

# Regenerative Power Electronics Solutions

Specially Designed Products for Testing



A combination of knowledge,  
experience and passion  
for what we do.



CINERGIA is the result of more than ten years of experience in the conception, design, production and service of customized power electronics solutions. Our key areas of expertise include power electronics, DSP-based digital control of converters, communications and software user interface (HMI).

#### Power Electronics Specialized

The origins of the founding team are in a University R&D center where we developed custom-made power converters for third party companies under a technology transfer framework. We then acquired knowledge and experience in power electronics for different types of applications.

#### Industrial Partnership

Our Barcelona-based partnership with an important online UPS manufacturer, both at an industrial and R&D level, allows CINERGIA to offer regenerative products combining the robustness and competitiveness of a UPS with the features and flexibility of an in-house control platform.

#### Founded in 2008

CINERGIA's beginnings focused on providing engineering services and customized power electronics solutions. 2014 was an important date for two reasons: we launched the standard product catalogue and the first distributors commercializing it were assigned. The new **ePlus** control platform provided better performance, as well as more modularity through master/slave connections.

#### Quality Policy

Providing high quality solutions is a priority at CINERGIA and our activities of Design and Production of Power Supplies have been certified with the **ISO 9001:2015**, the world's most recognised quality management standard. Our commitment is to continuously improve internal processes to increase customer satisfaction and comply with all legal and regulatory requirements for our activity.



**More than 18MW of our units supplied worldwide**

#### Products all over the world

● **Distributors**  
UK, Germany, Netherlands, Belgium, Luxembourg, Spain, Portugal, France, Italy, Sweden, Norway, Denmark, Finland, Austria, Switzerland, Poland, Czech Republic, Slovakia, Baltic and Hungary, USA, China, Israel, India and Singapore.

Contact us if you want to distribute our products.



# Discover our new equipment

## HIGHER SWITCHING FREQUENCY

Thanks to the SiC MOSFETs in our equipment, the switch is increased.

## BANDWIDTH

A higher bandwidth of the converter translates into better capacity to control fast-changing and high-frequency signals.

## RIPPLE

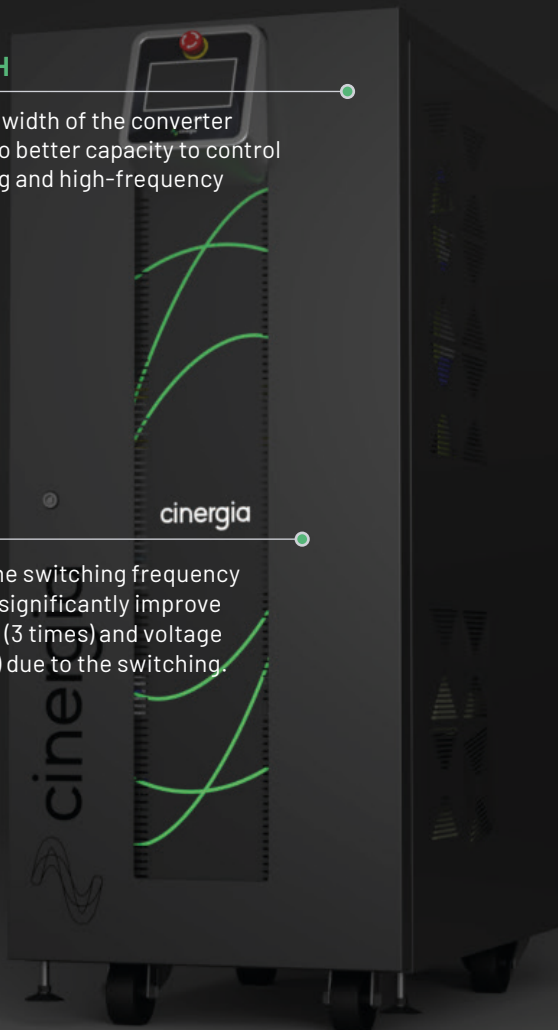
The increase of the switching frequency is high enough to significantly improve the current ripple (3 times) and voltage ripple (2.75 times) due to the switching.

## EFFICIENCY

Thanks to the use of SiC MOSFETs at both converters of the back-to-back configuration, the peak efficiency of the whole system is boosted above 94%.

## CURRENT IN DC MODE

Our equipment has the same current capacity in DC as in AC mode.



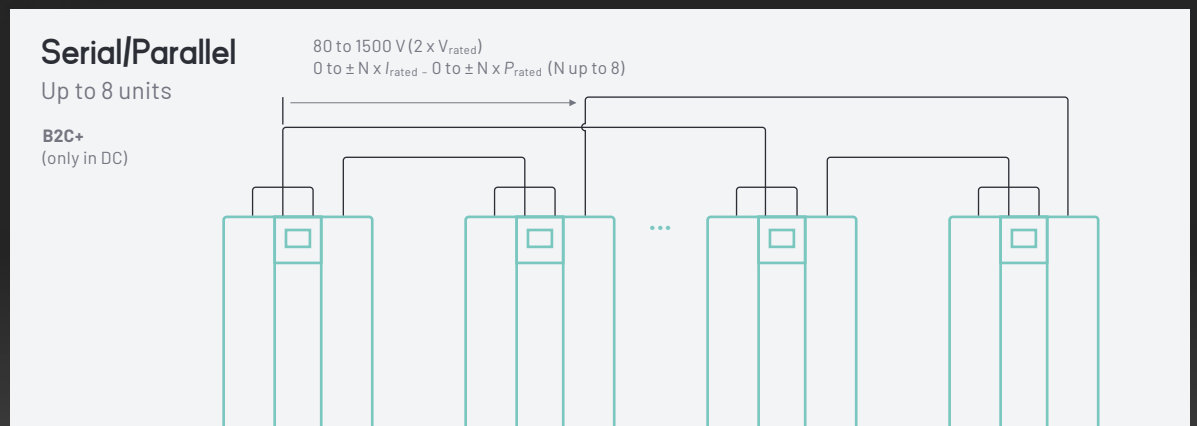
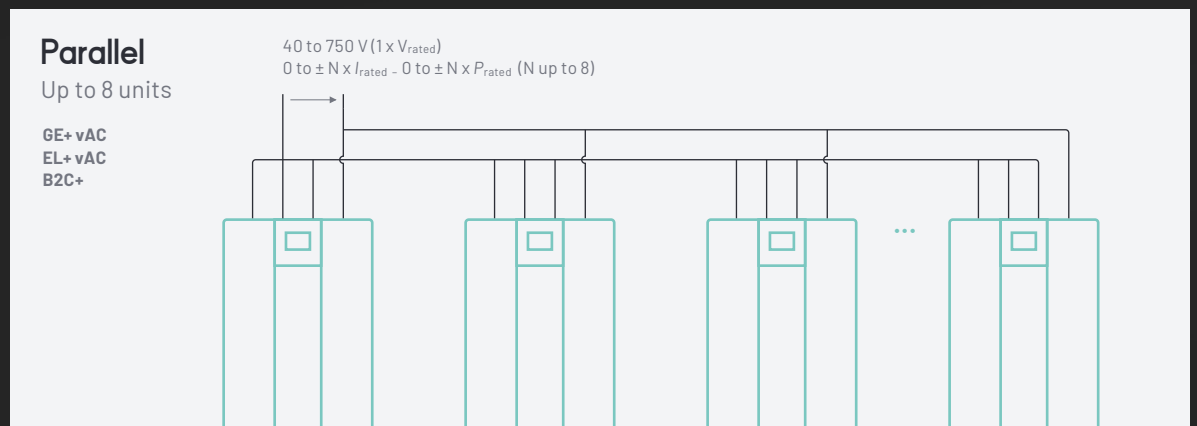
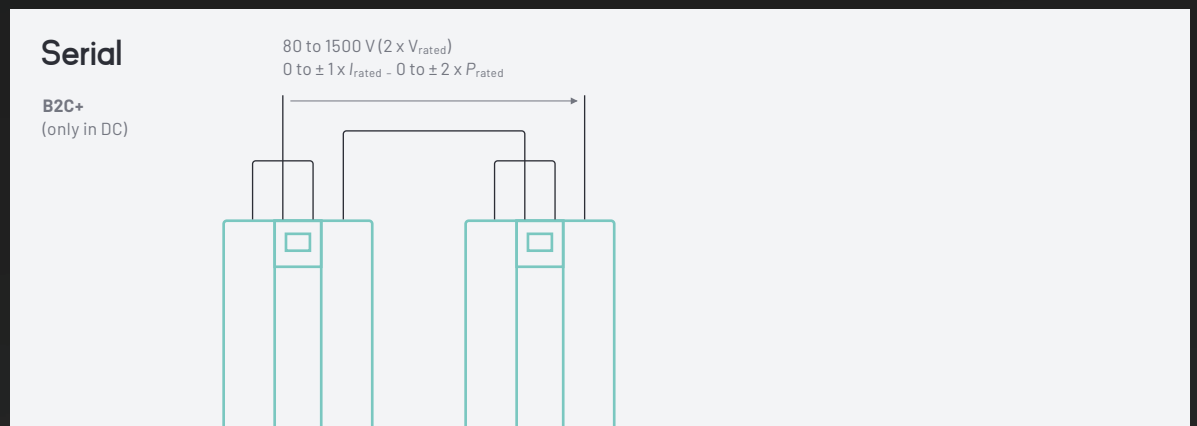




Isolated Transformers

In all DC configurations, it is necessary to use isolation transformers at the input of the device to guarantee the safety of the system.

