PACIFIC POWER SOURCE

EV Charging Test Solutions
DC Fast Charging, OBC, EVSE, V2G, V2H

Product Guide

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Product Guide

EV Charging Test Solutions

Charging Modes/Levels

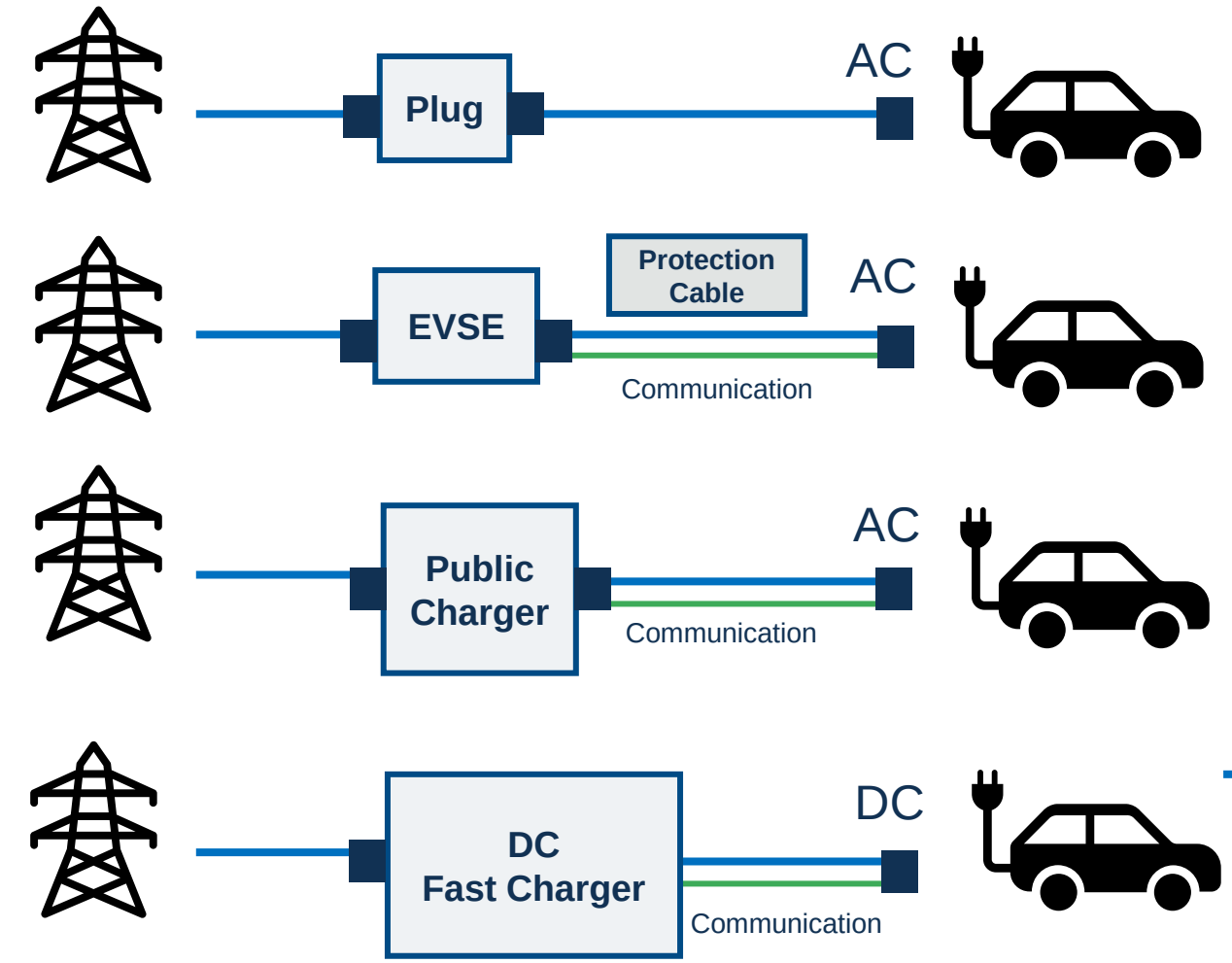
IEC 61851-1 - the International standard for electric vehicle conductive charging system defined 4 Modes of EV charging.

