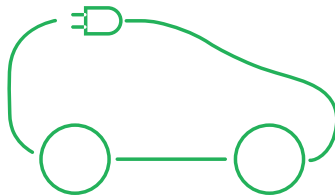


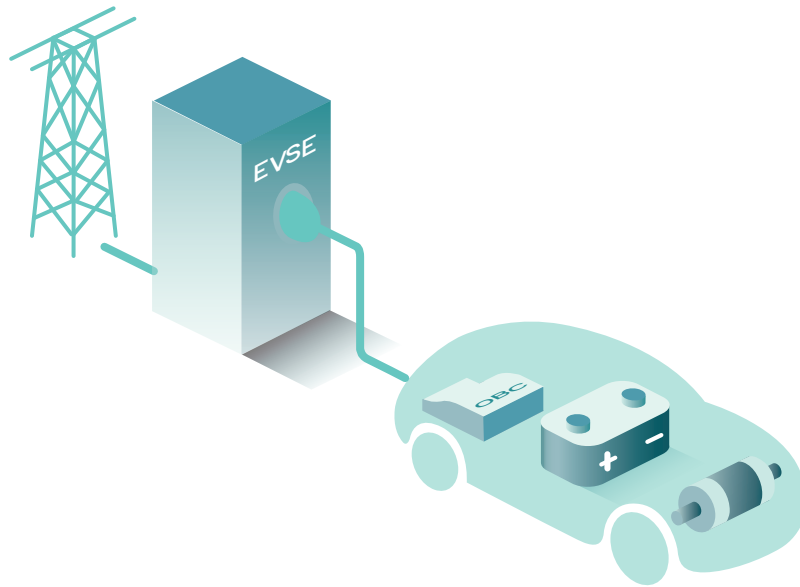


SOLUTIONS FOR ELECTROMOBILITY



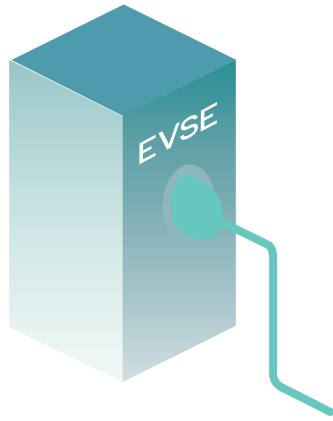
Electromobility Platform

Mobility is one of the main challenges of the 21st century. Environmental concerns are driving a growing demand for more efficient and cleaner means of transportation. Advances in the field of electromobility are mainly linked to the development of battery technology and power electronics for charging, discharging and driving electrical motors.



Our knowledge and experience is your best partner in e-mobility test platforms.

CINERGIA has thorough experience in providing solutions for R&D, Functional and End of Line tests in this field. Our products are continuously improved from the experience gained by applying our technology to many e-mobility projects and working closely with our customers. This technical note describes the functions and characteristics of the main devices involved in the EV-Charging process and the testing solutions CINERGIA can propose.



