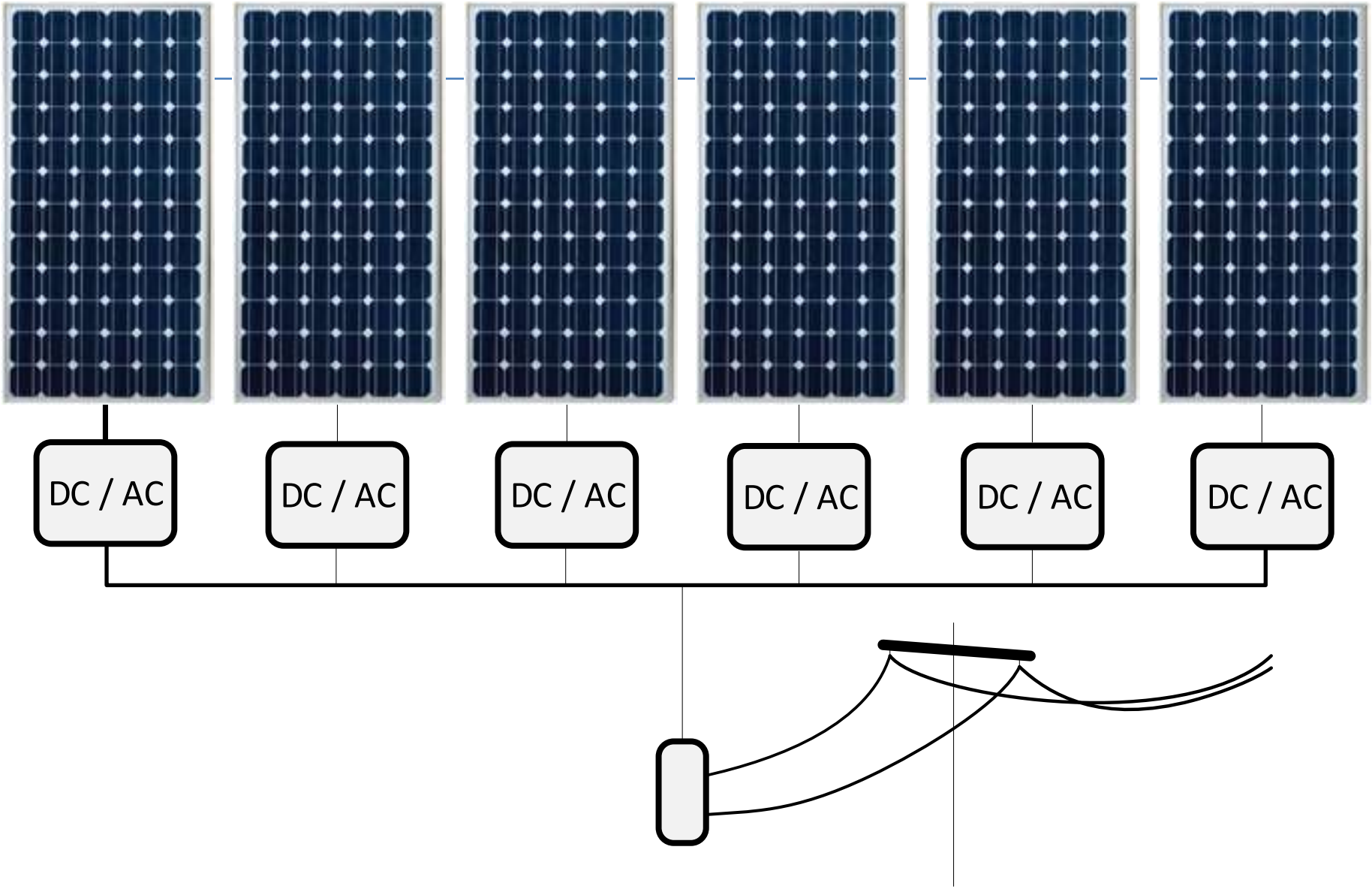


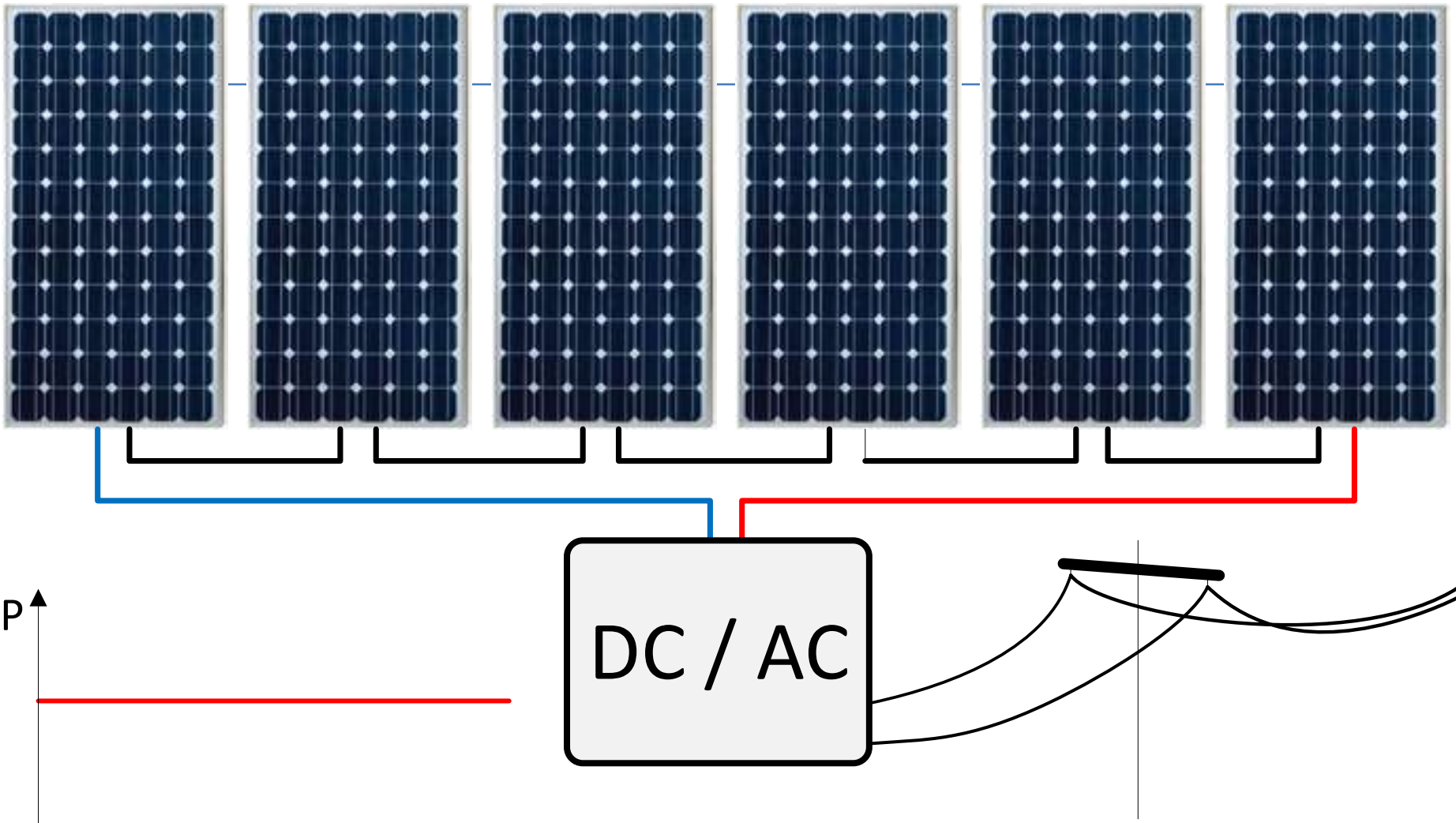
Sistem vodenj NN omrežja na pod. koncentratorju in PLC izmenjava podatkov s pametnimi števci



MIKRO RAZSMERNIKI

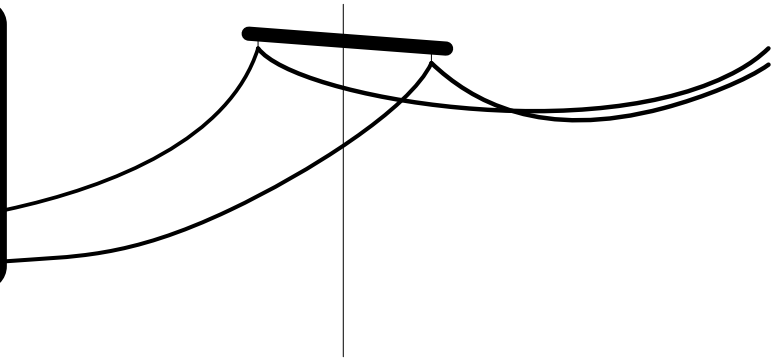

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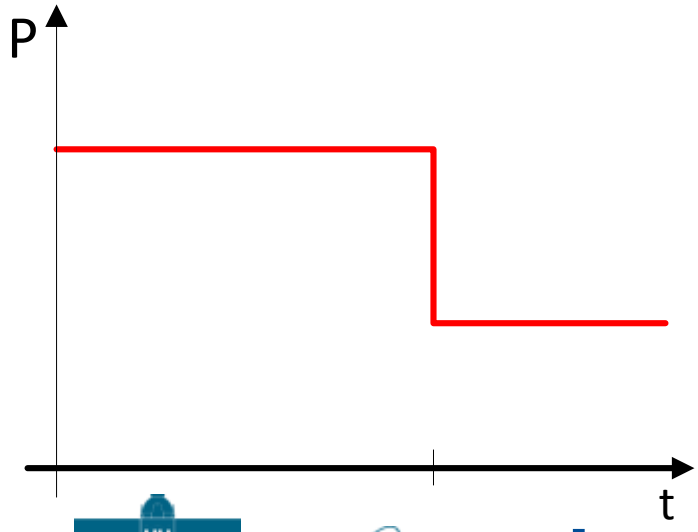

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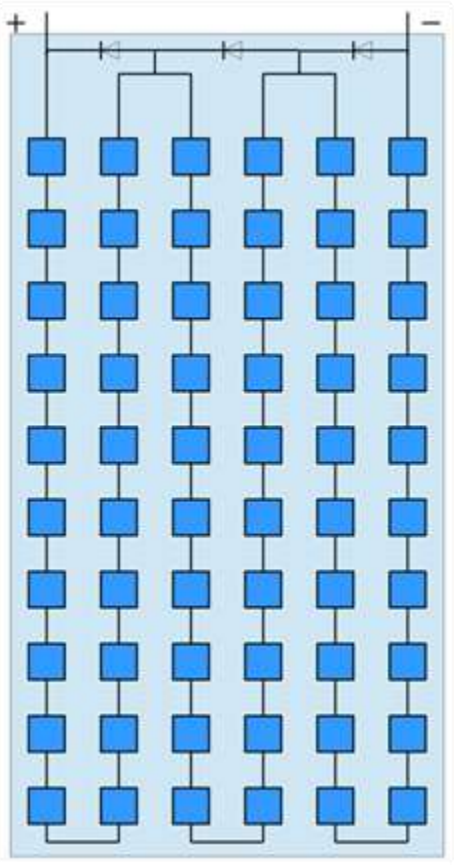


