

Kako preživeti zimo z električnim avtom?

Matjaž Vidmar



Pipistrel Sinus 912

5l/100km
@180km/h
bencin 95

2002-danes
>2500h

>15 let
brez okvar!

Ford model T - 1914



Cessna model 172 - 1955



Muzejska vozila so neučinkovita, potratna in nevarna!

Ulica Sergeja Mašere 21, 5000 Nova Gorica

Tržaška cesta 25, 1000 Ljubljana

Dodaj cilj

Možnosti poti

Izogibaj se

☐ Avtoceste

☐ Cestnine

☐ Trajekti

Dolžinske enote

☒ Samodejno

☐ milje

☐ km

ZAPRI

Pošljite navodila v telefon

prek H4 in A1

1 h 6 min

103 km


1 h 2 min po praznih cestah


Ta pot vključuje cestnine.


PODRBNOСТИ

Avtocesta

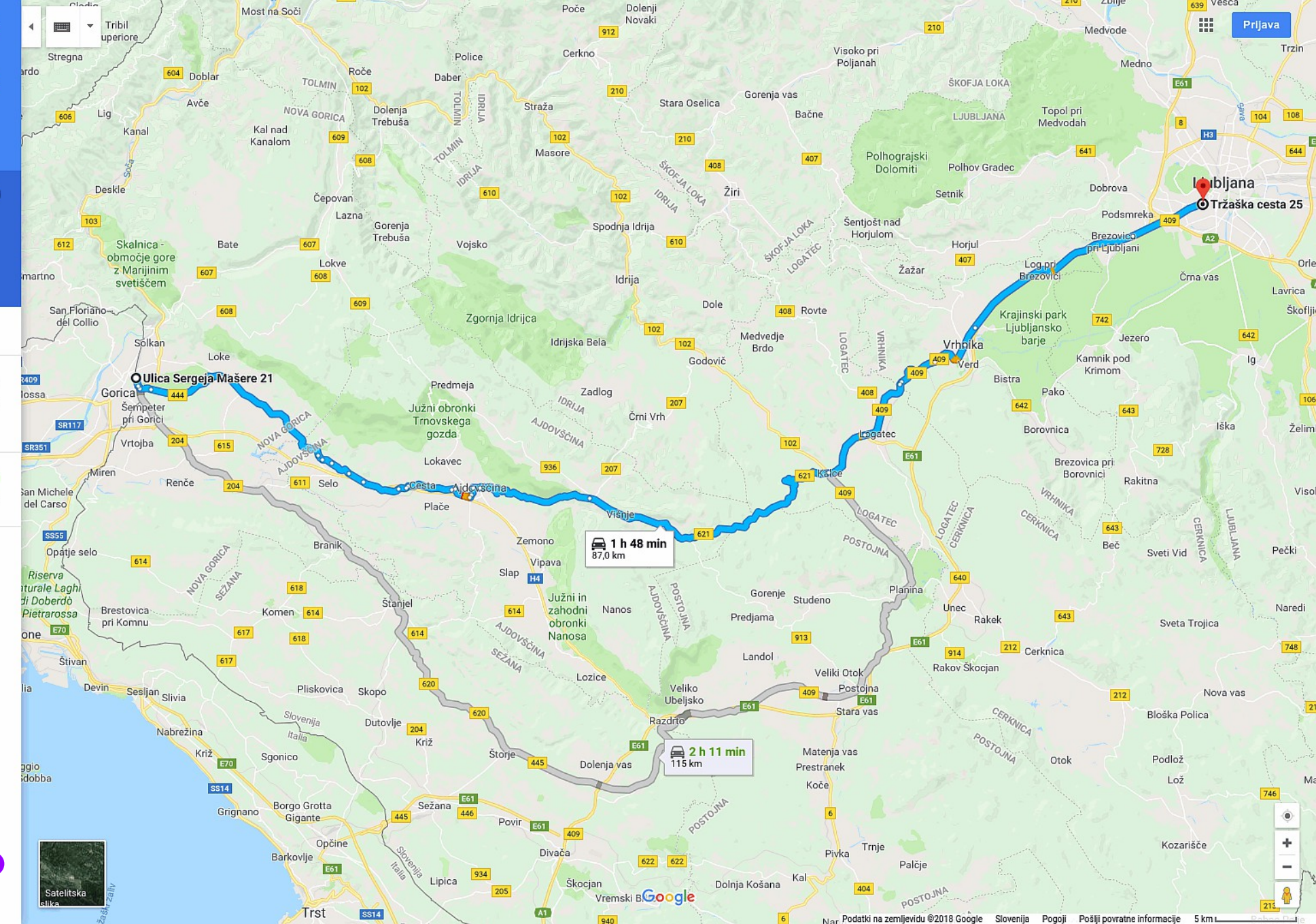
The map displays a route from Ulica Sergeja Mašere 21 in Nova Gorica to Tržaška cesta 25 in Ljubljana. The route is highlighted in blue and passes through several towns including Gornja Idrija, Vrhnika, and Logatec. The map shows various roads, including the A1 and E61, and includes a scale bar at the bottom right indicating 5 km. The map also shows the border between Slovenia and Italy.

 Pošljite navodila v telefon

 **prek Kalce - Col** **1 h 48 min**
1 h 42 min po praznih cestah 87,0 km
[PODROBNOSTI](#)

 **prek Dornberk- Štanjel** **2 h 11 min**
2 h po praznih cestah 115 km

Prevrnjeni tovornjaki?





Opel
Kadett E

poraba
7l/100km
osvinčen 98

1987-2007

380000km
uničen
od rje!

Zelo nevarno vozilo:
ESP vsebuje napake, vožnja po snegu
ni možna kljub 4x4
ABS ne dovoli zaviranja po prvem zdrsu

Audi A4
4x4 2.5l

poraba
7l/100km
diesel

2001-2005

Številne
napake
in okvare!





Kia Rio

poraba
6l/100km
bencin 95

2007-danes

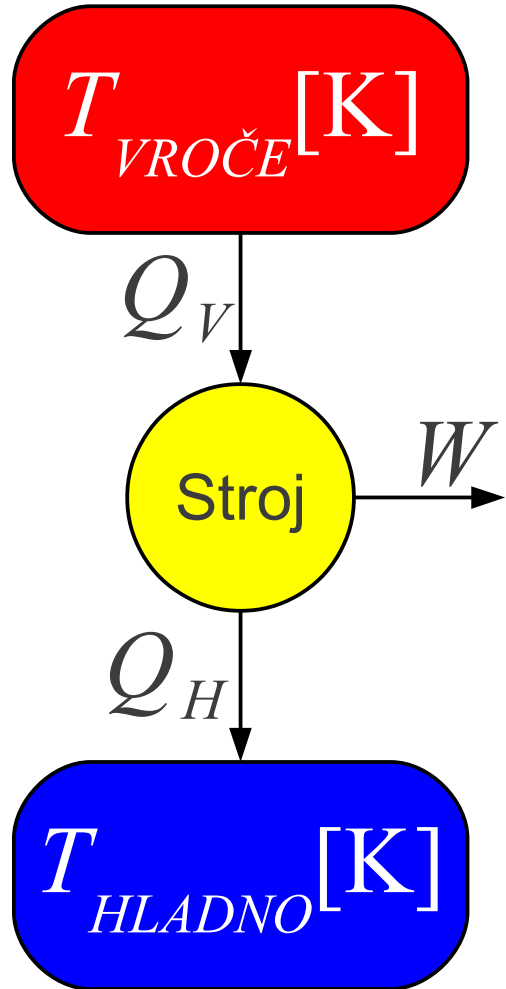
315000km+

>11 let
brez okvar!

Električno vozilo čez 10 let?

Nicolas Léonard Sadi Carnot 1824

$$\eta = \frac{W}{Q_T} \leq 1 - \frac{T_{\text{HLADNO}}}{T_{\text{VROČE}}}$$



Parna lokomotiva $\eta \approx 8\%$

Potniško letalo $\eta \approx 15\%$ (visoka hitrost!)

Bencinski motor $\eta \approx 20\%$ (optimalna moč)

Dieselski motor $\eta \approx 25\%$ (optimalna moč)

