cinergia

INNODC meeting

October 2020

Confidentiality

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Introduction

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Running a company:

CINERGIA trajectory and experience

Introduction

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Legs of a technology-based company:

- TECHNICAL
- SALES / MARKET
- OPERATIONS / FINANCIAL
- HUMAN FACTOR

The Human Factor: the company will progress with the skills, motivation and effort of the people.

The Business Plan is a tool to describe and test the first three legs before starting up the business. Afterwards, it allows an iterative process to check and correct.

Source: http://passionforstartups.com/

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Control
Intel.ligent
de l'energia

Objective

To promote the application of digital control and power electronics technologies for:

- Conversion of electrical energy
- Energy efficiency and savings

How

-Developing tailored equipments and solutions

- Offering products for:
  - Industry
  - R+D labs
  - Education and training

- Offering engineering services for mechatronics and enertronics applications:
  - Industrialization, commissioning, technical assistance
  - Industrial automation and communications
  - Energy efficiency and saving

Presentation of the Company

Who we are:

CINERGIA is an engineering company that provides high technology products and services in the field of electrical power conversion. Our areas of expertise are:

- Power electronics
- Digital control for power conversion
- Industrial communications and Automation

Our engineering team has the knowledge and experience to customize our solutions to the needs of our customers.

We provide solutions in:

- Smart Grids
- Electromobility
- Test equipment for R&D and Industrial laboratories

Products and services index

Standard Products

- Grid emulator
- Load emulator / electronic load
- Bidirectional AC & DC sources and loads
- Bidirectional Battery Chargers (V2G)
- Emulators of PV panels and DC storage systems
- Universal DER emulator
- Microgrid Manager (Battery Inverter/Charger)

Custom products (product + engineering)

- Custom power electronics converters
- Microgrid Energy Managers
- Test benches
- Industrial automation

Engineering Services

- Consulting
- Engineering
- Innovation services:
  - Development
  - Industrialization
  - Production
- Technical assistance
- Commissioning
- Homologation
- Training

The Company

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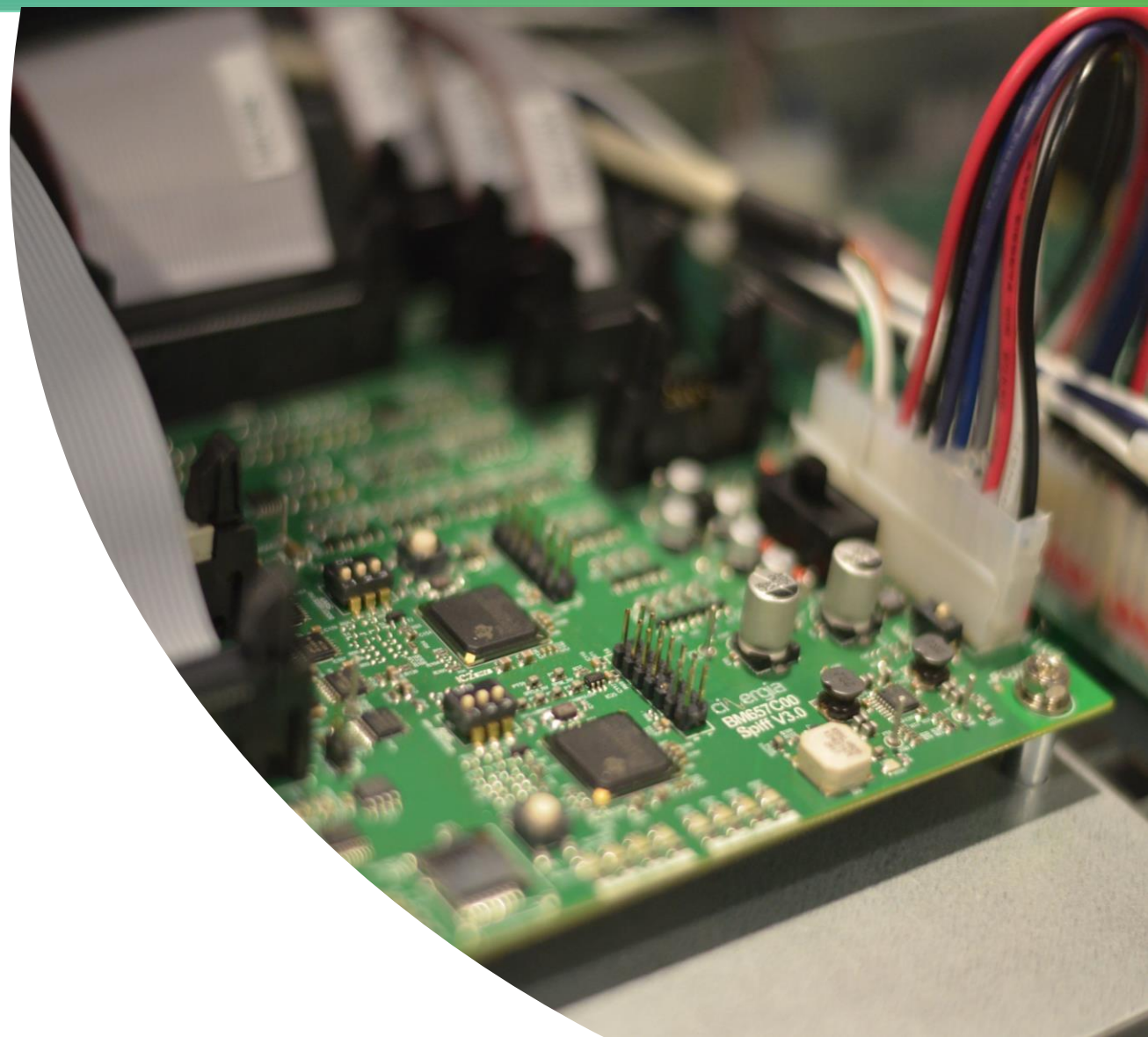
CINERGIA is the result of the know-how, the experience and the passion of our team in developing, producing and commercializing power electronics solutions.

Our areas of expertise include **power electronics**, DSP-based **digital control** of converters, **communications** and HMI.

We provide solutions for Testing, Research, Development and Academic applications.



The Company

2008

The origins of **CINERGIA** founding team is in a R&D Center in the University providing Technology Transfer R&D services to private companies. After the establishment, the main activity in the first years was focused on providing Engineering Services and Tailored Power Electronics solutions.

2014

CINERGIA launches its standard product catalogue for Industrial Testing, R&D and Academic applications. The first distributors around Europe are appointed and start the commercialization of these solutions. An industrial partnership agreement with Salicru is signed at production and R&D level.

2018

CINERGIA launches the PLUS family, the technical evolution of its standard product catalogue.

2020

CINERGIA launches the ePLUS platform with master/slave connection of units allowing a new field of applications in the high-power testing platforms.

The company

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Start-up company: "A startup is a temporary organization designed to search for a repeatable and scalable business model" (Steve Blank)

- Temporary organization: *"a startup always, sooner or later, finishes its launching phase and if it is successful, it leads into the growth phase and if not ... it shuts down (or even worse if its founders decide not to close it, then it becomes a zombie startup). But even the last case, it is no longer a startup because it is no longer in its launching phase".*

- Searching for a repeatable and scalable business model: *"Entrepreneurs are hardly sure of their business model when launching a startup. They do create their startup to find the right business model, the one which generates recurring revenues (repeatable business model), and also the one which is able to grow and with revenues growing proportionately more than their expenses (scalable business model)."*