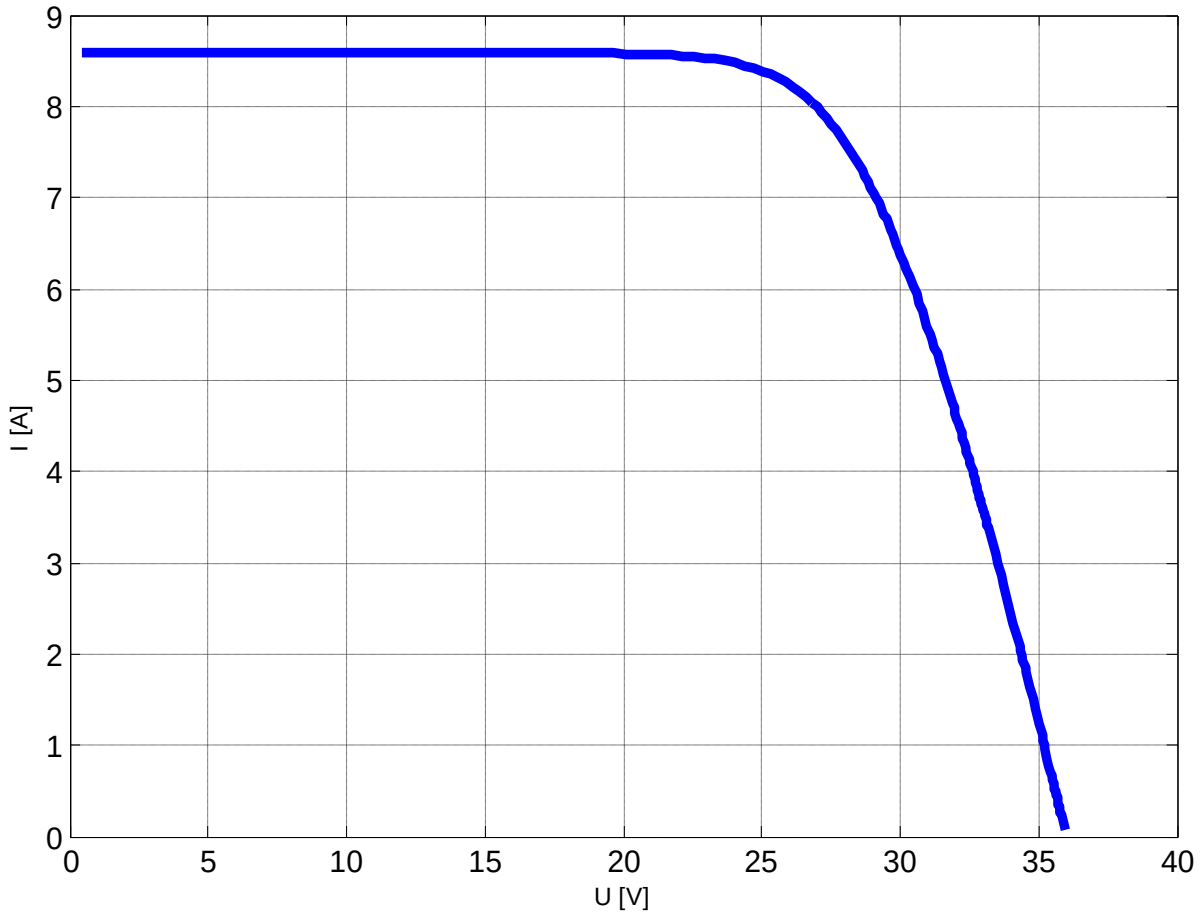
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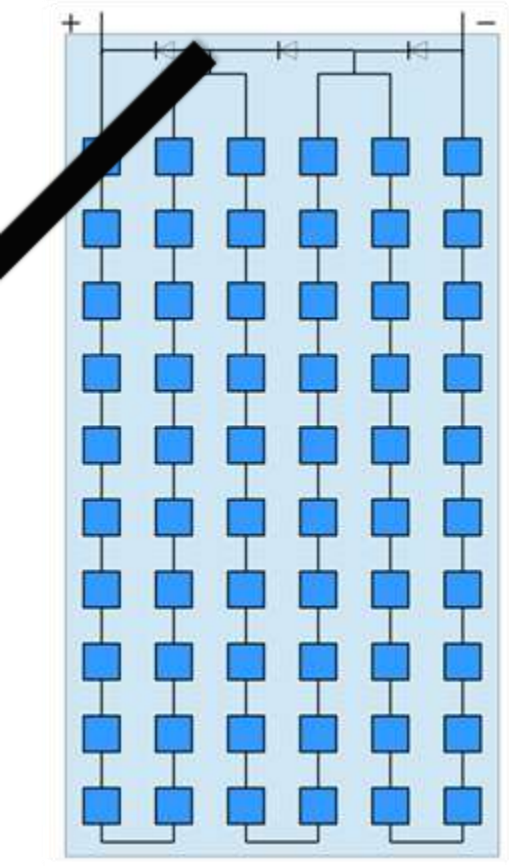