Jedrska elektrarna $\eta \approx 30\%$

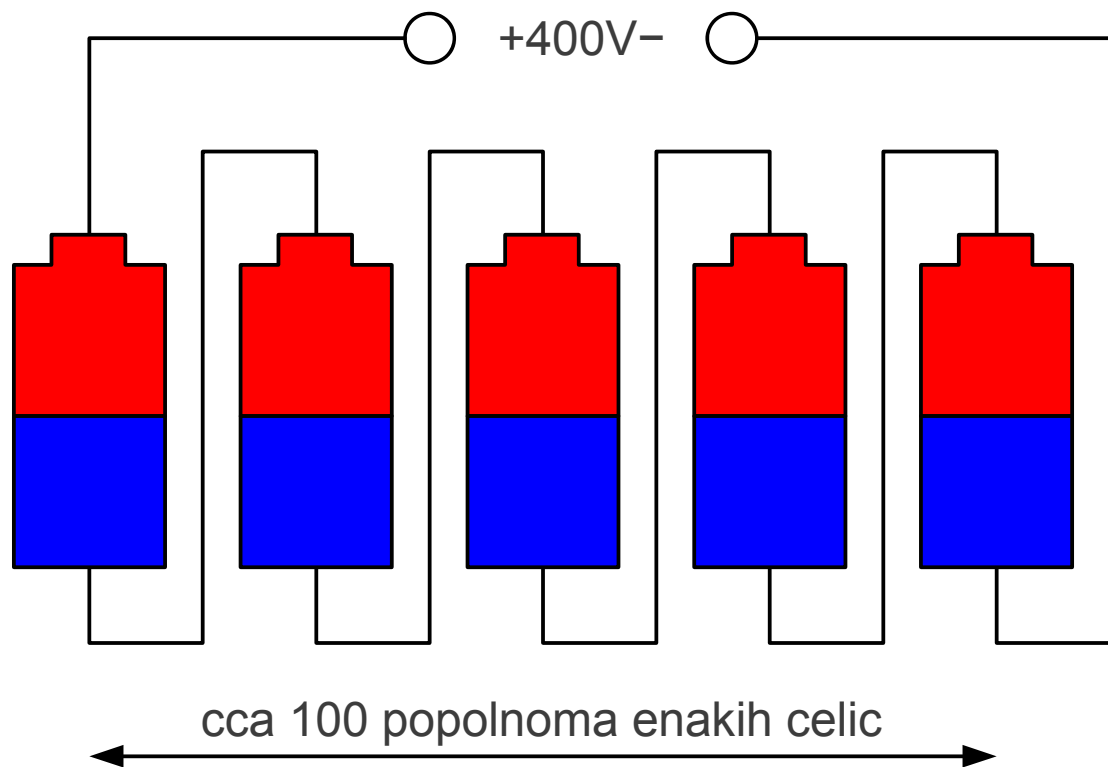
Avto na vodik $\eta \approx 30\%$ ($\eta \approx 60\%$ $\text{CH}_4 \rightarrow \text{H}_2$)

X $\eta \approx 50\%$ gorivne celice)

Termoelektrarna $\eta \approx 40\%$

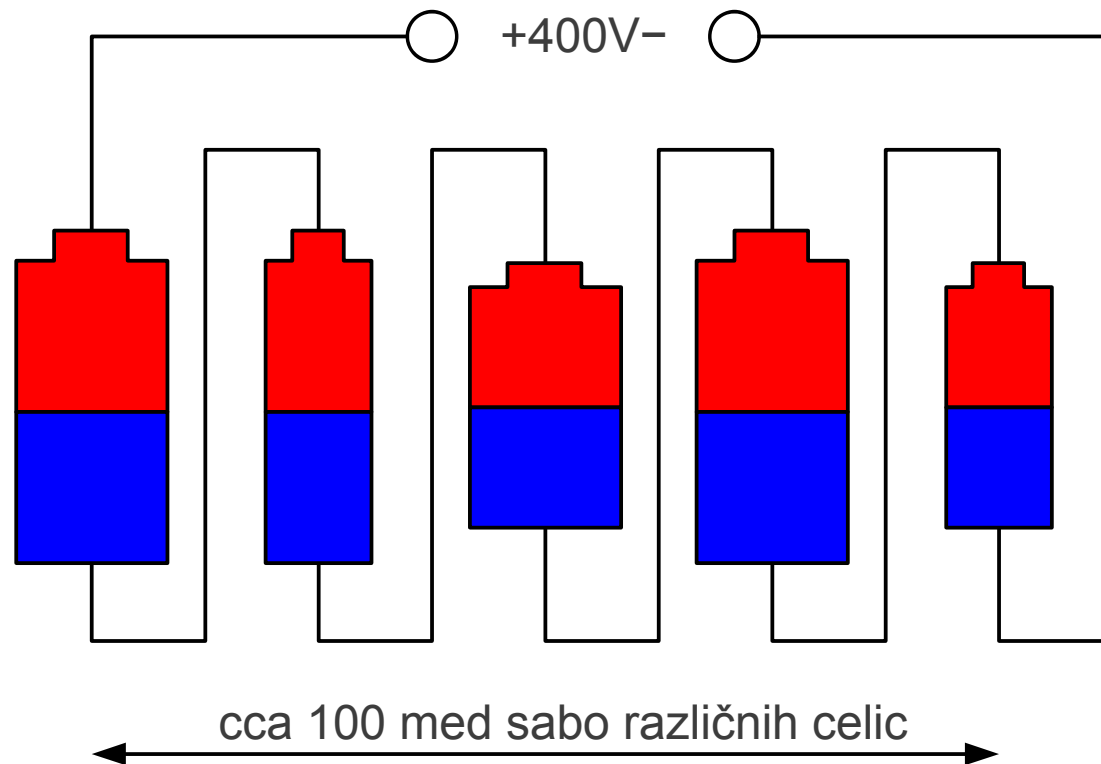
Baterijski avto $\eta \approx 40\%$ (termoelektrarna)

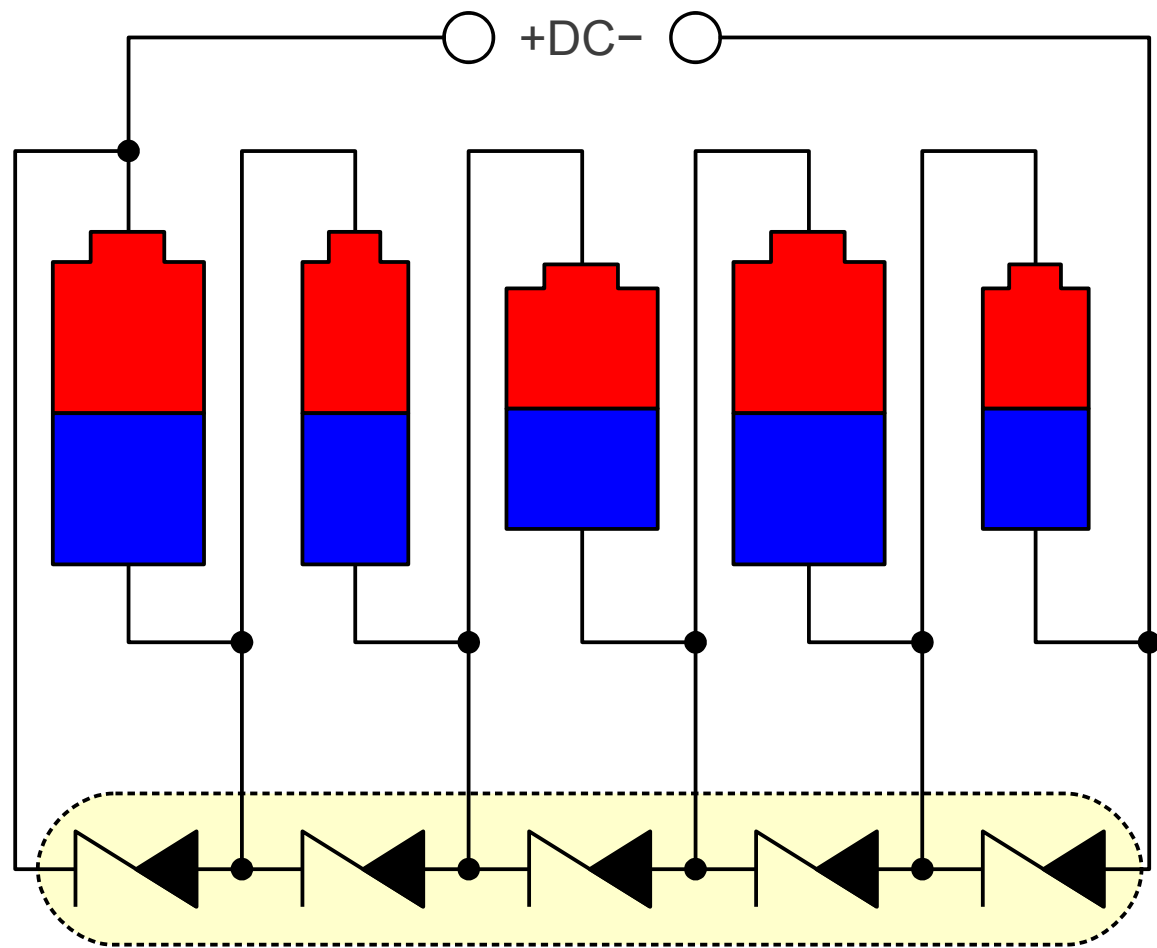
Sodobno malo letalo $\eta \approx 50\%$ (bencin)