## Three different Master/Slave connection possibilities



# Learn more about our new equipment



## Benefits of higher switching frequency

In switched power converters, such as the converters from CINERGIA, the power semiconductors work in two states: completely OFF (zero current) or entirely ON (near zero voltage). While transitioning from one state to the other, the voltages and currents do not change immediately and therefore are both non-zero during some short time. This current-voltage crossover generates power losses in the semiconductor at each switching cycle, which happens at 15 kHz.

The main benefit of SiC MOSFETs is the faster switching time, reducing the current-voltage crossover duration, and therefore reducing the losses at each commutation.

As the losses at each commutation are reduced, the switching frequency of the SiC MOSFET can be increased without increasing the total losses or even reducing the switching losses compared to the standard IGBT.

The output filtering stage can be reduced when the converter's switching frequency increases. That is, it needs less attenuation for the same output ripple. This implies that the cutoff frequency of the filter increases, and therefore also the resonance frequency of this filter. These effects increase the bandwidth of the control and, thus, the bandwidth of the whole converter.

## Bandwidth

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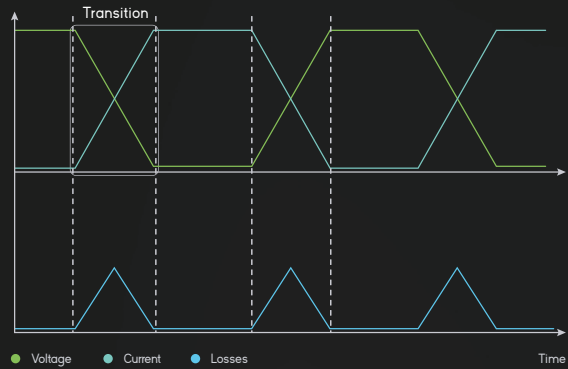
# We introduce you to our new equipment

GE+EL vAC/DC SiC

GE+EL vAC/DC SiC

## Benefits of higher switching frequency

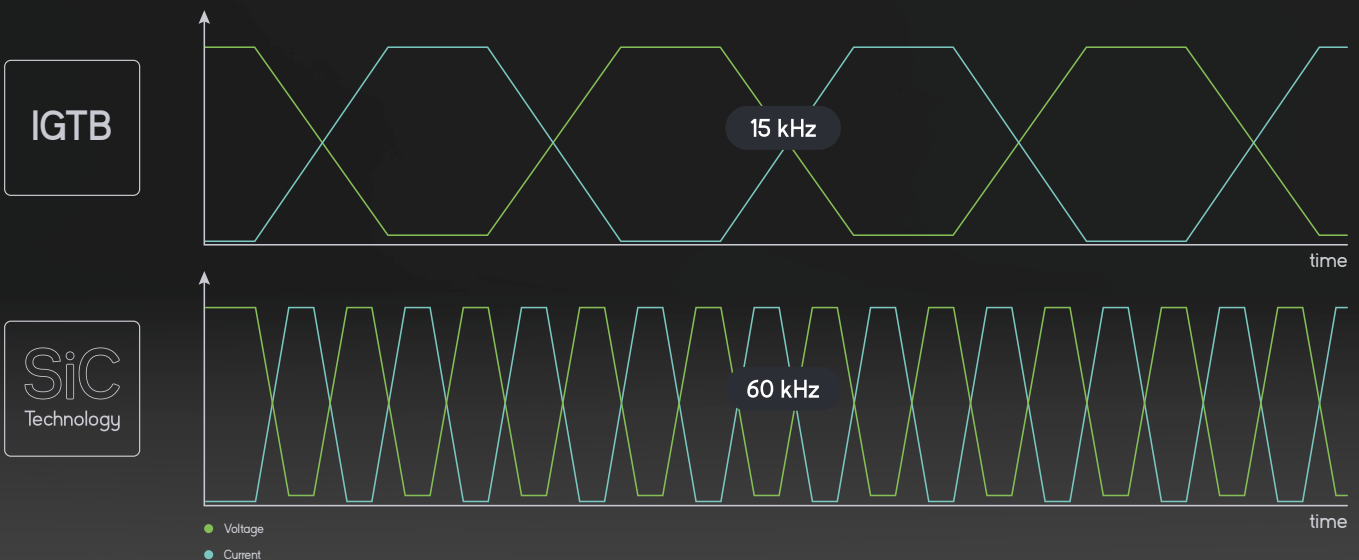
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## Hardware

The creation of this product is based on the replacement of the IGBTs by SiC MOSFETs.

Their characteristics allow us to make optimize the design and control of current equipment:

One of the main differences at the control level is the increase of the switching frequency.

### HIGHER SWITCHING FREQUENCY

Thanks to the SiC MOSFETs in our equipment, the switch is increased up to 60 kHz.

### BANDWIDTH

A higher bandwidth of the converter translates into a better capacity to control fast-changing and high-frequency signals.

### RIPPLE

The increase of the switching frequency is high enough to significantly improve the current ripple (3 times) and voltage ripple (2.75 times) due to the switching.

### EFFICIENCY

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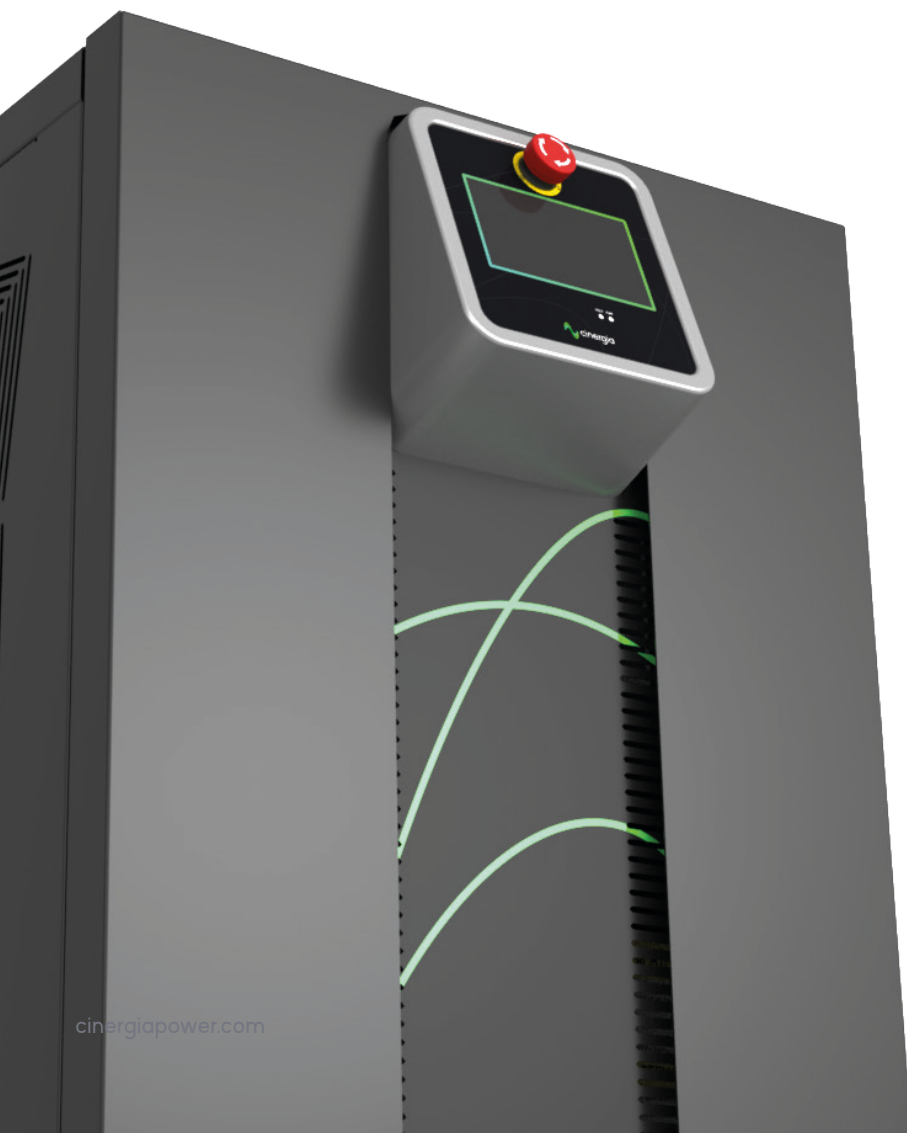
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# Regenerative converters for your test needs

## APPLICATIONS

We offer a comprehensive range of AC and DC regenerative power converters for Testing and R&D applications. CINERGIA's products are improved from the experience gained by applying our technology in different fields and working closely with our customers.