- Mode 1 – Very Slow AC (residential)
- Mode 2 – Slow AC (residential)
- Mode 3 – Semi-Fast AC (public charger)
- Mode 4 – Fast DC (public charger)

SAE defines these charging modes as levels

- Level 1 = Mode 1
- Level 2 = Modes 2 and 3
- Level 3 = Mode 4

EV Charging Modes



Mode 1 – Very Slow AC Charging

- Standard AC outlet (16A max)
- Direct to onboard charger (OBC)
- No Communication

Mode 2 – Slow AC

- Home charging (32A max)
- Uses EVSE & OBC
- Protection via cable signaling

Mode 3 – Semi-Fast AC

- Faster AC charge (80A max)
- Fixed public charging stations & OBC
- Signaling and communication

Mode 4 – Fast DC Charging

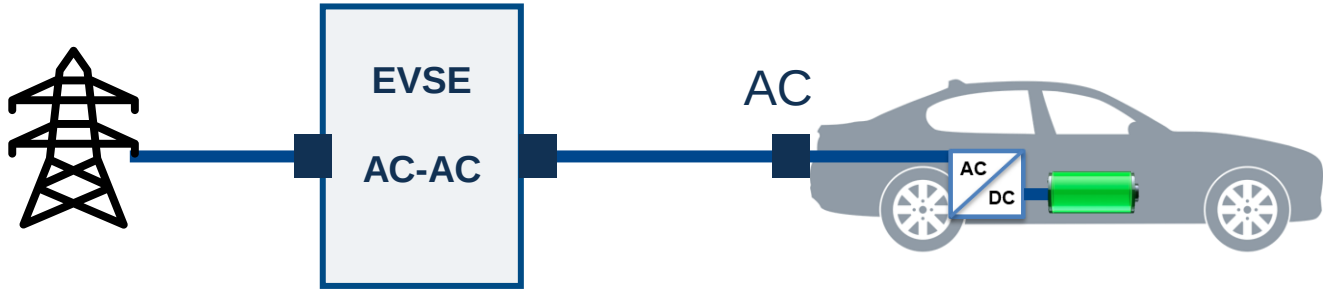
- Fastest charging mode (50-300kW)
- Direct to battery (bypasses OBC)
- Signaling and communication

AC vs. DC Charging

Mode 2 /Mode 3

Slow to Semi-Fast AC Charging

- Lower infrastructure cost, higher availability
- OBC can reduce max charging rate
- Mode 2 – Residential charging - 6kW to 22kW
- Mode 3 – Public station - 6kW to 44kW
- Faster charging controlled with communication

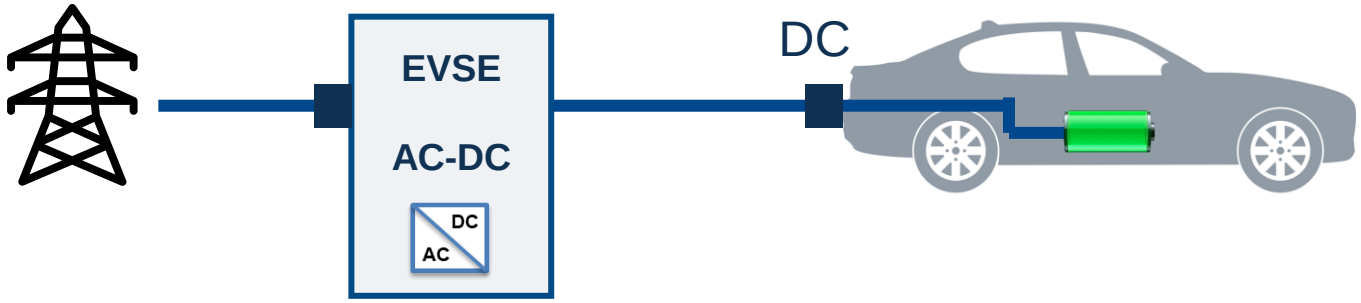


AC Charging Modes 2, 3: Alternating Current (AC) is supplied to the onboard charger (OBC) which is the battery charger.