Idealna baterija
električnega vozila

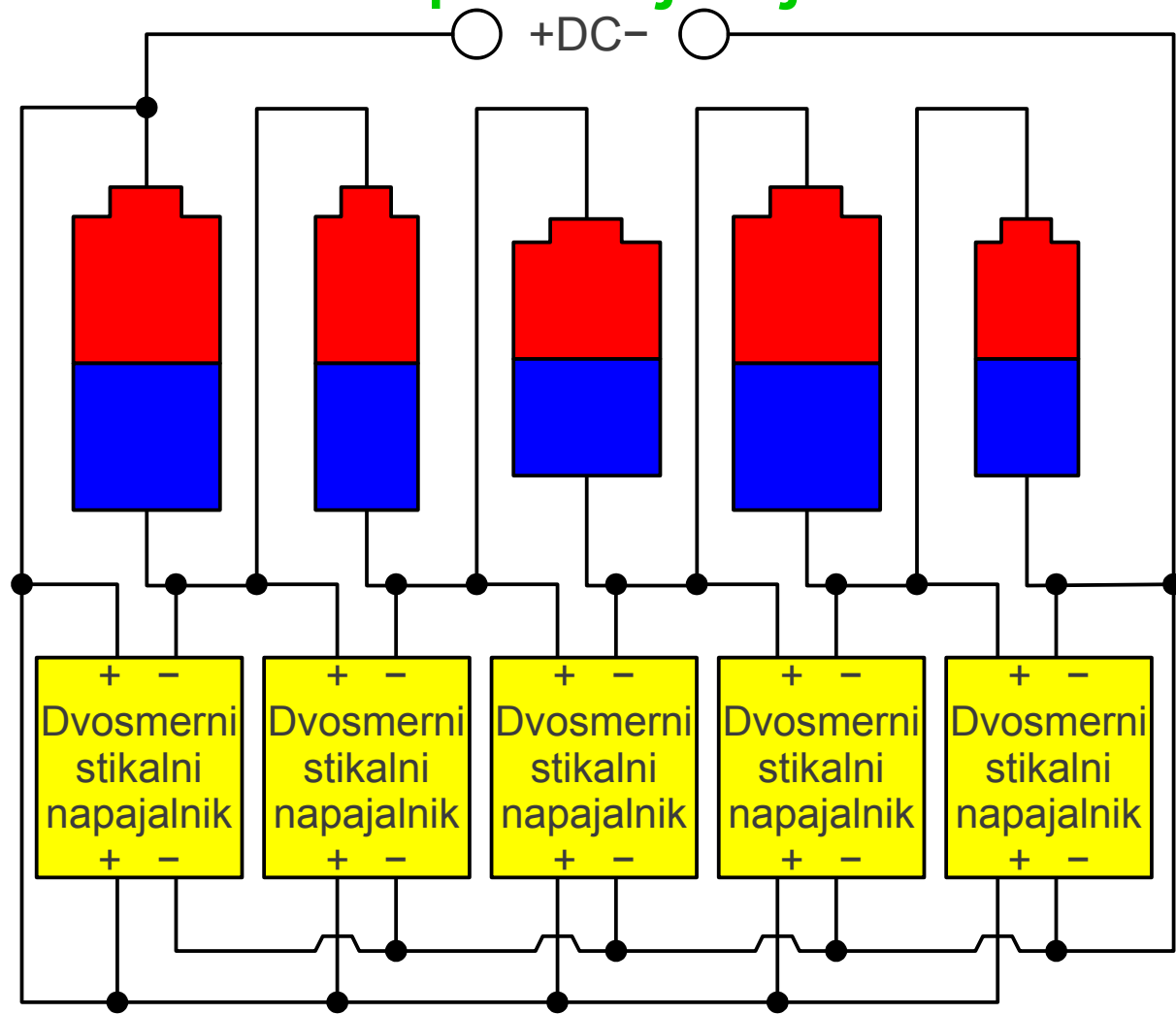
Resnična baterija
električnega vozila





Preprost uravnoteževalec
deluje samo pri polnjenju
baterije do 100%

Celovit uravnoteževalec
deluje med polnjenjem
in praznjenjem



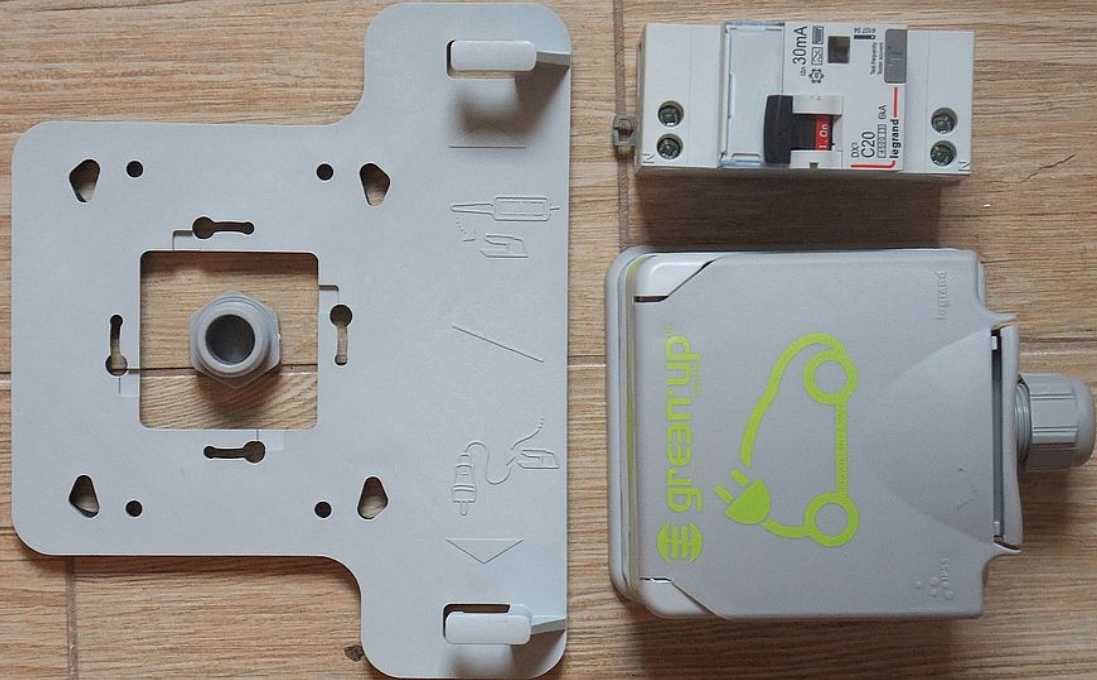
Več javnih polnilnic kot električnih avtov?



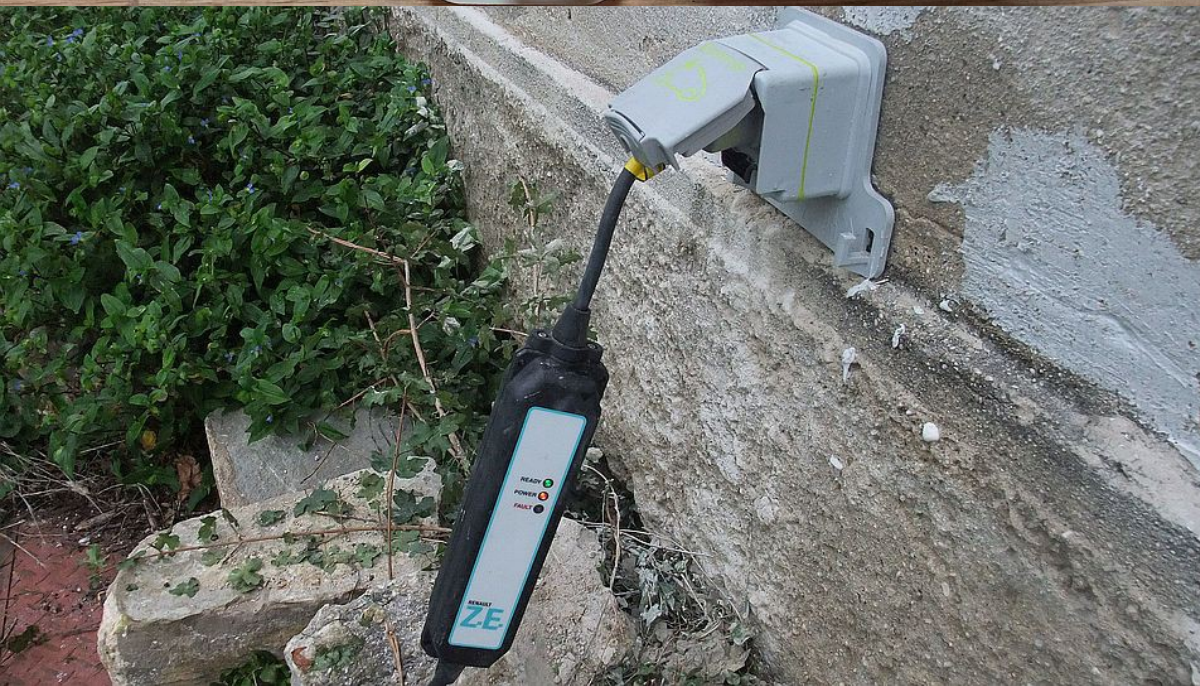
Neenoten dostop
Slabo vzdrževane
Nepraktična uporaba
Neprimerne za
obstoječe baterije

Ljubljana FE - enofazna vtičnica 16A
+ kabel Renault ZE (omejen 8A) ~24h





Enofazna šuko vtičnica
Legrand "GreenUp"
posrebreni kontakti 14A
vsebuje RFID tag, ki
deluje samo s kablom
Renault ZE (12A) ~16h



A white Renault ZOE electric car is parked at a charging station. The car is connected to a charging cable that is plugged into a charging port on the front of the vehicle. The charging station is a grey, wall-mounted unit with a green light indicator. The car is parked on a paved surface next to a concrete wall. In the background, there is a grassy area and some buildings. The text "Ljubljana FRI - trifazna polnilna postaja 3x32A ~2h" is overlaid on the bottom left of the image.

Ljubljana FRI - trifazna
polnilna postaja 3x32A ~2h

Maribor FERl - trifazna vtičnica 3x16A ~4h



A white electric car is parked on a driveway, connected to a charging cable. The car's license plate is GO MV-103. In the foreground, a red and grey charging cable is plugged into a concrete surface. The background shows a house with a garden and a tree.

