VRIJE UNIVERSITEIT BRUSSEL

EVS35 OSL2022

Electrical safety as key issue in EV charging infrastructure

P. Van den Bossche

VUB

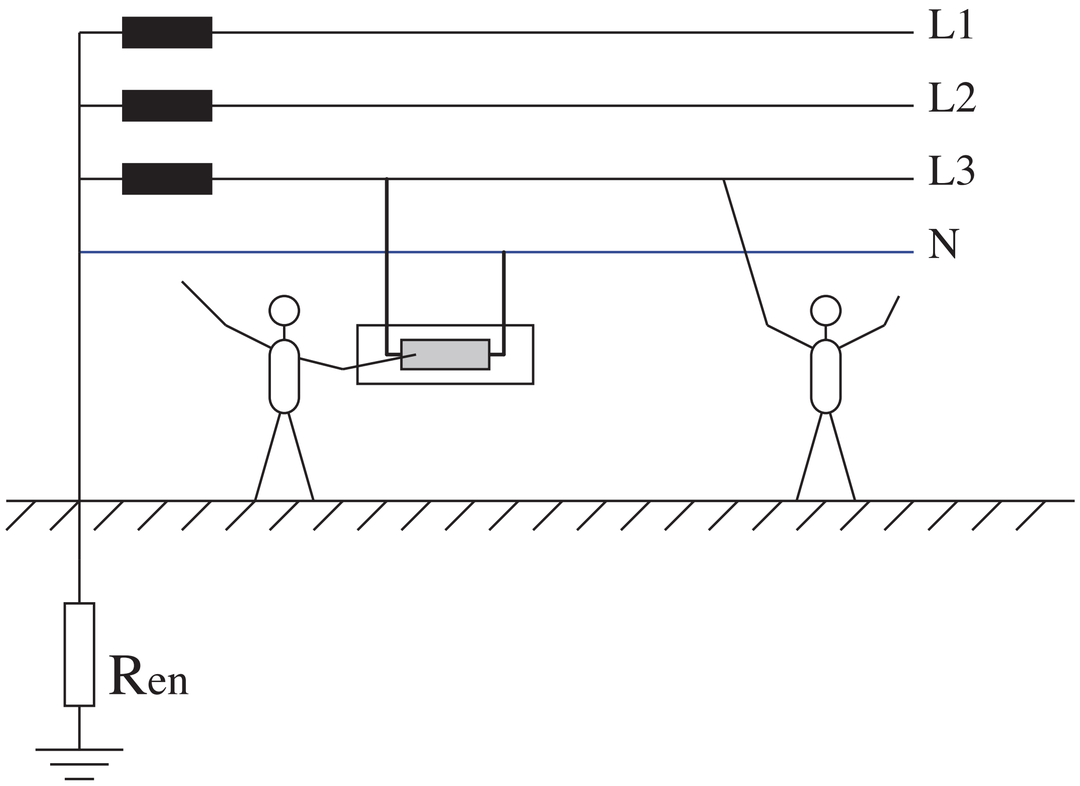
IEC TC69

Voltage hazards

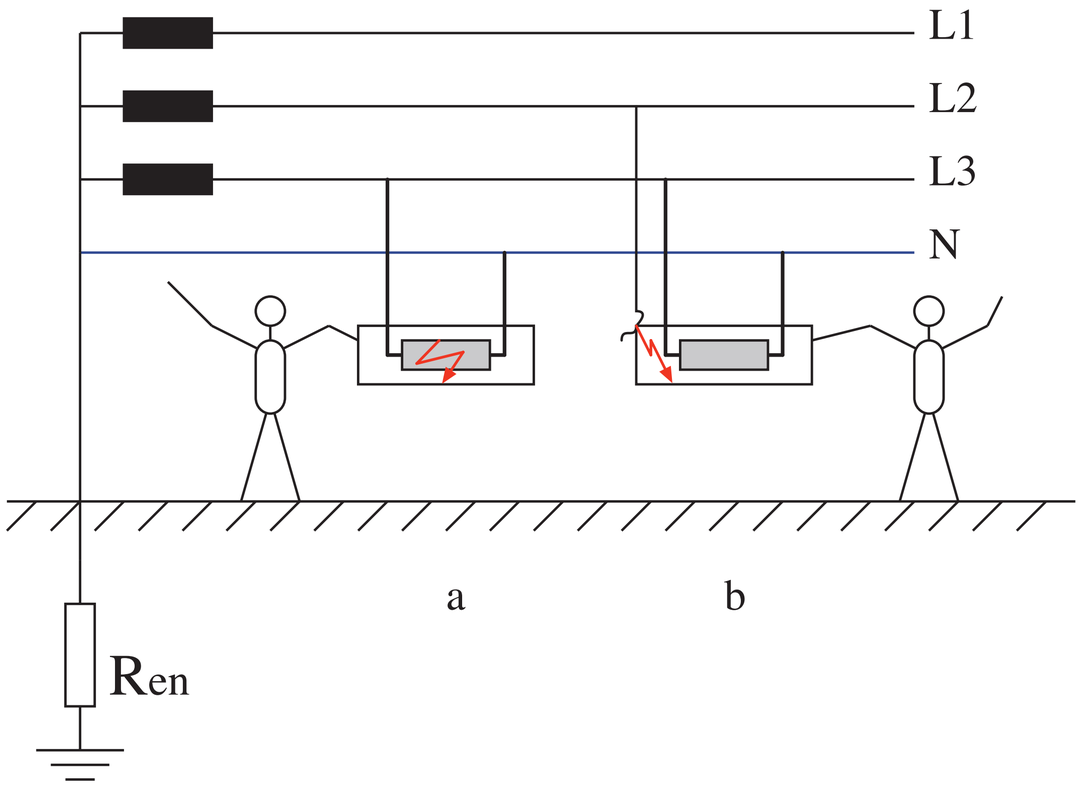