Source: http://passionforstartups.com/

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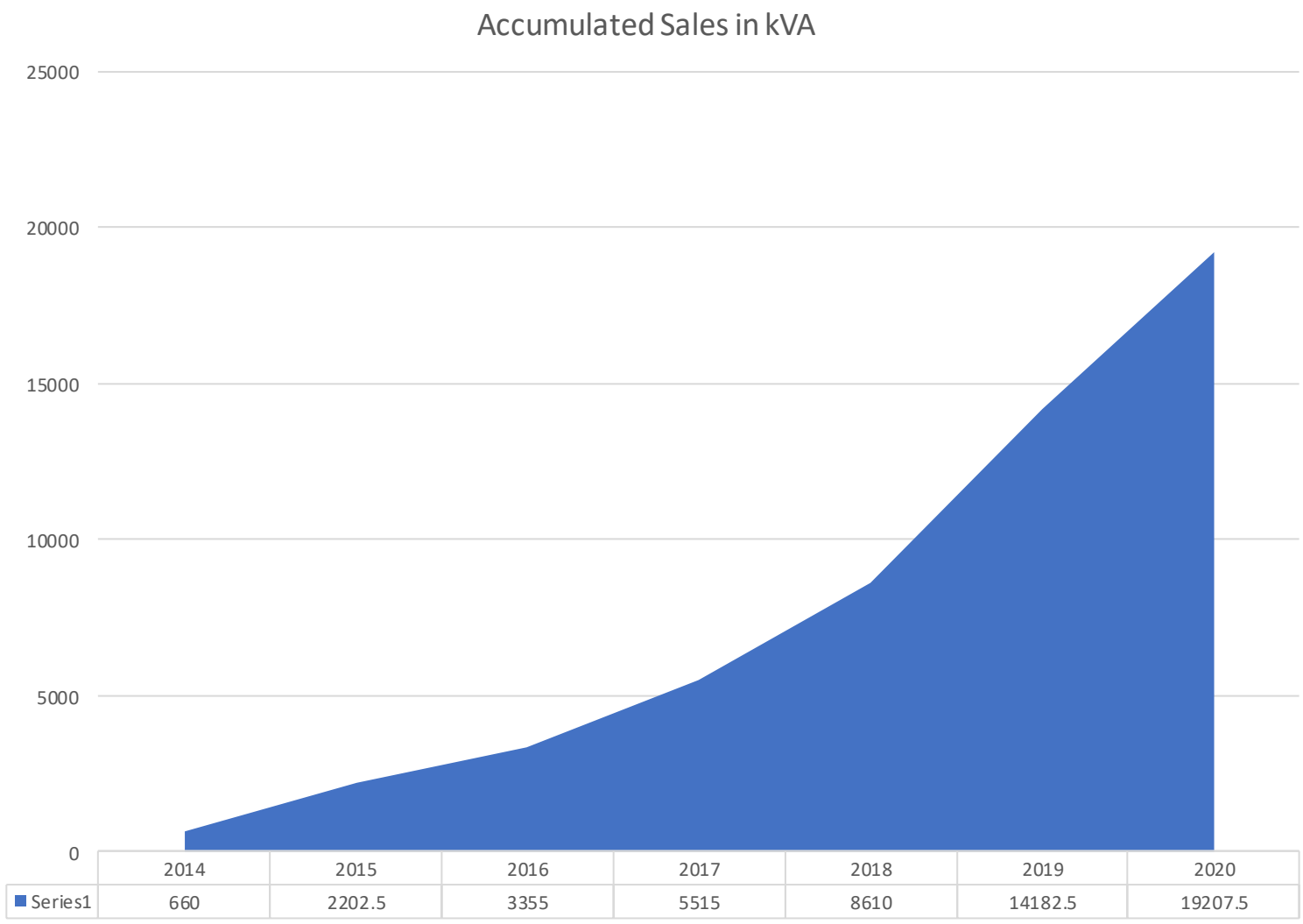

The company

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More than 18MW of our units supplied worldwide

The company

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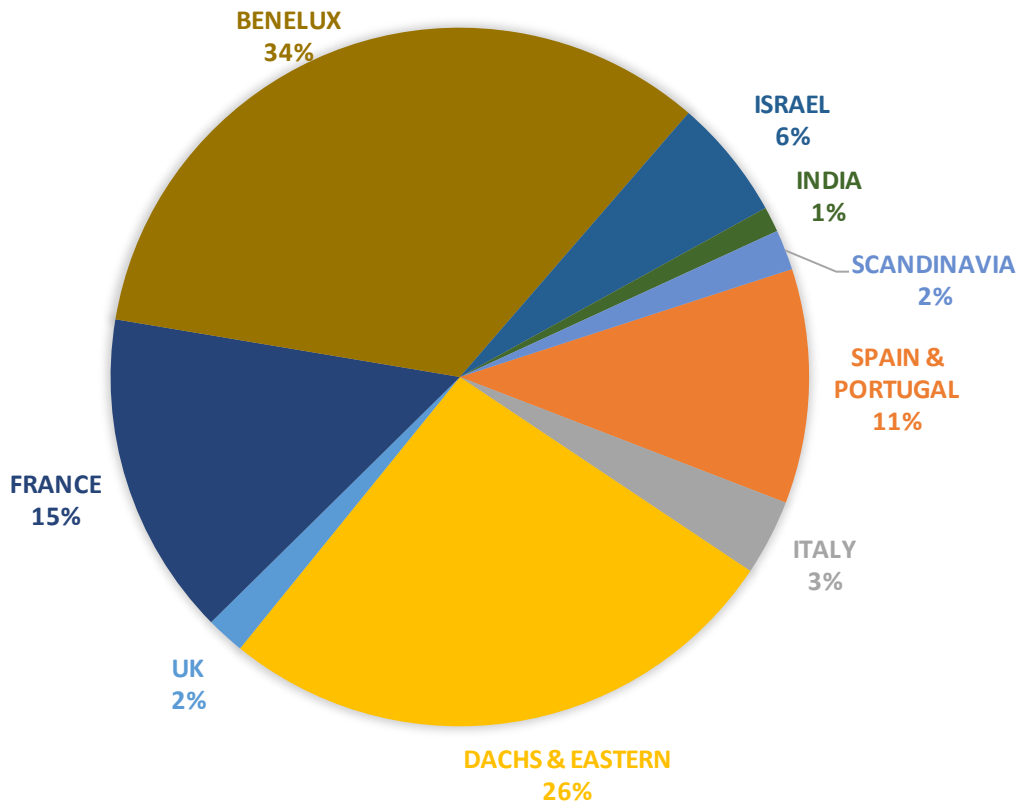
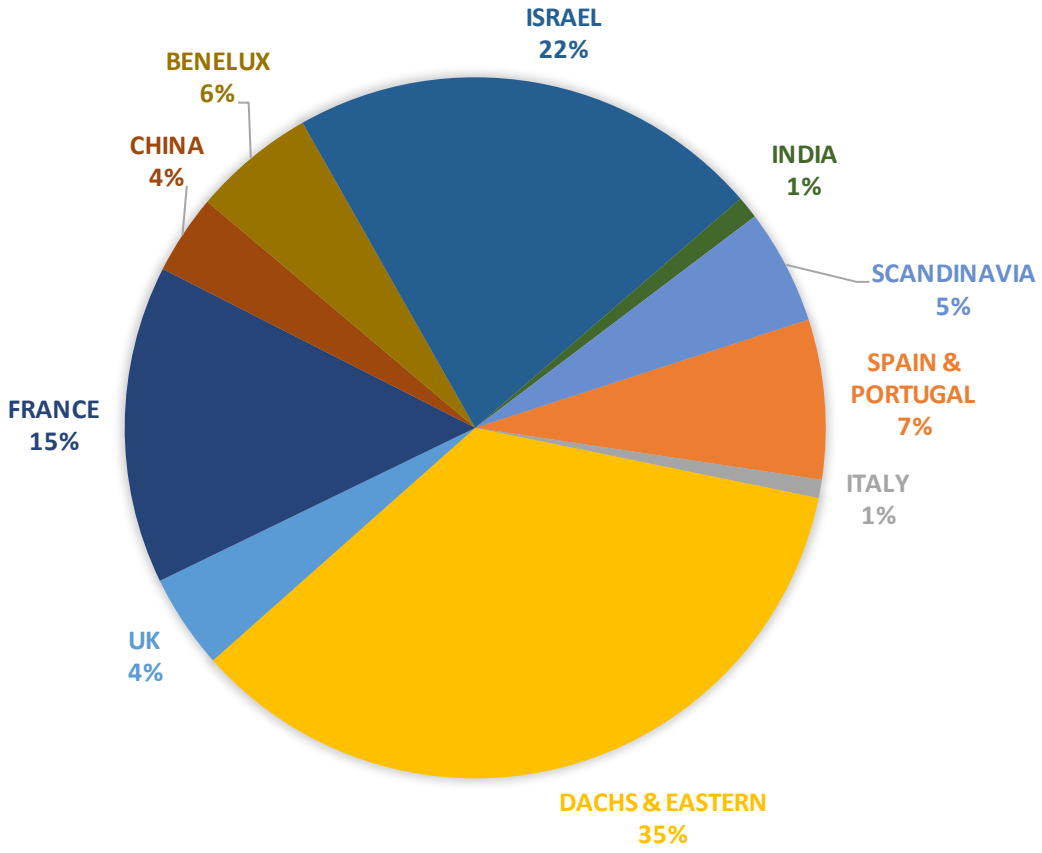
SALES BY COUNTRY 2019