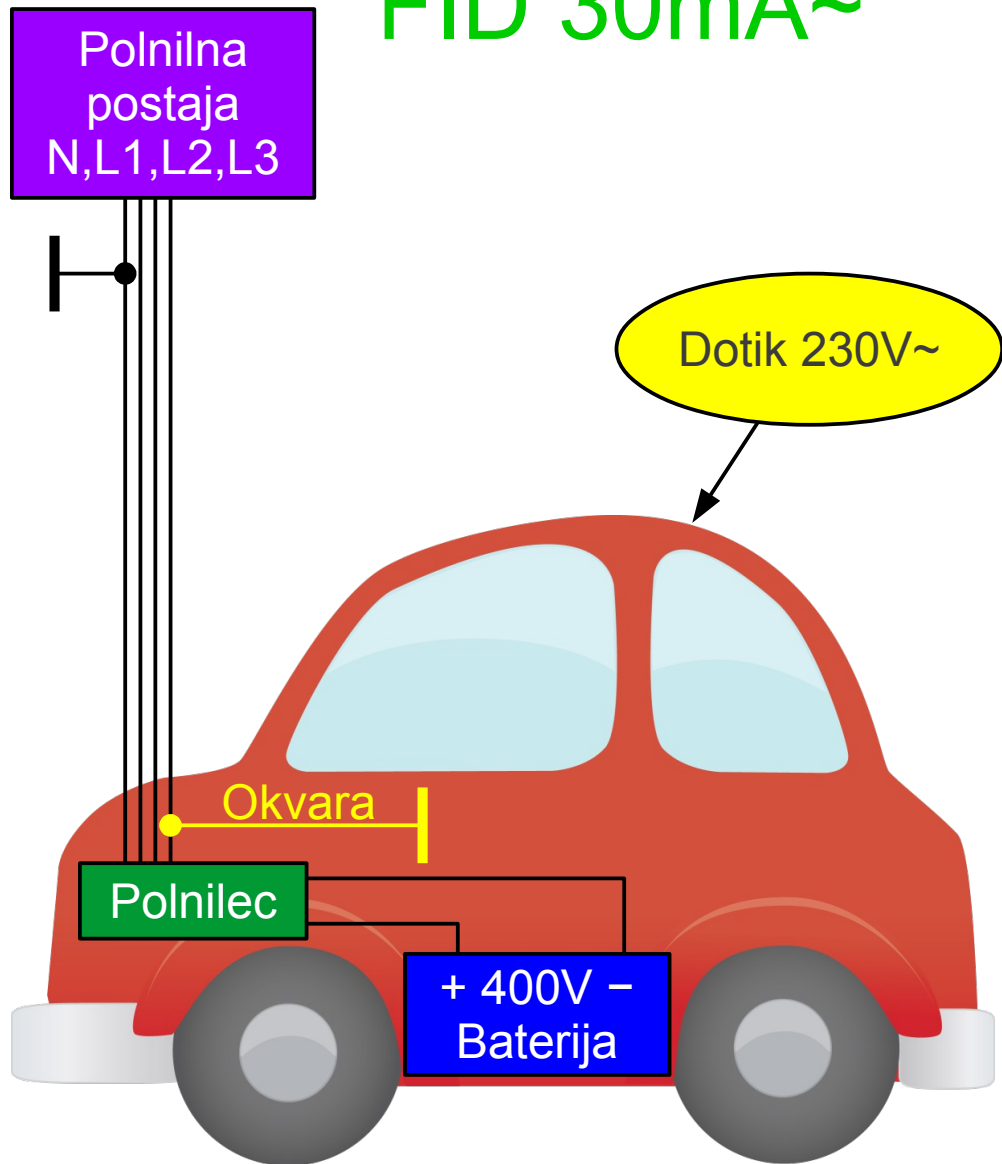
Nova Gorica (doma)
trifazni podaljšek 3x16A
+ kabel Juice Booster 2 ~4h