- Absolute conventional limit voltage

	AC	DC ripple	DC
BB1	50	75	120
BB2	25	36	60
BB3	12	18	30

Direct contact



Indirect contact



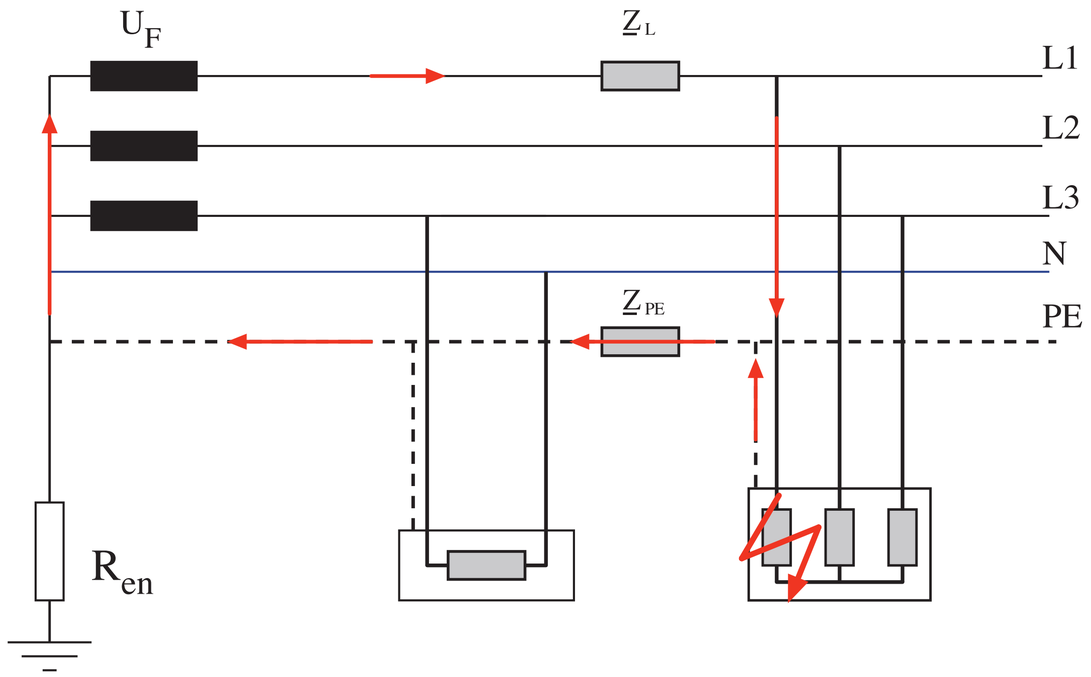
Protection against electric shock

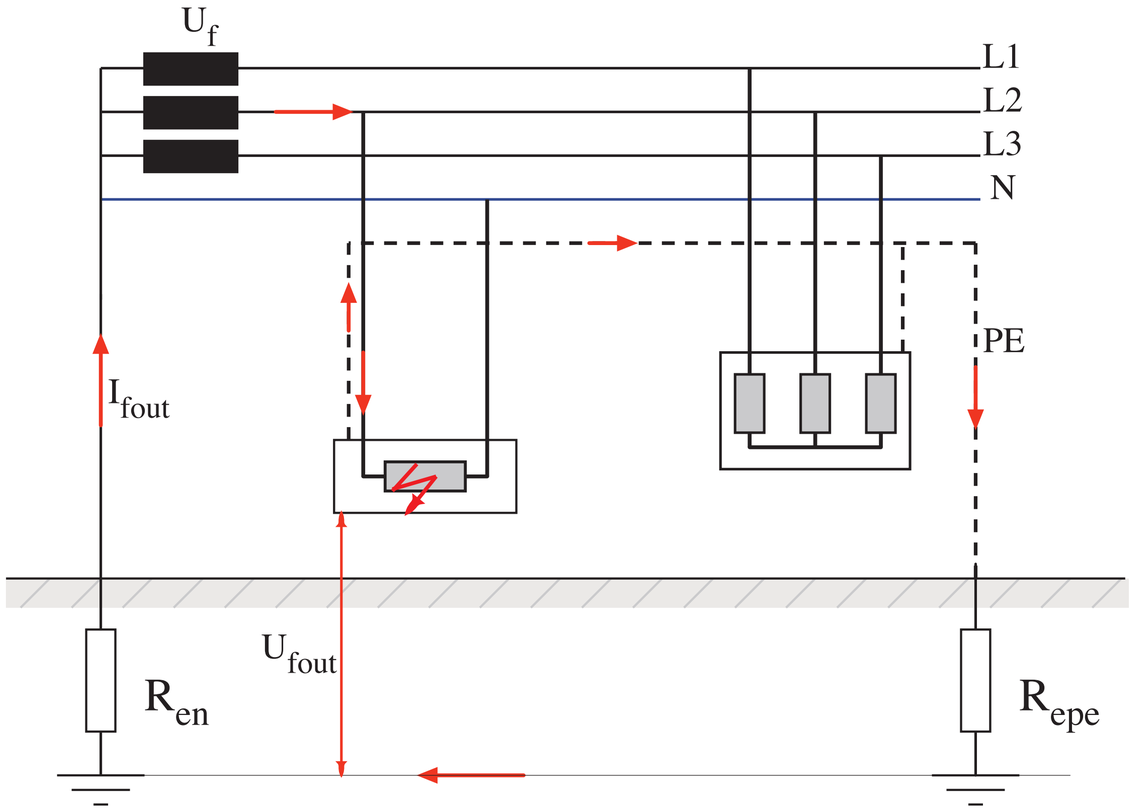
- Automatic disconnection of supply
- Double or reinforced insulation
- Electrical separation
- *Extra low voltage*

IEC61851-1 Mode 3 charging

- Protective earth
- Earthing systems TN and TT
- Residual current device (GFCI)
  -