SALES BY COUNTRY 2020



The company

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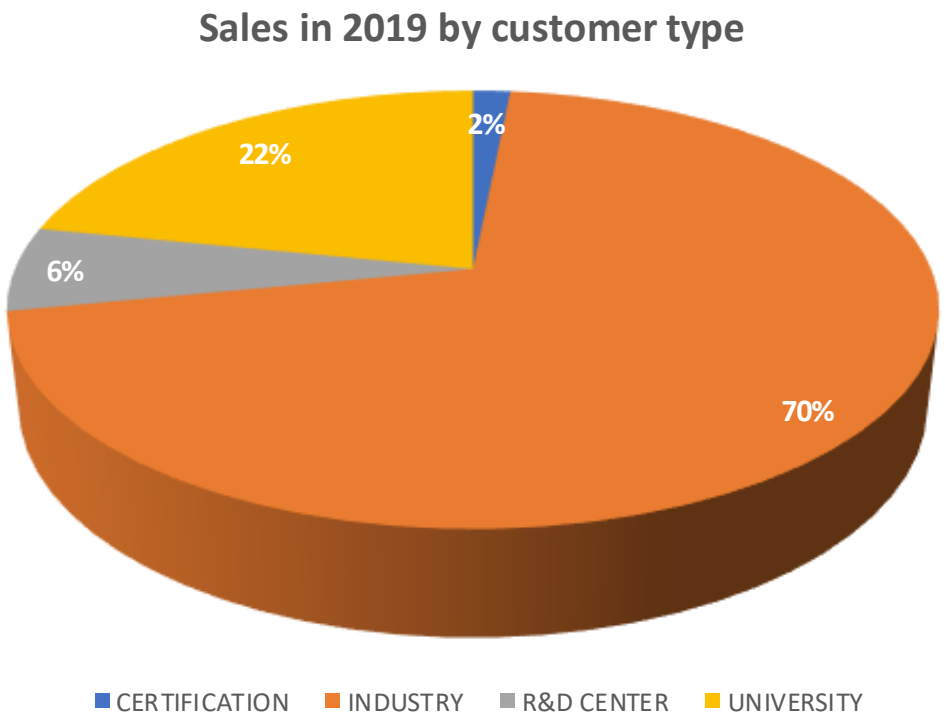
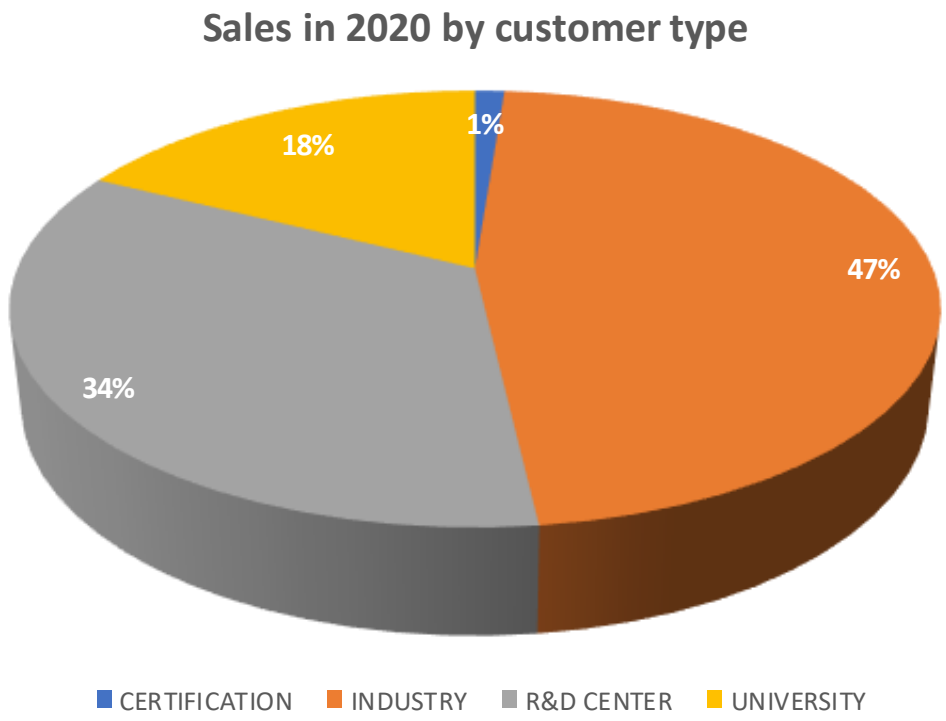
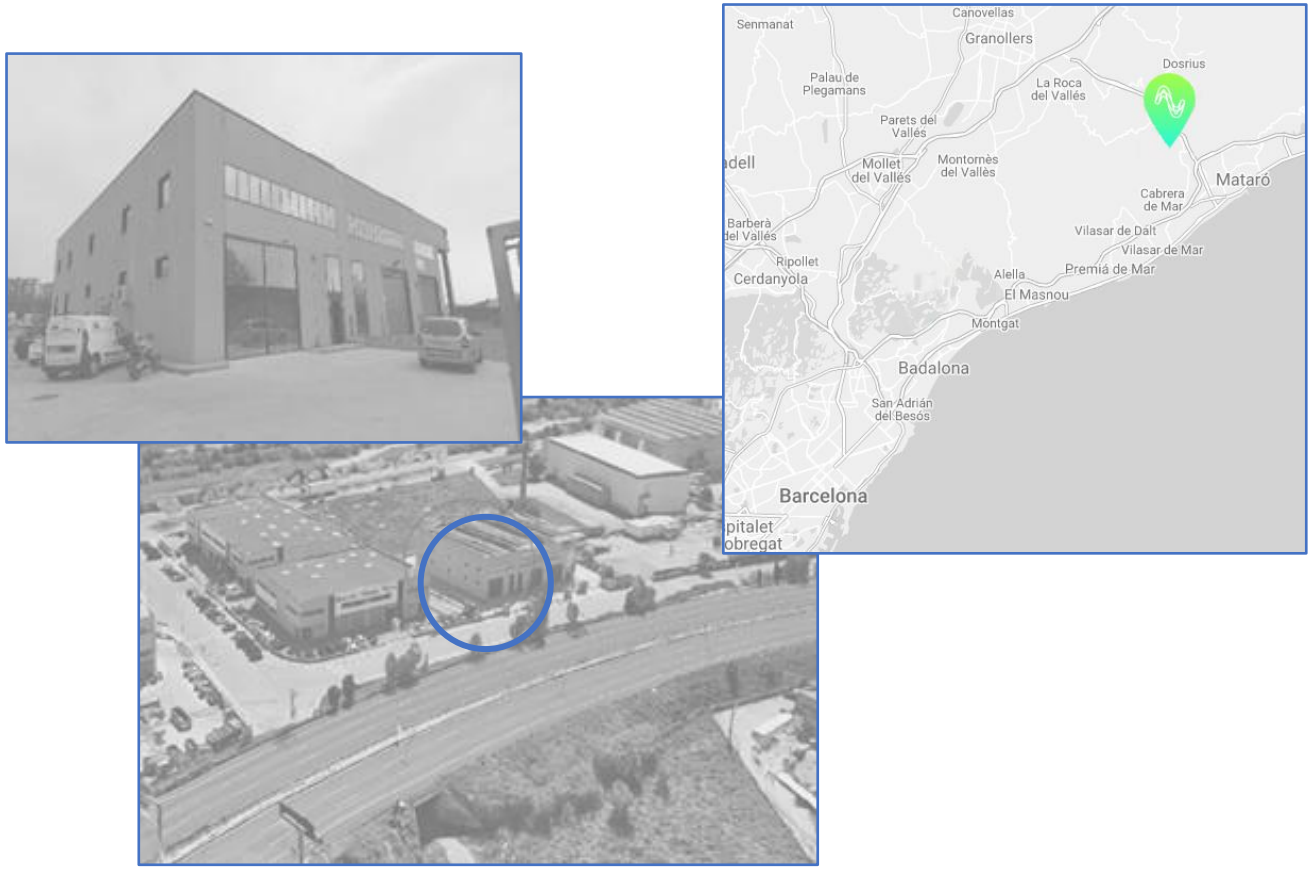




The company

CINERGIA facilities are located in Argentona, 34km away from Barcelona. A 760m2 industrial plant very well located for logistic.



200 m² Work Area and laboratories.

73 m² Training area.

240 m² Offices and meeting rooms.

117 m² Waiting and rest room

40 m² Cantina and networking area.

87 m² Warehouse.

VIDEO

What do we do?