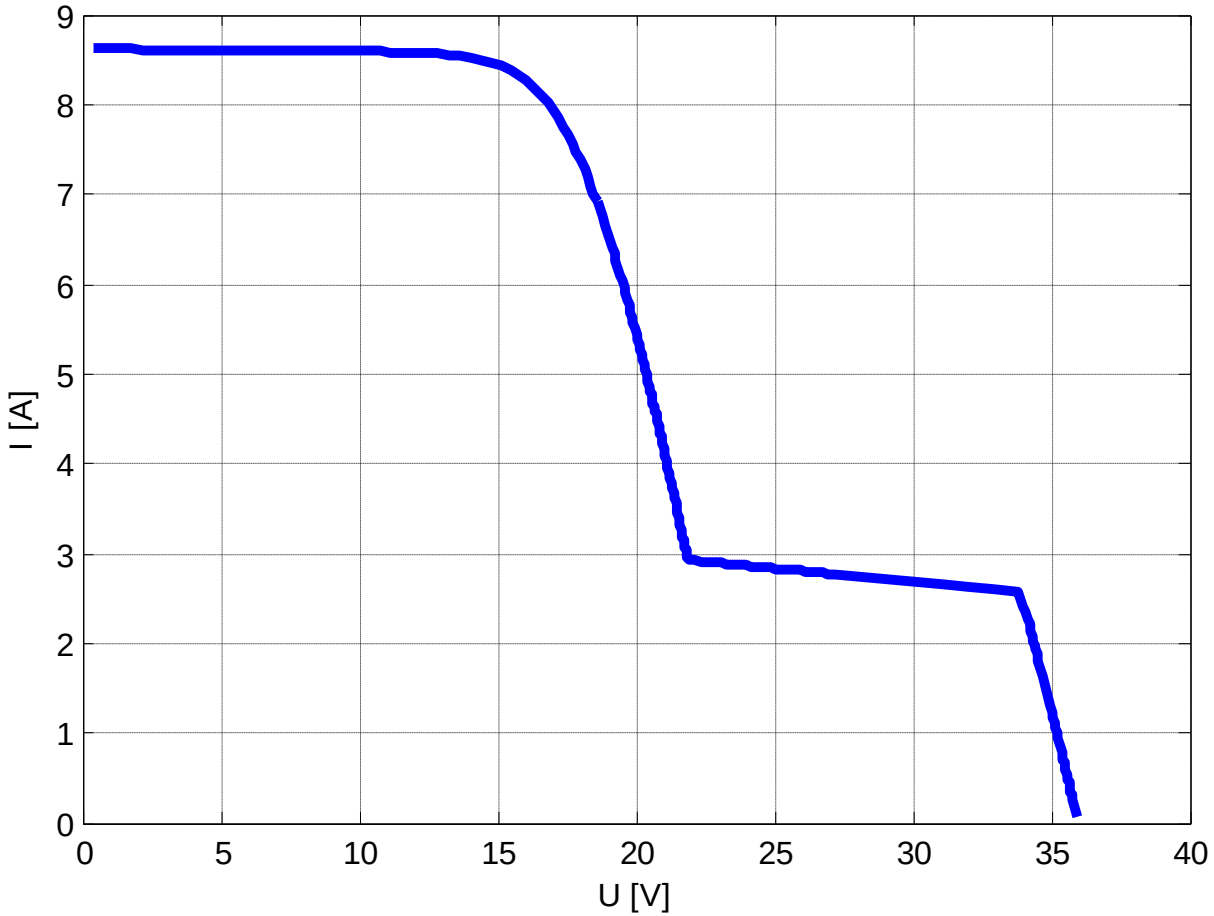


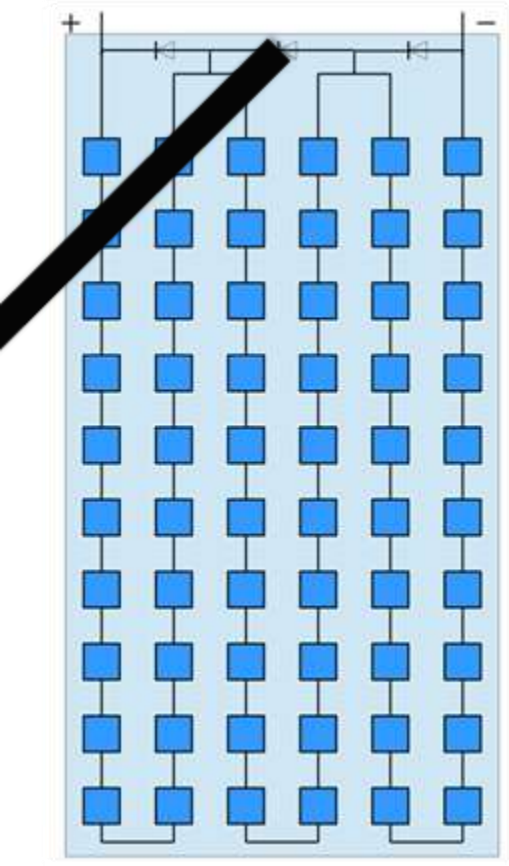
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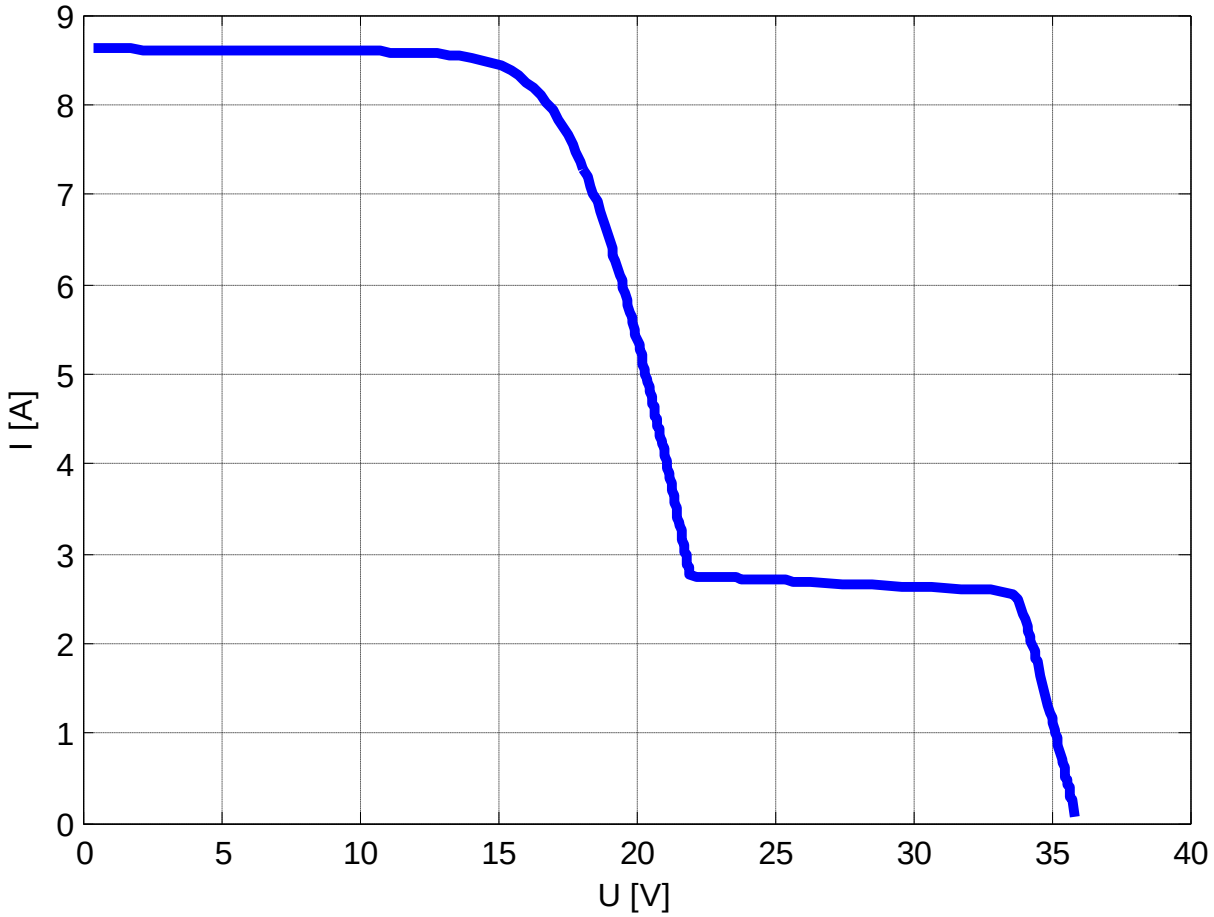

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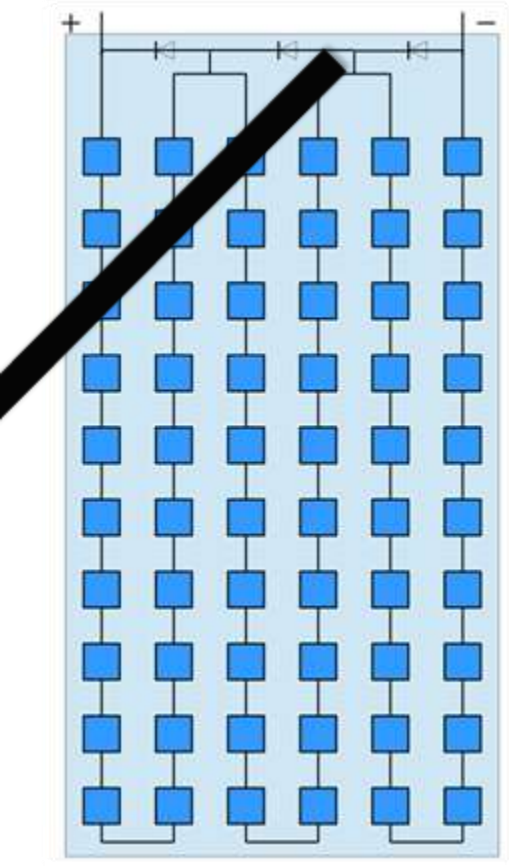

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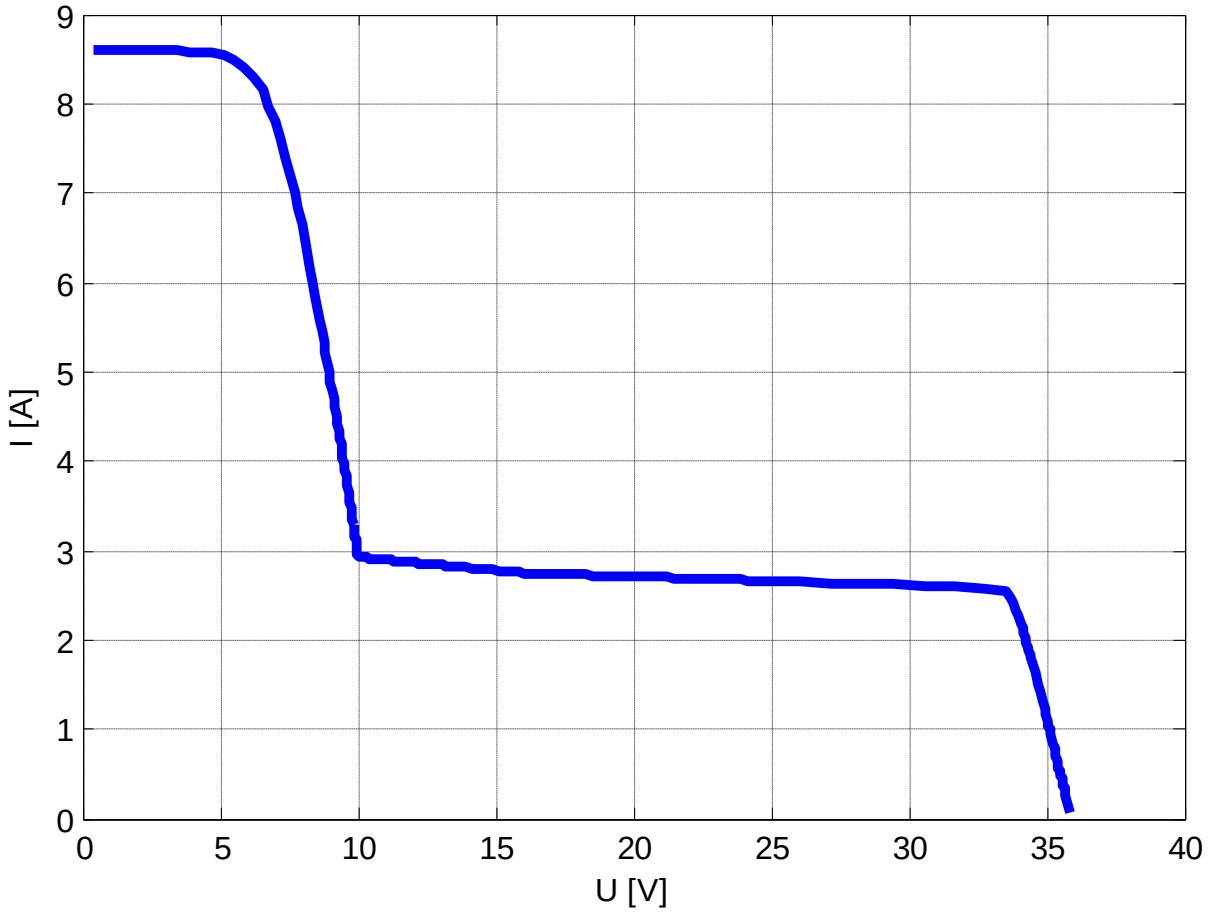

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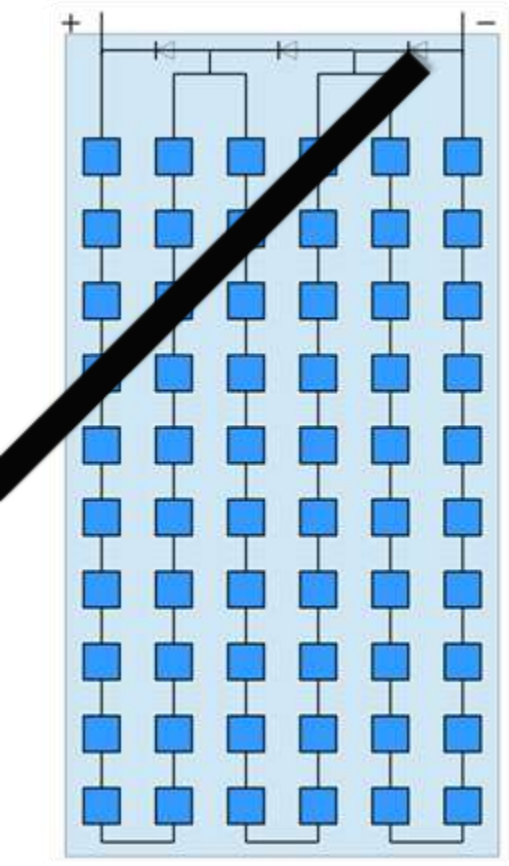