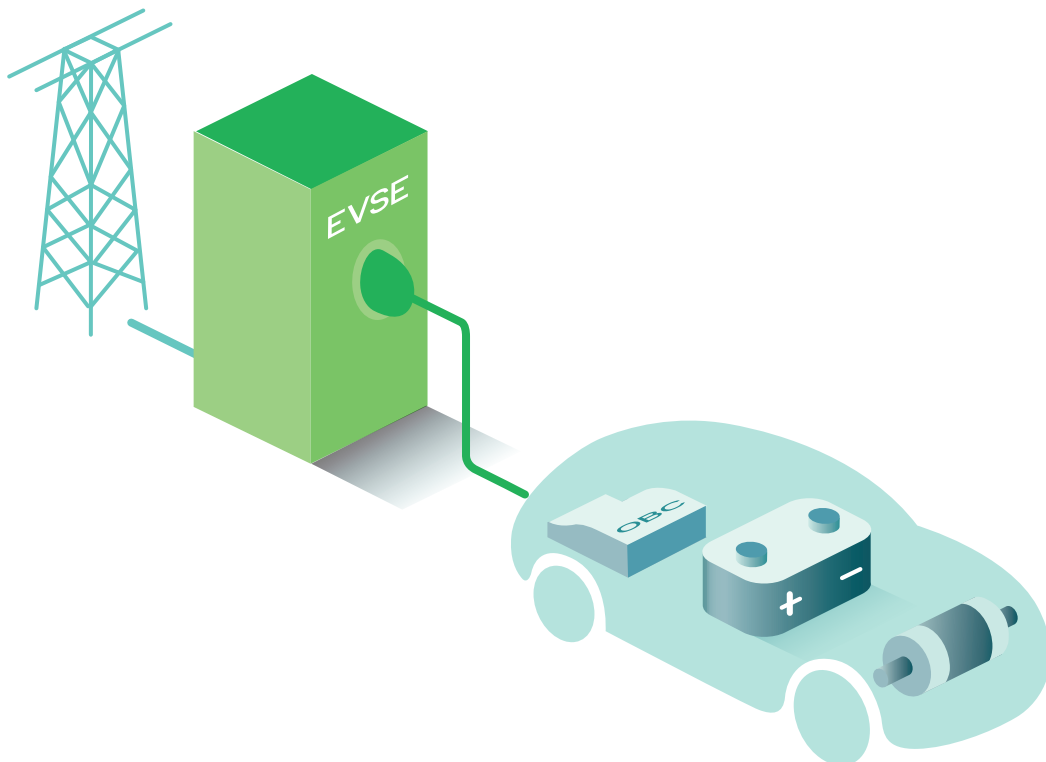
Off-board EV Charger

Test platforms

EVSE manufacturers need to test their units from the AC grid side and the EV output side. Our **Regenerative AC Grid Simulators (GE)** can be used to provide stable and clean voltages, as well as to generate worldwide grids. When needed, the Grid Simulator will create disturbances following IEC 61000-4/11/13/14/28 standards.

Our **Regenerative Electronic Loads (EL)** and **DC Converters (B2C+)** will emulate the electrical behaviour of an EV both in AC or in DC to test the output of a charger or a mode 2 cable.

Our combined **All-in-one products (AC/DC, GE/EL)** offers the most cost-effective solution. For applications requiring simultaneous operation, the **GE&EL AC/DC SiC-RSe**, with its **Mixed Mode** functionality, enables the independent and simultaneous use of all modes.



What charging modes exist?

The charging process of the electric vehicle has been regulated by IEC-61851, where four charging modes are defined.

Mode 1

Slow charge in AC. From a conventional, standard plug base. There is no pilot function between the vehicle and the charging point.

Mode 2

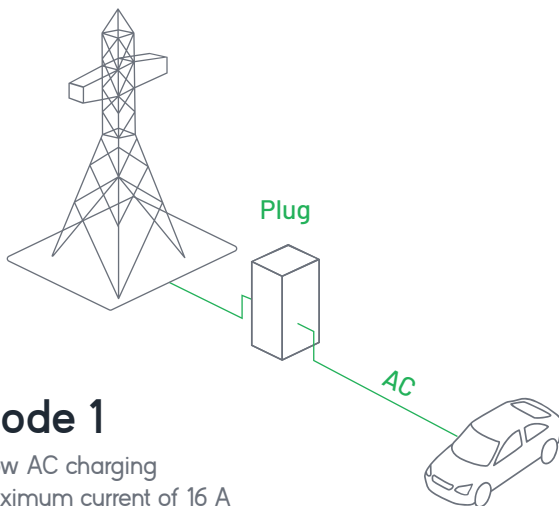
Slow charge in AC. The cable includes communications, a ground monitoring system for safety and pilot function.

Mode 3

Semi-fast charging in AC. Fixed charging point integrating communications, a ground monitoring system for safety and a pilot function.

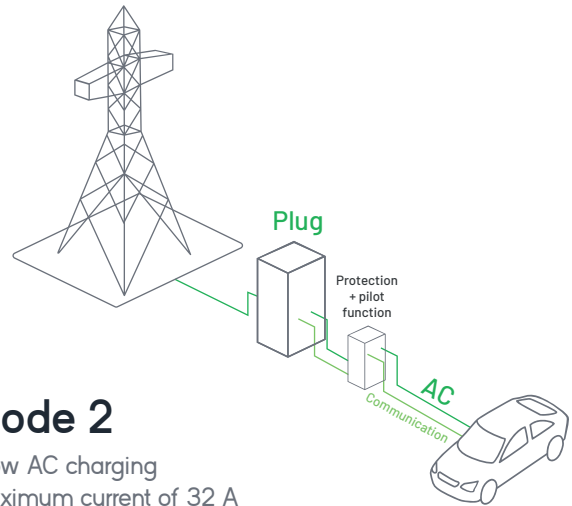
Mode 4

Slow charge in AC. From a conventional, standard plug base. There is no pilot function between the vehicle and the charging point.