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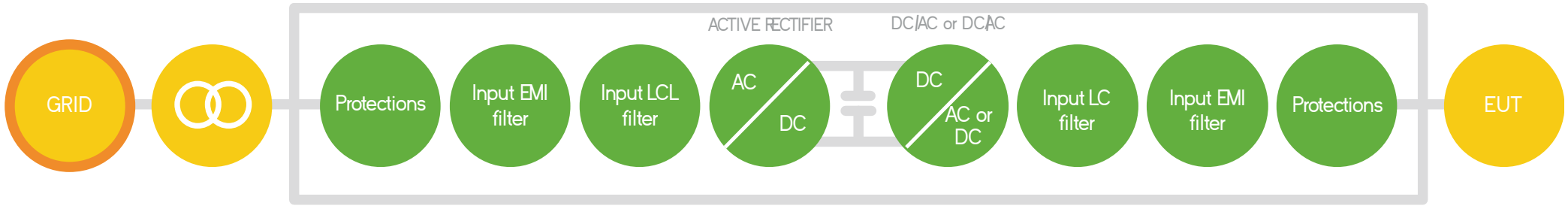

- **Back-to-back topology**
- **Grid-side (input) converter**: An Active Rectifier regulates the voltage at the DC-link while sinks/sources sinusoidal current in/to the AC-grid
- **EUT-side (output) converter**: a DC-AC inverter or DC-DC converter controls the output voltage / current / power / frequency

Regenerative Power Hardware: AC version (GE+)

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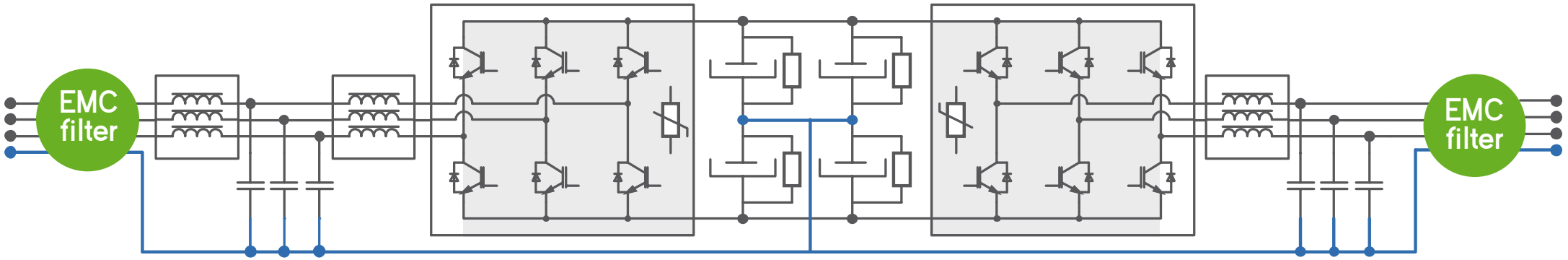

Current Sensor x3

Driver x6

Voltage Sensor x2

Driver x6

Current Sensor x3

Voltage Sensor x3

DSP Controller

DSP Controller

Voltage Sensor x3

HMI

Modbus/ TCP / Ethernet

Regenerative Power Hardware: AC version (EL+)

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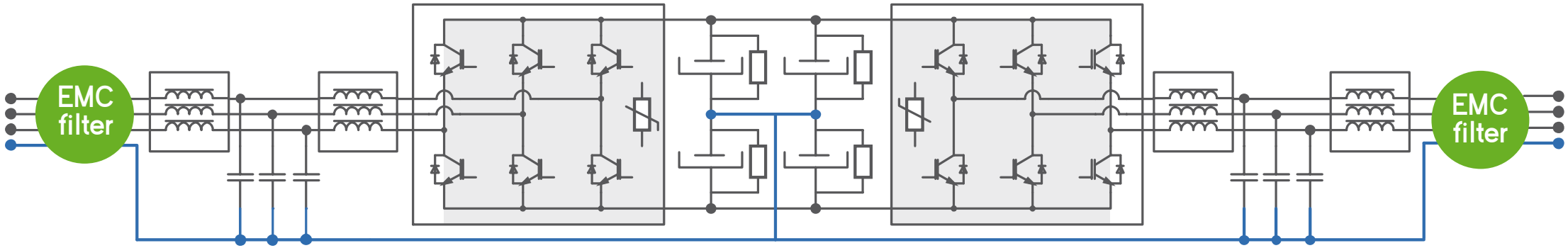

Current Sensor x3

Driver x6

Voltage Sensor x2

Driver x6

Current Sensor x3

Voltage Sensor x3

DSP Controller

DSP Controller

Voltage Sensor x3

HMI

Modbus/ TCP / Ethernet

The B2C+ (Regenerative DC converter)

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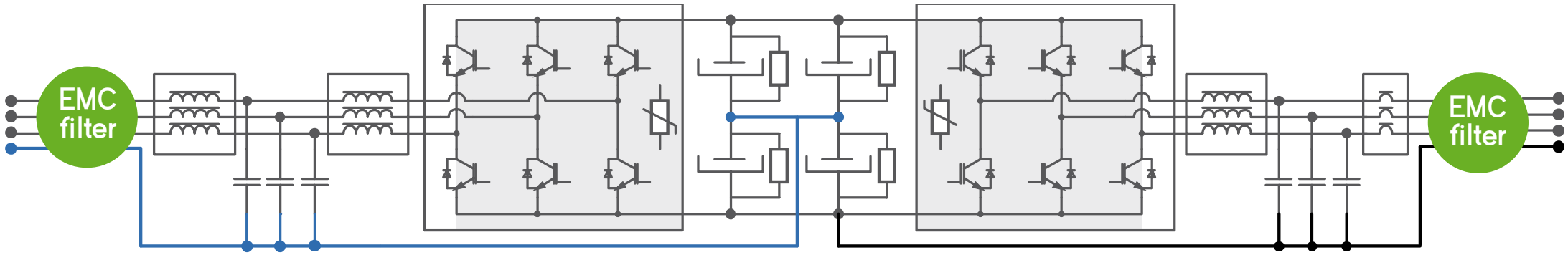

Current Sensor x3

Driver x6

Voltage Sensor x2

Driver x6

Current Sensor x3

Voltage Sensor x3

DSP Controller

DSP Controller

Voltage Sensor x3

HMI

Modbus/ TCP / Ethernet

Product Portfolio

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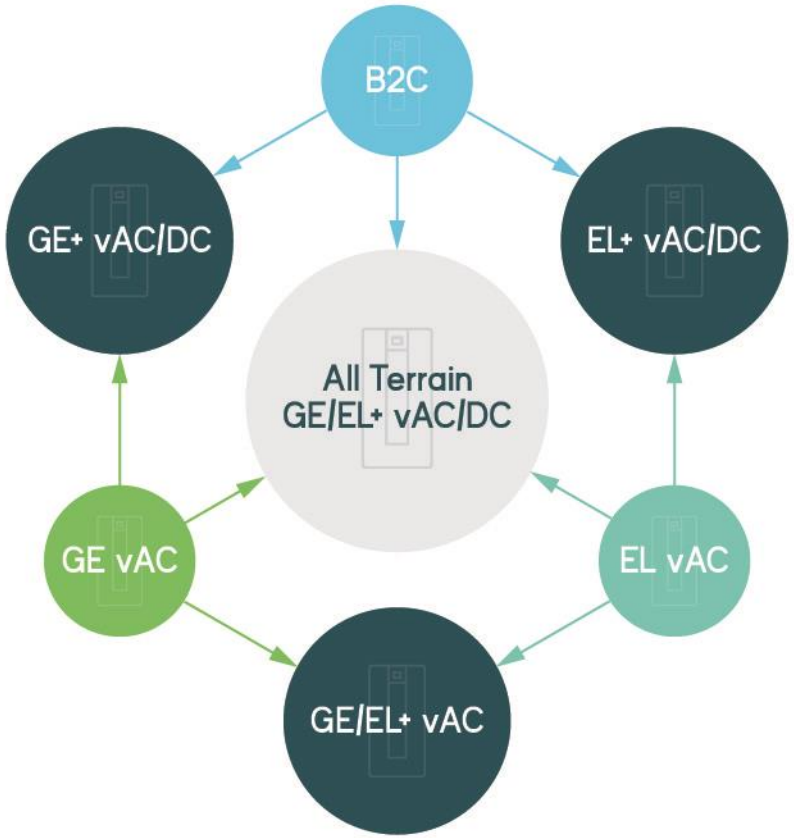

ALL in ONE

- GE/EL vAC/DC: AC Grid Emulator / AC Electronic Load / B2C

TWO in ONE

- GE vAC/DC: AC Grid Emulator / B2C
- EL vAC/DC: AC Electronic Load / B2C
- GE/EL vAC: AC Grid Emulator / AC Electronic Load

ONE FUNCTIONALITY

- GE vAC: AC only Grid Emulator
- EL vAC: AC only Electronic Load
- B2C: DC Source and Load

Product Portfolio

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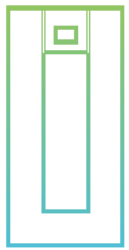
Products



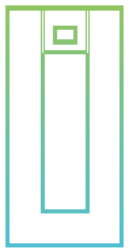
GE&EL+

Grid Simulator + Electronic Load

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

Models
All-Terrain vAC/DC
All-in-One vAC

Power Range
7.5 kW - 160 kW



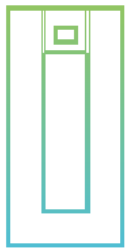
GE+

Grid Simulator

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

Models
EL+ vAC
EL+ vAC/DC Full

Power Range
7.5 kW - 160 kW



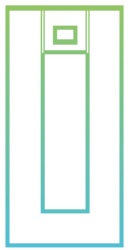
EL+

Electronic Load

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

Models
GE+ vAC
GE+ vAC/DC Full

Power Range
7.5 kW - 160 kW



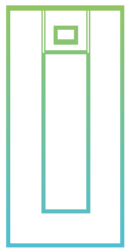
B2C+

Bidirectional DC Converter

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

Models
Battery Pack Tester
PV Panel Emulation
Battery Emulation

Power Range
7.5 kW - 160 kW



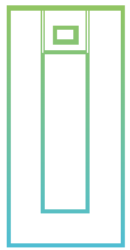
Avionics

High Frequency

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

Models
EL+ vHF/DC
EL+ vHF/AC
EL+ vHF

Power Range
7.5 kW - 160 kW



PHiL

Power HiL

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

Models
Battery Pack Tester
PV Panel Emulation
Battery Emulation

Power Range
7.5 kW - 160 kW

The enhanced ePLUS family

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The ePLUS is the 3rd generation of CINERGIA control platform integrating a more powerful dual-core DSP.

