Solutions for EV fast chargers
Multi purpose DC grid trolley chargers

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PRE Power Developers – Quick facts

• Founded 1984, 50 people
• High-tech industry of *Power Electronics*
• Supply modules for EV fast chargers since 2009
PRE supplies......

• **Products:**
  * power modules
  * charge controllers

• **Technology:**
  * blueprints for charger concepts
Charging solutions

- Fast charging (EVC products) 12.5kW AC/DC
Motorway charging
200–400 km / hour
Charging solutions

- Fast charging (EVC products) 12.5kW AC//DC
- Home/office DC charging (V2G products) 10kW AC//DC bidirectional
Home/Office fast charging: 100km per hour
Home/Office bidirectional V2G charging: 100km per hour – support grid – get benefits
Charging solutions

- Fast charging (EVC products) 12.5kW AC//DC
- Home/office DC charging (V2G products) 10kW AC//DC bidirectional
- Charger parks (EVDC) 25kW DC//DC (u.d.)
Charge from DC network (trolley, tram)
150kW (700km per hour)
Technology / Modular systems

- Reliability (N+1)
- Future expandable
- 2 plugs at same time
- Low acoustic noise
- 500V and 1000V DC
- Easy to service
  → lowest TCO

Image source: EVTEC
Technology / Cooling & protection of Charger

- Air cooling
- Liquid cooling
  → For compact/slim chargers
  → For invisible (under-the-ground) chargers
  → *Dust and water proof* option (IP65)

*Image source: Tritium*
Technology / ready for future batteries

• Current: EV batteries: 200 to 500V
• New: EV batteries: 200 to 1000V (Porsche Taycan)
• Future: 1400 V DC / 800kW – competition for Trolley systems?

• Higher battery voltage
  → Lower charging current
  → Thinner/Lighter cables

• Image source: Porsche
Technology / DC charging cables

- **Today:** 200A natural cooled
- **Coming:** 500A liquid cooled
- **Innovation:**
  - 400A DC *natural* cooled

Image source: Phoenix contacts
Example 150kW Espresso & Charge

- 20kW to 150kW, in steps of 10kW
- DC output: 170-1000V, up to 400A
- Charging multiple cars simultaneously
- CHAdeMO (2), CCS (2) and AC (2) output
- Dynamic power management
- Air cooled cable (400A) - proprietary
- Optional DC storage

Image source: EVTEC
DC storage / 500kW bidirectional – example

- Battery: 700 V DC
- Trolley grid: 700 V DC (over voltage category III)
- Power: 500kW bidirectional (50 modules)

Features:
- Modular reliability
- Galvanic isolation
- 98% efficiency, from 2kW to 500kW
- DC charging from battery
- Solar charging to battery
PRE’s working area and industries

- Solar inverter companies
- AGV companies (fast chargers)
- Marine cathodic protection companies
- Water treatment (Chlorine, UV) companies
- Explosion hazardous areas (chemical plants)
- Stand-alone energy supply companies (inverters)

Since 2009:
- Several charger companies
  (EVTEC, ABB, Delta Europe, etc.)
PRE’s strategy

- One stop shopping – the best solution for every charger
- Services: Reference designs for chargers, up to 500kW
- Reliable supply (multi-source) for manufacturing

Key success factors:
- PRE’s leading in innovations and patents
- Vertical understanding up to the end product/customer
- Anticipate on Change.. the energy market, energy transition, standardization
Market of Electrical energy

- **Generation:** 0.03 to 0.06 EURO per kWh
- **Consumer rate:** 0.25 EURO (flat rate) → 6 times cost price!
  
  DC charging: 0.29 – 0.59 EUR per kWh (Fastned)

- **Today:** Month price - based on highest month peak
  (= Punishment system)

- **Future:** depend on supply and demand, and congestion
  (= Reward system)
V2G in Europe

- Ovo Energy (UK)
- Newmotion
- OEM’s
- Nissan
- Mitsubishi
PRE’s innovations

- Full range of SiC converters for any charger
- Future (standardization) proof
- Reliable modular concept
- Patents

Examples:
- *Reactive* power capability
- Vehicle to grid (V2G) converters
- Integrated solution: V2G + direct solar charging
V2G + direct solar charging / features...

- Zero-energy dwelling: *no* grid interaction (8 months)
- Cost reduction (50%) for PV solar investment
- No Solar grid entry, *no* taxes
- Charge EV or HES
Fast charging solutions / summary

- Motorway charging: 12.5kW AC/DC module
- Home / office charging: 12.5kW AC/DC module
- Home / office V2G charging: 6kW / 10kW bidirectional module
- Trolley catenary charging: 15kW DC/DC module
- Charger parks: 15kW DC/DC module
- Energy storage systems: 10kW bidirectional module

Datasheets: PRE power developer products
Summary PRE power developers

• Innovative, leading product portfolio to serve OEM charging companies
• Fast charging from trolley/tram catenary system: (cost) efficient solution
• Thank you for your attention!
PRE on the web – links..

- Products PRE power developers
- LinkedIn
- Facebook
- Flyer