Mode 4

DC Fast Charging

- Direct to battery charging (no OBC)
- Higher infrastructure cost, higher complexity
- Requires communication controls
- Suitable for public charger stations
- Can be very high power > 300kW

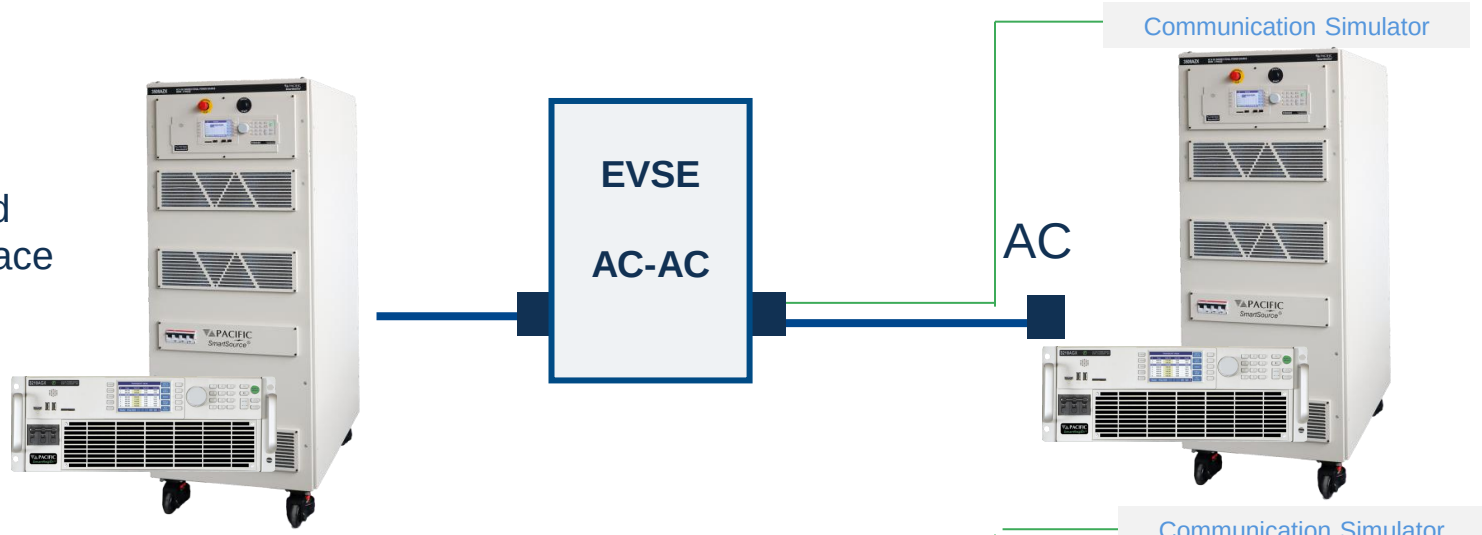


DC Charging Modes 4: DC directly charges the battery.

