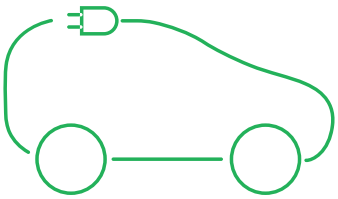
cinergia

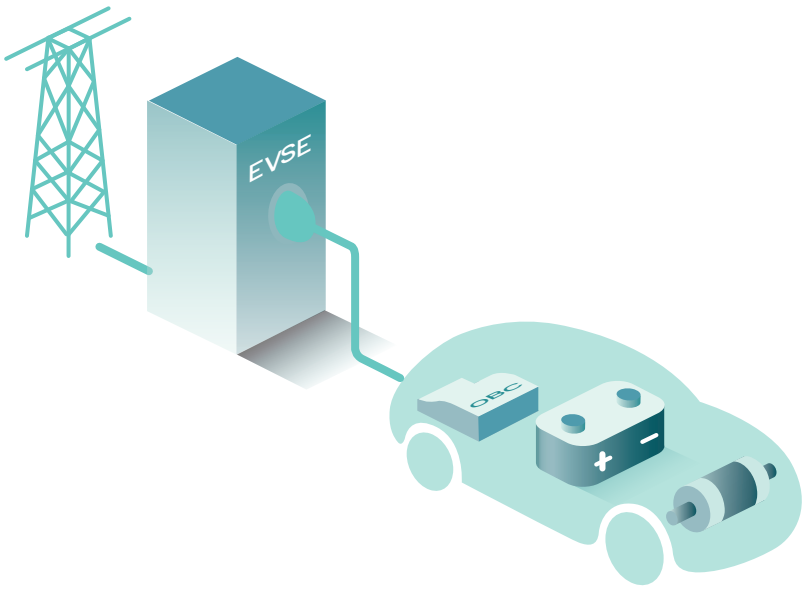
SOLUTIONS FOR ELECTROMOBILITY



www.cinergiapower.com

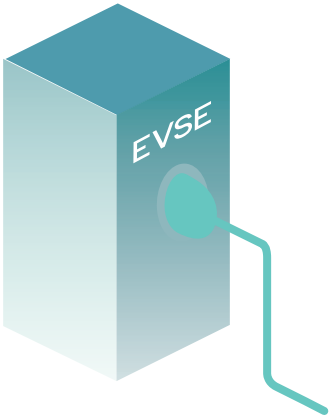
Electromobility Platform

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.