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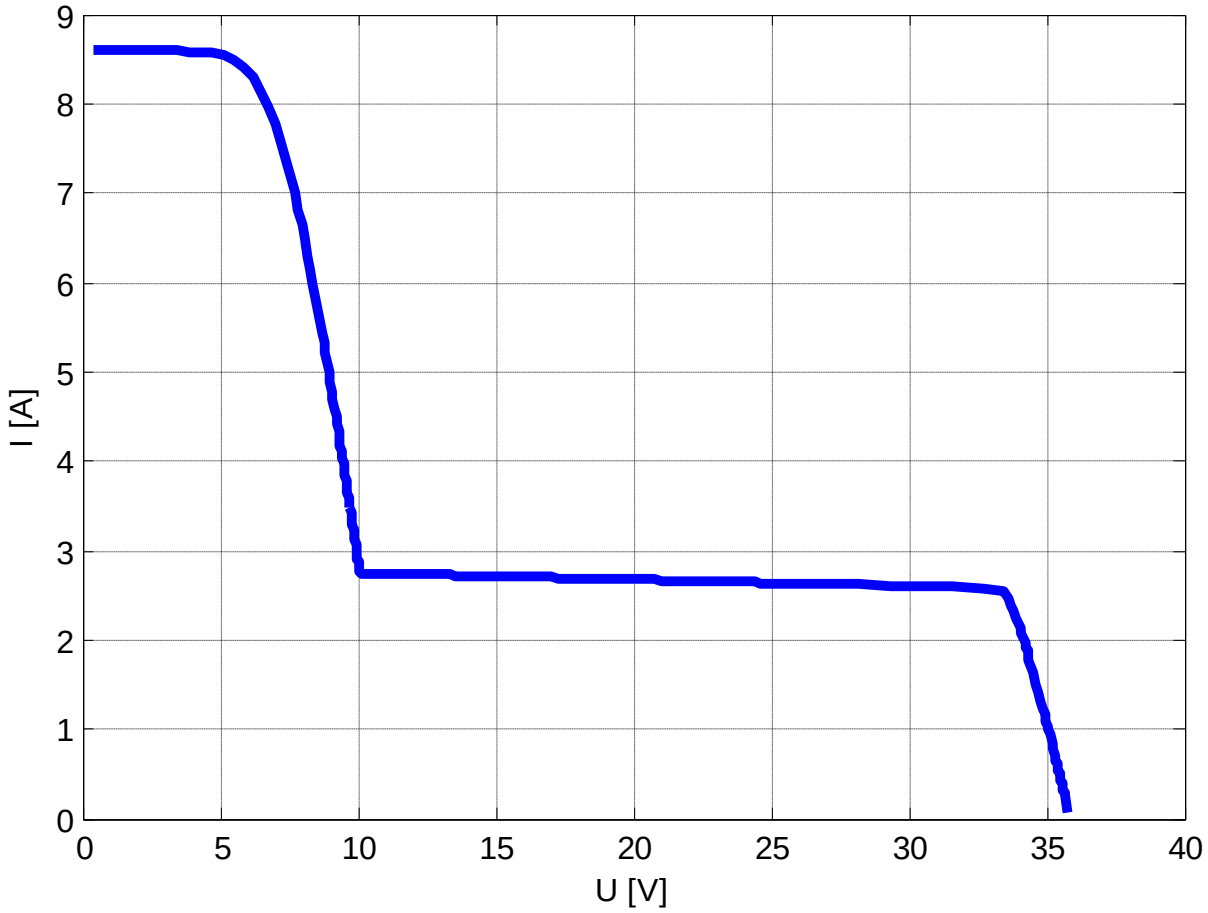

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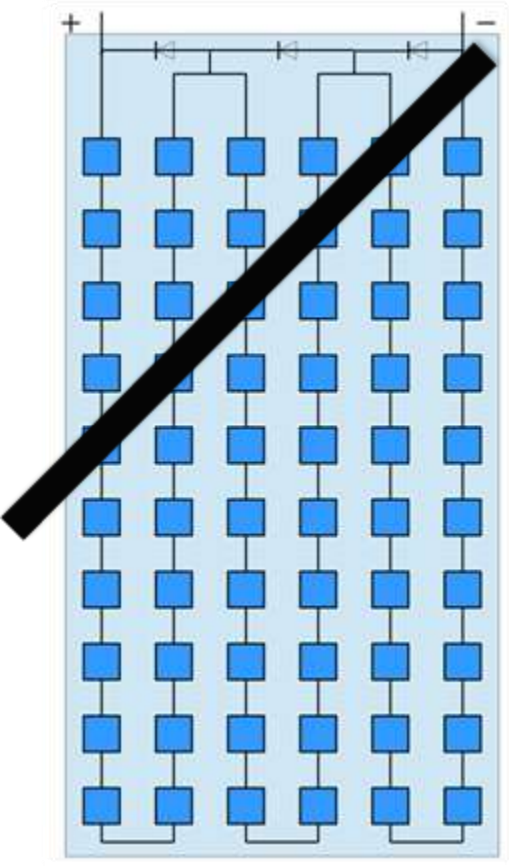

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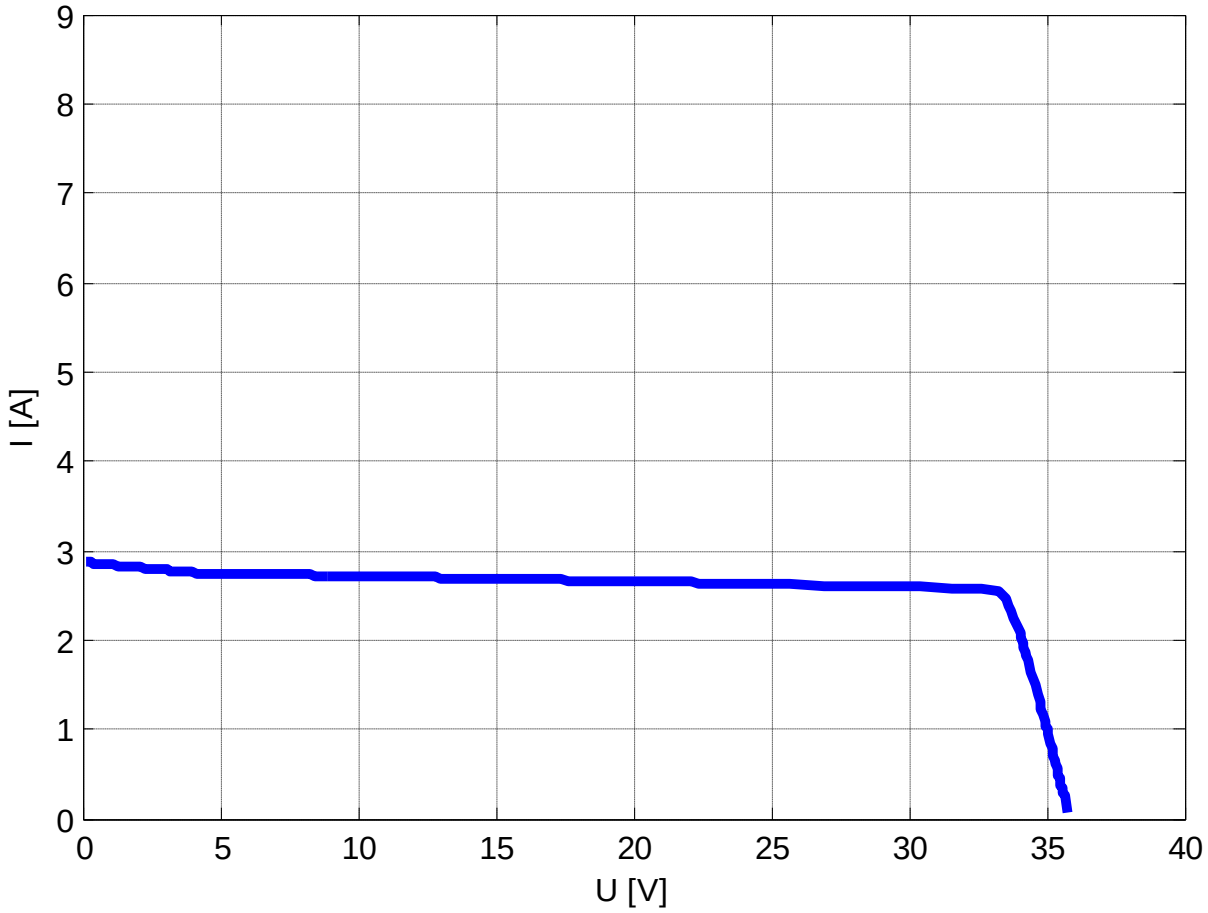

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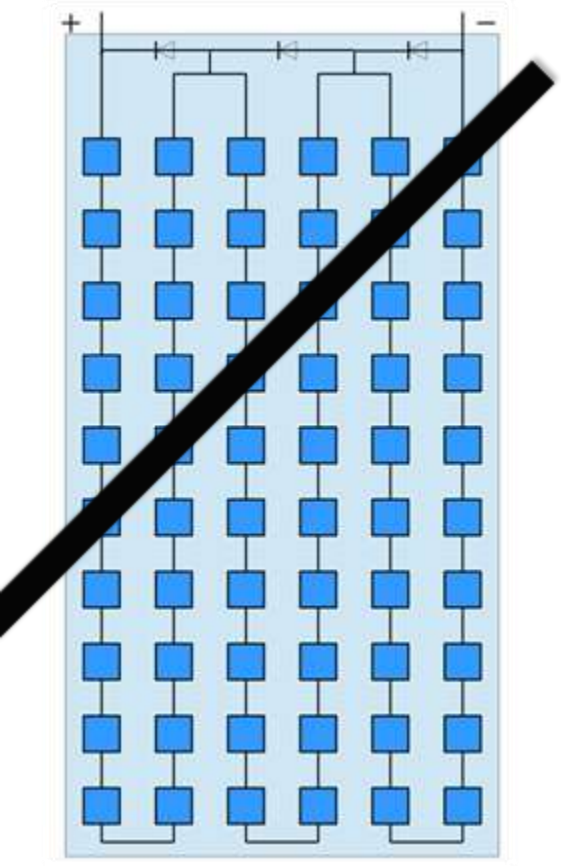

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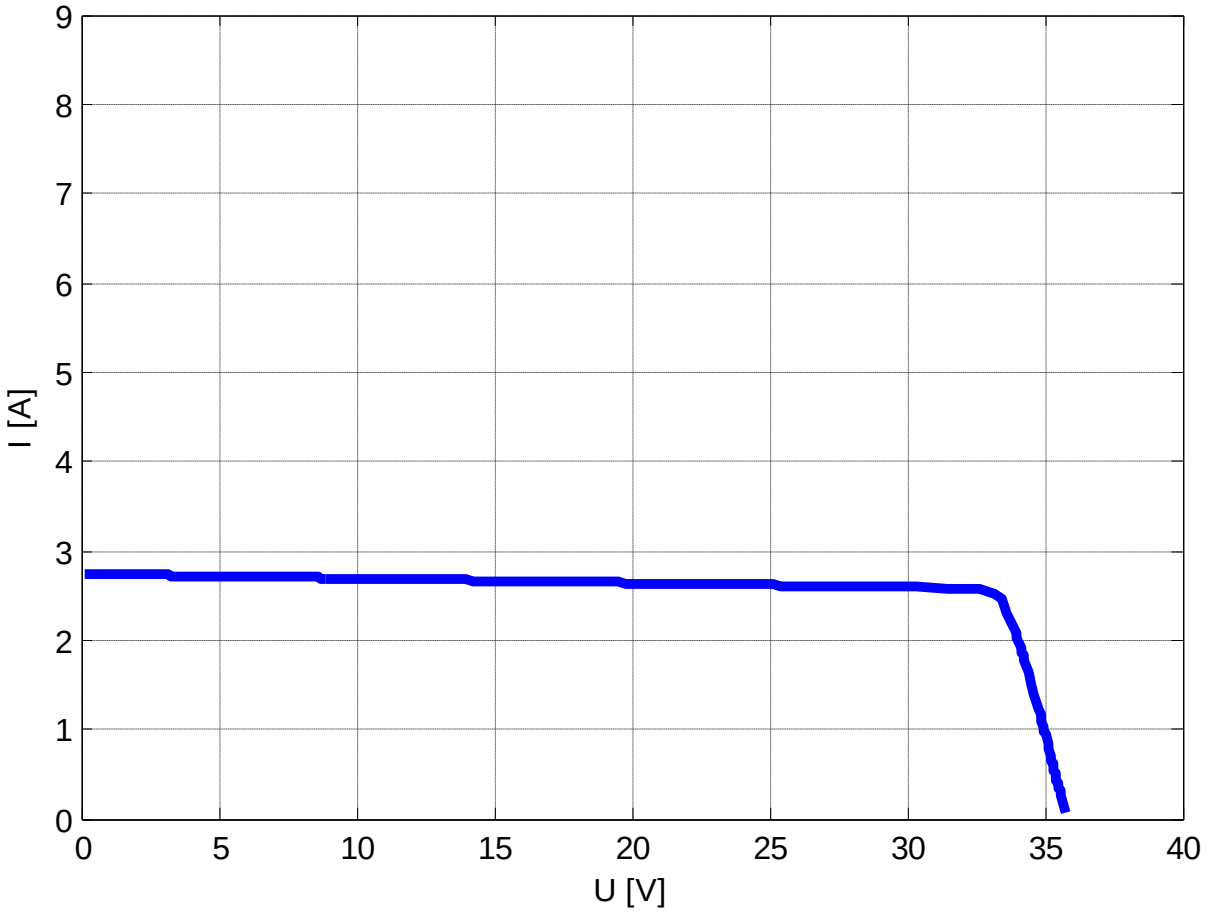