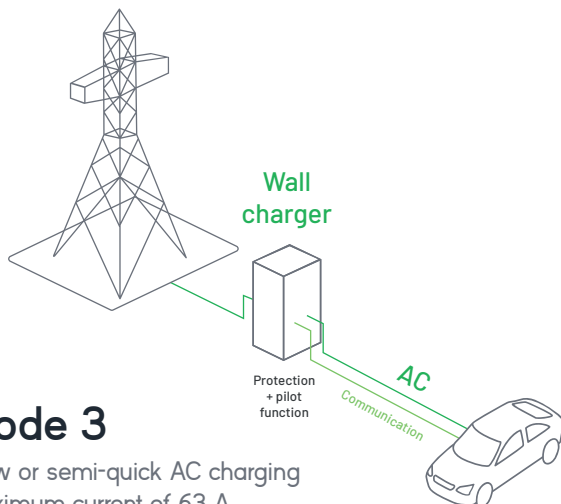
Mode 1

Slow AC charging
Maximum current of 16 A
Without communication
Standard power connections



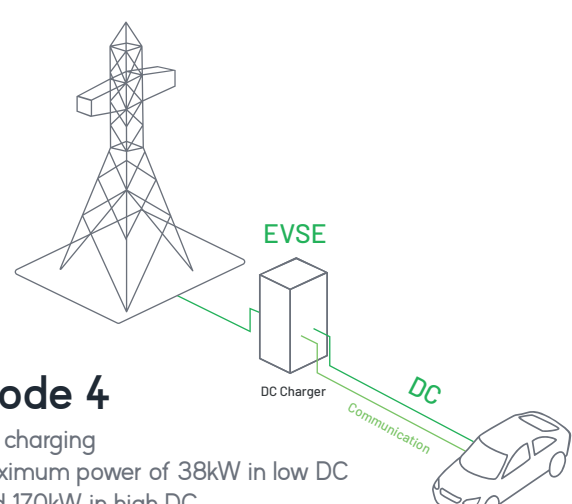
Mode 2

Slow AC charging
Maximum current of 32 A
Protection and Pilot function in the cable



Mode 3

Slow or semi-quick AC charging
Maximum current of 63 A
Protection and Pilot function integrate into the wall charging

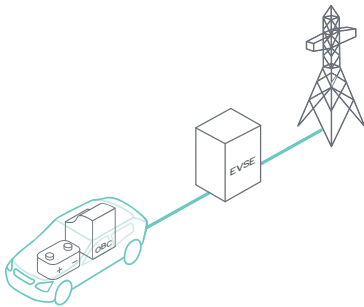


Mode 4

DC charging
Maximum power of 38kW in low DC and 170kW in high DC
Monitoring, Protection and Pilot function integrate into the charger

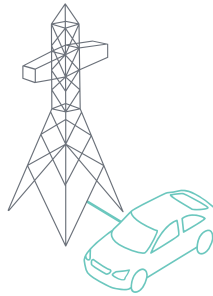
Our Solutions for

EVSE and OBC



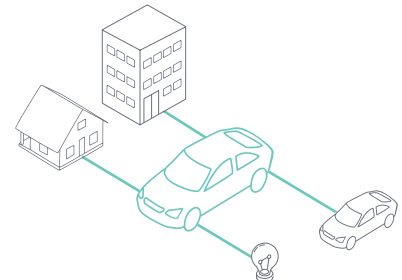
Electric Vehicle Supply Equipment is designed to charge the battery of EV in AC or DC. In AC applications the On Board Charger converts AC in DC.