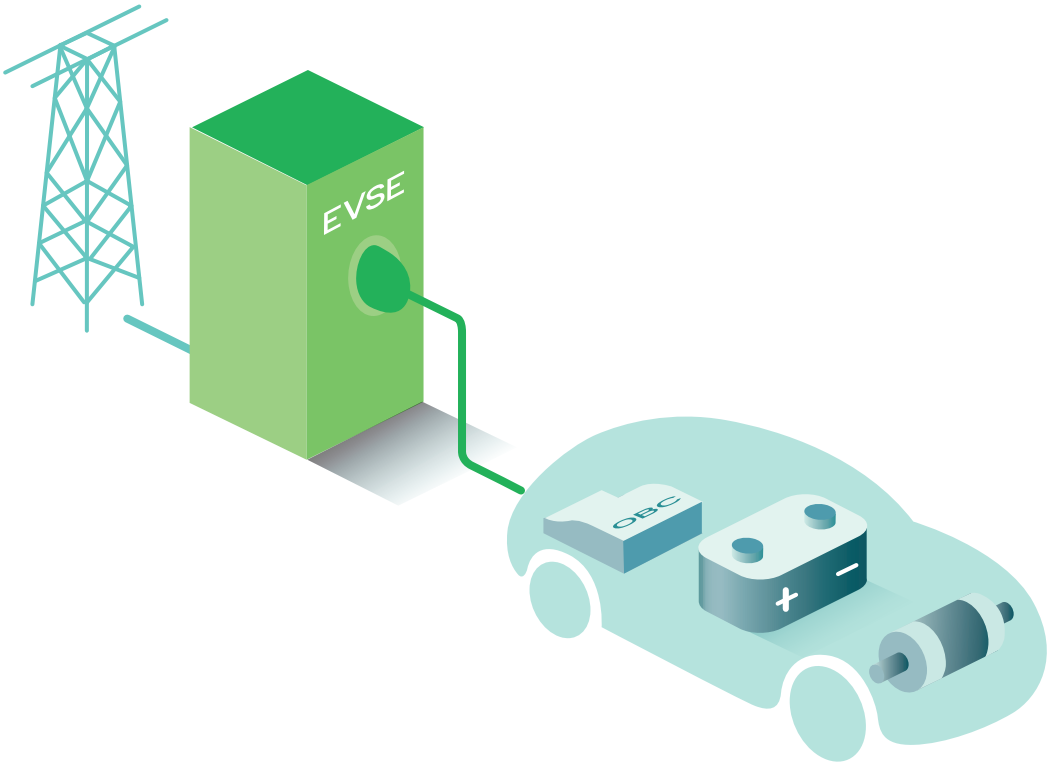


Off-board EV Charger

Test platforms

Electrical Vehicle Supply Equipments (EVSE), also called Off-board chargers, are the components interfacing the public grid to an electric vehicle. They are standardized in 4 different modes, described in the following page, depending on the power, safety functionality and communication capabilities.

EVSE manufacturers need to test their units from the AC grid side and the EV output side. Our Grid Simulator (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 fol lowing IEC 61000-4/11/13/14/28 standards. Our Regenerative Electronic Load will emulate the electrical behaviour of an EV both in AC (EL+) or in DC (B2C+) to test the output of a charger or a mode 2 cable. When simultaneity is not required, the combined. All-in-one product (AC/DC, GE/EL) offers the most cost-effective solution.



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

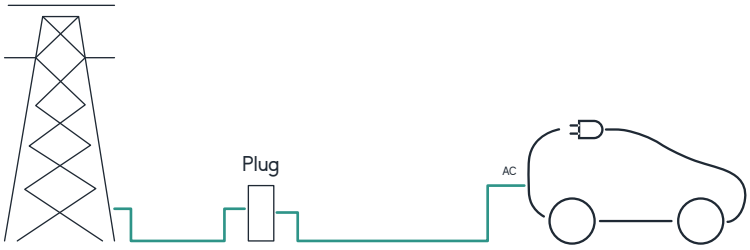
Semi-fast charging in AC. Fixed charging point integrating communications, a ground monitoring system for safety and a pilot function.