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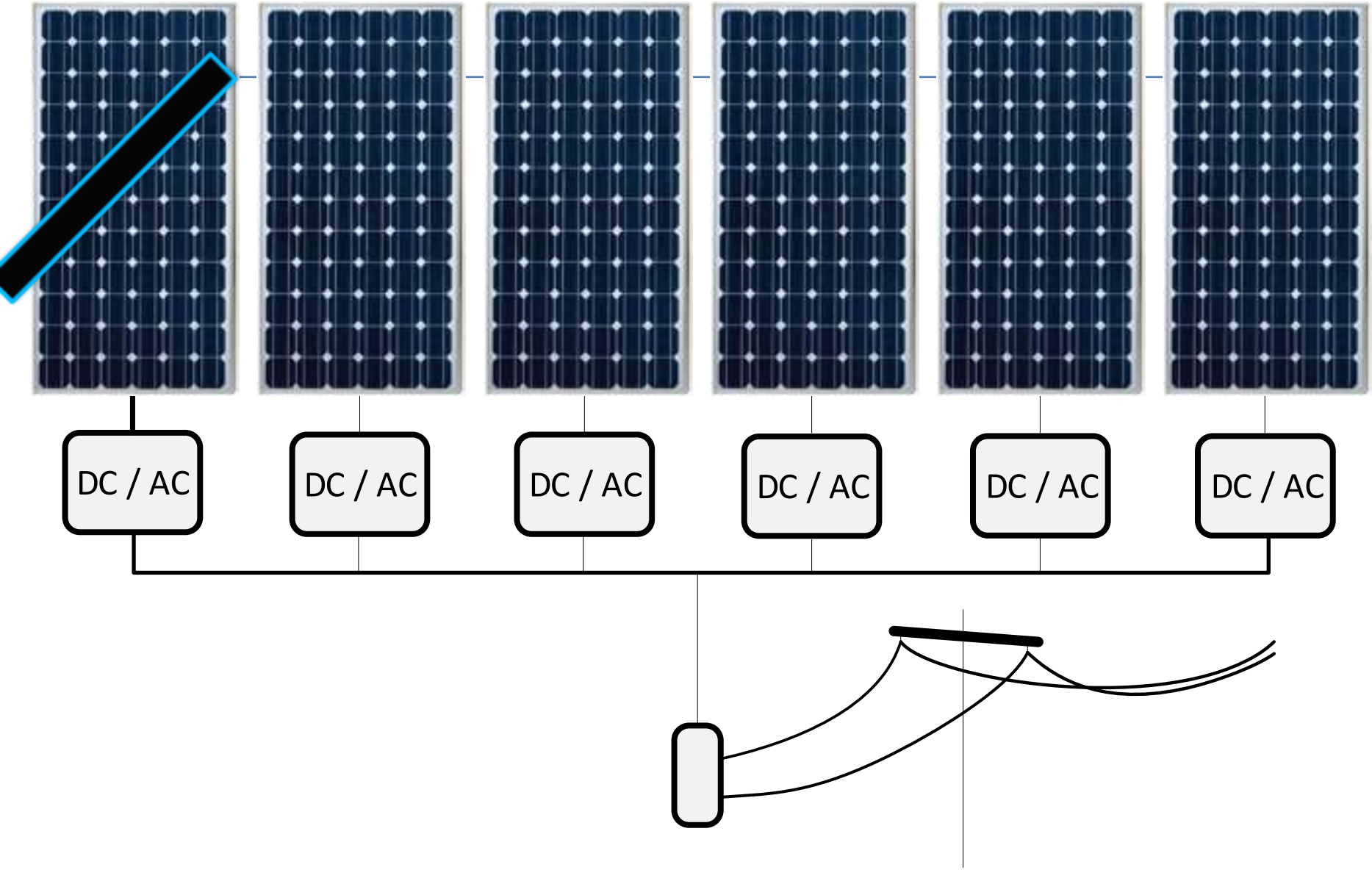

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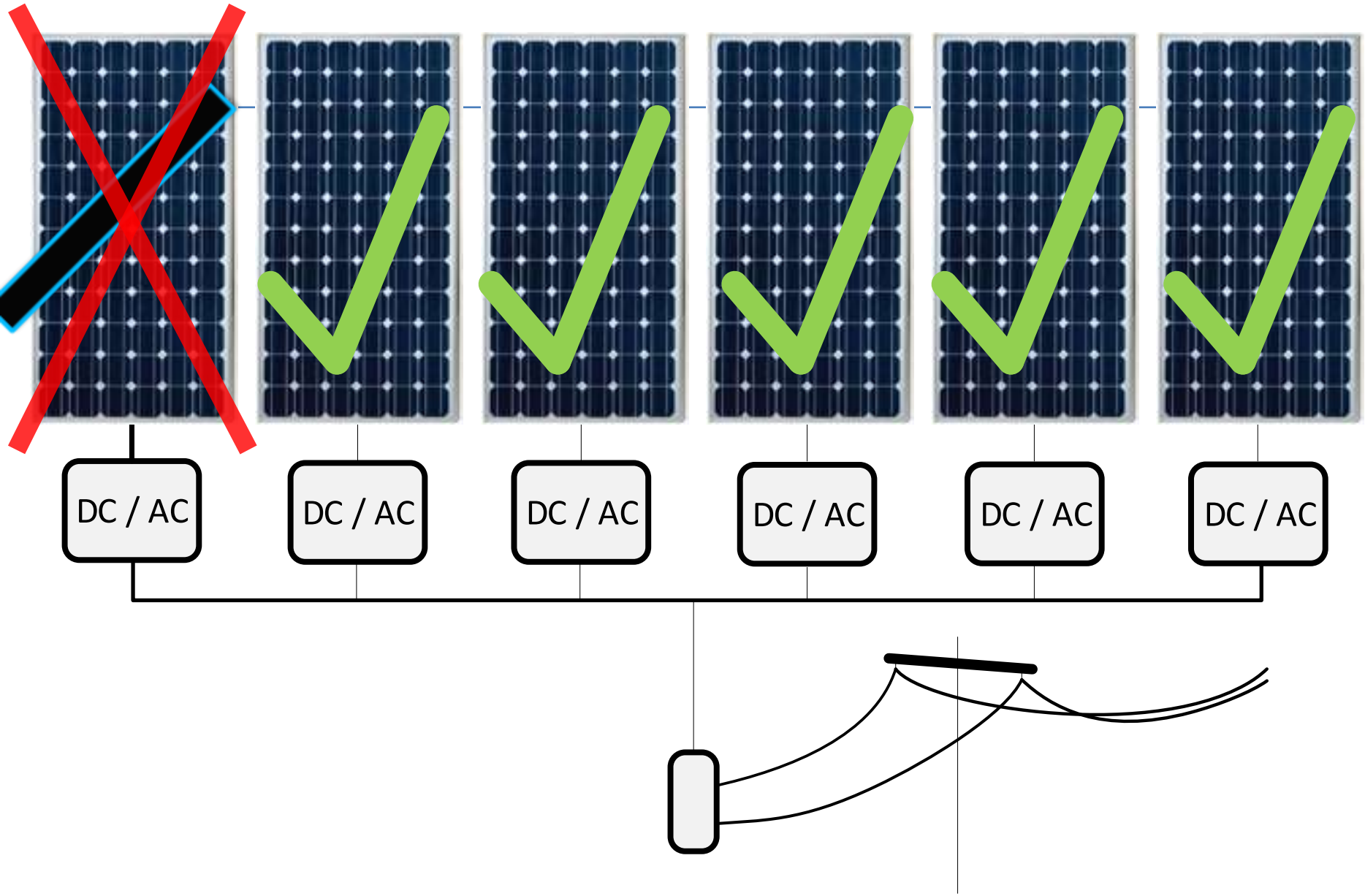

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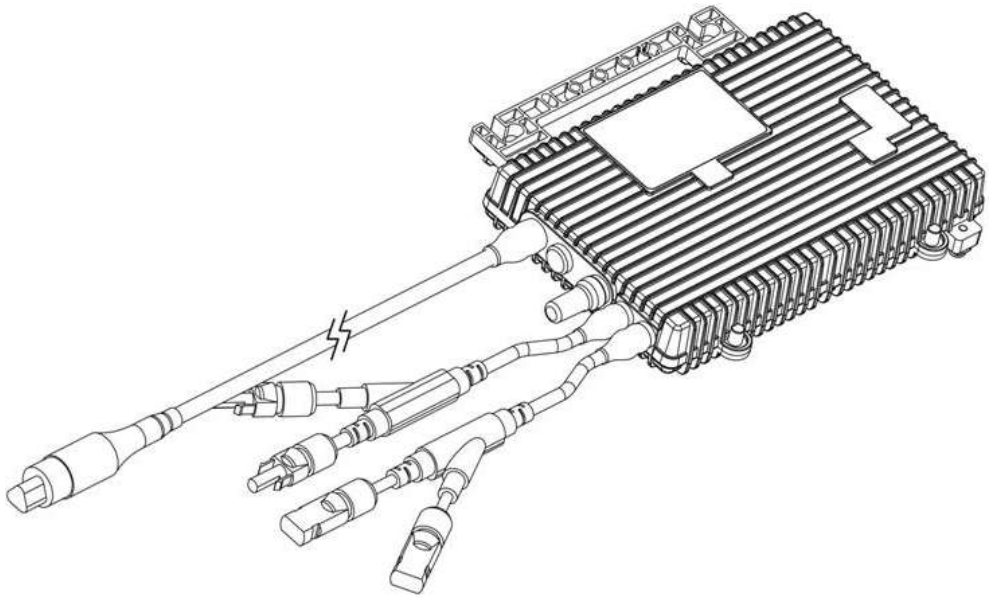
Mikro-razsmernik