Ljubljana FE - enofazna vtičnica 16A
+ shekan Juice Booster 2 (16A) ~12h



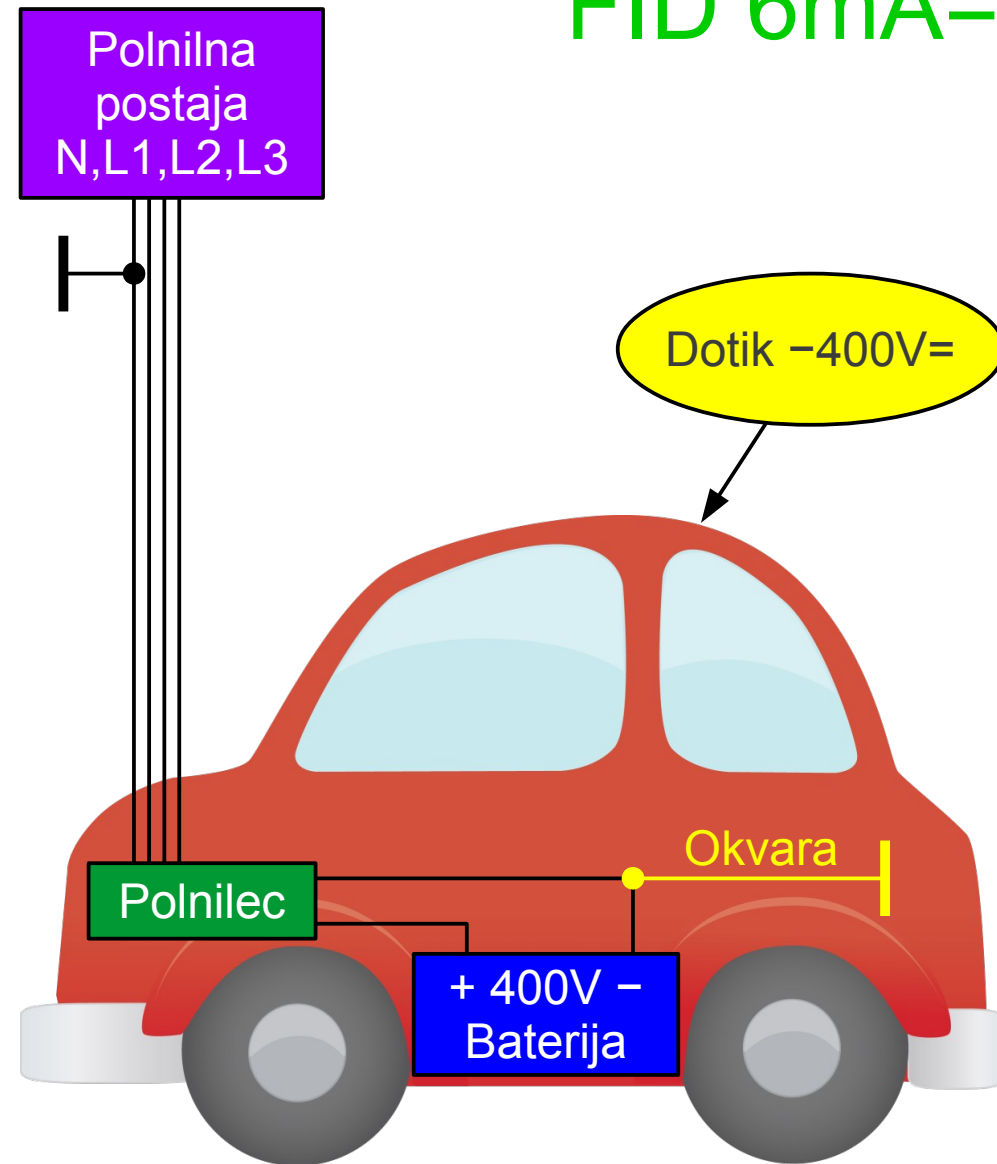
Izmenična okvara

FID 30mA~



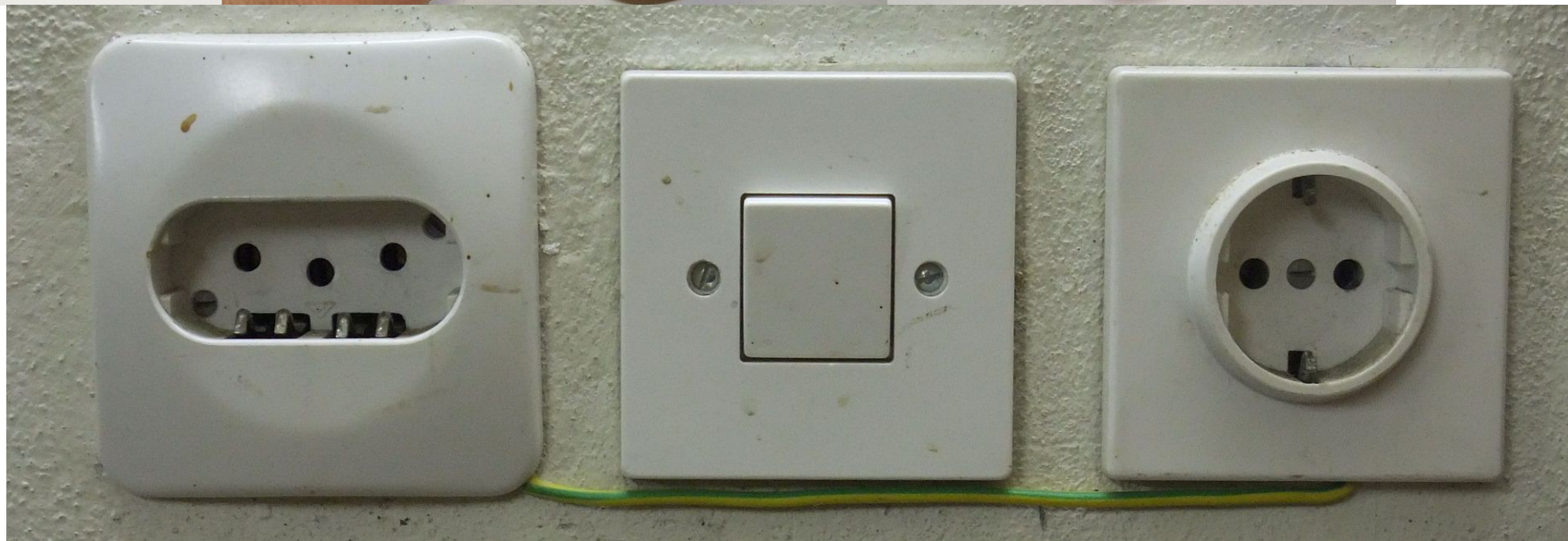
Enosmerna okvara

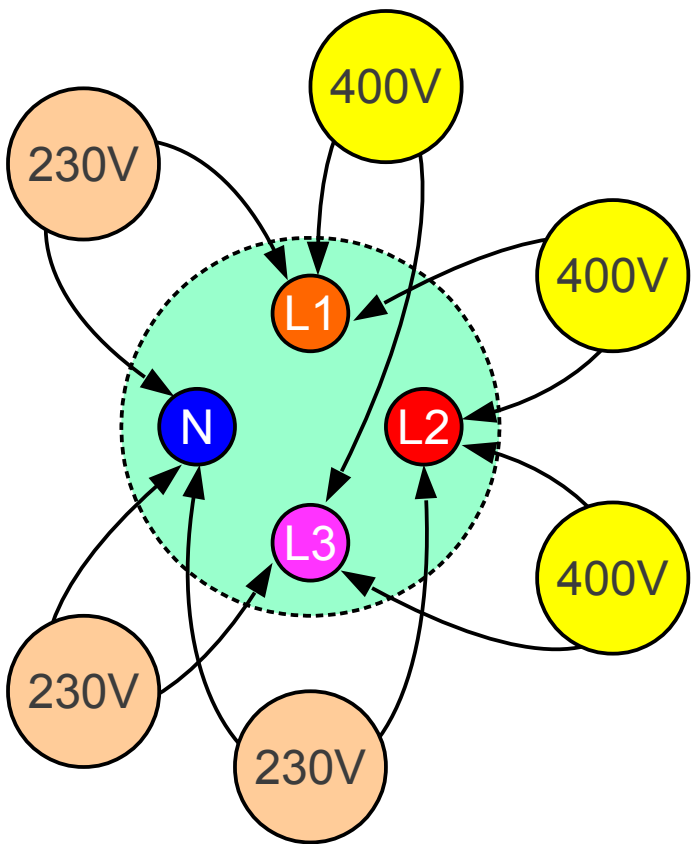
FID 6mA=





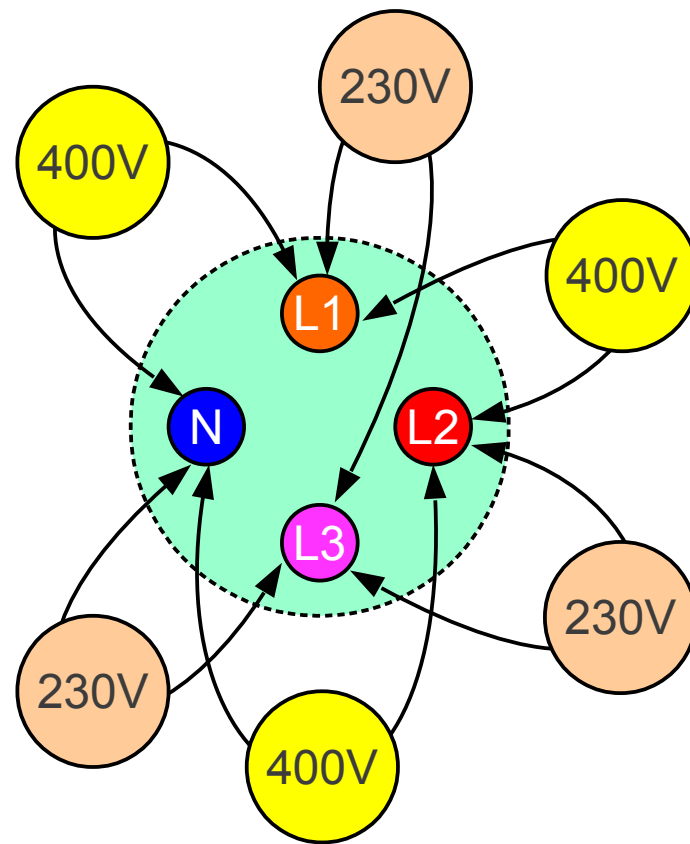
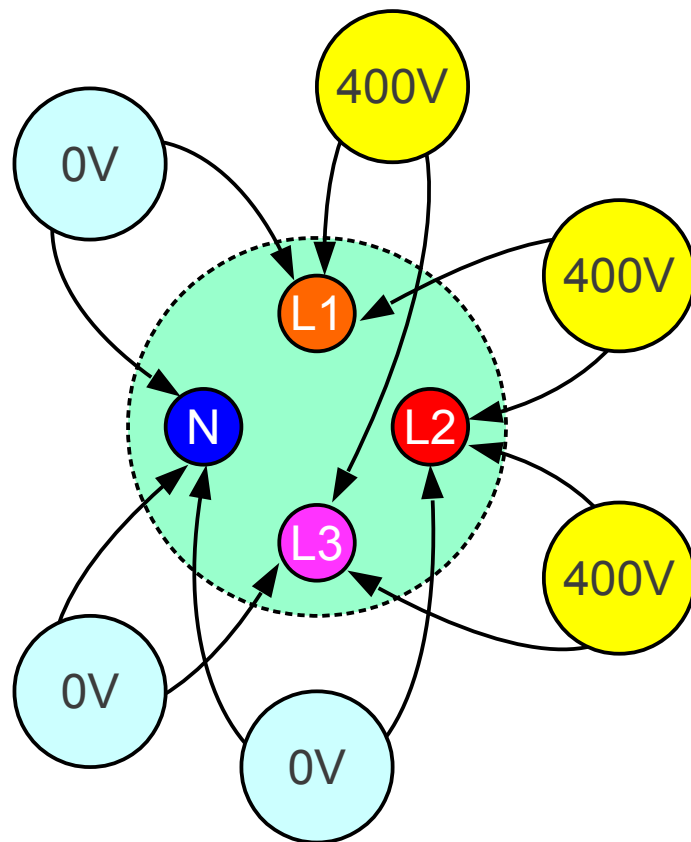
Stari
3x16A
"šuko"
nevaren!