Electromobility



Smart Grids



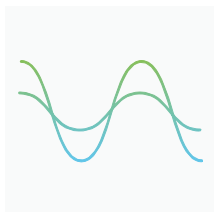
Academic & Rcp



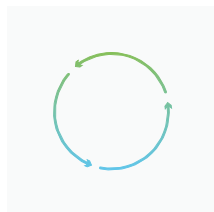
Avionics



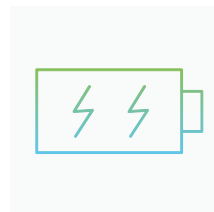
Photovoltaic



Industrial Test

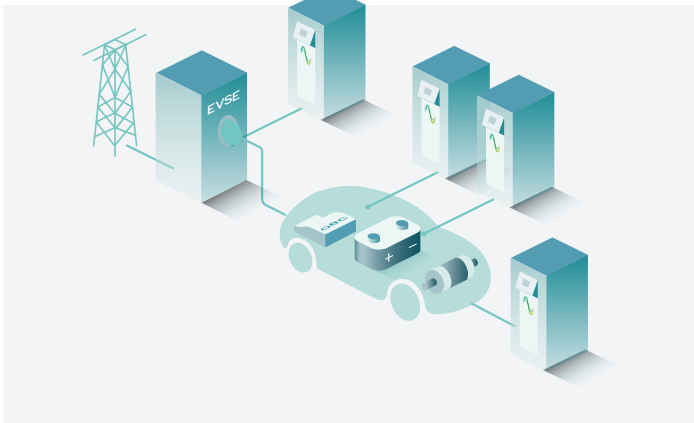


Power Hil



Energy Storage

## Electromobility



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

Scan the QR code to visit the application website →



Products for this application

**EL+ vAC/DC Full Battery Emulation Battery Pack Tester B2C+**  
**GE+vAC**  
**GE+ vAC/DC Full**  
**GE&EL+ vAC/DC**  
**GE&EL+ vAC**



## Smart Grids



The electrical grid is in a transformation process that will affect the production, storage, consumption and commercialization of energy. Smartgrids need power electronics and ICT to manage energy flows and ensure the quality and continuity of the electricity supply. This will allow us to know in real time the consumption and thus learn about our consumption habits, how to improve the efficiency of the grid and how to contribute to the energy saving.

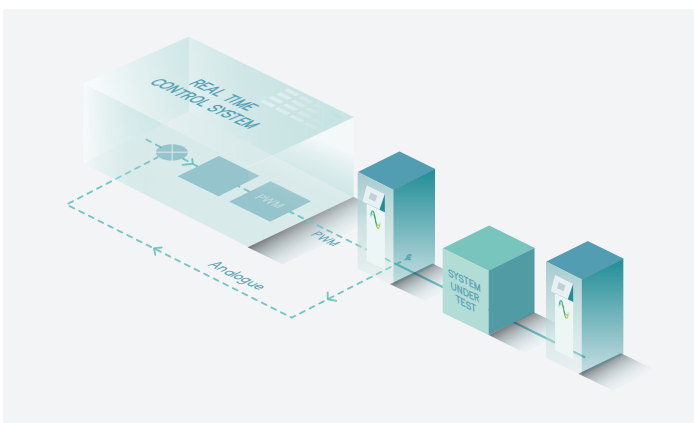


Products for this application

**EL+ vAC**  
**EL+ vAC/DC Full Battery Emulation B2C+**  
**GE+vAC**  
**GE+ vAC/DC Full**  
**GE&EL+ vAC/DC**  
**GE&EL+ vAC**



## Academic & RCP



The origins of CINERGIA's founding team is in a research and development center in the university so we understand the specific needs of Academic and Research applications. In addition to our standard catalogue of products we are able to adapt them to fit the particular requirements these applications.



Products for this application

**EL+ vHiL**  
**EL+ vAC/DC Full B2C+**  
**GE+ vHiL**  
**GE+ vAC/DC Full**  
**GE&EL+ vAC/DC**  
**GE&EL+ vAC**





## ✈️ Avionics



More electric and all-electric aircraft projects along with variable frequency generation systems are driving new developments and new test needs in the fields of avionics. CINERGIA offers a unique Regenerative AC Electronic Load (EL+ vHF) designed to work in a frequency range of 360 to 900Hz used mainly in aircraft generator's testing platforms.

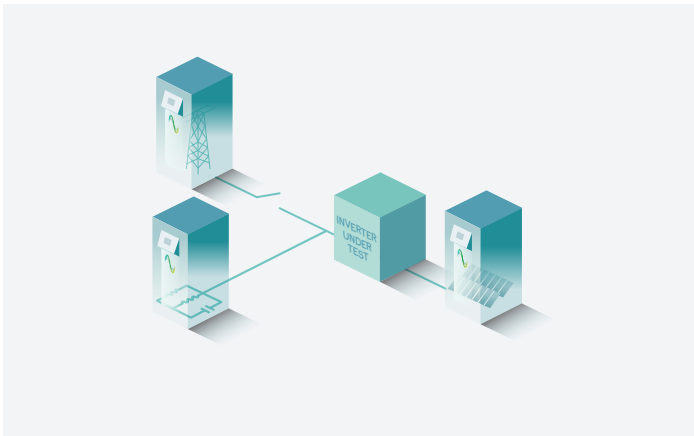


Products for this application

EL+ vHF/DC  
EL+ vHF  
EL+ vAC  
EL+ vAC/DC Full  
B2C+  
GE&EL+ vAC/DC  
GE&EL+ vAC



## ☀️ Photovoltaic



CINERGIA can provide all necessary power devices for PV Inverter testing in a closed energy loop. In such a platform the total power and energy consumption from the grid will be reduced down to the losses of the power converters involved in the test, typically in the range of 20 to 35% of the power generated by the Inverter under test. In R&D, the main advantage will be the reduction of power needed: a 100kW Inverter could be tested in a laboratory with 20 to 35kW installation.

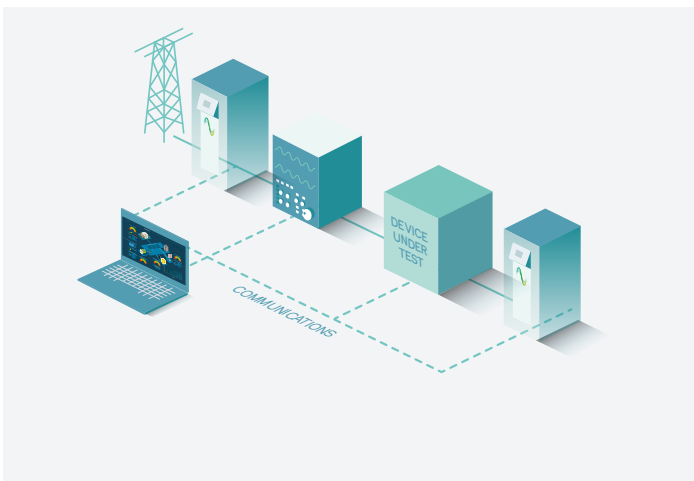


Products for this application

EL+ vAC/DC Full  
PV Panel Emulation  
B2C+  
GE+vAC  
GE+ vAC/DC Full  
GE&EL+ vAC/DC  
GE&EL+ vAC



## 📡 Industrial Test



CINERGIA devices have been carefully designed to be part of manual and automated test benches for functional and quality testing as well as research and development of new products. Integrating our devices in test platforms is simple by means of the MODBUS/TCP protocol used (other field buses are offered as an option) and the comprehensive documentation provided of the communication protocol. Labview drivers are supplied with each one of the equipment along with an open source Labview project that will allow a quick start.