TN and TT



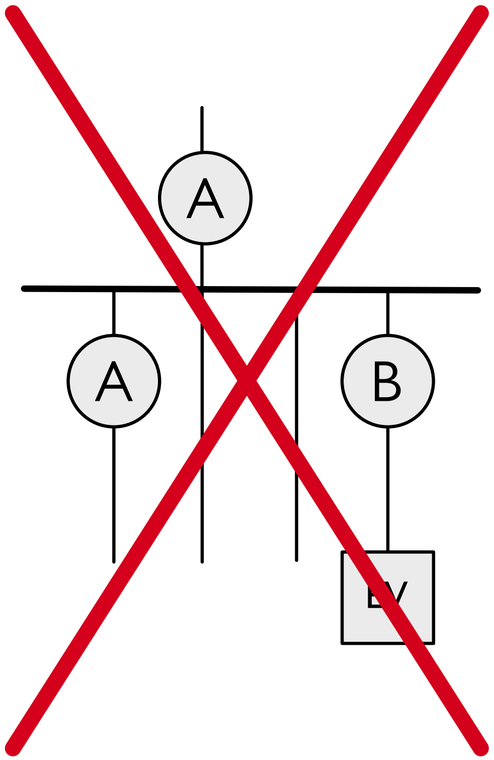


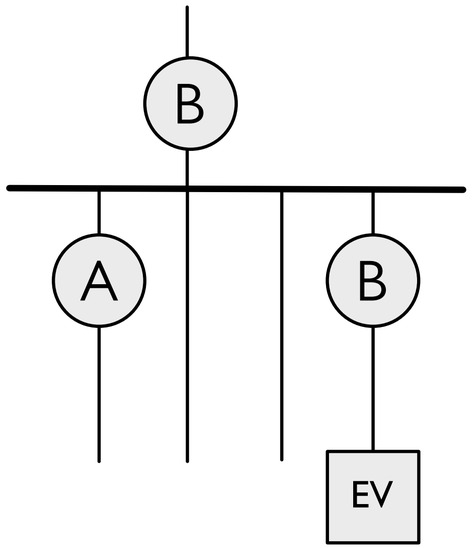
RCD issues

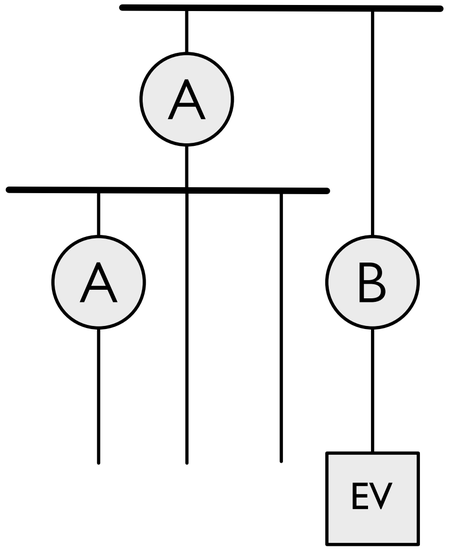
- DC fault currents: Type A vs Type B
- Blinding (saturation) of Type A: 6ma DC
- No type B downstream of type A
- Type A-EV IEC62955
- Protection in charging post