- Prednosti
  - Je priključen direktno na PV modul
  - Zagotavlja boljše kondicioniranje (impedančno prilagoditev) PV modula
  - V pogojih delnega senčenja več proizvedene energije
  - Daljša življenjska doba
  - Enostavna razširitev

- Slabosti
  - **Višja cena**
  - Nižji izkoristek
  - Montaža pod modulom (izpostavljenost zunanjim vplivom)

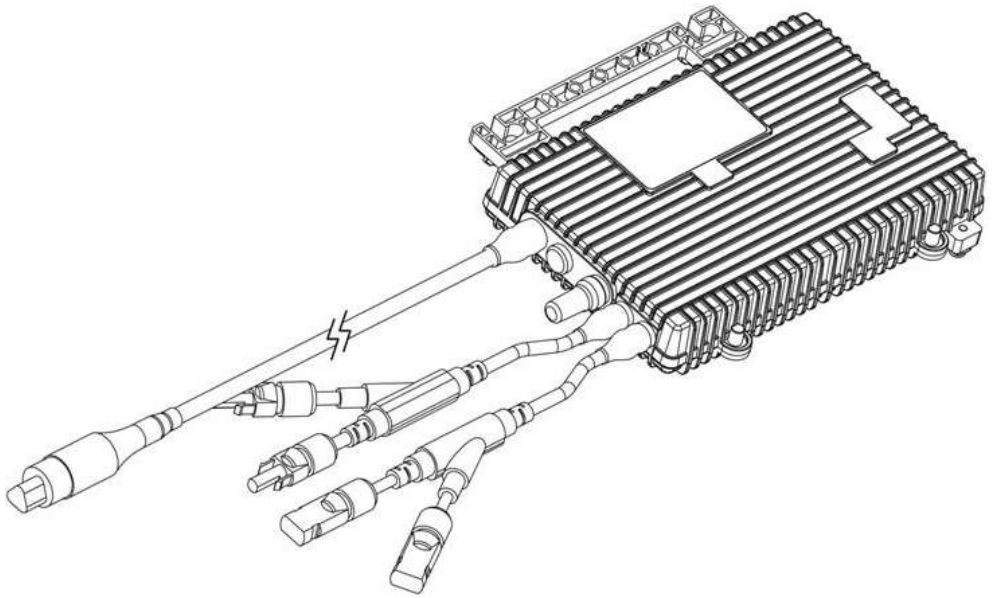
OMEJITVE RAZSMENIKA

OMEJITVE RAZMERNIKA



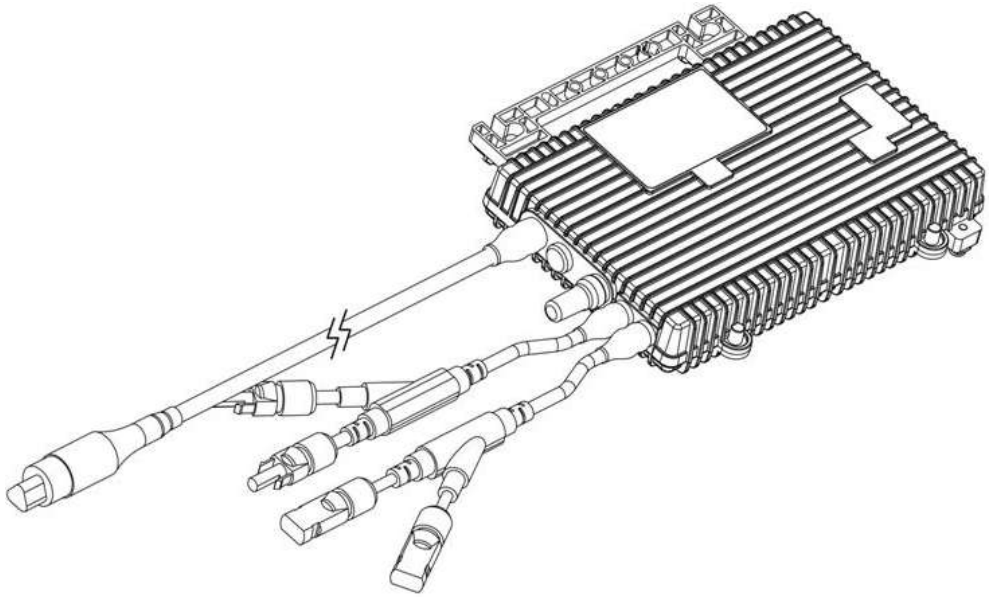
$$I_{\max}$$

OMEJITVE RAZMERNIKA



$$S_{\max} = U_{\text{ef}} \cdot I_{\max}$$

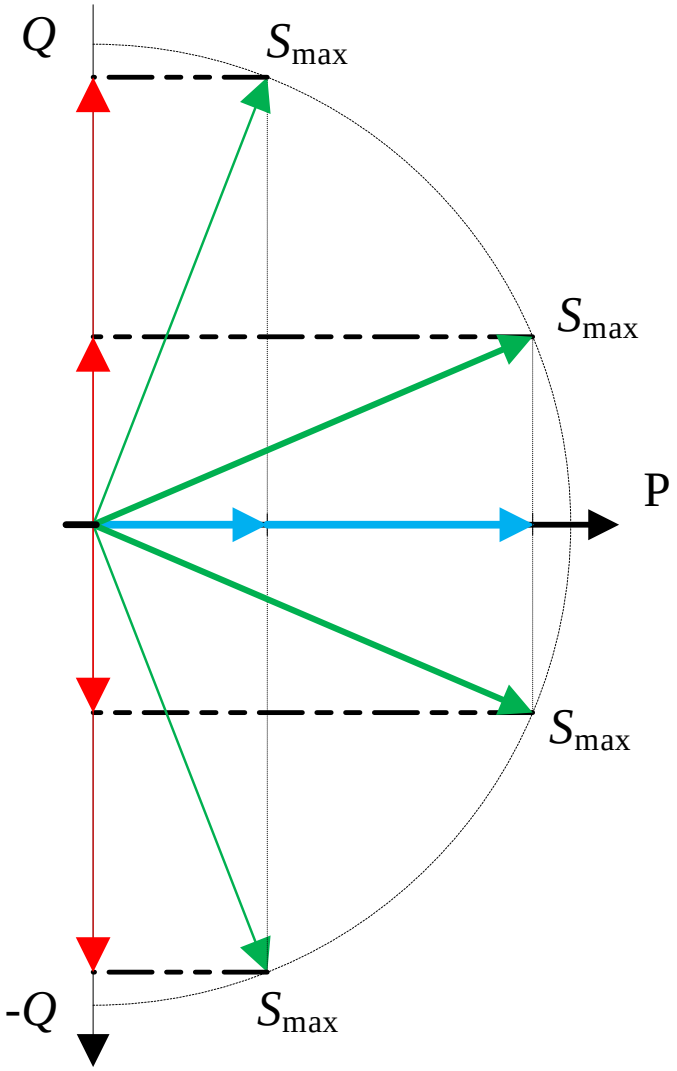
OMEJITVE RAZMERNIKA



$$Q_{max} = \sqrt{S_{\max}^2 - P^2}$$

INVERTER LIMITS

$$Q_{\max} = \sqrt{S_{\max}^2 - P^2}$$

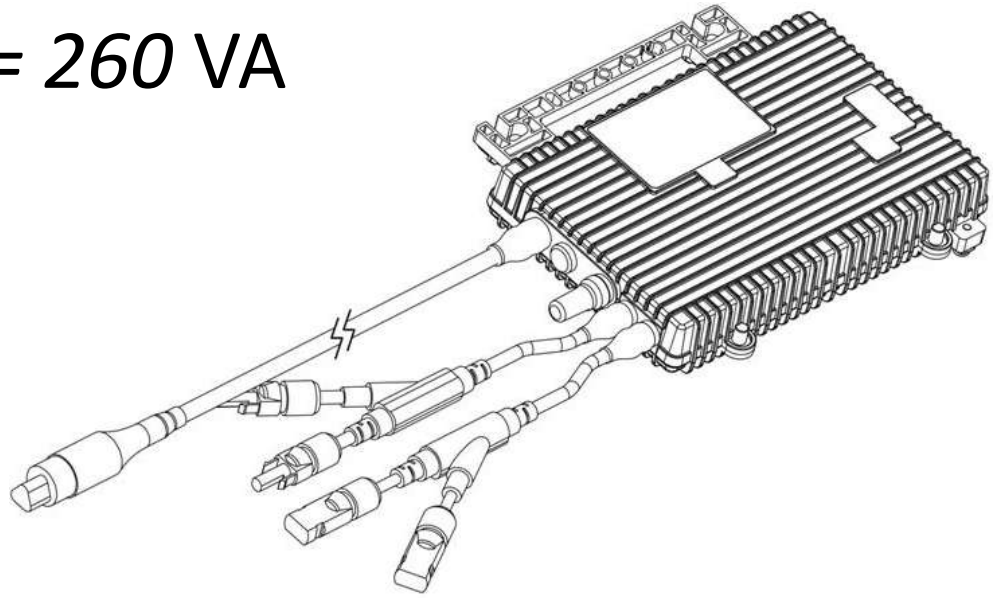


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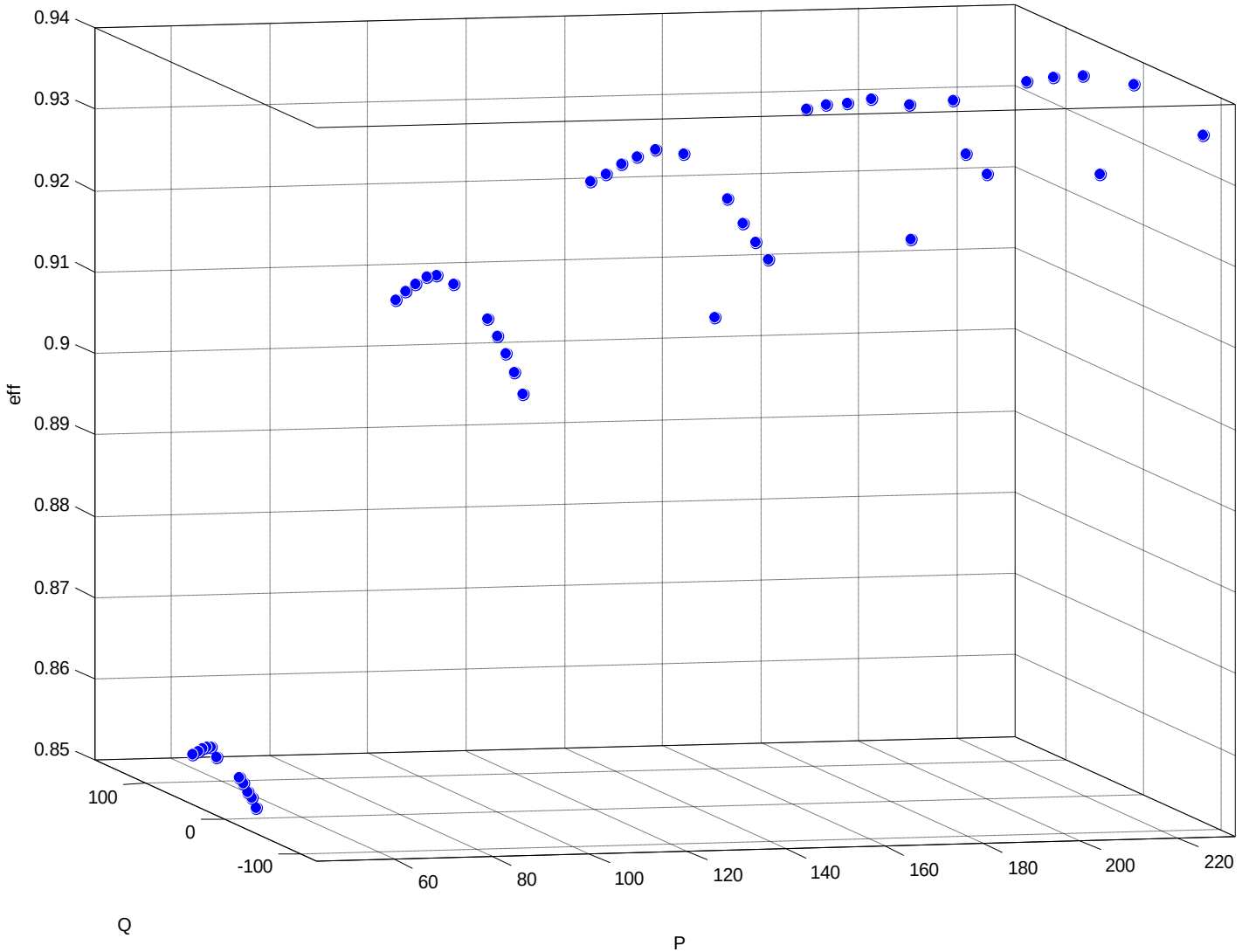
MERITVE RAZSMERNIKA