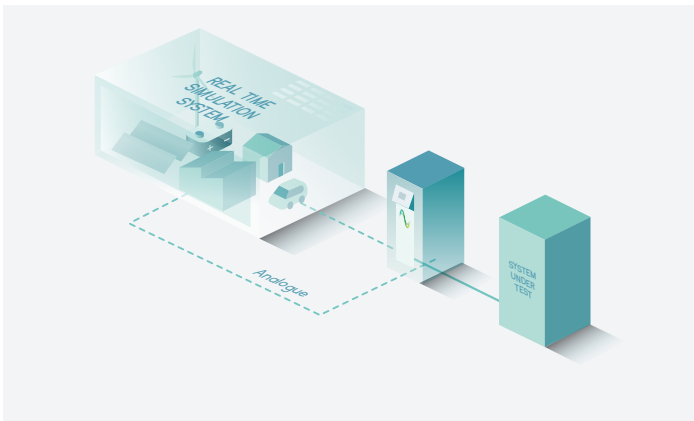


Products for this application

EL+ vAC  
EL+ vAC/DC Full  
B2C+  
GE+vAC  
GE+ vAC/DC Full  
GE&EL+ vAC/DC  
GE&EL+ vAC



## Power HiL



Real Time Simulation and Power Converters are converging into the field known as Power Hardware in the Loop (PHiL). In these kind of applications, a real world system is simulated on a real-time basis and then emulated: converted in real voltage, current and power. This emulation is performed by a power converter that transforms the reference signal generated by the real time simulator into a voltage or current waveform. A power converter used in such a way is generally known as a power amplifier.

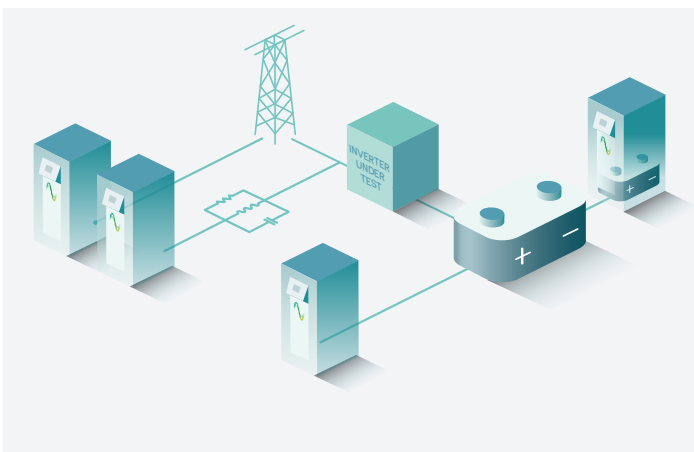


Products for this application

- EL+ vHiL
- EL+ vAC/DC Full B2C+
- GE+ vHiL
- GE+ vAC/DC Full
- GE&EL+ vAC/DC
- GE&EL+ vAC



## Energy Storage System



Electricity has been traditionally produced and consumed at the same time, but the appearance of new battery technologies and the optimisation of existing technologies as fuel cells and flywheel systems is changing this paradigm. Electrical Energy can be now stored cost-effectively and this will have a strong impact in the electrical system (smoothing the intermittency of renewable energies, storing excess of production, shifting peaks of consumption, increasing the efficiency, etc...) and in transportation (cars, trucks, buses, aircraft, ships, ...).



Products for this application

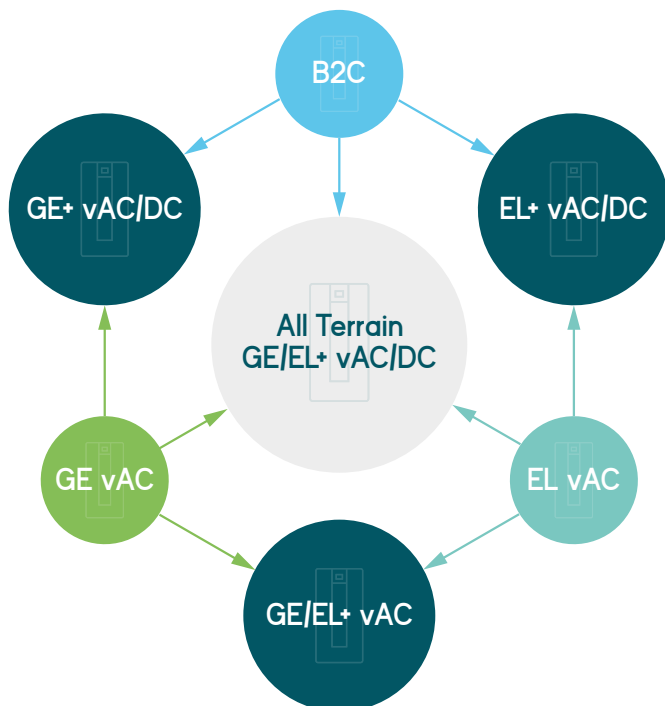
- Battery Emulation
- Battery Pack Tester
- B2C+
- GE+ vAC/DC Full
- GE&EL+ vAC/DC
- GE&EL+ vAC



# Product Overview

## PRODUCTS

CINERGIA offers a wide range of products specially designed for testing, perfectly suitable for most applications in the field of Renewable Energy, Smartgrids and ESS, PV Panel Emulation and PV Inverter Testing, Anti-islanding, Power HiL, IEC Testing, Battery and Electric Vehicle Testing. Our product catalogue is unique for the flexibility and versatility of our units. Three main functions are the base of our catalogue: grid simulator (regenerative 4Q AC voltage source), AC electronic load (regenerative 4Q AC current source) and DC Sink/Source (regenerative 2Q/4Q DC bidirectional sink/source). Each CINERGIA product will include one, two or the three main functions providing a high versatility.



All functions in one cabinet



## All Terrain GE&EL+ vAC/DC

### Grid Simulator + Electronic Load

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

#### AC Power

7.5 kW - 160 kW

#### DC Power

7.5 kW - 160 kW

#### AC Current (per phase)

11 A - 232 A

#### DC Current (3 channel / 1 channel)

±10 A / ±30 A - ±185 A / ±555 A

#### Key Features

Bidirectional and Regenerative

Clean grid current:  
THDi < 3% and PF > 0.98

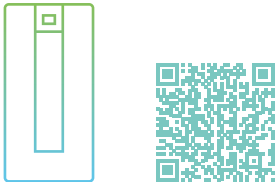
Same power in DC and AC

Parallelization of units to increase the power

The most flexible testing equipment in a single cabinet



## Two functionalities in one cabinet



### All in one GE&EL+ vAC

#### Grid Simulator + Electronic Load

The GE&EL product family is the aggregation of Grid Simulators, Electronic Loads.

**AC Power**  
7.5 kW - 160 kW

**DC Power**  
If you need a product with DC features,  
please check **GE&EL+ vAC/DC**.

**AC Current (per phase)**  
11 A - 232 A

**DC Current (3 channel / 1 channel)**  
If you need a product with DC features,  
please check **GE&EL+ vAC/DC**.

**Key Features**  
Bidirectional and Regenerative

Clean grid current:  
THDi < 3% and PF > 0.98

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



### GE+ vAC/DC Full

#### Grid Simulator

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

**AC Power**  
7.5 kW - 160 kW

**DC Power**  
7.5 kW - 160 kW

**AC Current (per phase)**  
11 A - 232 A

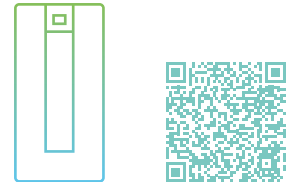
**DC Current (3 channel / 1 channel)**  
 $\pm 10$  A /  $\pm 30$  A -  $\pm 185$  A /  $\pm 555$  A

**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 the power



### EL+ vAC/DC Full

#### Electronic Load

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

**AC Power**  
7.5 kW - 160 kW

**DC Power**  
7.5 kW - 160 kW

**AC Current (per phase)**  
11 A - 232 A

**DC Current (3 channel / 1 channel)**  
 $\pm 10$  A /  $\pm 30$  A -  $\pm 185$  A /  $\pm 555$  A

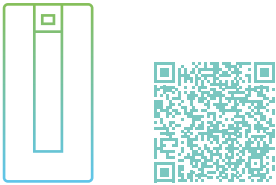
**Key Features**  
Bidirectional and Regenerative

Clean grid current:  
THDi < 3% and PF > 0.98

Same power in DC and AC

Parallelization of units to  
increase the power

Single function  
optimized



## GE+ vAC

### Grid Simulator

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

#### AC Power

7.5 kW - 160 kW

#### DC Power

If you need a product with DC features, please check **GE+ vAC/DC Full**.