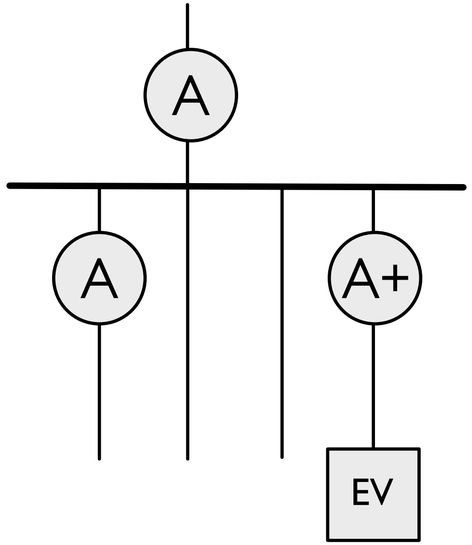
Permissible type B arrangements

- I



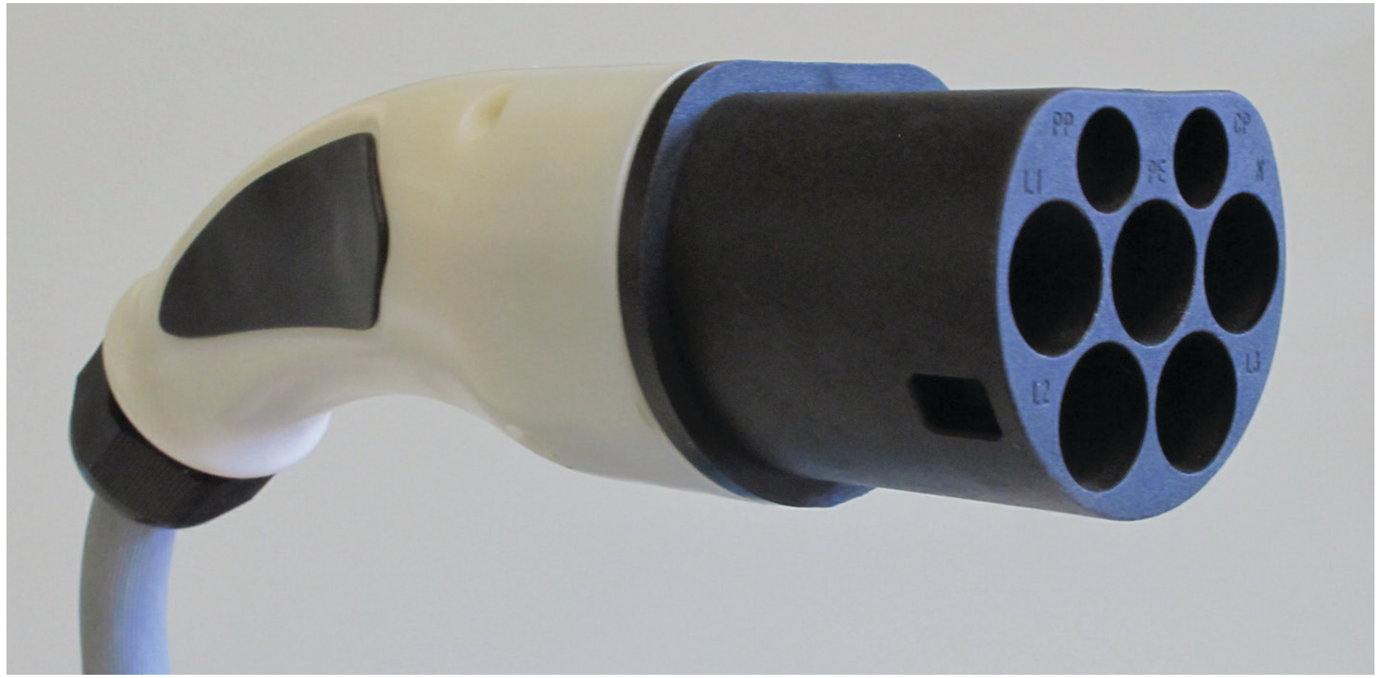






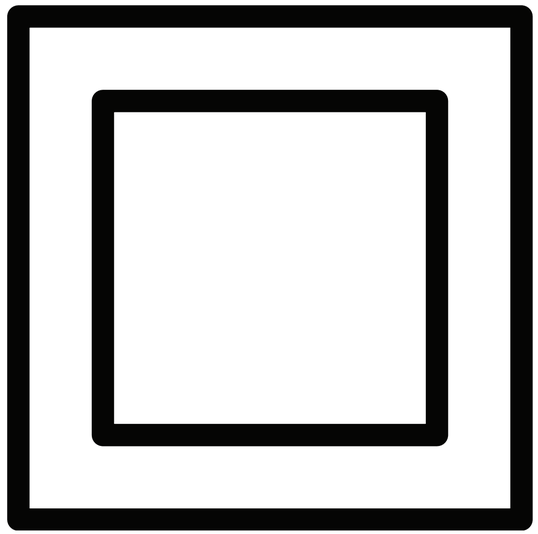