Vehicle to grid (V2G)



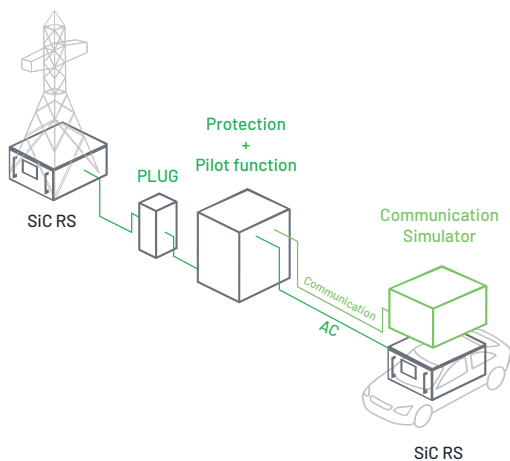
V2G is a system where EVs interact with the power grid, allowing bidirectional energy transfer between them to balance demand and supply

Vehicle to Everything (V2X)

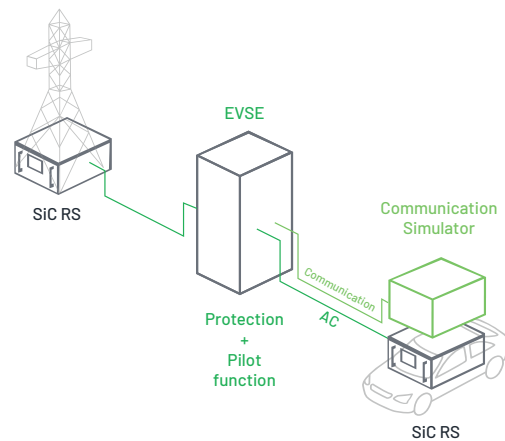


The integration of EV to the grid creates new applications as vehicle to home/building, vehicle to load, vehicle to vehicle, etc... included in V2X

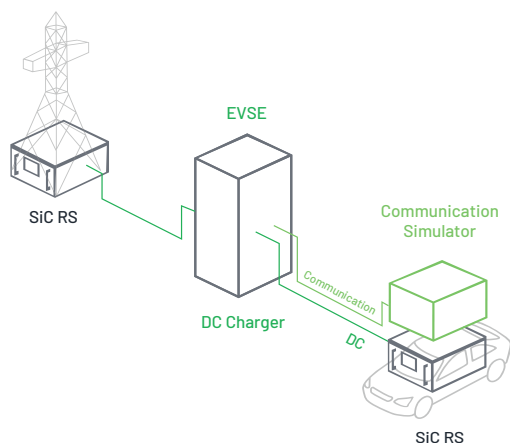
EVSE MODE 2 TEST PLATFORM FOR TYPE 2 CHARGING CABLES



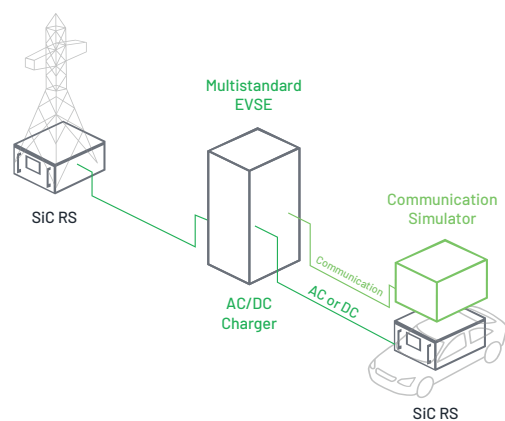
EVSE MODE 3 TEST PLATFORM FOR WALL CHARGERS



EVSE MODE 4 TEST PLATFORM FOR DC CHARGERS

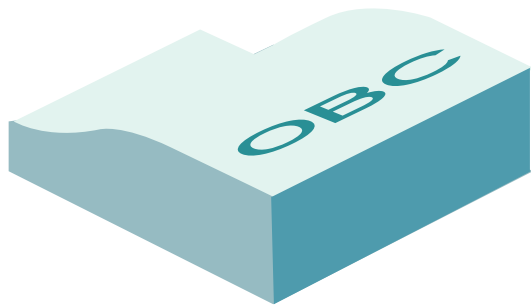


MULTISTANDARD EVSE



**SUITABLE PRODUCTS
FOR EVERY EVSE MODE**

GE AC/DC to emulate the grid
EL AC/DC to emulate the EV
GE&EL AC/DC for non-simultaneous use (suitable in all applications)
New GE&EL AC/DC SiC-RSe for simultaneous use (suitable in all applications)



On-board Charger

Test platforms

These AC to DC converters are used to charge the battery, in DC, directly from the public grid. They are embedded on the car, so they need to be light and in consequence, they are typically low power AC to DC converters. In some cases, however, the charger is part of the drive train converter allowing high power charging.