- **MASTER/SLAVE CONNECTION:** by using a fiber optics link to increase power/voltage capabilities:
  - GE in AC: can be connected in parallel
  - EL in AC: can be connected in parallel
  - B2C: can be connected in parallel, or series or series/parallel
- **MORE HARMONICS:** 50 per phase with 20 free-harmonics
- **DELTA LOAD** for the EL in AC mode
- **ADJUSTABLE DC TRANSIENT** controllers to improve stability of the system
- **SAME ELECTRICAL RATINGS and SAME BANDWIDTH:** because the power platform is not changed

The enhanced ePLUS family

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- **HIGHER RESOLUTION:** by using an oversampling technique @300kHz on the analogue measurements
- **FASTER DYNAMICS:** transient < 1ms, based on the higher resolution and low noise measurements
- **MORE FUNCTIONALITIES** in AC and DC
- **POWER AMPLIFIER** model for Power Hardware in the Loop applications
- **STEPS** automated tests executed directly on the unit for deterministic and accurate testing
- **PREDEFINED TESTS:** IEC61000, LVRT, etc...
- **USER CONFIGURABLE** analog inputs & outputs (6+6)

The enhanced ePLUS family

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- **SAFETY**: emergency input&output ready to integrate the unit in the Emergency Interlock Circuit
- **USER CONFIGURABLE LIMITS AND ALARMS**: for current, voltage, overcurrent, overvoltage & overload
- **SAVING OF LIMITS AND ALARMS**: in EEPROM by advanced user (password protected)
- **NEW SOFTWARE**: more intuitive and flexible
- **4.3" LOCAL TOUCHSCREEN**
- **DATALOGGING**: of test variables, accessible from FTP (200ms minimum step time)

The SiC ePLUS platform

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- SiC transistors replace IGBT transistors in the power platform, both at the grid side and the EUT side
- 60kHz switching frequency
- Large signal bandwidth up to 1000Hz
- 60, 50 and 40kW models with isolation transformer in the same cabinet

Master/Slave configurations

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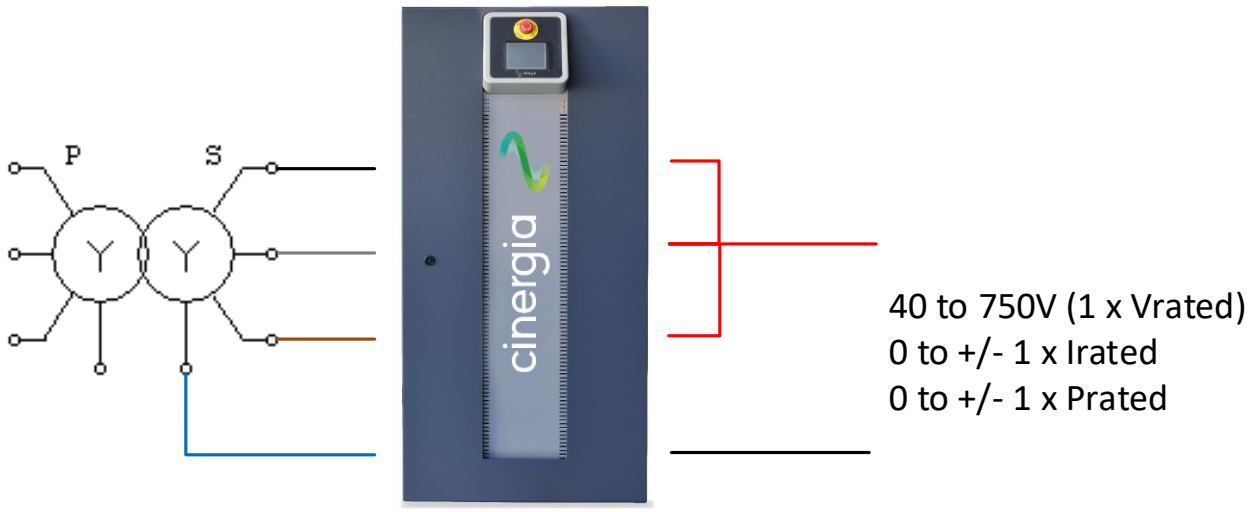
Master/Slave configuration examples in DC

CONFIGURATIONS: 1 Unit in 1CH mode



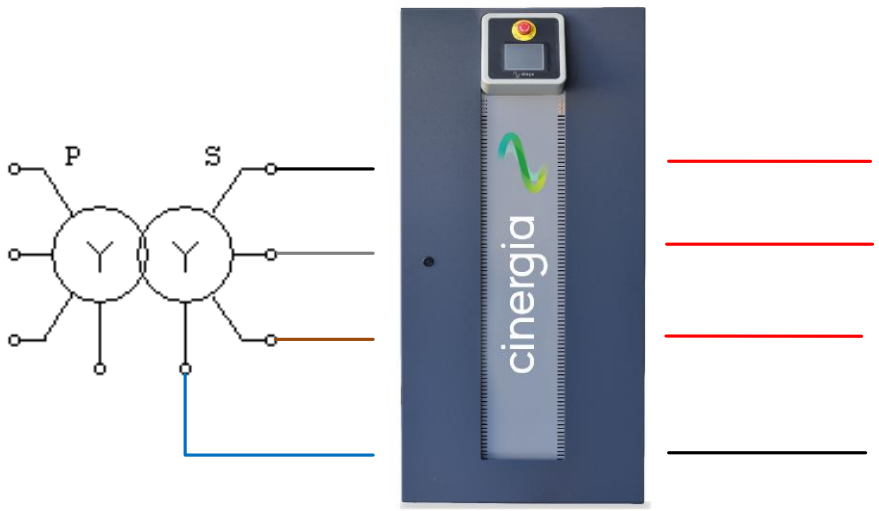
B2C+120

- 40 to 750Vdc
- 0 to +/- 390Adc
- 0 to +/- 108kW (0 to +/- 162kW for 1 min)

B2C+200

- 40 to 750Vdc
- 0 to +/- 555Adc
- 0 to +/- 160kW (0 to +/- 240kW for 1 min)

CONFIGURATIONS: 1 Unit in 3CH mode



Each channel:
40 to 750V (1 x Vrated)
0 to +/- 1/3 x Irated
0 to +/- 1/3 x Prated