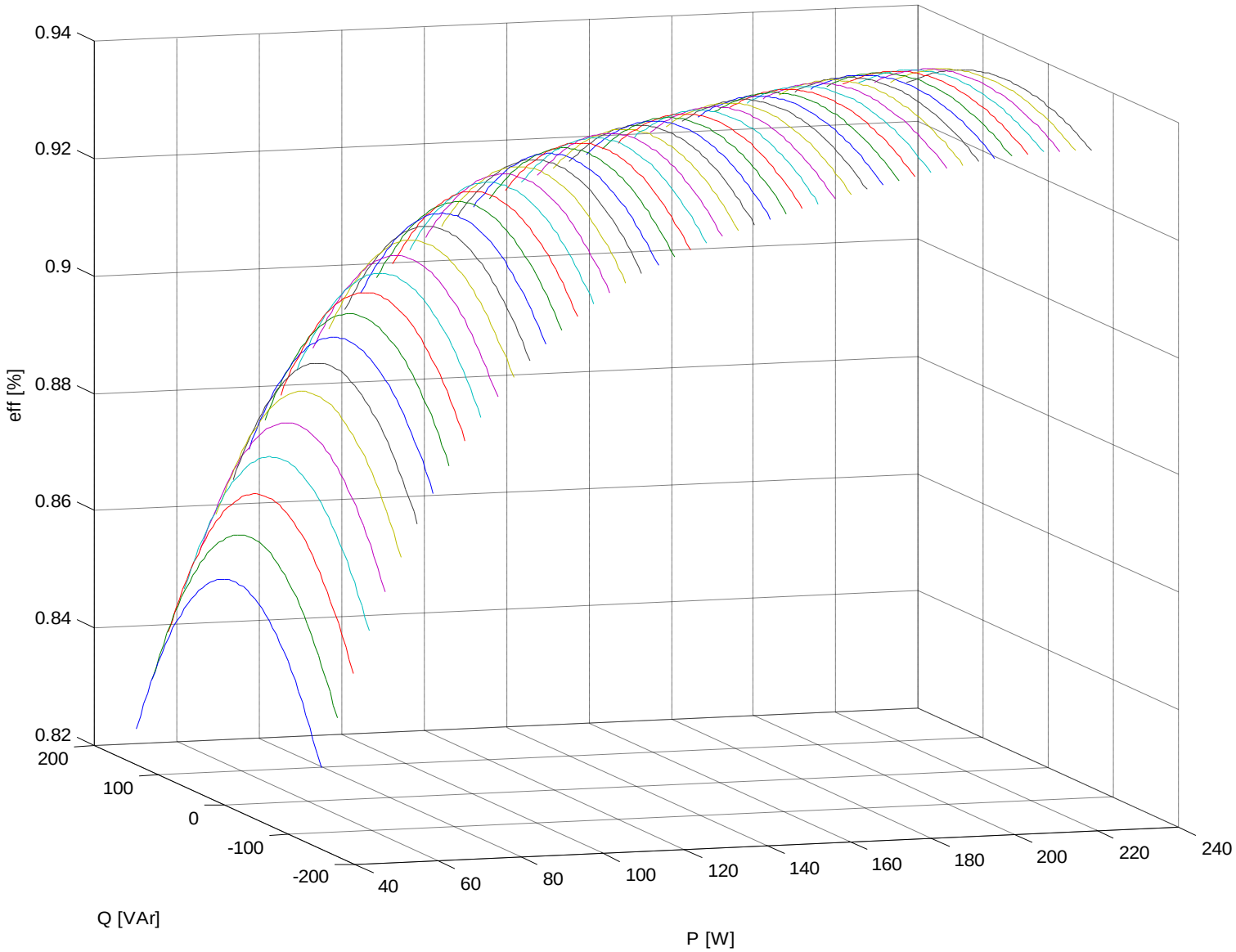
MERITVE RAZSMENIKA

- Mikro razsmernik
- Nazivna moč $S = 260$ VA



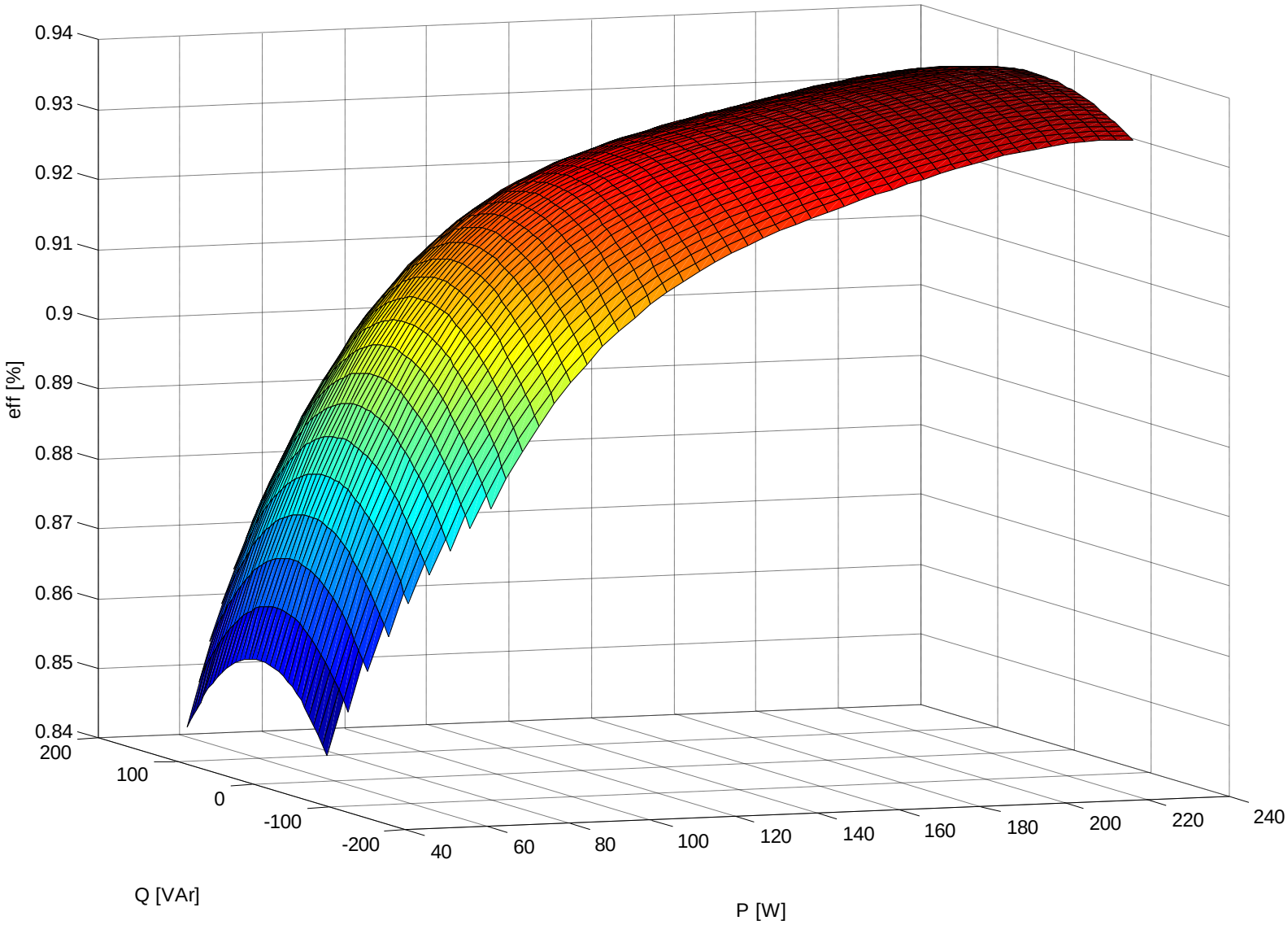
MERITVE RAZSMENIKA

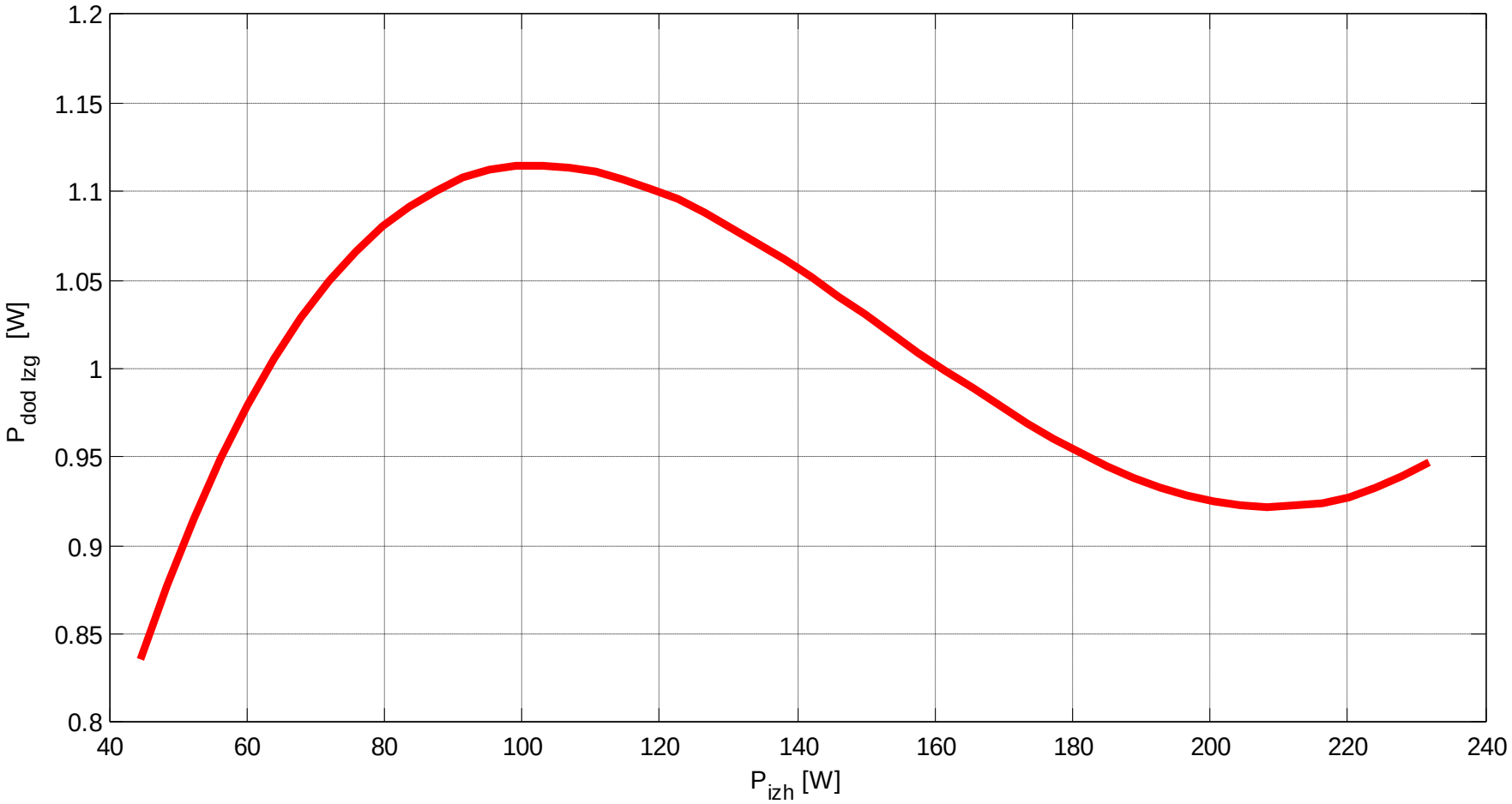




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APROKSIMACIJA PLOSKVE





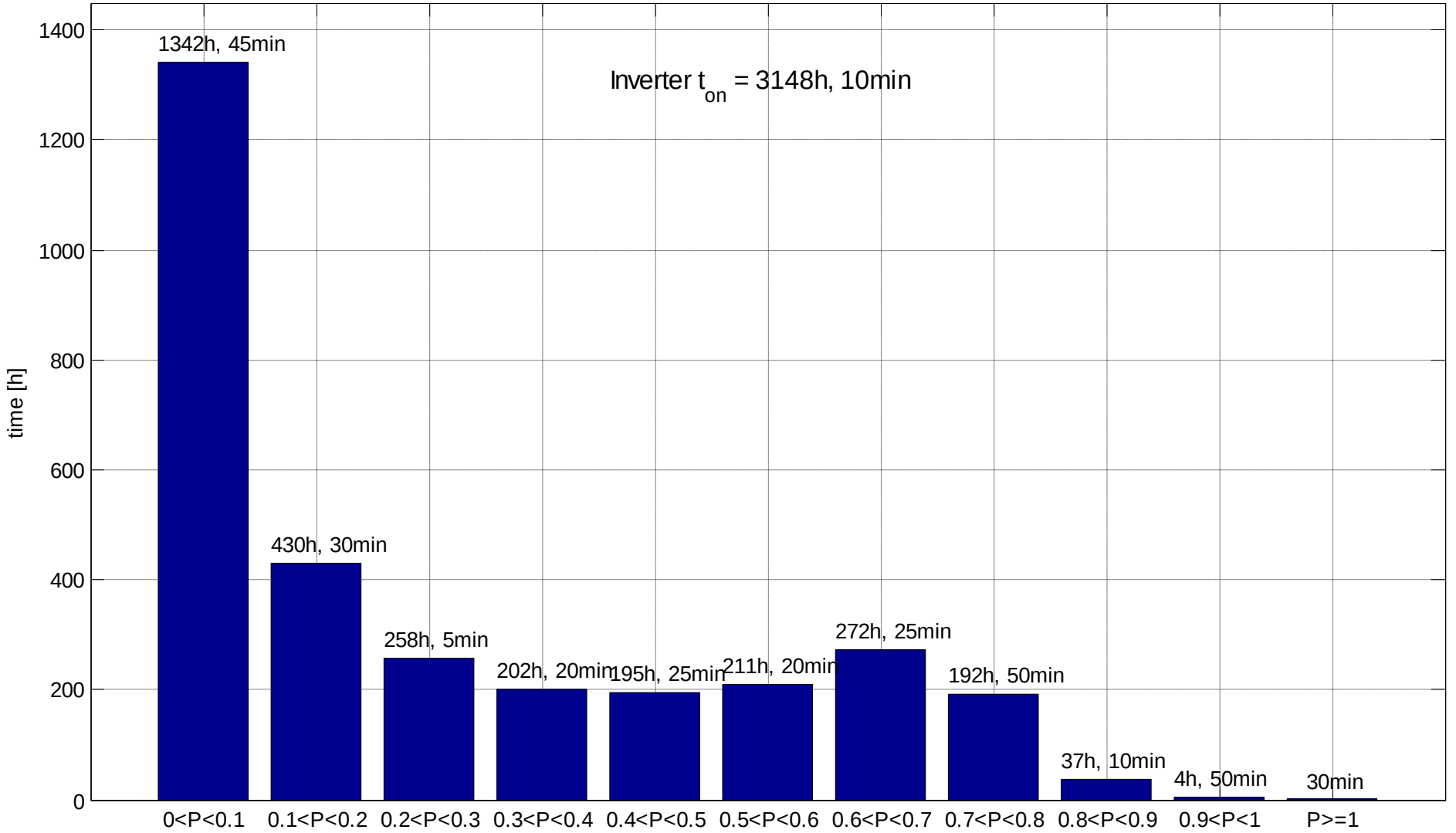
- Dodatne izgube $\boldsymbol{P_{\text{dod izg}}}$[W]
- Konstantna vrednost jalove moči ***Q = 100*** **Var**
- Spreminjanje delovne moči $\boldsymbol{P_{\text{izh}}}$ [W]