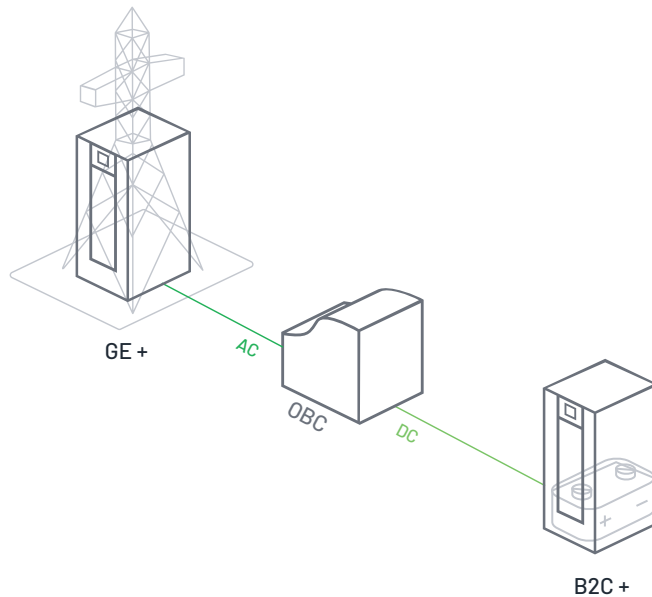
Our **Grid Simulators (GE)** are perfect to test the AC side of the charger in stable and distorted conditions and perform functional and immunity assessments. The DC side is tested using our **DC Electronic Loads (B2C+)** which include a software option to emulate the electrical behaviour of a battery.

Our devices can reduce the total power used thanks to their regenerative hardware.



Our Solutions

Test Platform for OBC charger



SUITABLE PRODUCTS

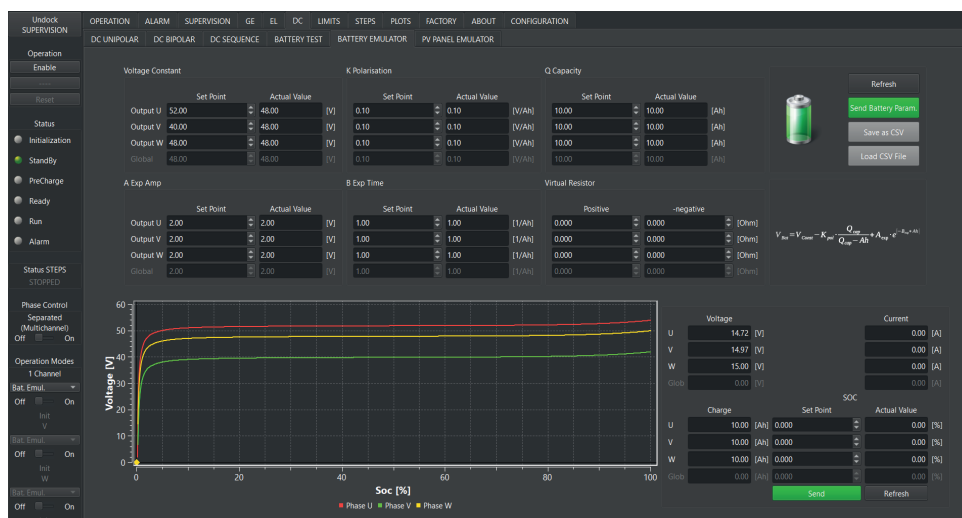
GE+ to emulate the grid

B2C+ to simulate Battery

GE+ vAC/DC for non-simultaneous use (suitable in all applications)

New GE&EL AC/DC SiC-RSe for simultaneous use (suitable in all applications)