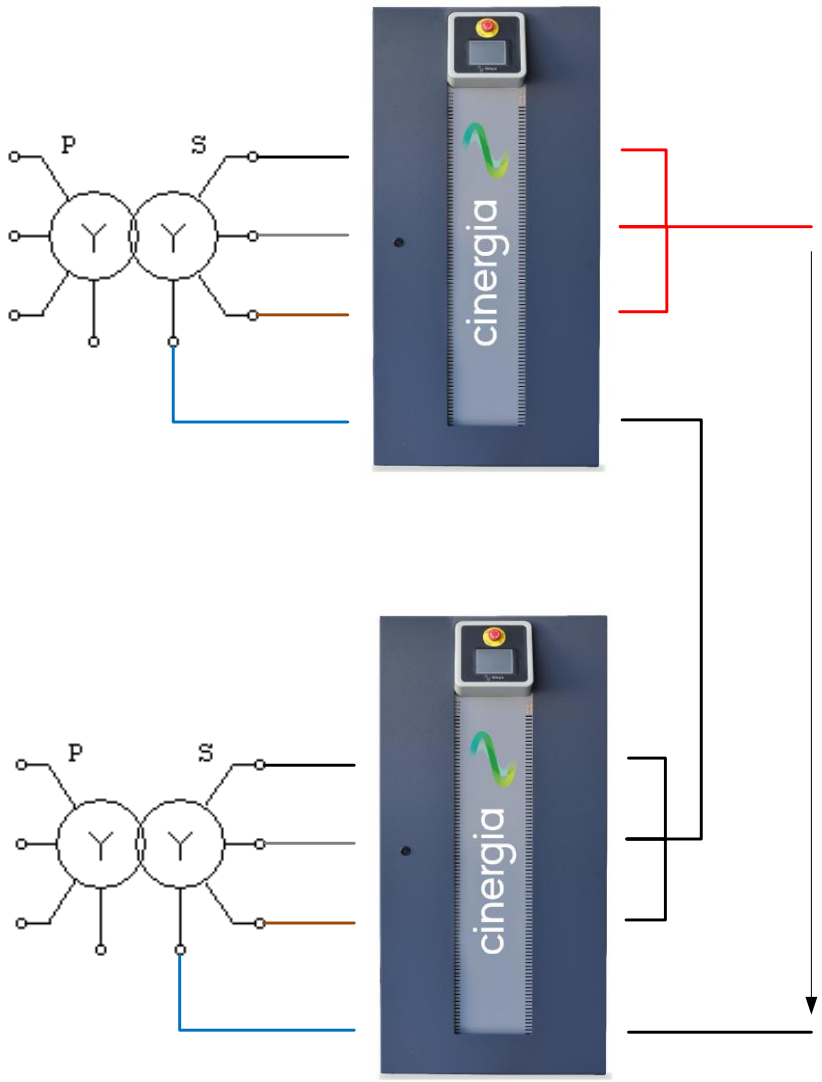
B2C+120 (each channel)

- 40 to 750Vdc
- 0 to +/- 130Adc
- 0 to +/- 36kW (0 to +/- 54kW for 1 min)

B2C+200 (each channel)

- 40 to 750Vdc
- 0 to +/- 185Adc
- 0 to +/- 53.3kW (0 to +/- 80kW for 1 min)

CONFIGURATIONS: 2 Units in SERIAL



80 to 1500V (2 x Vrated)
0 to +/- 1 x Irated
0 to +/- 2 x Prated

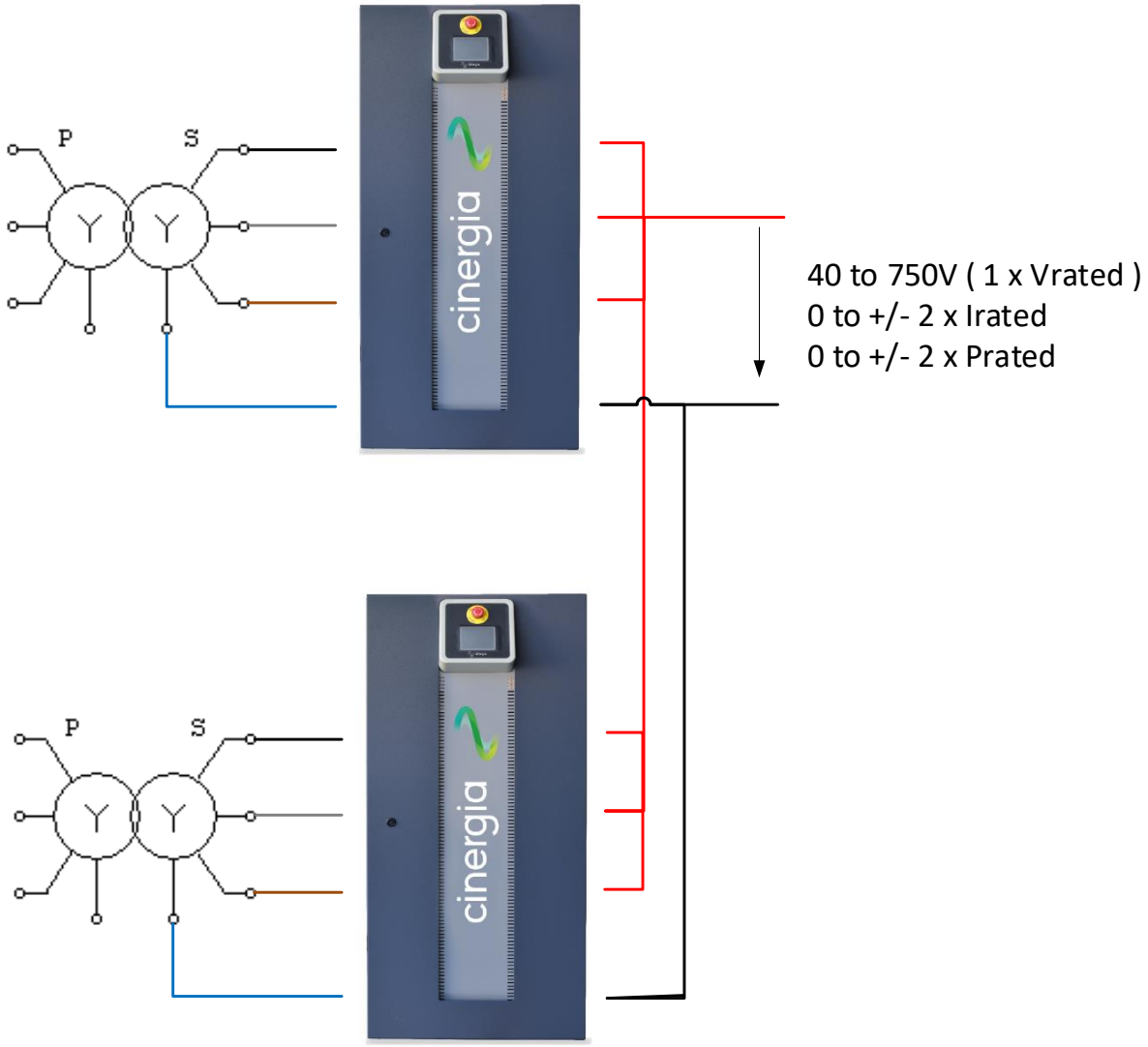
B2C+120

- 80 to 1500Vdc
- 0 to +/- 390Adc
- 0 to +/- 216kW (0 to +/- 324kW for 1 min)

B2C+200

- 80 to 1500Vdc
- 0 to +/- 555Adc
- 0 to +/- 320kW (0 to +/- 480kW for 1 min)

CONFIGURATIONS: 2 Units in PARALLEL



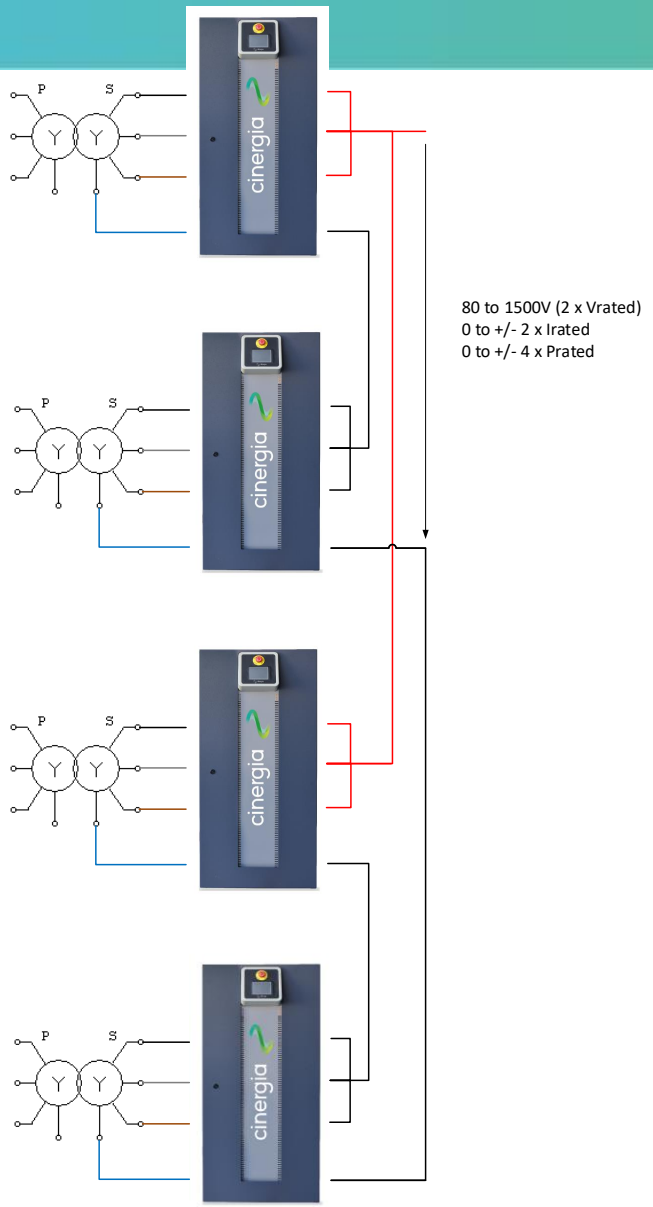
B2C+120

- 40 to 750Vdc
- 0 to +/- 780Adc
- 0 to +/- 216kW (0 to +/- 324kW for 1 min)