Charging Modes

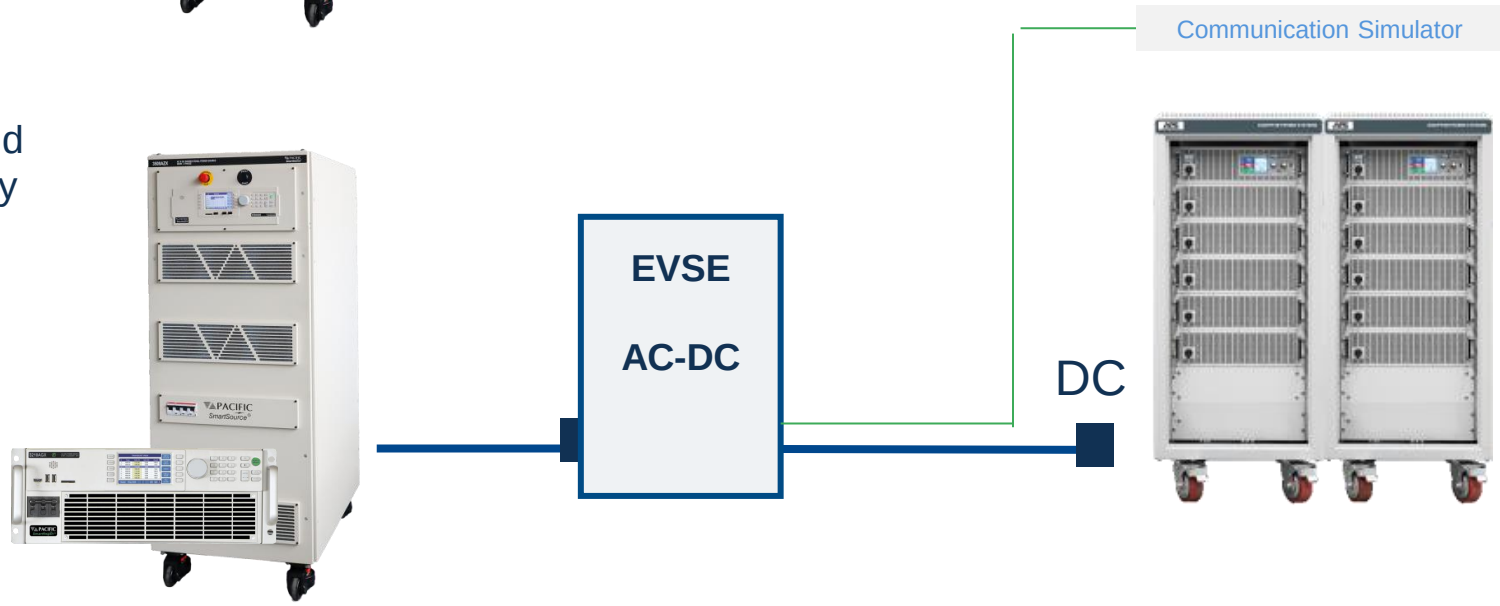
Mode 1, 2, 3 – AC to AC Charging

- RSG to emulate the utility grid
- RLS to simulate EV AC interface



Mode 4 – DC Fast Charging

- GSZ to emulate the utility grid
- DC to emulate the EV battery



EV Charger Testing

Fast Charger, OBC, EVSE, V2G & more

Level 1/ Mode 1 – Very Slow AC Charging

Standard AC outlet (16A max)
Direct to onboard charger (OBC)
No Communication

Level 2/ Mode 2 – Slow AC

Home charging (32A max)
Uses EVSE & OBC
Protection via cable signaling

Level 2/ Mode 3 – Semi-Fast AC

Faster AC charge (80A max)
Fixed public charging stations & OBC
Signaling and communication

Level 3/ Mode 4 – Fast DC Charging

Fastest charging mode (50-300kW)
Direct to battery (bypasses OBC)
Signaling and communication

EV Charging Test Solutions

Fast Charging

EVSE

On-Board Charger (OBC)

