CAPACITORS FOR ELECTRIC VEHICLE BATTERY CHARGER APPLICATIONS
An Introduction to EV Chargers for Autos and Light Trucks

There are three basic types of Electric Vehicle Charging Stations:

- **Level 1**, Residential Charging: 120-Vac - Charging Speed (range): 3 to 5 miles per charging hour*
- **Level 2**, Residential, Public Charging: 208-Vac to 240-Vac - Charging Speed: 12 to 80 miles per charging hour*
- **Level 3**, Commercial, Public Charging: 400-Vac to 900-Vac (DC Fast Charge & Supercharging) - Charging Speed: 3 to 20 miles per charging minute.

*When powered from the grid.*
High Performance Capacitors are Essential for EV Chargers

Capacitors are critical components used in inverters and converters for all types of Electric Vehicle Charging Stations:

- Grid-powered Level 1 and Level 2 chargers do not require AC to DC conversion, however solar-powered Level 1 and 2 chargers use an inverter, and require a variety of capacitors, including:
  - DC Input Filter Capacitors
  - DC Link Capacitors
  - AC Output Filter Capacitors

- Level 3: DC fast chargers use AC to DC conversion requiring power capacitors:
  - AC input filter capacitors
  - DC link capacitors
Solar-Powered Inverter EV Charging System (Levels 1 and 2)

Supercapacitors are used in combination with batteries for energy storage from solar inverters.

**DC Input Filter Selection**
DCMC, 380LX, 381LX

**DC Link Selection**
550C, 947D, 944U, BLH, Custom

**Snubber Selection**
SCD, PMB, 940C

**AC Harmonic Filter Selection**
ALH, PC, PFCH

**Supercapacitor Selection**
DGH, DSF
Grid-Powered EV Charging System (Level 3)

220 VAC LINE

DC Link Selection
550C, 947D, 944U, BLH, Custom

AC Harmonic Filter Selection
ALH, PC, PFCH

AC INPUT FILTER

AC-TO-DC RECTIFIER

DC LINK

DC – HVDC VARIABLE

Level 3 chargers require higher power components.

CONTROL CIRCUIT
LEVEL 3 20kW to 240kW

CONTROL SIGNALS

METERING / BILLING

Level 3 chargers require higher power components.
CDE Capacitors at a Glance for Inverters and Converters

CDE is recognized as a global leader in the design and manufacture of capacitors for all stages of power conversion for standard and custom solutions.

https://www.cde.com/solutions/inverters
Custom DC Link Capacitors for Level 3 EV Charging Stations

CDE has the capability to produce custom DC link capacitors, optimized for power inverter/converter EV charging systems.

- Module designs, engineered to meet mechanical and electrical requirements of the application, including high energy and high-current density
- High capacitance values available
- Low inductance: <5 nH achievable
- Very high ripple current: 100's of amperes (rms)
- Self-healing and low-loss dielectric system
- Metal or insulated plastic cases available
- Advanced capacitor performance modeling based on customer’s application

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Capacitance Range:</td>
<td>Designed for specific application</td>
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<tr>
<td>Voltage Range:</td>
<td>450 Vdc to 1600 Vdc</td>
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<tr>
<td>Operating Temperature:</td>
<td>-40 ºC to +105 ºC</td>
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<tr>
<td>Life Expectancy:</td>
<td>200,000 hours typical</td>
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Useful Links and Contacts

Cornell Dubilier Website Homepage
https://www.cde.com/

CDE Inverter Solutions
https://www.cde.com/solutions/inverters

CDE Custom DC Link Product Brief

CDE Custom DC Link Solutions

CDE Sales Rep Contacts
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