Mode 4

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

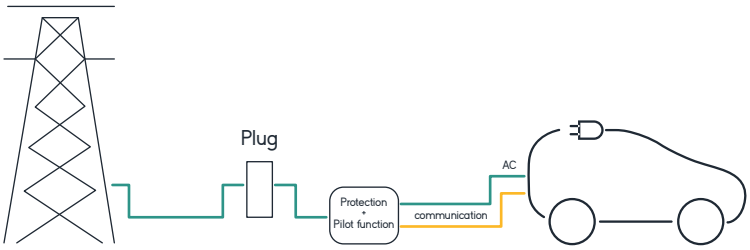
Mode 1

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



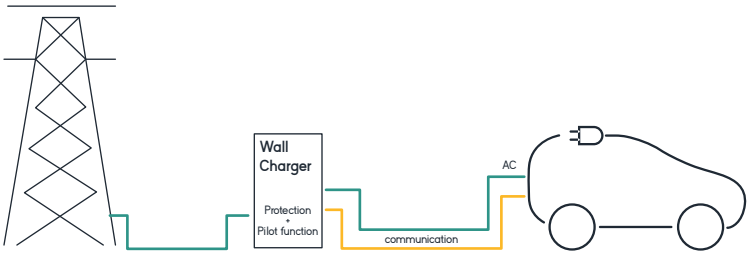
Mode 2

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



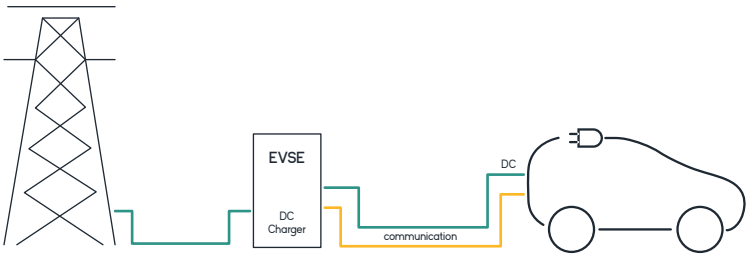
Mode 3

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



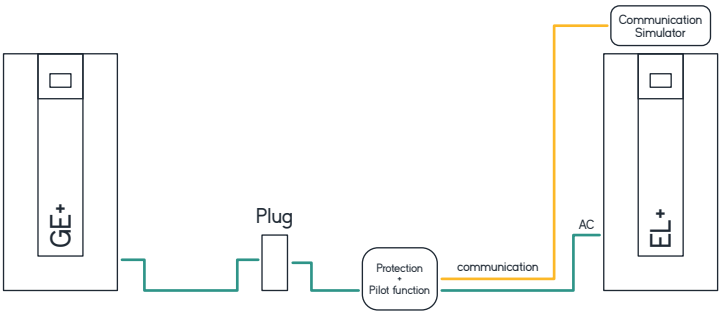
Mode 4

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

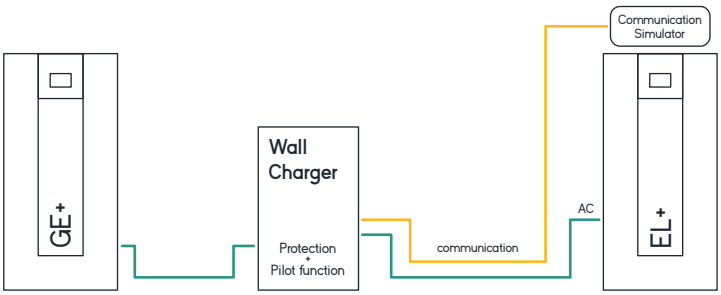
EVSE Mode 2 Test Platform for Type 2 Charging Cables



SUITABLE PRODUCTS

GE+ to emulate the grid
EL+ to simulate EV
GE&EL+ for non-simultaneous use
(suitable in all applications)

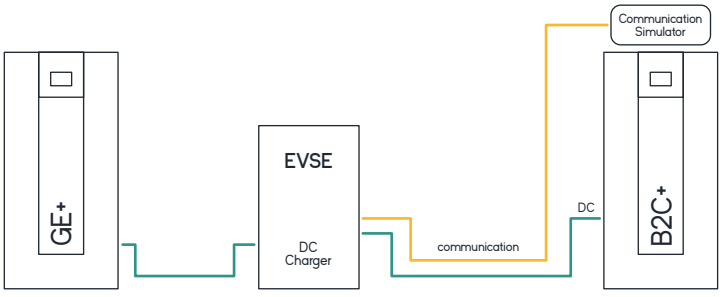
EVSE Mode 3 Test Platform for Wall Chargers



SUITABLE PRODUCTS

GE+ to emulate the grid
EL+ to simulate EV
GE&EL+ for non-simultaneous use
(suitable in all applications)

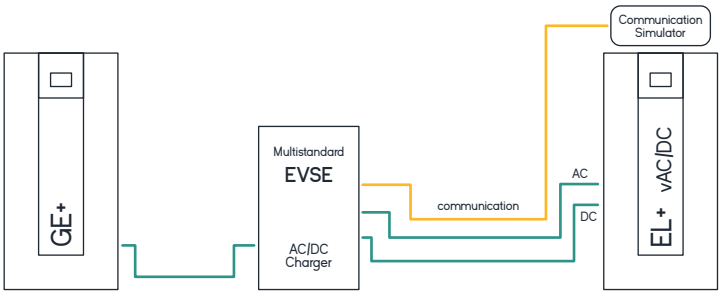
EVSE Mode 4 Test Platform for DC Chargers