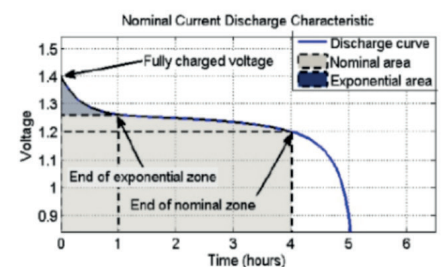
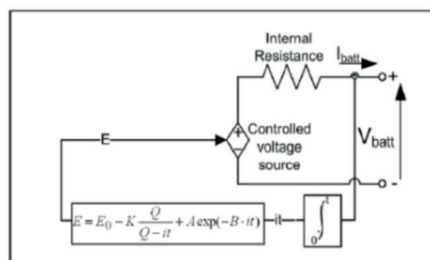
Battery Emulation



BATTERY EMULATION

The B2C+ integrates a mathematical model to emulate the voltage behaviour of a real battery pack. The output voltage changes as a function of the SOC and Current. By configuring the provided parameters, the voltage profile can be adjusted to match different technologies: Lilon, NiMH, NiCd, Pb, Flux, etc...

Our battery emulation software works with a model from O. Tremblay, L.-A. Dessaint, A.-I. Dekkiche, "A Generic Battery Model for the Dynamic Simulation of Hybrid Electric Vehicles", 2007 IEEE® Vehicle Power and Propulsion Conference, September 9-13, 2007, Arlington/Texas, USA.

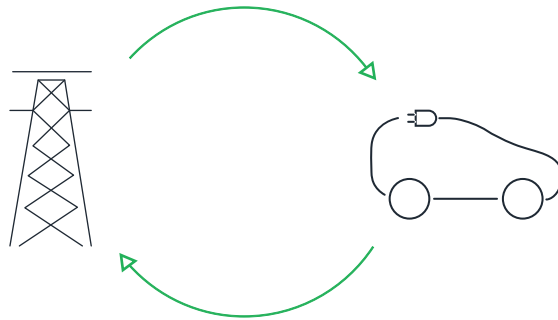


Discover our Battery Emulator: <https://cinergiapower.com/en/publications/discover-our-battery-emulator>

V2G Vehicle to grid (V2G)

V2H Vehicle to home (V2H)

Test platforms



'Vehicle to' solutions, like Vehicle to grid (V2G), Vehicle to home (V2H) and Vehicle to everything V2X), are next generation systems that convert the electrical vehicle into an active agent of the electrical grid.

These systems are able to reduce power consumption (becoming a controllable load) or to supply energy from the EV battery into the grid to provide ancillary services in high-demand scenarios. New revolutionary developments go even further in using the EV battery as the energy resource of an islanded grid.

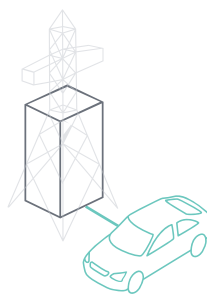
VEHICLE TO HOME



V2H

This allows energy stored in the EV battery to act as a power source for the home.

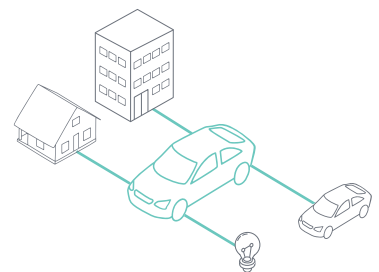
VEHICLE TO GRID



V2G

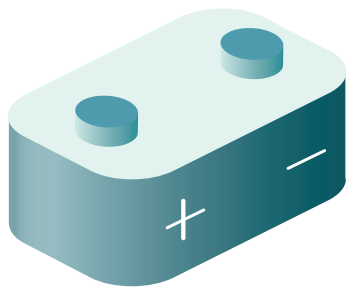
This feeds EV battery energy back into the grid, to help boost grid capacity at times of peak demand. An OVO V2G trial is currently under way .

VEHICLE TO X



V2V

One vehicle can be used to charge another vehicle, especially in an emergency situation.