#### AC Current (per phase)

11 A - 232 A

#### DC Current (3 channel / 1 channel)

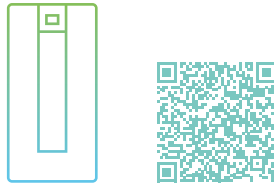
If you need a product with DC features, please check **GE+ vAC/DC Full**.

#### Key Features

Bidirectional and Regenerative

Clean grid current:  
THDi < 3% and PF > 0.98

Parallelization of units to increase the power



## EL+ vAC

### Electronic Load

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

#### AC Power

7.5 kW - 160 kW

#### DC Power

If you need a product with DC features, please check **EL+ vAC/DC Full**.

#### AC Current (per phase)

11 A - 232 A

#### DC Current (3 channel / 1 channel)

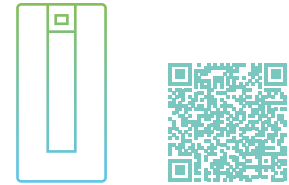
If you need a product with DC features, please check **EL+ vAC/DC Full**.

#### Key Features

Bidirectional and Regenerative

Clean grid current:  
THDi < 3% and PF > 0.98

Parallelization of units to increase the power



## B2C+

### Bidirectional DC Converter

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

#### Models

**Battery Pack Tester**

**Battery Emulation**

**PV Panel Emulation**

#### AC Power

If you need a product with AC features, please check **AC/DC** models.

#### DC Power

7.5 kW - 160 kW

#### DC Voltage (normal range/HV option)

30V-750V/800V - 30V-750V/800V

#### DC Current (independent /parallel)

±10 A / ±30 A - ±185 A / ±555 A

#### Key Features

Bidirectional and Regenerative

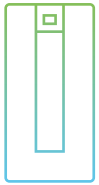
2Q and 4Q configuration

Clean grid current:  
THDi < 3% and PF > 0.98

Serialization of units to increase voltage up to 1500 V

Parallelization of units to increase the power

## Optimized for Avionics and PHiL applications



### Avionics

#### High Frequency

Regenerative Electronic Load products capable of working in a frequency range of 360 to 900Hz. Designed to simulate the different loads that can be found in the aircraft.

##### Models

**EL+ vHF/DC**  
**EL+ vHF**

##### AC Power

7.5kW - 160kW

##### DC Power\*

7.5kW - 160kW

##### AC Current (per phase)

11A - 232A

##### DC Current (3 channel / 1 channel)\*

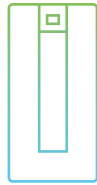
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Same power in DC and AC

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

\*Only in models with DC functionality



### PHiL

#### Power HiL

Optimized in performance and price for Power Hardware in the Loop applications. This version includes Power Amplifier functions to connect with Real-Time Control Systems.

##### Models

**EL+ vHiL**  
**GE+ vHiL**

##### AC Power

7.5kW - 160kW

##### DC Power

7.5kW - 160kW

##### AC Current (per phase)

11A - 232A

##### DC Current (3 channel / 1 channel)

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# Friendly interface

## SOFTWARE

The user interface used by CINERGIA devices has been developed by our R&D team, to offer total control of the device, with a comfortable and intuitive design. This allows us to take full advantage of the capabilities of the device, as well as the programming and execution of standardized or self-created tests.



### Remote Control port

- ~ LAN Ethernet with Modbus/TCP protocol.
- ~ Labview Drivers
- ~ RS485 (optional)

### Digital IO port

- ~ 4 digital inputs
- ~ 3 relay outputs
- ~ 1 emergency stop

### Optional analogue port

- ~ 6 analogue input 0-10V
- ~ 6 analogue output 0-10V

Windows 7/10 user interface for remote operation and data acquisition.

## Features and capabilities

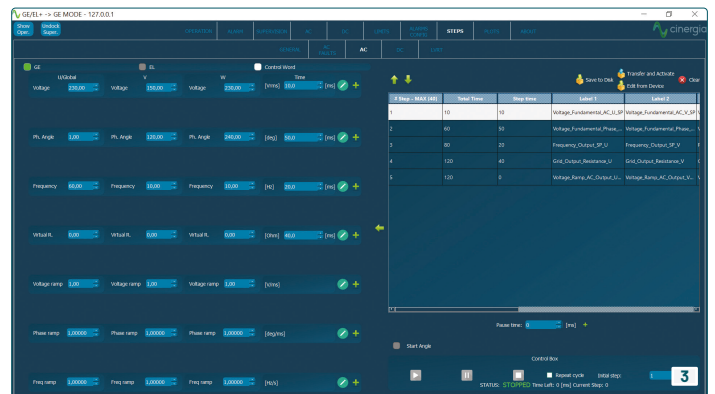
\*The software functions available on each product depends of its features.

### AC Operation<sup>(1)</sup>

In AC, each phase can be independently configured: RMS current, phase delay, harmonics content, free-frequency harmonic and transition ramps. A plot shows the expected waveform, the theoretical FFT representation, RMS, peak, CF and THD.

### DC Operation

Access to all DC set points and limits. Thanks to Multichannel feature, each phase can have a different Operation Mode: voltage, current, power, resistance and advanced DC applications. Transition ramps, voltage and current limits can be modified. The limits for sink and source operation are different for safer testing.



### Harmonics<sup>(2)</sup>

The device can generate simultaneously harmonics up to the 50th. The first 20 allow the injection of sub-harmonics, inter-harmonics and high frequency harmonics up to the 50th, setting both the magnitude and phase delay.

### 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 data logger can be activated from the LCD of the unit to record automatically the resulting voltage and current measurements with a time resolution of 400 ms.