SUITABLE PRODUCTS

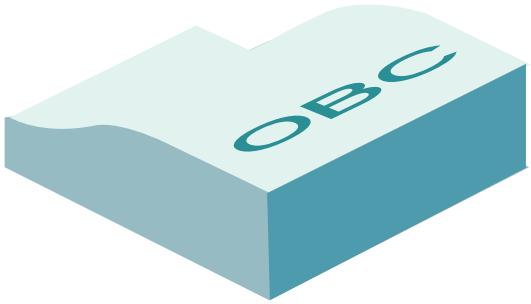
GE+ to emulate the grid
B2C+ to simulate EV
GE+ v AC/DC for non-simultaneous use
(suitable in all applications)

Multistandard EVSE



SUITABLE PRODUCTS

GE+ to emulate the grid
EL+ vAC/DC to simulate EV
GE&EL+ for non-simultaneous use
(suitable in all applications)



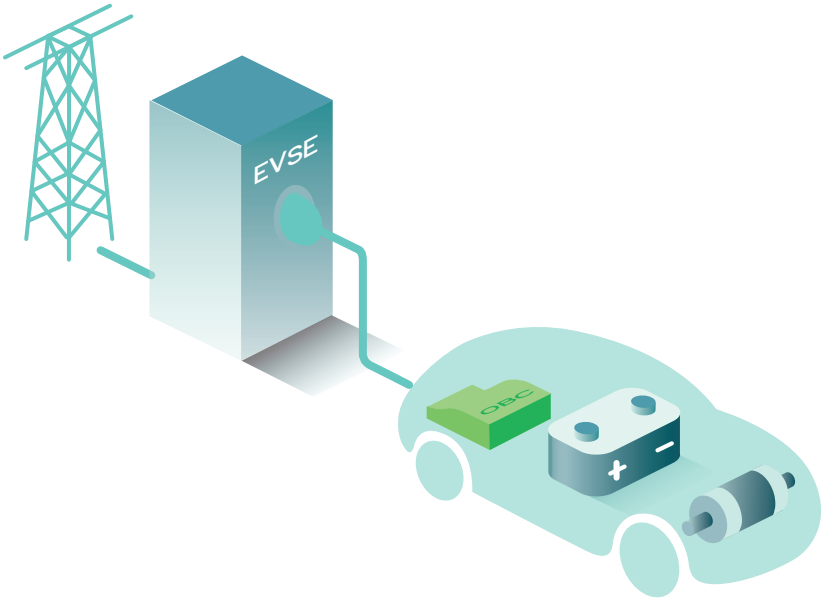
On-board Charger

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.

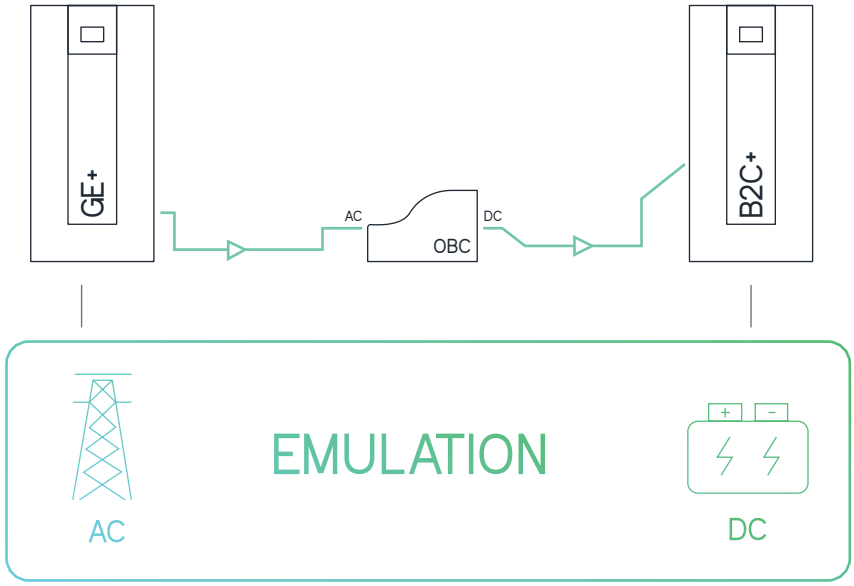
Our Grid Simulator (GE+) is perfect to test the AC side of the charger in stable and distorted conditions and perform functional and immunity assessments. The DC side is tested using our DC Electronic Loads (B2C+) which include a software option to emulate the electrical behaviour of a battery.