Accessories

- Type B standardized in Europe



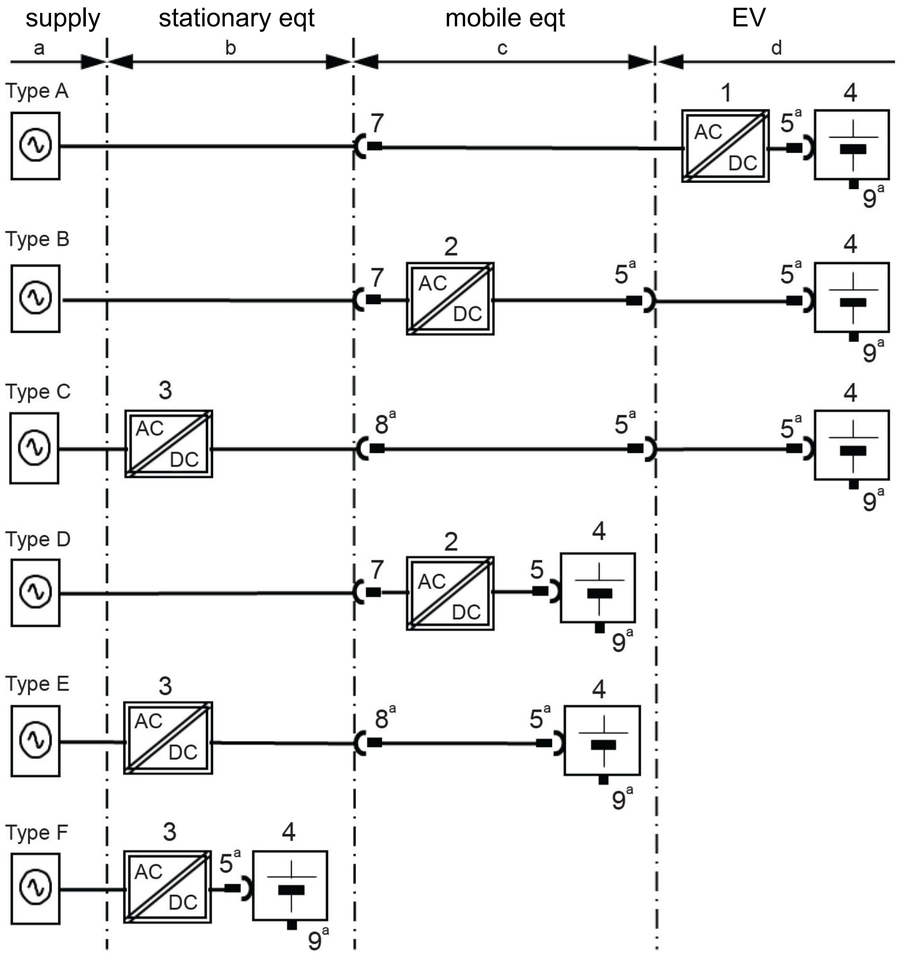
Double or reinforced insulation

- No earthing connection !