Vehicle 2 Grid

Key Advantages

- Modular & scalable power
- Fast transient capabilities
- Regenerative power

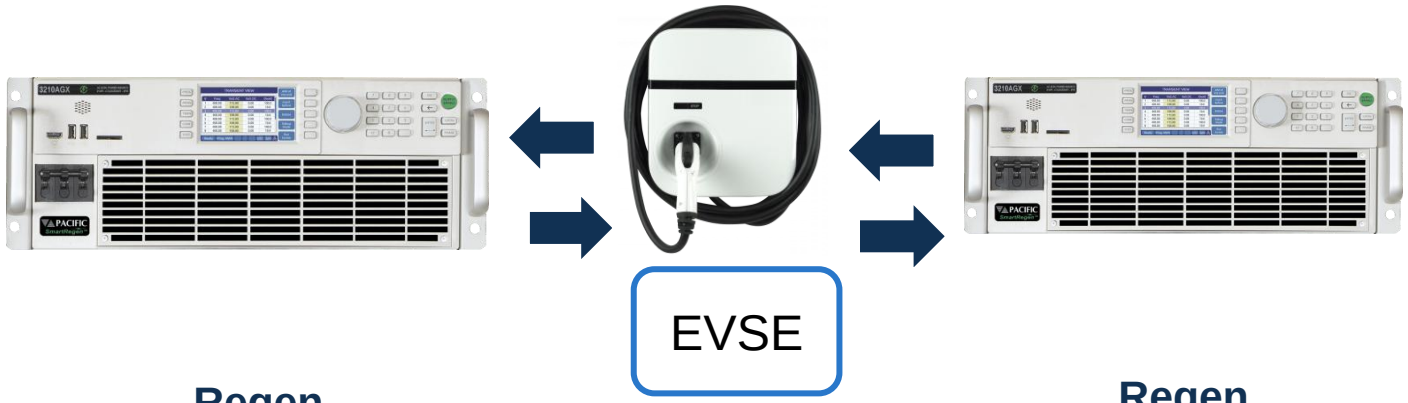
Test Solutions

- Regen Grid Simulator
- Regen 4 Quadrant AC / DC Load
- Bidirectional DC Power Source, Battery emulator

Mode 2: EVSE
6kW to 44kW

Mode 3: AC Public Charger
6kW to 44kW

Grid Simulation & AC Charging



Regen
AC Grid Sim

Regen
AC/DC Load

- Regenerative Grid Simulator simulates the utility grid
- Regenerative 4 Quadrant AC Load emulates the AC loading

Mode 4: DC Fast Charger
50-350kW

DC Fast Charger

Regen
AC Grid Sim

DC Fast Charger

Battery
Emulator

Regenerative Grid Simulator
simulates the utility grid

On-Board Charger

Grid Simulation

Regen
AC Grid Sim

Onboard Charger

Battery Emulator

- Regenerative Grid Simulator simulates the utility grid
- Battery Emulator emulates the battery

Vehicle to Grid

Grid & AC Load Simulation

Regen
AC Grid Sim

V2G
EVSE

Optional Load or
Regen 4 Quadrant Load

- Regenerative Grid Simulator simulates the utility grid
- Regenerative 4 Quadrant AC Load emulates the AC loading

Regenerative Series: The SmartSource Differentiation

Regenerative > 90%
Greater than 90% energy efficiency. Source & sink to emulate bidirectional power.

Powerful Hardware
Robust SiC topology for advanced applications.

Constant Power Voltage Range
Seamless testing over a wide voltage range without power interruption. Test wide variety of products.

Ultra Flexible Output Configuration
Simultaneous AC and DC operation per phase AND automatic switching of outputs provides extensive flexibility.

SmartSource Suite Control
Embedded Real-Time Remote-Control Platform to easily create, modify, and run test programs.

Programming Capability
Multiple control options, intuitive user interface, powerful waveform tools, and simplified set-up saves time.

Modular & Scalable Power
Modular power up provides future-proofing. Upgrade modules later if needed.

Optional PHIL & Load
Optimized for PHIL applications with high-speed analog I/O and low latency. (AZX/GSZ/ELZ Series)

Optional AC/DC load capability.

Smart Design & Safety
Built-in galvanic isolation, protection limits, and air-filters provide added protection. Continuous self-calibration. Compact and Mobile-friendly cabinets.

All-in-1 Regenerative Power Source and Load

Multi-Functional Test System for Testing Wide Range of Applications

AC/DC Voltage Source, Current Source, Power Supply, Load

- AC, DC, AC+DC
- Ultra Configuration Flexibility
- High Frequency Range
- Current Source Mode
- Load Option
- PHIL Option (AZX Series)

AGX Series

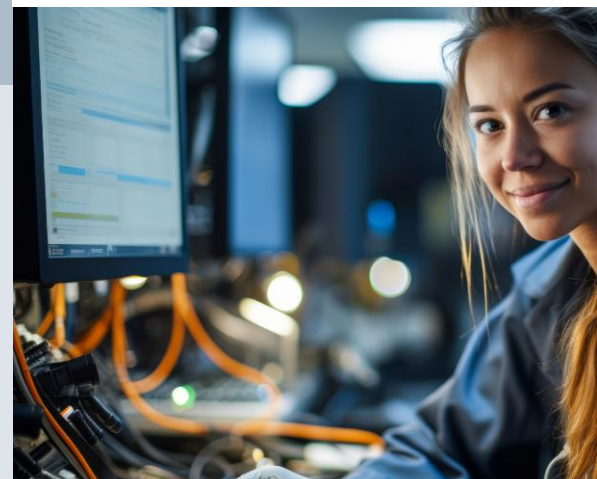
6kW up to 252kW

- Dual cabinets up to 252kW
- Voltage: 0-350 VAC L-N 1ø / 0-606 VAC L-L 3ø; -500Vdc to +500Vdc
- 15 – 1200Hz; Extended Option -1 – 3000Hz
- High Power Density in Compact 4U Chassis