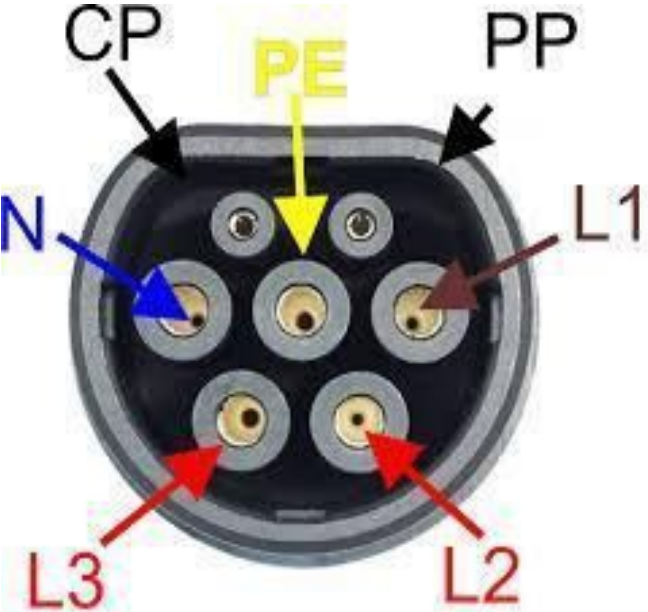


Avtomobilaska
vezava

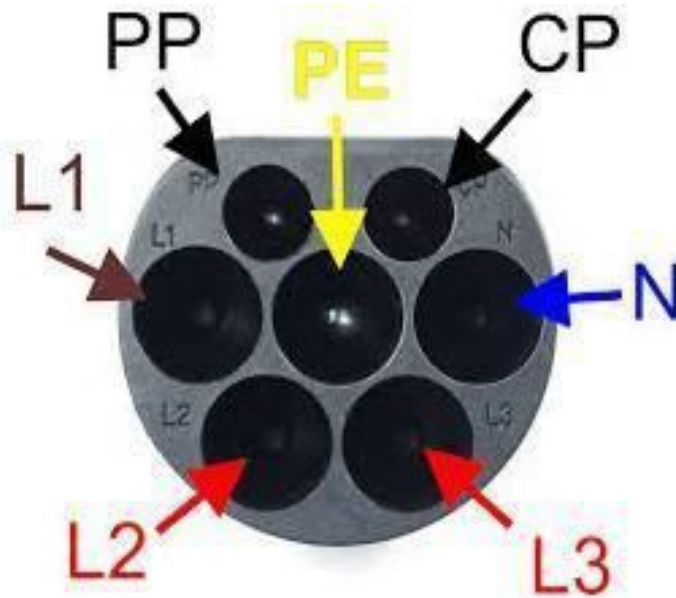
Kmetijska
vezava



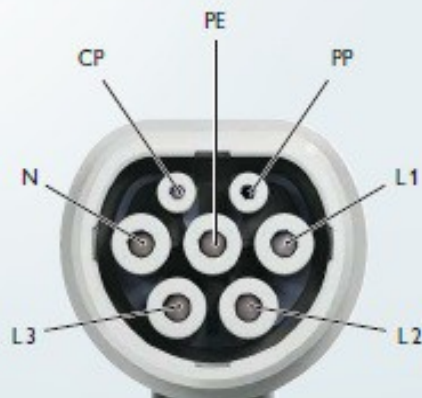
Električarska
vezava



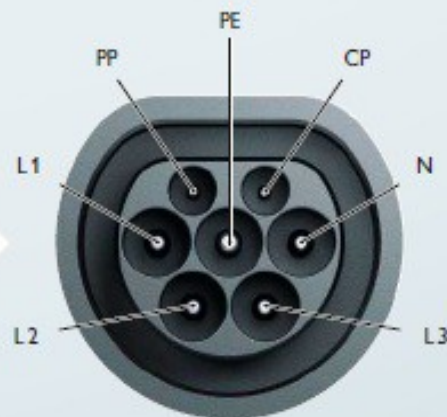
Type 2 Female Plug Pinout



Type 2 Male Plug Pinout



AC vehicle connector Type 2

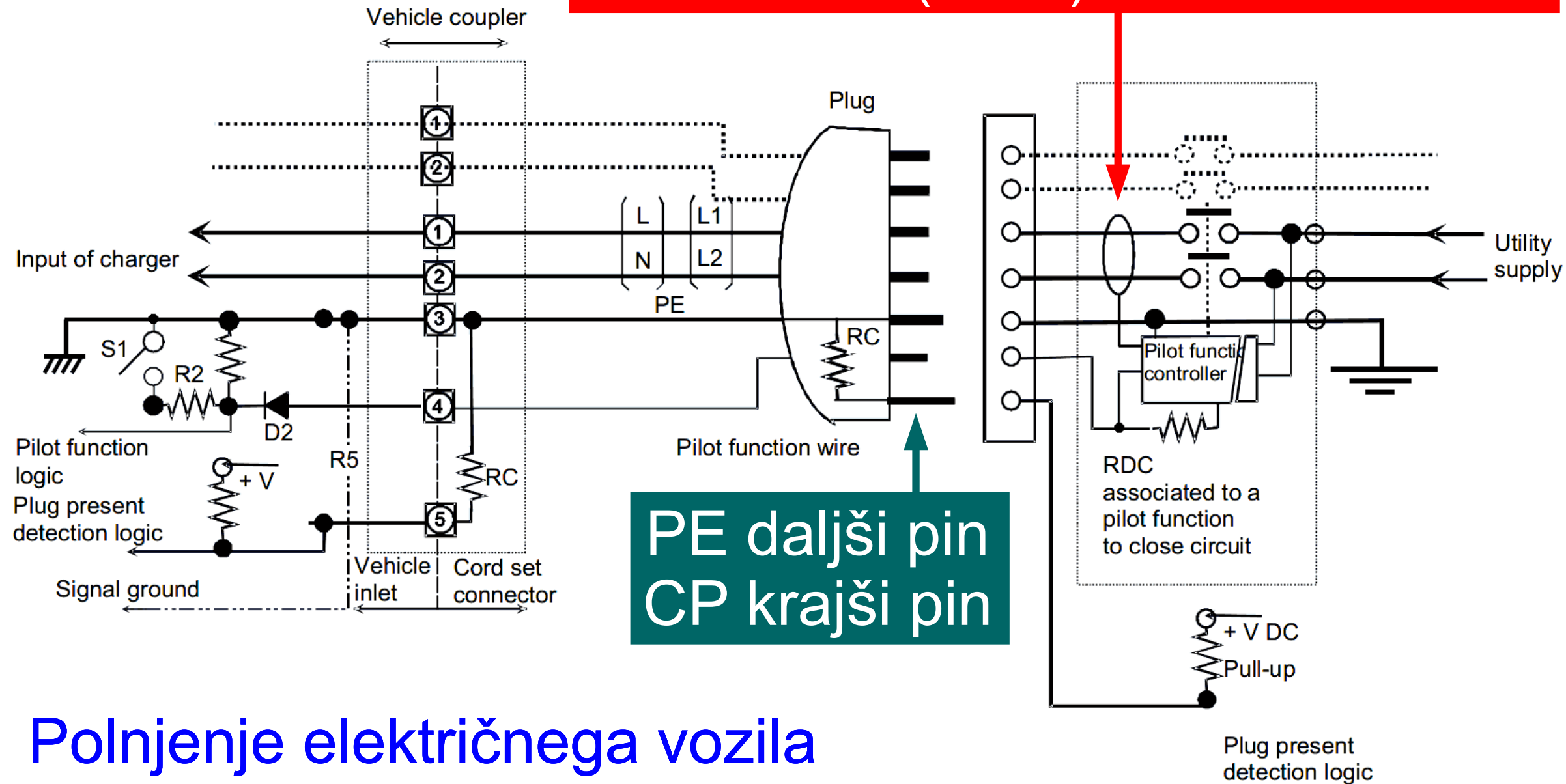


AC vehicle inlet Type 2

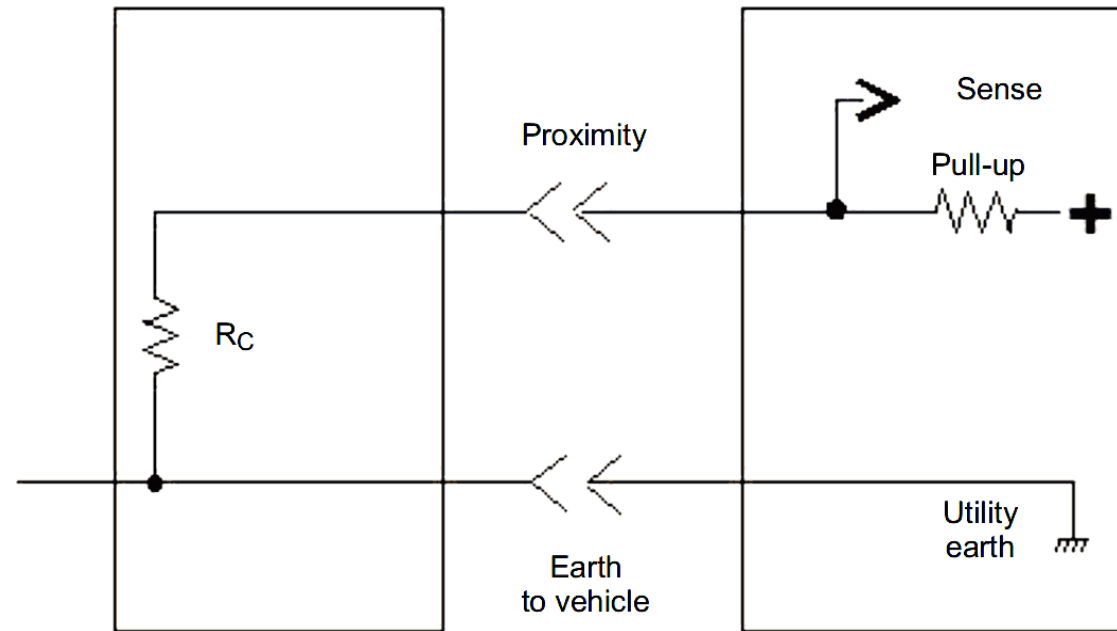
	AC ein - bis dreiphasig	max. 500V AC 3 x 63A oder 1 x 80A
	AC ein - bis dreiphasig DC-Low	max. 500V AC/DC 3 x 63A AC oder 1 x 70A AC oder 1 x 80A DC
	DC-Mid	max. 500V DC 1 x 140 A
	DC-High	≥ 500V DC 1 x 200A

EN 61851

FID zaščita (RCD) 30mA~ & 6mA=



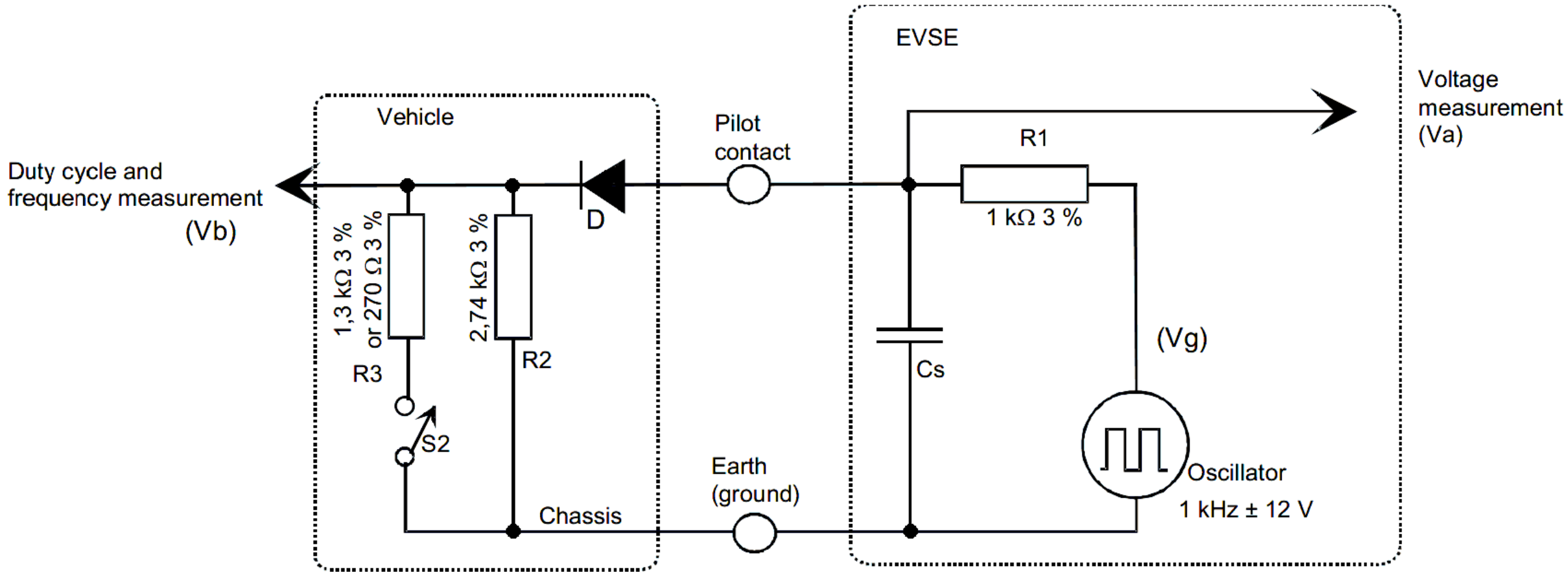
Vezava signala Proximity Pilot (PP)