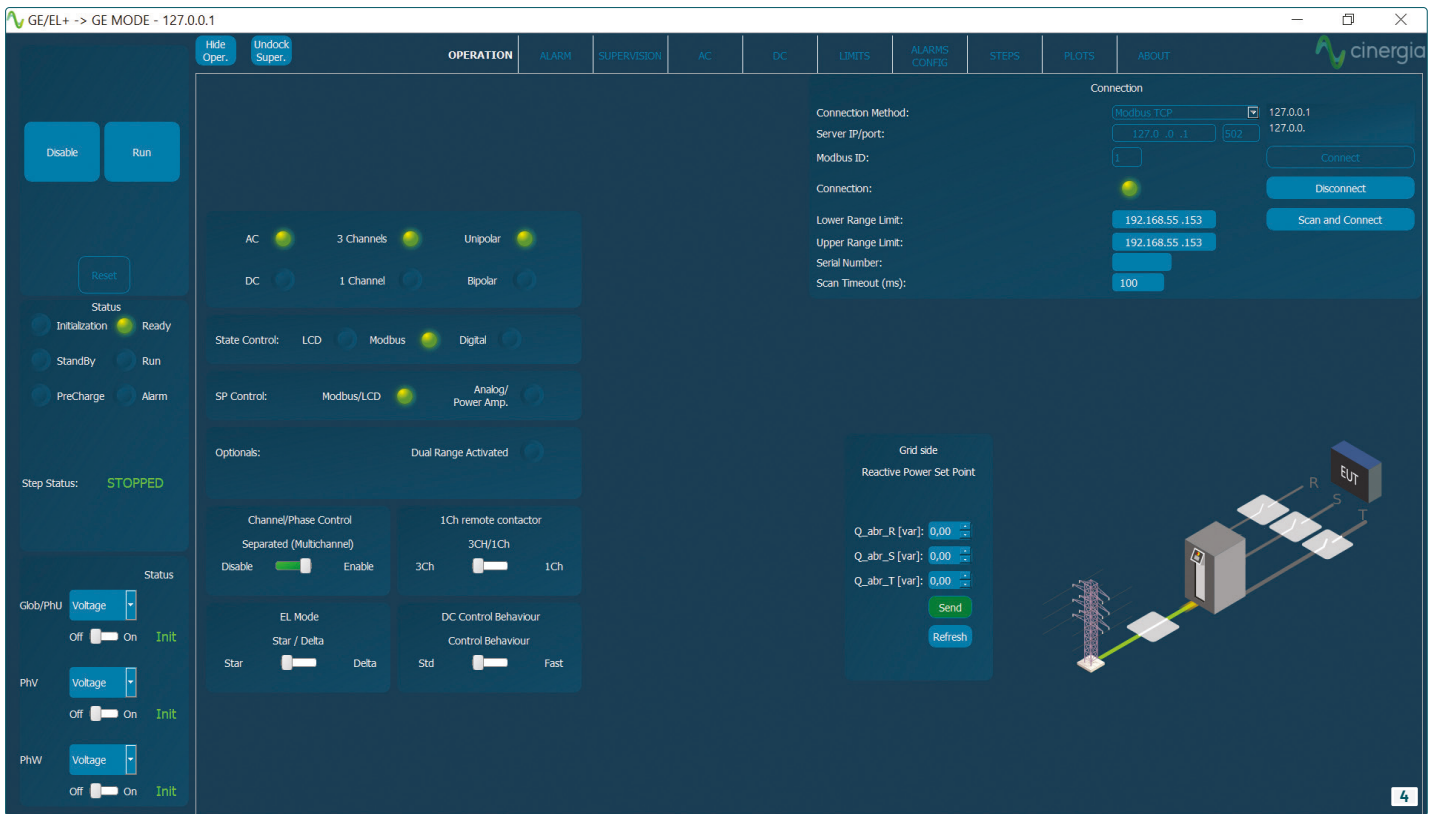
### Power and Impedance

The active and reactive power of each phase is independently controlled. In Impedance mode, the device emulates an RLC load allowing to parametrize resistance, inductance and capacitance per phase making this device suitable for Anti-Islanding test of grid converters.

### Multichannel<sup>(4)</sup>

Enabling the Separated Channel Control converts the device in three functionally independent DC Bidirectional Power Supplies, sharing the common negative rail. Each channel can have a different status (ON, OFF, Warning, Alarm), Operation Mode (see Range and Specifications table), Setpoint, Ramp and Limits.





**Steps Mode (3)**

Step test files are saved and executed by the DSP allowing deterministic timing with a resolution of 66µs. The user gains access to all registers of the device to create complex test sequences which run directly in the converter without the need of an external computer.

**Disturbance Generation**

The steps mode includes predefined easy-to-use test panels. The AC faults panel is a powerful yet intuitive editor which allows generating and configuring flicker. Specific profiles can be saved in .csv files, modified, and reused by importing an existing one.

**Battery Pack Testing (5)**

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. Profiles for each Battery technology can be saved and imported in .CSV files.

**Battery Emulation**

The B2C+ integrates a mathematical model to emulate the voltage behaviour of a real battery pack. The output voltage will change 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.



**Linear & Non-Linear**

The capacity to emulate linear and non-linear loads is one of the main features of the 4Q Electronic Load. Through our intuitive control software, the magnitude of harmonics can be set and different types of loads can be generated.

**PV Panel Emulation (6)**

Based on the single-diode equivalent circuit of a PV cell and the series-parallel connection of cells to form a panel. A Runtime functionality allows the simulation of a complete day by launching different irradiance and temperature setpoints from a .csv file, enabling the user burn-in and functional tests of PV Inverters.

**Parallel Mode**

The device can be controlled in parallel mode where all phases are short-circuited internally. This mode it's suitable for single-phase applications. To increase the total power of the solution, the device can be connected in parallel\* with multiple devices.

**IEC Testing**

Software includes a library supporting IEC compatible tests. The profiles defined in the standards are preloaded in the software for a user friendly execution and edition. Currently the following standards are available: **IEC61000-4/11, IEC61000-4/13, IEC61000-4/14, IEC61000-4/28.**

MODELS

Reference	AC Power Rated <sup>(9)</sup>	AC Current Rated <sup>(9)</sup> RMS 3 channel / 1 channel	DC Power Rated <sup>(9)</sup>	DC Current Rated <sup>(9)</sup> RMS 3 channel / 1 channel	Weight	Dimensions D x W x H
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GE&EL+

GE&EL+ vAC/DC SiC	AC Power	AC Current	DC Power	DC Current	Weight	Dimensions
GE&EL+50 vAC/DC SiC + ITi	50 kW	73 A / 219 A	50 kW	±73A / ±219A	395 kg	770 x 835 x 1100 mm
GE&EL+50 vAC/DC SiC + ITe	50 kW	73 A / 219 A	50 kW	±73A / ±219A	200 kg	770 x 450 x 1100 mm

GE&EL+ vAC/DC	AC Power	AC Current	DC Power	DC Current	Weight	Dimensions
GE&EL+7.5 vAC/DC	7.5 kW	11 A / 33 A	7.5 kW	±10A / ±30A	155 kg	770 x 450 x 1100 mm
GE&EL+10 vAC/DC	10 kW	15 A / 45 A	10 kW	±15A / ±45A	155 kg	770 x 450 x 1100 mm
GE&EL+15 vAC/DC	15 kW	22 A / 66 A	15 kW	±20A / ±60A	155 kg	770 x 450 x 1100 mm
GE&EL+20 vAC/DC	20 kW	29 A / 87 A	20 kW	±25A / ±75A	155 kg	770 x 450 x 1100 mm
GE&EL+30 vAC/DC	27 kW	40 A / 120 A	27 kW	±30A / ±90A	155 kg	770 x 450 x 1100 mm
GE&EL+40 vAC/DC	40 kW	58 A / 174 A	40 kW	±40A / ±120A	200 kg	770 x 450 x 1100 mm
GE&EL+50 vAC/DC	50 kW	73 A / 219 A	50 kW	±50A / ±150A	200 kg	770 x 450 x 1100 mm
GE&EL+60 vAC/DC	54 kW	80 A / 240 A	54 kW	±57A / ±171A	200 kg	770 x 450 x 1100 mm
GE&EL+80 vAC/DC	80 kW	116 A / -	80 kW	±105A / ±315A	400 kg	870 x 875 x 1320 mm
GE&EL+100 vAC/DC	100 kW	145 A / -	100 kW	±130A / ±390A	400 kg	870 x 875 x 1320 mm
GE&EL+120 vAC/DC	108 kW	157 A / -	108 kW	±130A / ±390A	400 kg	870 x 875 x 1320 mm
GE&EL+160 vAC/DC	145 kW	211 A / -	145 kW	±155A / ±465A	680 kg	850 x 900 x 2000 mm
GE&EL+200 vAC/DC	160 kW	232 A / -	160 kW	±185A / ±555A	680 kg	850 x 900 x 2000 mm

GE&EL+ vAC	AC Power	AC Current	-	-	Weight	Dimensions
GE&EL+7.5 vAC	7.5 kW	11 A / 33 A	-	-	155 kg	770 x 450 x 1100 mm
GE&EL+10 vAC	10 kW	15 A / 45 A	-	-	155 kg	770 x 450 x 1100 mm
GE&EL+15 vAC	15 kW	22 A / 66 A	-	-	155 kg	770 x 450 x 1100 mm
GE&EL+20 vAC	20 kW	29 A / 87 A	-	-	155 kg	770 x 450 x 1100 mm
GE&EL+30 vAC	27 kW	40 A / 120 A	-	-	155 kg	770 x 450 x 1100 mm
GE&EL+40 vAC	40 kW	58 A / 174 A	-	-	200 kg	770 x 450 x 1100 mm
GE&EL+50 vAC	50 kW	73 A / 219 A	-	-	200 kg	770 x 450 x 1100 mm
GE&EL+60 vAC	54 kW	80 A / 240 A	-	-	200 kg	770 x 450 x 1100 mm
GE&EL+80 vAC	80 kW	116 A / -	-	-	400 kg	870 x 875 x 1320 mm
GE&EL+100 vAC	100 kW	145 A / -	-	-	400 kg	870 x 875 x 1320 mm
GE&EL+120 vAC	108 kW	157 A / -	-	-	400 kg	870 x 875 x 1320 mm
GE&EL+160 vAC	145 kW	211 A / -	-	-	680 kg	850 x 900 x 2000 mm
GE&EL+200 vAC	160 kW	232 A / -	-	-	680 kg	850 x 900 x 2000 mm

\*All specifications are subject to change without notice.