B2C+200

- 40 to 750Vdc
- 0 to +/- 1110Adc
- 0 to +/- 320kW (0 to +/- 480kW for 1 min)

CONFIGURATIONS: 4 Units in SERIAL/PARALLEL



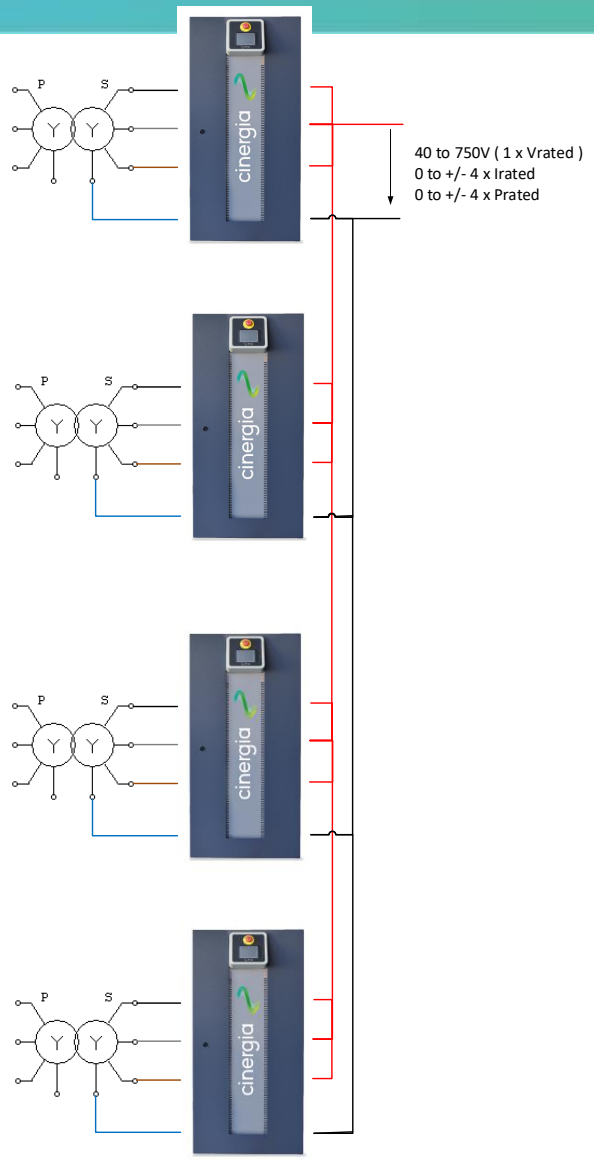
B2C+120

- 80 to 1500Vdc
- 0 to +/- 780Adc
- 0 to +/- 432kW (0 to +/- 648kW for 1 min)

B2C+200

- 80 to 1500Vdc
- 0 to +/- 1110Adc
- 0 to +/- 640kW (0 to +/- 960kW for 1 min)

CONFIGURATIONS: 4 Units in PARALLEL



B2C+120

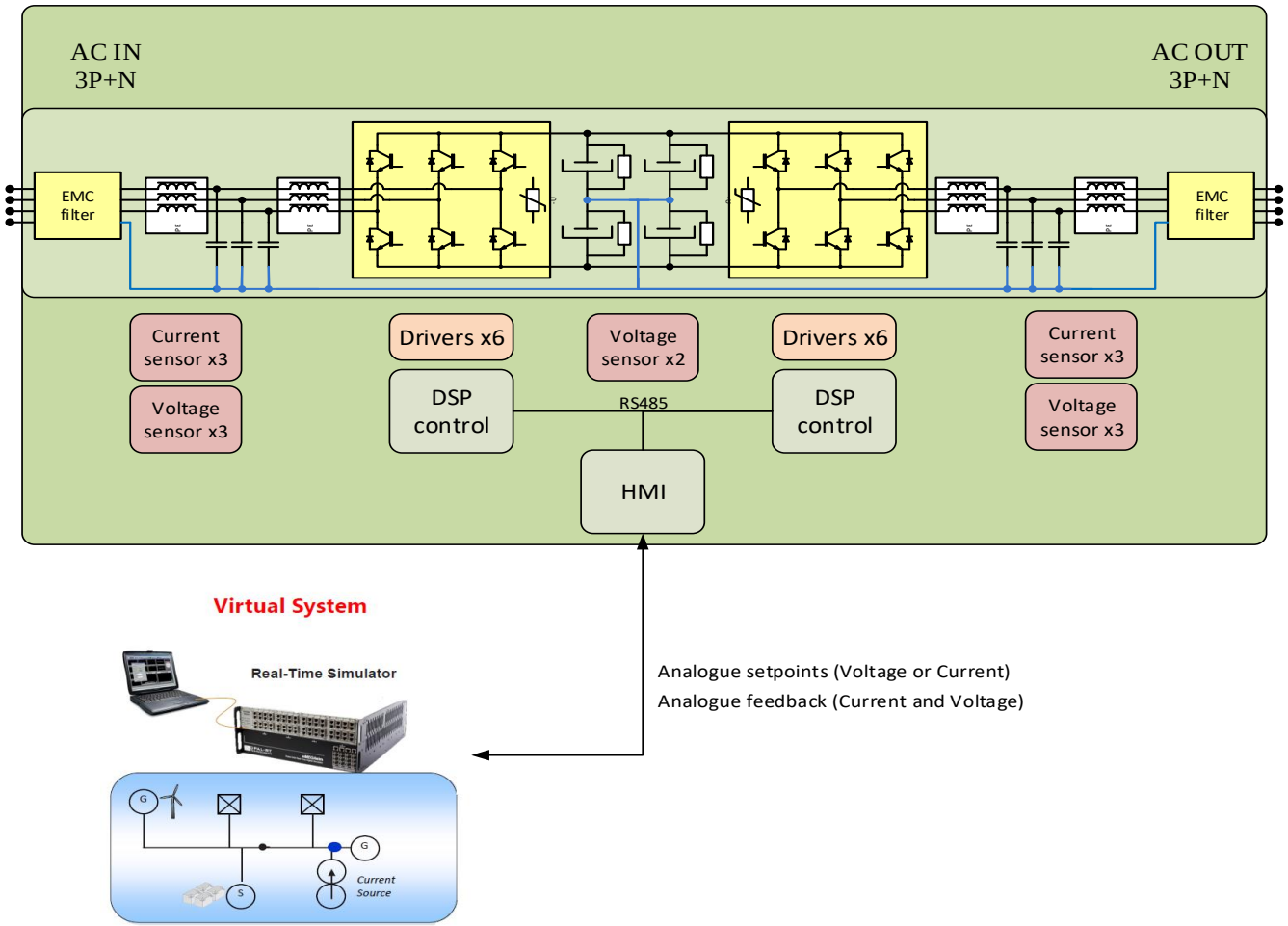
- 40 to 750Vdc
- 0 to +/- 1560Adc
- 0 to +/- 432kW (0 to +/- 648kW for 1 min)

B2C+200

- 40 to 750Vdc
- 0 to +/- 2220Adc
- 0 to +/- 640kW (0 to +/- 960kW for 1 min)