AZX Series

30kW up to 550kW

- 30, 45, 55kW, paralleled up to 550kW
- Voltage: 0-240 Vac L-N / 0-415 Vac L-L and 0-480 Vac-LN / 0-830 Vac-LL; 0-340 Vdc and 0-680 Vdc
- 15-1000Hz; Extended 1 – 10,000Hz
- 3 DSP controllers, PHIL Amplifier Mode Option



Regenerative Grid Simulators

Ideal for testing Grid-Tied devices (PV inverter, ESS, EV Chargers V2G) or microgrids and PHIL applications

Grid Simulator with Optional Load or PHIL

- AC, DC (AC+DC Option)
- Ultra configuration flexibility
- Exceptionally High Currency
- Harmonics & Inter-harmonics
- Load Option
- **PHIL Option (GSZ Series)**

Test to regulatory standards (e.g. IEEE 1547, UL 1741, IEC 61000-3, IEC 61000-4, etc.)

RGS Series

12kW up to 252kW

- 12kW up to 168kW; Dual cabinets up to 252kW
- 0-350 VAC L-N 1ø / 0-606 VAC L-L 3ø; -500Vdc to +500Vdc
- 15 – 200Hz
- High Power Density in Compact 4U Chassis

GSZ Series

30kW up to 550kW

- 30, 45, 55kW; Parallel cabinets up to 550kW
- Voltage: 0-240 Vac L-N / 0-415 Vac L-L and 0-480 Vac-LN / 0-830 Vac-LL; 0-340 Vdc and 0-680 Vdc
- 15 – 200Hz
- 3 DSP controllers, PHIL Amplifier Mode Option

Regenerative Electronic Loads

Ideal for AC & DC Loading Applications

High Power Regenerative 4 Quadrant Load

- AC, DC
- Ultra configuration flexibility
- Exceptionally High Currency
- Harmonics with Inter-harmonics Option
- **RLC Circuit Emulation Modes (ELZ Series)**
- **PHIL Option (ELZ Series)**

RLS Series

6kW up to 252kW

- 6kW up to 168kW; Dual cabinets up to 252kW
- Voltage: 0-350 VAC L-N 1ø / 0-606 VAC L-L 3ø; -500Vdc to +500Vdc
- 15 – 1200Hz
- High Power Density in Compact 4U Chassis

ELZ Series

30kW up to 550kW

- 30, 45, 55kW; Parallel cabinets up to 550kW
- Voltage: 5~220Vac & 5~440Vac; 0~335Vdc & 9~650Vdc
- 15-1000Hz; Extended 1 – 10,000Hz
- 3 DSP controllers, PHIL Amplifier Mode Option

Battery Emulator

Ideal for Battery Emulation or DC Loading Applications

High Power Regenerative, Bi-Directional DC Power Supplies

- 2 quadrant source and sink
- Modular, scalable power
- Ultra configuration flexibility
- Parallel up to 32 cabinets
- Constant Power, True Auto-ranging

APS DCB SERIES

2.5kW, 5kW, 7.5kW 10kW, 15kW or 30kW

- Voltage: 0 – 2000Vdc
- Current: 0 – 1000Adc

Bi-directional DC power supply/load - two quadrant (source and sink) in 3U or 4U chassis.

APS DCB SERIES CABINETS

30kW up to 450kW

- Voltage: 0 – 2000Vdc
- Current: 0 – 15,300Adc

High Power options over 15kW, two or more DCS or DCB Series DC power supplies can be paralleled up to 8 cabinets.


PACIFIC
POWER SOURCE
The Power of Expertise.
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