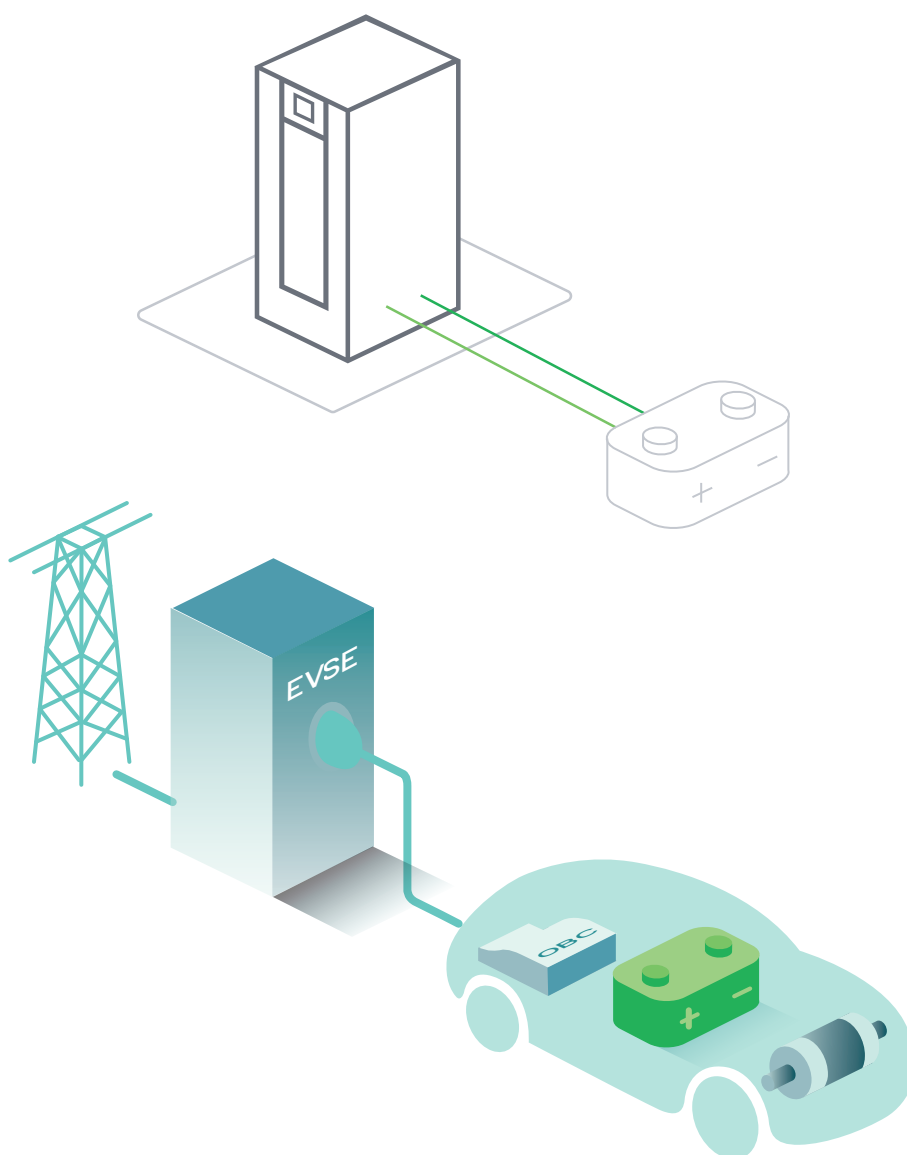


Battery

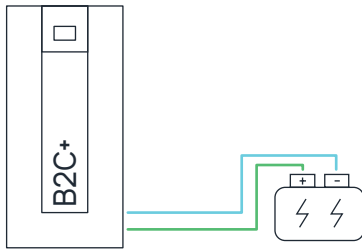
Test platforms

The constant research in the batteries field has allowed for performance improvement in terms of autonomy, density and power ratings, amongst others. A key factor in this process is testing new developments for verification and characterization of batteries.

The **Regenerative DC Bidirectional Converter (B2C+)** is CINERGIA's model specially designed to test battery packs. Through our software, advanced tests can be configured and automated for charging, discharging, cycling, ageing and characterizing. Driving profiles can be emulated by downloading .csv files.