Current capability of the cable assembly	Equivalent resistance of R_c Tolerance $\pm 3\%$ ^c
13 A	1,5 k Ω 0,5 W ^{a, b}
20 A	680 Ω 0,5 W ^{a, b}
32 A	220 Ω 0,5 W ^{a, b}
63 A (3 phase) / 70 A (1 phase)	100 Ω 0,5 W ^{a, b}

- ^a The power dissipation of the resistor caused by the detection circuit shall not exceed the value given above. The value of the pull-up resistor shall be chosen accordingly.
- ^b Resistors used should preferably fail open circuit failure mode. Metal film resistors commonly show acceptable properties for this application.
- ^c Tolerances to be maintained over the full useful life and under environmental conditions as specified by the manufacturer.

EN 61851



Vezava signala Control Pilot (CP)

Vehicle state		Vehicle connected	S2	Charging possible		Va ^a	
A		no	open	no		12 V ^d	Vb = 0 V
B		yes	open	no		9 V ^b	R2 detected
C	}	yes	closed	Vehicle ready	{	6 V ^c	R3 = 1,3 kΩ ± 3 % Charging area ventilation not required
D						3 V ^c	R3 = 270 Ω ± 3 % Charging area ventilation required
E		yes	open	no		0 V	Vb = 0: EVSE, utility problem or utility power not available, pilot short to earth ...
F		yes	open	no		-12 V	EVSE not available

^a All voltages are measured after stabilization period, tolerance ±1 V.

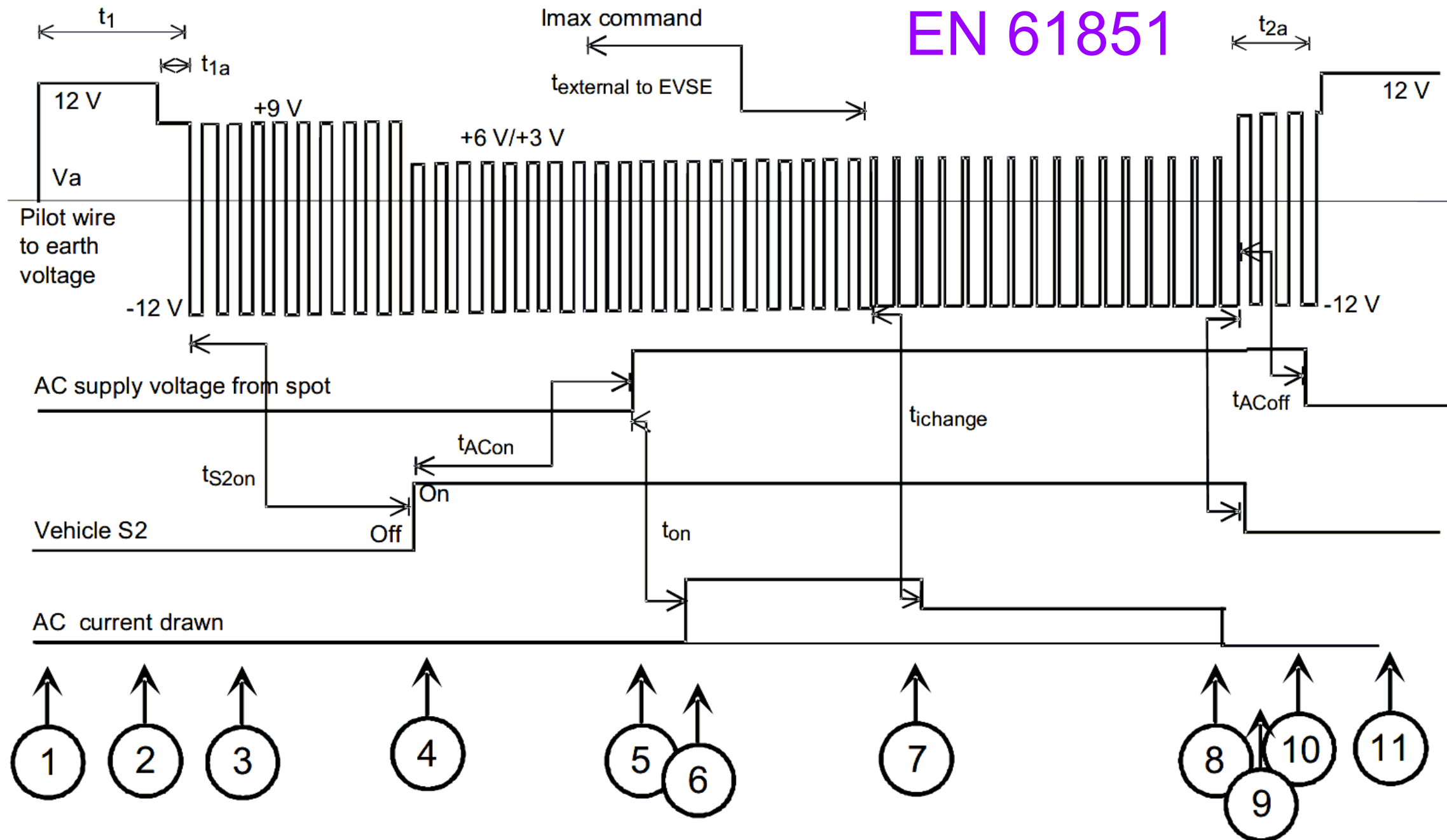
^b The EVSE generator may apply a steady state DC voltage or a ±12 V square wave during this period. The duty cycle indicates the available current as in Table A.5.

^c The voltage measured is function of the value of R3 in Figure A.1 (indicated as Re in Figure A.2).