Reference	AC Power Rated <sup>(9)</sup>	AC Current Rated <sup>(9)</sup> RMS 3 channel / 1 channel	DC Power Rated <sup>(9)</sup>	DC Current Rated <sup>(9)</sup> RMS 3 channel / 1 channel	Weight	Dimensions D x W x H
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**GE+**

GE+ vAC/DC Full	AC Power	AC Current	DC Power	DC Current	Weight	Dimensions
GE+7.5 vAC/DC	7.5 kW	11 A / 33 A	7.5 kW	±10A / ±30A	155 kg	770 x 450 x 1100 mm
GE+10 vAC/DC	10 kW	15 A / 45 A	10 kW	±15A / ±45A	155 kg	770 x 450 x 1100 mm
GE+15 vAC/DC	15 kW	22 A / 66 A	15 kW	±20A / ±60A	155 kg	770 x 450 x 1100 mm
GE+20 vAC/DC	20 kW	29 A / 87 A	20 kW	±25A / ±75A	155 kg	770 x 450 x 1100 mm
GE+30 vAC/DC	27 kW	40 A / 120 A	27 kW	±30A / ±90A	155 kg	770 x 450 x 1100 mm
GE+40 vAC/DC	40 kW	58 A / 174 A	40 kW	±40A / ±120A	200 kg	770 x 450 x 1100 mm
GE+50 vAC/DC	50 kW	73 A / 219 A	50 kW	±50A / ±150A	200 kg	770 x 450 x 1100 mm
GE+60 vAC/DC	54 kW	80 A / 240 A	54 kW	±57A / ±171A	200 kg	770 x 450 x 1100 mm
GE+80 vAC/DC	80 kW	116 A / -	80 kW	±105A / ±315A	320 kg	870 x 590 x 1320 mm
GE+100 vAC/DC	100 kW	145 A / -	100 kW	±130A / ±390A	320 kg	870 x 590 x 1320 mm
GE+120 vAC/DC	108 kW	157 A / -	108 kW	±130A / ±390A	320 kg	870 x 590 x 1320 mm
GE+160 vAC/DC	145 kW	211 A / -	145 kW	±155A / ±465A	680 kg	850 x 900 x 2000 mm
GE+200 vAC/DC	160 kW	232 A / -	160 kW	±185A / ±555A	680 kg	850 x 900 x 2000 mm

GE+ vAC	AC Power	AC Current	-	-	Weight	Dimensions
GE+7.5 vAC	7.5 kW	11 A / 33 A	-	-	155 kg	770 x 450 x 1100 mm
GE+10 vAC	10 kW	15 A / 45 A	-	-	155 kg	770 x 450 x 1100 mm
GE+15 vAC	15 kW	22 A / 66 A	-	-	155 kg	770 x 450 x 1100 mm
GE+20 vAC	20 kW	29 A / 87 A	-	-	155 kg	770 x 450 x 1100 mm
GE+30 vAC	27 kW	40 A / 120 A	-	-	155 kg	770 x 450 x 1100 mm
GE+40 vAC	40 kW	58 A / 174 A	-	-	200 kg	770 x 450 x 1100 mm
GE+50 vAC	50 kW	73 A / 219 A	-	-	200 kg	770 x 450 x 1100 mm
GE+60 vAC	54 kW	80 A / 240 A	-	-	200 kg	770 x 450 x 1100 mm
GE+80 vAC	80 kW	116 A / -	-	-	320 kg	870 x 590 x 1320 mm
GE+100 vAC	100 kW	145 A / -	-	-	320 kg	870 x 590 x 1320 mm
GE+120 vAC	108 kW	157 A / -	-	-	320 kg	870 x 590 x 1320 mm
GE+160 vAC	145 kW	211 A / -	-	-	680 kg	850 x 900 x 2000 mm
GE+200 vAC	160 kW	232 A / -	-	-	680 kg	850 x 900 x 2000 mm

**EL+**

EL+ vAC/DC Full	AC Power	AC Current*	DC Power	DC Current	Weight	Dimensions
EL+7.5 vAC/DC	7.5 kW	11 A / 33 A	7.5 kW	±10A / ±30A	155 kg	770 x 450 x 1100 mm
EL+10 vAC/DC	10 kW	15 A / 45 A	10 kW	±15A / ±45A	155 kg	770 x 450 x 1100 mm
EL+15 vAC/DC	15 kW	22 A / 66 A	15 kW	±20A / ±60A	155 kg	770 x 450 x 1100 mm
EL+20 vAC/DC	20 kW	29 A / 87 A	20 kW	±25A / ±75A	155 kg	770 x 450 x 1100 mm
EL+30 vAC/DC	27 kW	40 A / 120 A	27 kW	±30A / ±90A	155 kg	770 x 450 x 1100 mm
EL+40 vAC/DC	40 kW	58 A / 174 A	40 kW	±40A / ±120A	200 kg	770 x 450 x 1100 mm
EL+50 vAC/DC	50 kW	73 A / 219 A	50 kW	±50A / ±150A	200 kg	770 x 450 x 1100 mm
EL+60 vAC/DC	54 kW	80 A / 240 A	54 kW	±57A / ±171A	200 kg	770 x 450 x 1100 mm
EL+80 vAC/DC	80 kW	116 A / -	80 kW	±105A / ±315A	400 kg	870 x 875 x 1320 mm
EL+100 vAC/DC	100 kW	145 A / -	100 kW	±130A / ±390A	400 kg	870 x 875 x 1320 mm
EL+120 vAC/DC	108 kW	157 A / -	108 kW	±130A / ±390A	400 kg	870 x 875 x 1320 mm
EL+160 vAC/DC	145 kW	211 A / -	145 kW	±155A / ±465A	680 kg	850 x 900 x 2000 mm
EL+200 vAC/DC	160 kW	232 A / -	160 kW	±185A / ±555A	680 kg	850 x 900 x 2000 mm

\*For EL mode is not available a physical 3 channel/1 channel switch. To work in a single phase mode, it's necessary to introduce a monophasic grid at the output.

\*\*All specifications are subject to change without notice.

## MODELS

EL+ vAC	AC Power	AC Current*	-	-	Weight	Dimensions
EL+7.5 vAC	7.5 kW	11 A / 33 A	-	-	155 kg	770 x 450 x 1100 mm
EL+10 vAC	10 kW	15 A / 45 A	-	-	155 kg	770 x 450 x 1100 mm
EL+15 vAC	15 kW	22 A / 66 A	-	-	155 kg	770 x 450 x 1100 mm
EL+20 vAC	20 kW	29 A / 87 A	-	-	155 kg	770 x 450 x 1100 mm
EL+30 vAC	27 kW	40 A / 120 A	-	-	155 kg	770 x 450 x 1100 mm
EL+40 vAC	40 kW	58 A / 174 A	-	-	200 kg	770 x 450 x 1100 mm
EL+50 vAC	50 kW	73 A / 219 A	-	-	200 kg	770 x 450 x 1100 mm

Reference	DC Power Rated <sup>(9)</sup>	DC Voltage Normal Range / HV option	DC Current Rated 3 channel Unipolar Mode	DC Current Rated 1 channel Unipolar Mode	DC Current Rated + / 0 / - Bipolar 40 Mode	Weight	Dimensions D x W x H
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## B2C+

B2C+	DC Power	DC Voltage	DC Current	DC Current	DC Current	Weight	Dimensions
B2C+7.5	7.5 kW	30-750 / 800 V	±10 A	±30 A	±10 A	155 kg	770 x 450 x 1100 mm
B2C+10	10 kW	30-750 / 800 V	±15 A	±45 A	±15 A	155 kg	770 x 450 x 1100 mm
B2C+15	15 kW	30-750 / 800 V	±20 A	±60 A	±20 A	155 kg	770 x 450 x 1100 mm
B2C+20	20 kW	30-750 / 800 V	±25 A	±75 A	±25 A	155 kg	770 x 450 x 1100 mm
B2C+30	27 kW	30-750 / 800 V	±30 A	±90 A	±30 A	155 kg	770 x 450 x 1100 mm
B2C+40	40 kW	30-750 / 800 V	±40 A	±120 A	±40 A	200 kg	770 x 450 x 1100 mm
B2C+50	50 kW	30-750 / 800 V	±50 A	±150 A	±50 A	200 kg	770 x 450 x 1100 mm
B2C+60	54 kW	30-750 / 800 V	±57 A	±170 A	±57 A	200 kg	770 x 450 x 1100 mm
B2C+80	80 kW	30-750 / 800 V	±105 A	±315 A	±105 A	320 kg	870 x 590 x 1320 mm
B2C+100	100 kW	30-750 / 800 V	±130 A	±390 A	±130 A	320 kg	870 x 590 x 1320 mm
B2C+120	108 kW	30-750 / 800 V	±130 A	±390 A	±130 A	320 kg	870 x 590 x 1320 mm
B2C+160	145 kW	30-750 / 800 V	±155 A	±465 A	±155 A	680 kg	850 x 900 x 2000 mm
B2C+200	160 kW	30-750 / 800 V	±185 A	±555 A	±185 A	680 kg	850 x 900 x 2000 mm

\*All specifications are subject to change without notice.