Sposobnost generacije jalove moči **Q** z razsmerniki

Mikro sončna elektrarna UM FERI

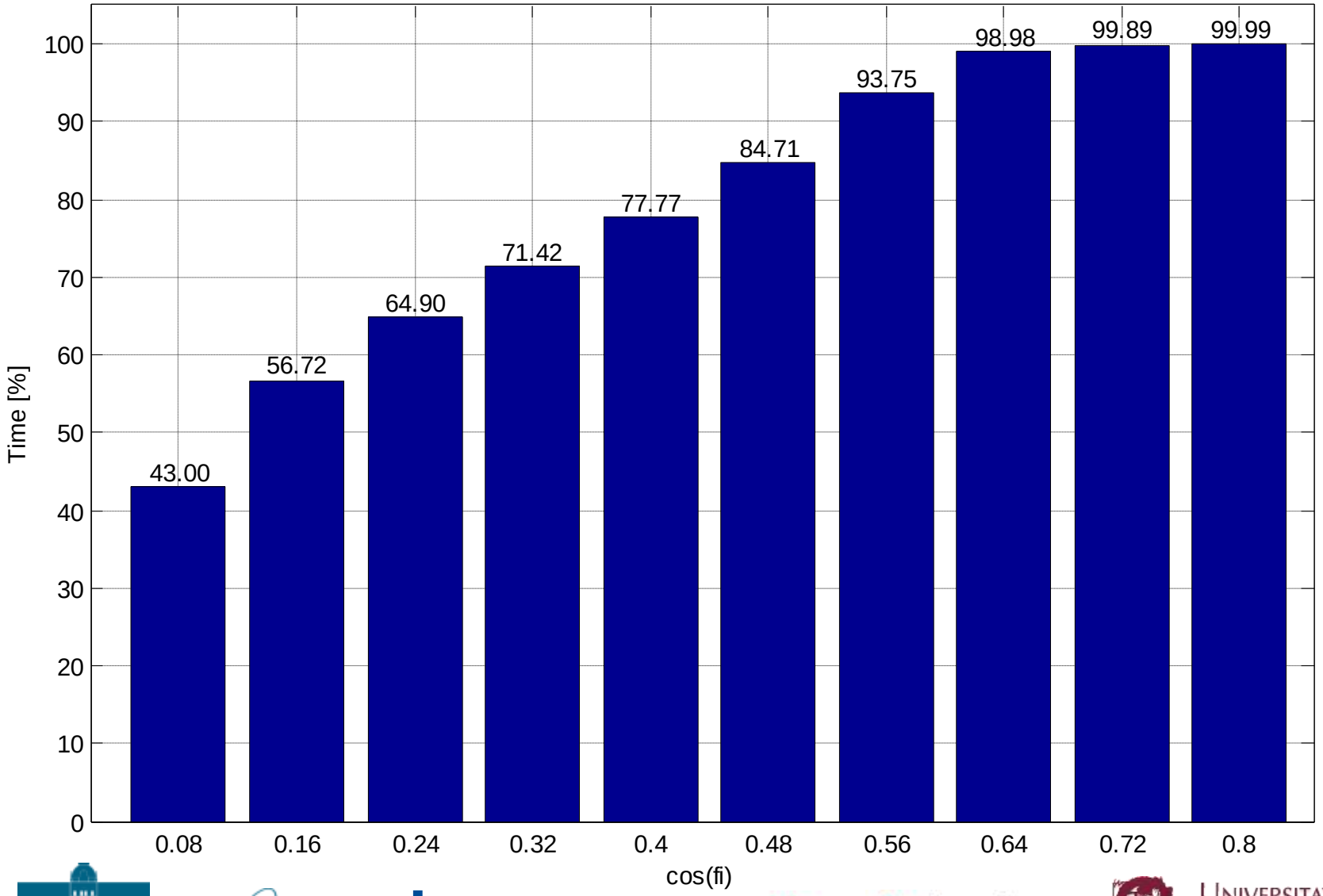


Čas obratovanja sončne elektrarne 2013



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Časovna sposobnost zagotavljanja določenega faktorja cos(fi)



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SKLEP

- IZKORISTEK ZARADI GENERACIJE JALOVE MOČI **Q** PADE ZA MANJ KOT 2% !

- Velika časovna razpoložljivost generacije jalove moči Q