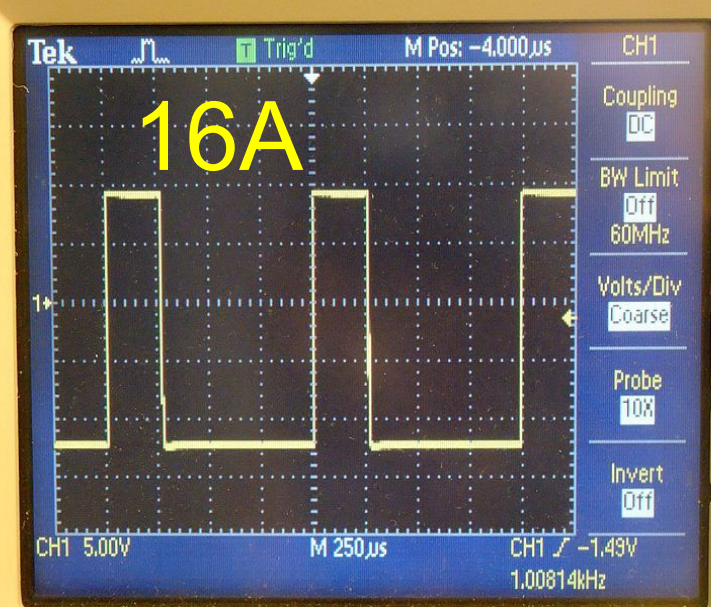
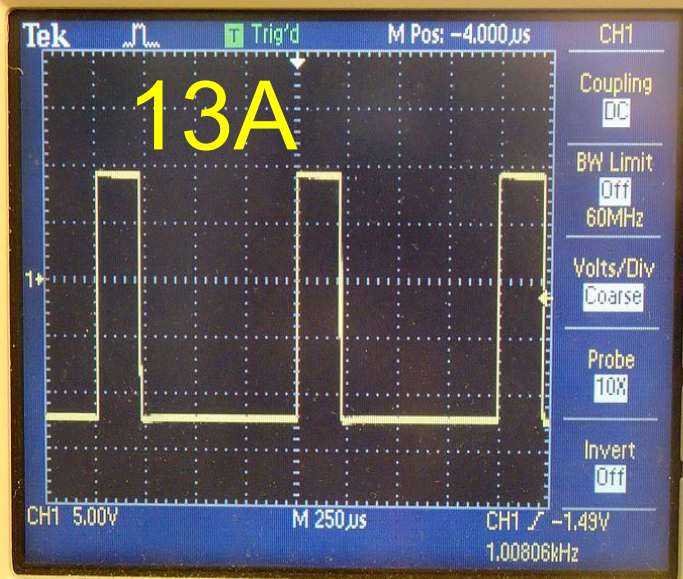
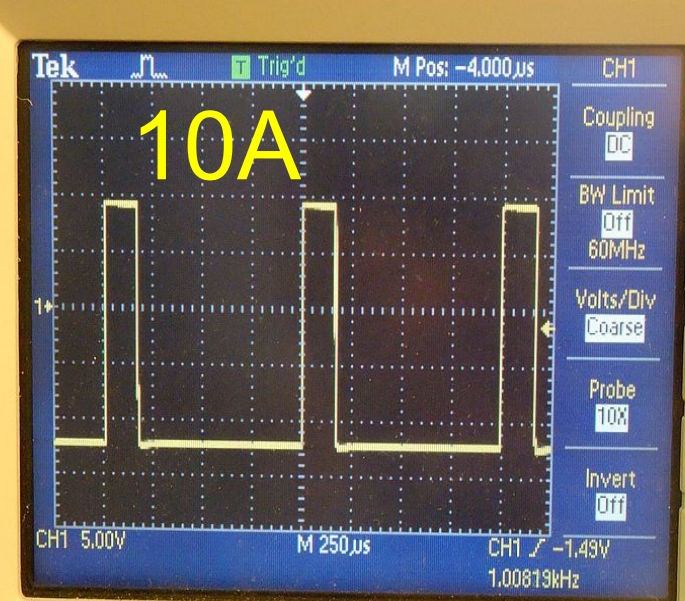
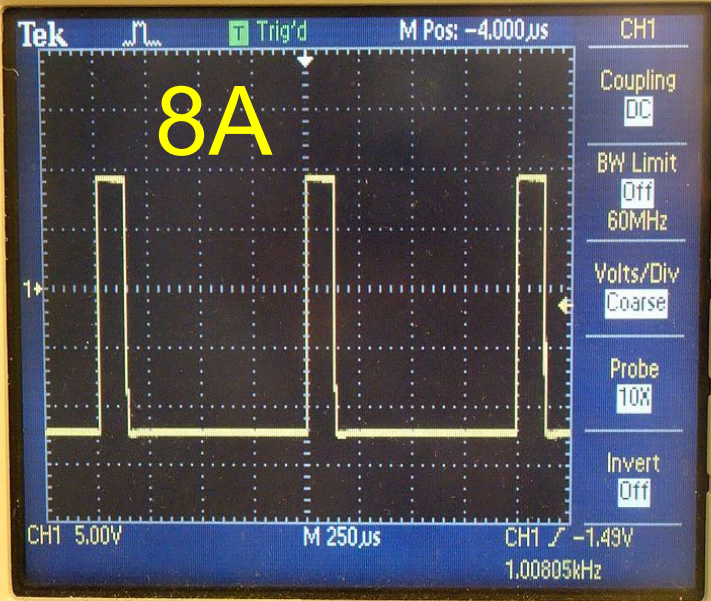
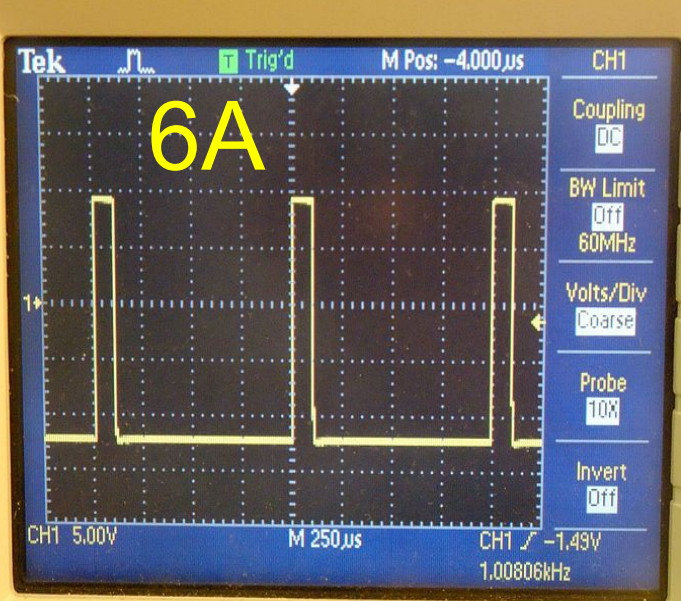
^d 12 V static voltage.

Protokol polnjenja Control Pilot (CP)

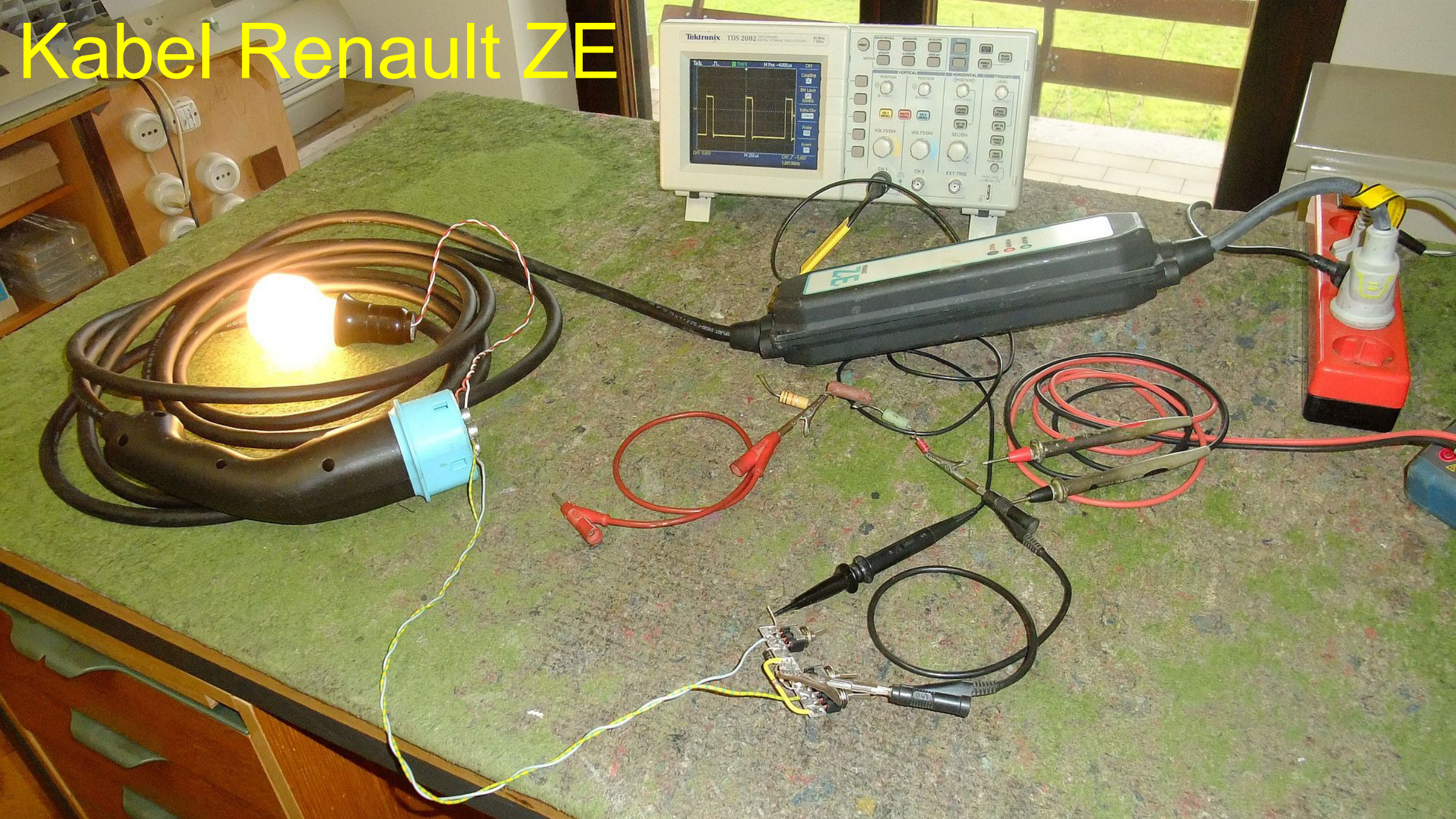
EN 61851



Nominal duty cycle interpretation by vehicle	Maximum current to be drawn by vehicle EN 61851
Duty cycle < 3 %	Charging not allowed
3 % ≤ duty cycle ≤ 7 % <div>Se ne uporablja</div>	Indicates that digital communication will be used to control an off-board DC charger or communicate available line current for an on-board charger. Digital communication may also be used with other duty cycles. Charging is not allowed without digital communication. 5 % duty cycle shall be used if the pilot function wire is used for digital communication
7 % < duty cycle < 8 %	Charging not allowed
8 % ≤ duty cycle < 10 %	6 A
10 % ≤ duty cycle ≤ 85 %	Available current = (% duty cycle) × 0,6 A
85 % < duty cycle ≤ 96 %	Available current = (% duty cycle - 64) × 2,5 A
96 % < duty cycle ≤ 97 %	80 A
Duty cycle > 97 %	charging not allowed
If the PWM signal is between 8 % and 97 %, the maximum current may not exceed the values indicated by the PWM even if the digital signal indicates a higher current.	



Kabel Renault ZE



Juice Booster 2