Reference	AC Power Rated <sup>(9)</sup>	AC Current Rated <sup>(9)</sup> RMS 3 channel / 1 channel	DC Power Rated <sup>(9)</sup>	DC Current Rated <sup>(9)</sup> RMS 3 channel / 1 channel	Weight	Dimensions D x W x H
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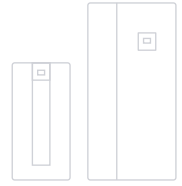
## Avionics

EL+ vHF/DC	AC Power	AC Current*	DC Power	DC Current	Weight	Dimensions
EL+15 vHF/DC	15 kW	20 A / 60 A	15 kW	±20 A / ±60 A	155 kg	770 x 450 x 1100 mm
EL+20 vHF/DC	20 kW	26 A / 78 A	20 kW	±25 A / ±75 A	155 kg	770 x 450 x 1100 mm
EL+30 vHF/DC	27 kW	40 A / 120 A	27 kW	±30 A / ±90 A	155 kg	770 x 450 x 1100 mm
EL+40 vHF/DC	40 kW	52 A / 156 A	40 kW	±40 A / ±120 A	200 kg	770 x 450 x 1100 mm
EL+50 vHF/DC	50 kW	65 A / 195 A	50 kW	±50 A / ±150 A	200 kg	770 x 450 x 1100 mm

EL+ vHF	AC Power	AC Current*	-	-	Weight	Dimensions
EL+15 vHF	15 kW	20 A / 60 A	-	-	155 kg	770 x 450 x 1100 mm
EL+20 vHF	20 kW	26 A / 78 A	-	-	155 kg	770 x 450 x 1100 mm
EL+30 vHF	27 kW	40 A / 120 A	-	-	155 kg	770 x 450 x 1100 mm
EL+40 vHF	40 kW	52 A / 156 A	-	-	200 kg	770 x 450 x 1100 mm
EL+50 vHF	50 kW	65 A / 195 A	-	-	200 kg	770 x 450 x 1100 mm

\*For EL mode is not available a physical 3 channel/1 channel switch. To work in a single phase mode, it's necessary to introduce a monophasic grid at the output.

\*\*All specifications are subject to change without notice.



Reference	AC Power Rated <sup>(9)</sup>	AC Current Rated <sup>(9)</sup> RMS 3 channel / 1 channel	DC Power Rated <sup>(9)</sup>	DC Current Rated <sup>(9)</sup> RMS 3 channel / 1 channel	Weight	Dimensions D x W x H
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## PHiL

EL+ vHiL	AC Power	AC Current*	DC Power	DC Current	Weight	Dimensions
EL+7.5 vHiL	7.5 kW	11 A / 33 A	3.75 kW	±5 A / ±15 A	155 kg	770 x 450 x 1100 mm
EL+10 vHiL	10 kW	15 A / 45 A	5 kW	±7.5 A / ±22.5 A	155 kg	770 x 450 x 1100 mm
EL+15 vHiL	15 kW	22 A / 66 A	7.5 kW	±10 A / ±30 A	155 kg	770 x 450 x 1100 mm
EL+20 vHiL	20 kW	29 A / 87 A	10 kW	±12.5 A / ±37.5 A	155 kg	770 x 450 x 1100 mm
EL+30 vHiL	27 kW	40 A / 120 A	13.5 kW	±15 A / ±45 A	155 kg	770 x 450 x 1100 mm
EL+40 vHiL	40 kW	58 A / 174 A	20 kW	±20 A / ±60 A	200 kg	770 x 450 x 1100 mm
EL+50 vHiL	50 kW	73 A / 219 A	25 kW	±25 A / ±75 A	200 kg	770 x 450 x 1100 mm
EL+60 vHiL	54 kW	80 A / 240 A	27 kW	±28.5 A / ±85.5 A	200 kg	770 x 450 x 1100 mm
EL+80 vHiL	80 kW	116 A / -	40 kW	±52.5 A / ±157.5 A	400 kg	870 x 875 x 1320 mm
EL+100 vHiL	100 kW	145 A / -	50 kW	±65 A / ±195 A	400 kg	870 x 875 x 1320 mm
EL+120 vHiL	108 kW	157 A / -	54 kW	±65 A / ±195 A	400 kg	870 x 875 x 1320 mm
EL+160 vHiL	145 kW	211 A / -	72.5 kW	±77.5 A / ±232.5 A	680 kg	850 x 900 x 2000 mm
EL+200 vHiL	160 kW	232 A / -	80 kW	±92.5 A / ±277.5 A	680 kg	850 x 900 x 2000 mm

GE+ vHiL	AC Power	AC Current	DC Power	DC Current	Weight	Dimensions
GE+7.5 vHiL	7.5 kW	11 A / 33 A	3.75 kW	±5 A / ±15 A	155 kg	770 x 450 x 1100 mm
GE+10 vHiL	10 kW	15 A / 45 A	5 kW	±7.5 A / ±22.5 A	155 kg	770 x 450 x 1100 mm
GE+15 vHiL	15 kW	22 A / 66 A	7.5 kW	±10 A / ±30 A	155 kg	770 x 450 x 1100 mm
GE+20 vHiL	20 kW	29 A / 87 A	10 kW	±12.5 A / ±37.5 A	155 kg	770 x 450 x 1100 mm
GE+30 vHiL	27 kW	40 A / 120 A	13.5 kW	±15 A / ±45 A	155 kg	770 x 450 x 1100 mm
GE+40 vHiL	40 kW	58 A / 174 A	20 kW	±20 A / ±60 A	200 kg	770 x 450 x 1100 mm
GE+50 vHiL	50 kW	73 A / 219 A	25 kW	±25 A / ±75 A	200 kg	770 x 450 x 1100 mm
GE+60 vHiL	54 kW	80 A / 240 A	27 kW	±28.5 A / ±85.5 A	200 kg	770 x 450 x 1100 mm
GE+80 vHiL	80 kW	116 A / -	40 kW	±52.5 A / ±157.5 A	320 kg	870 x 590 x 1320 mm
GE+100 vHiL	100 kW	145 A / -	50 kW	±65 A / ±195 A	320 kg	870 x 590 x 1320 mm
GE+120 vHiL	108 kW	157 A / -	54 kW	±65 A / ±195 A	320 kg	870 x 590 x 1320 mm
GE+160 vHiL	145 kW	211 A / -	72.5 kW	±77.5 A / ±232.5 A	680 kg	850 x 900 x 2000 mm
GE+200 vHiL	160 kW	232 A / -	80 kW	±92.5 A / ±277.5 A	680 kg	850 x 900 x 2000 mm

\*For EL mode is not available a physical 3 channel/1 channel switch. To work in a single phase mode, it's necessary to introduce a monophasic grid at the output.  
\*\*All specifications are subject to change without notice.

## Galvanic Isolation (optional)

INSIDE THE CABINET	Circuit Breaker Recommended	Weight	IN EXTERNAL CABINET IP20	Circuit Breaker Recommended	Weight	Dimensions D x W x H
IT 7.5i	Type C - 25 A	145 kg	IT 30e	Type D - 80 A	174 kg	595 x 415 x 708 mm
IT 10i	Type C - 25 A	145 kg	IT 40e	Type D - 100 A	217 kg	710 x 525 x 775 mm
IT 15i	Type C - 32 A	145 kg	IT 50e	Type D - 125 A	280 kg	710 x 525 x 775 mm
IT 20i	Type C - 40 A	145 kg	IT 60e	Type D - 160 A	381 kg	875 x 600 x 900 mm
IT 30i	Type C - 50 A	195 kg	IT 80e	Type D - 200 A	435 kg	875 x 600 x 900 mm
IT 40i*	Type C - 63 A	195 kg	IT 100e	Type D - 250 A	458 kg	875 x 600 x 900 mm
IT 50i*	Type C - 83 A	195 kg	IT 120e	Type D - 315 A	514 kg	875 x 600 x 900 mm
			IT 160e	Type D - 400 A	612 kg	964 x 648 x 1252 mm
			IT 200e	Type D - 500 A	753 kg	1210 x 750 x 1430 mm

\*In the IT 40i and IT 50i models the size of the cabinet increases to a total of 770 x 835 x 1100 mm. The others keep the original size.

# Regenerative Power Electronics Solutions

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