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



Our Solutions

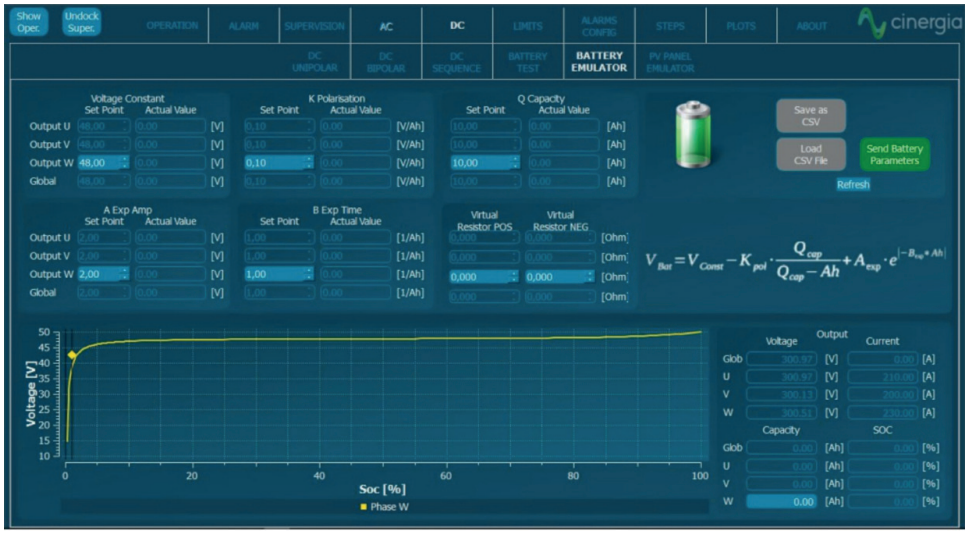
Test Platform for OBC charger



SUITABLE PRODUCTS

GE+ to emulate the grid
B2C+ to simulate Battery
GE+ vAC/DC for non-simultaneous use (suitable in all applications)

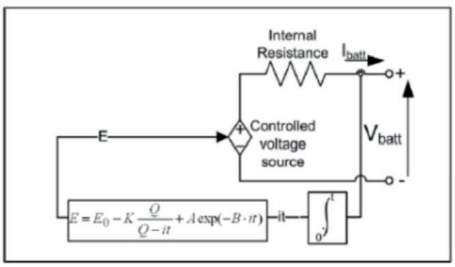
Battery Emulation

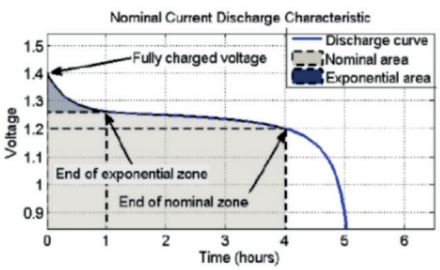


BATTERY EMULATION

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, Arl i ngton/Texas, USA.