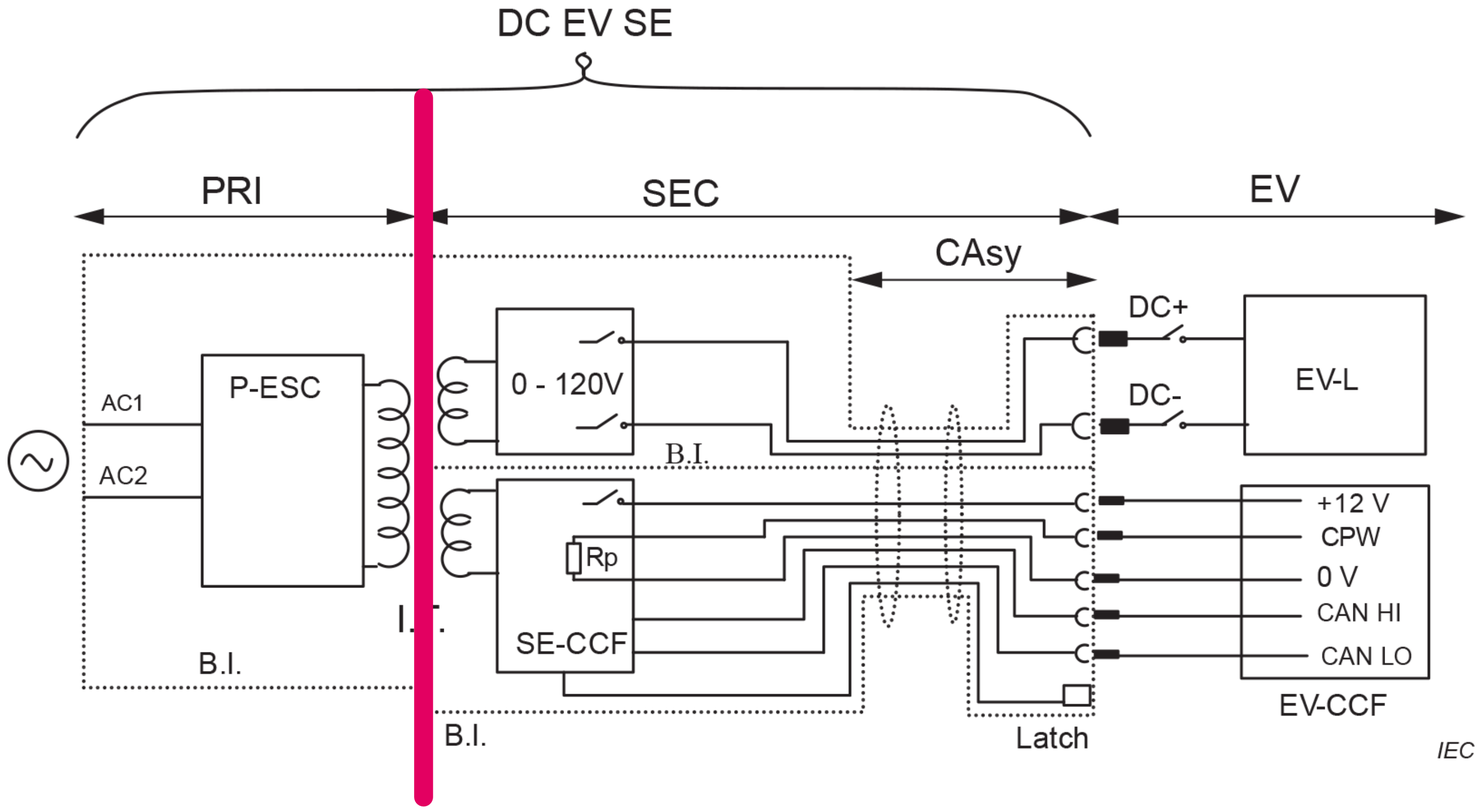
IEC61851-3 series

- "Light" electric vehicles



Electrical separation

- IEC61851-25



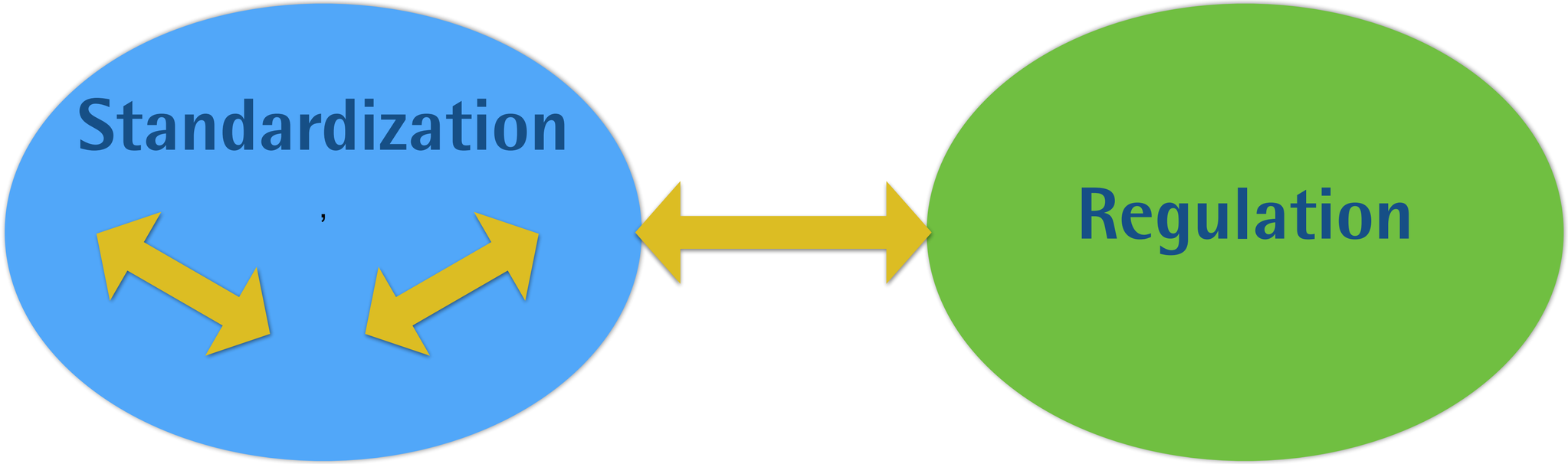
Wiring regulations

- Approaches vary by country
- France: national standard
- US: National Electrical Code (NFPA)
- Belgium: Law (General Regulation on Electrical Installations)
  - AREI - RGIE edition 2019
  - Forthcoming chapter on EV charging

GREI on EV

- IEC60364-722
- Mode 3 part of fixed installation
- Dedicated current path
- 30mA RCD
- External influences
- Emergency cutoff
- Provision for V2G

Interactions and dynamics



- Thank you for your attention!

- pvdbos@vub.be