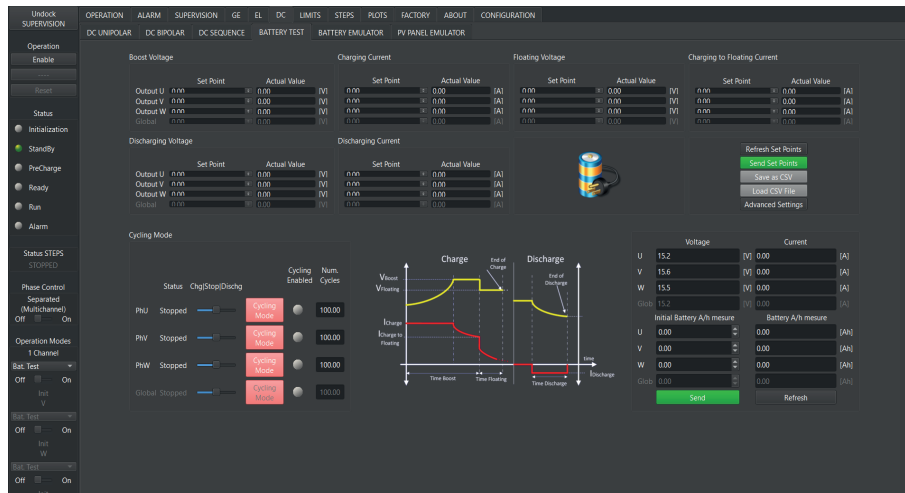
Battery Pack Testing



- Characterization
- Burn-in & Production Test
- Charger
- Discharge
- Cycling

SUITABLE PRODUCTS

B2C+ with Battery Test
& PHiL Operation Mode

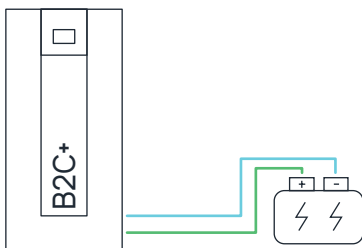


BATTERY PACK TESTING

This functionality enables the user to precisely control the charge, discharge and cycling of a Battery. Basic parameters include the charge/ discharge current, fast charge and floating voltages, while advanced parameters add Energy (Ah) and Time as transition conditions. Prof iles for each Battery technology can be saved and imported in .csv files.

Discover our Battery Pack Testing: <https://cinergiapower.com/en/publications/evaluate-the-performance-of-a-battery>

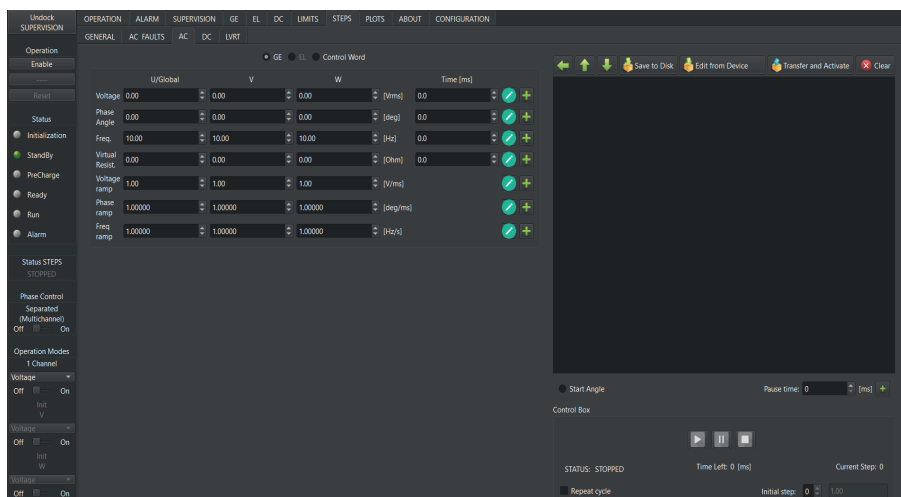
EV Drivetrain Emulation



- Drivetrain emulation
- Driving profiles

SUITABLE PRODUCTS

B2C+ with Battery Emulation Mode
B2C+ with PHiL Operation Mode
& Power Operation Mode



SEQUENCE

The User Interface Software integrates a Sequence Editor to create automatic test sequences, save them for future use and import them in .csv files. A smart datalogger can be activated to record automatically the resulting voltage and current measurements with a time resolution of 400 ms.



CINERGIA's Solutions for Electromobility

www.cinergiapower.com