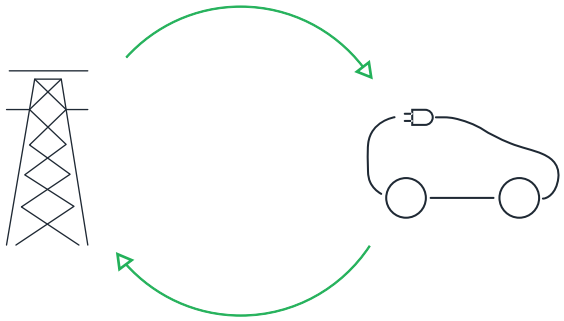




V2G
V2H

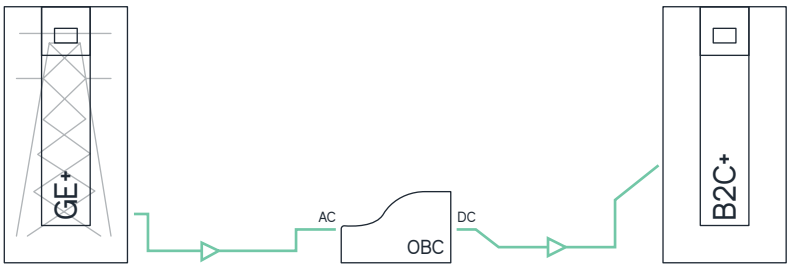
Vehicle to grid (V2G)
Vehicle to home (V2H)

Test platforms



Vehicle to grid and Vehicle to home solutions 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.

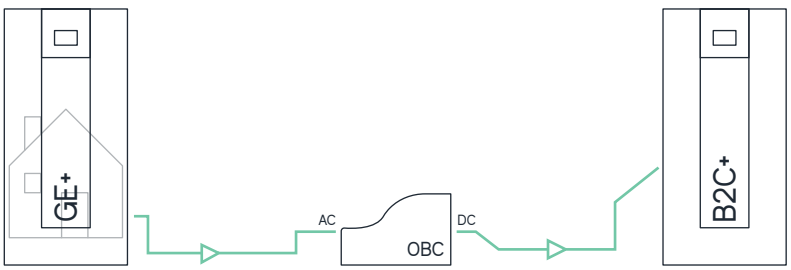
Test Platform for OBC in V2G system



SUITABLE PRODUCTS

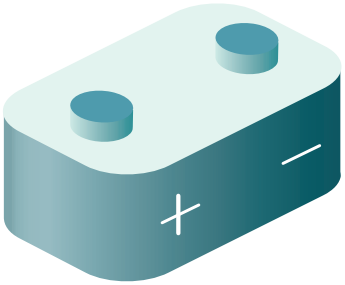
GE+ to emulate grid
B2C+ to simulate Battery
GE+ vAC/DC for non-simultaneous use
(suitable in all applications)

Test Platform for OBC in Vehicle to insulated grid



SUITABLE PRODUCTS

EL+ to emulate grid or loads
B2C+ to simulate Battery
EL+ vAC/DC for non-simultaneous use
(suitable in all applications)

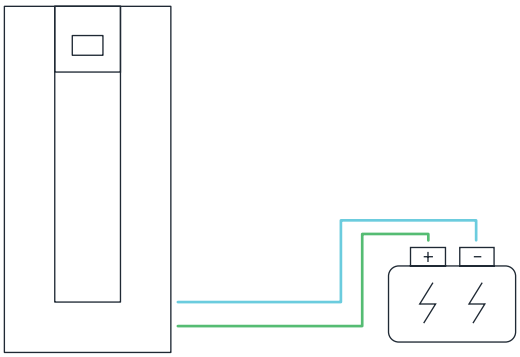


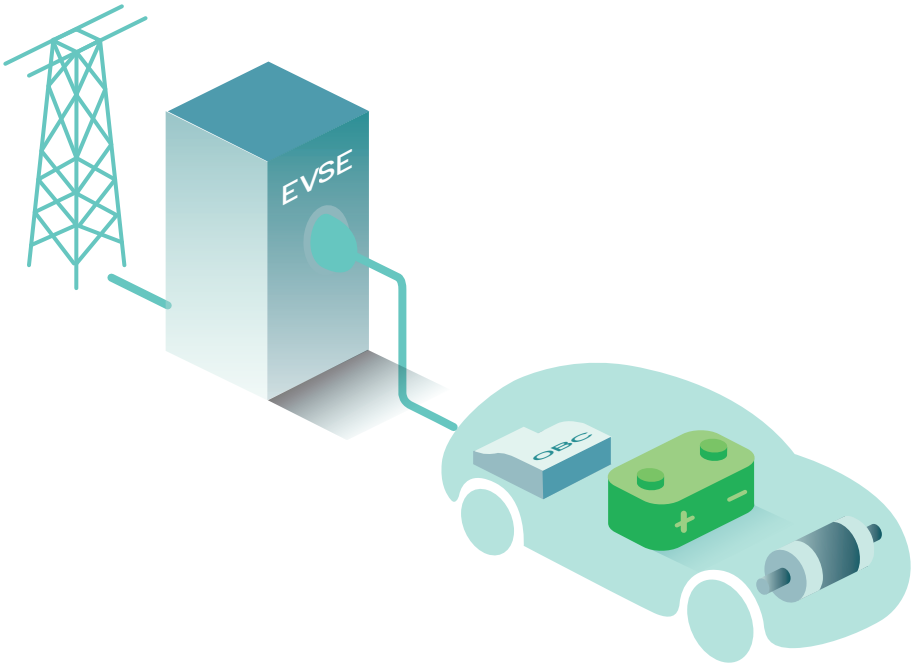
Battery

Test platforms

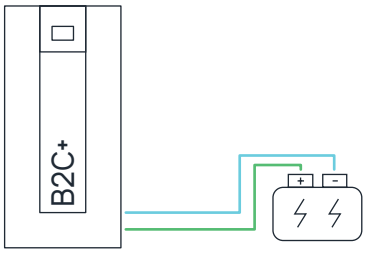
The constant research in this field has allowed for performance improvement in terms of autonomy, density and power ratings, amongst others. A key factor in this process is testing new developments for verification and characterization of batteries.

B2C+ (DC Bidirectional Converter) 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.





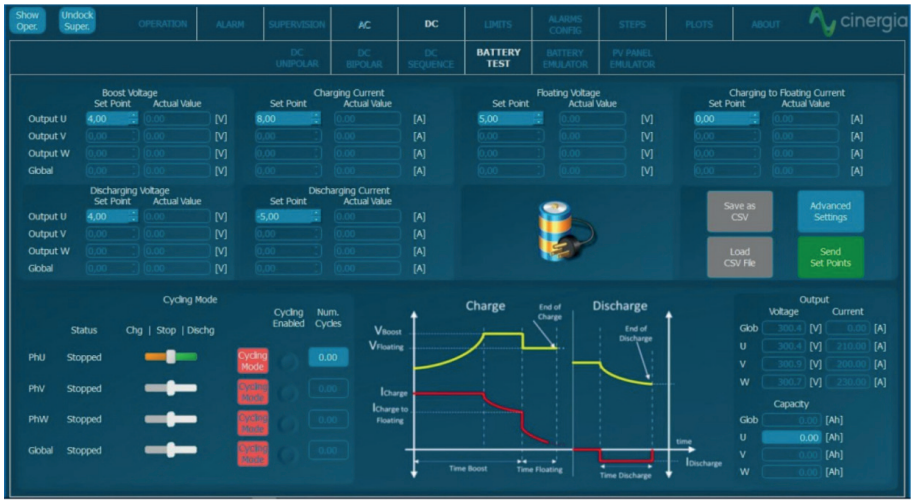
Battery Pack Testing



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

SUITABLE PRODUCTS

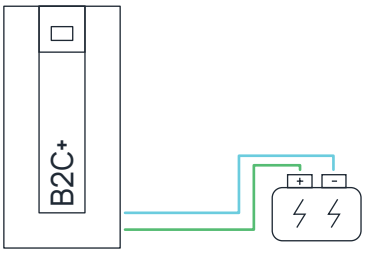
B2C+ with Battery Test
& PHiL Operation Mode



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 mported in .csv files.

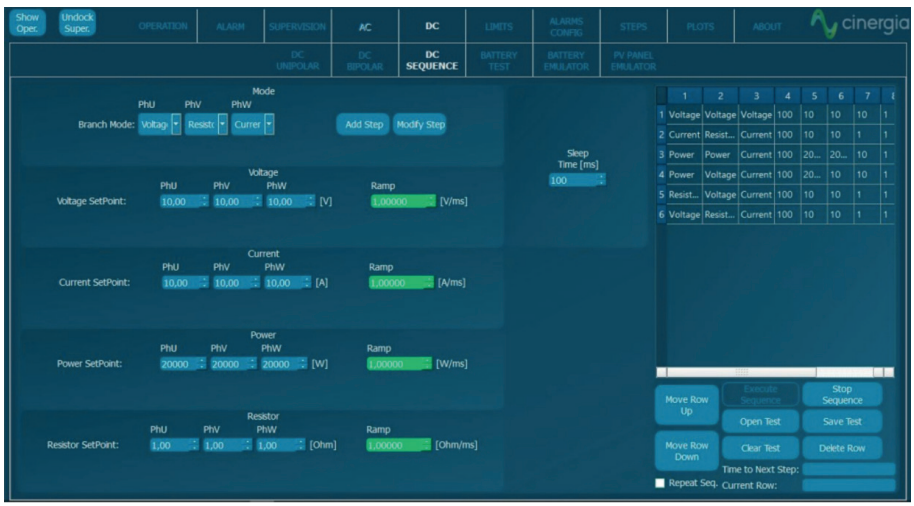
EV Drivetrain Emulation



- 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 themor 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.

Products

The GE&EL product family is the aggregation of Grid Simulators, Electronic Loads and Bidirectional DC Converters in one product.

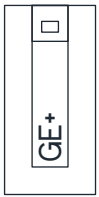
Models
All-Terrain vAC/DC B2C+
All-in-one vAC

AC Power
7.5kW - 160kW
DC Power*
7.5kW - 160kW
AC Current (per phase)
11A - 232A
DC Current (per phase/parallel)*
±10A / ±30A - ±185A / ±555A

Key features
Bidirectional and Regenerative
Clean grid current: THDi ‹ 3%
and PF › 0.98
Same power in DC and AC

Parallelization of units to increase power
The most flexible testing equipment in a single cabinet

*Only in models with DC functionality.



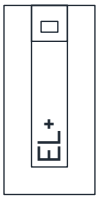
Grid Simulators are power electronic devices that emulate AC electrical grids in both normal and disturbed conditions.

Models
GE+vAC/DC Full
GE+ vAC

AC Power
7.5kW - 160kW
DC Power*
7.5kW - 160kW
AC Current (per phase)
11A - 232A
DC Current (per phase/parallel)*
±10A / ±30A - ±185A / ±555A

Key features
Bidirectional and Regenerative
Clean grid current: THDi ‹ 3%
and PF › 0.98
Same power in DC and AC

Parallelization of units to increase power



The EL+ family is power electronic device designed to emulate AC and DC electrical loads.

Models
EL+ vAC/DC Full
EL+ vAC

AC Power
7.5kW - 160kW
DC Power*
7.5kW - 160kW
AC Current (per phase)
11A - 232A
DC Current (per phase/parallel)*
±10A / ±30A - ±185A / ±555A

Key features
Bidirectional and Regenerative
Clean grid current: THDi ‹ 3%
and PF › 0.98
Same power in DC and AC

Parallelization of units to increase power

CINERGIA's DC Programmable Power Supplies are designed to generate a controlled DC source or load.

Models
B2C+

AC Power
-
DC Power
7.5kW - 160kW
DC Voltage (normal range/HV option)
10V-750V/800V - 20V-750V/800V
DC Current (per phase/parallel)
±10A / ±30A - ±185A / ±555A

Key features
Bidirectional and Regenerative
2Q and 4Q conf iguration
Clean grid current: THDi ‹ 3%
and PF › 0.98

Selialitzation of units to increase voltage up to 1500V
Parallelization of units to increase power

For futher information, consult our website www.cinergiapower.com or contact us.

CINERGIA's Solutions for Electromobility

www.cinergiapower.com