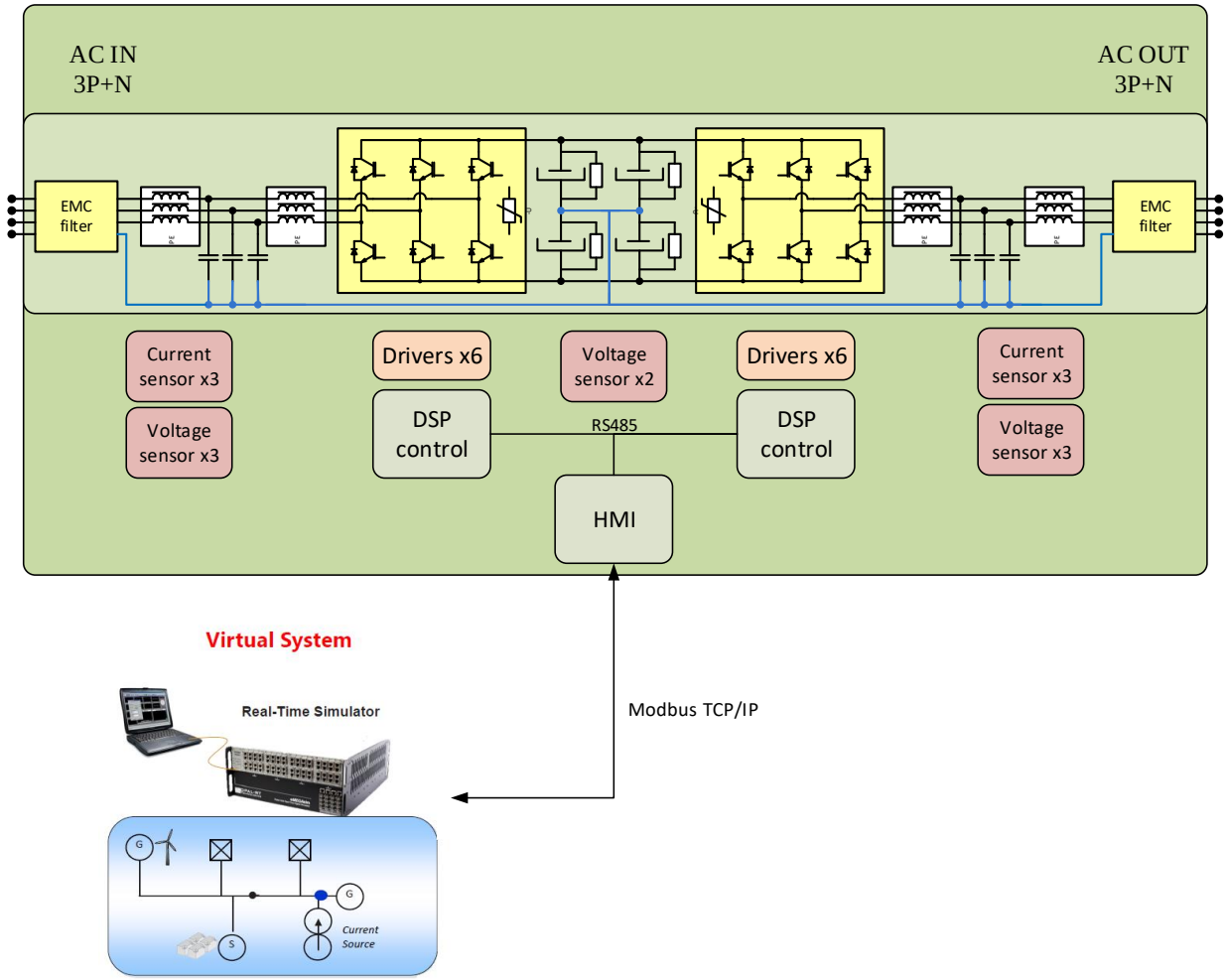
RCP and PHIL platforms

1a. Standard unit connected the RTSS via Analogue signals



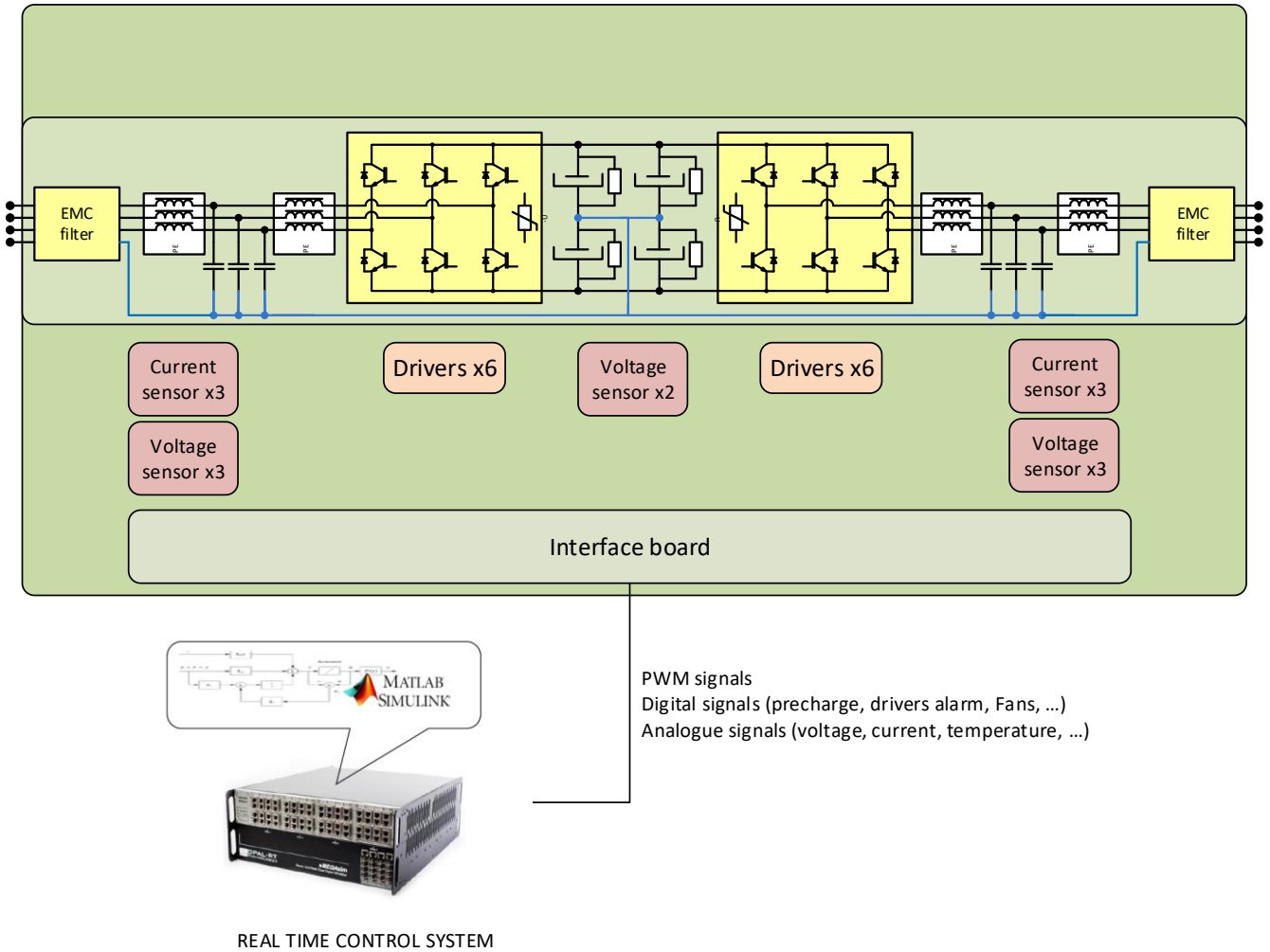
RCP and PHIL platforms

1b. Standard unit connected the RTSS via Digital communication



RCP and PHIL platforms

2. Open Converter unit connected the RTSS for RCP



RCP and PHIL platforms

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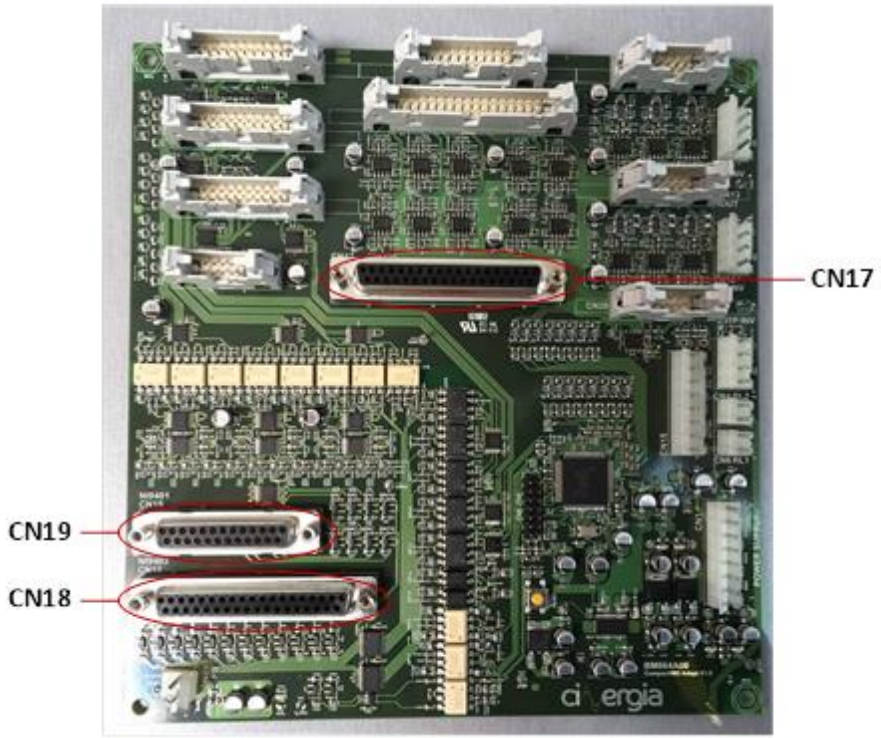
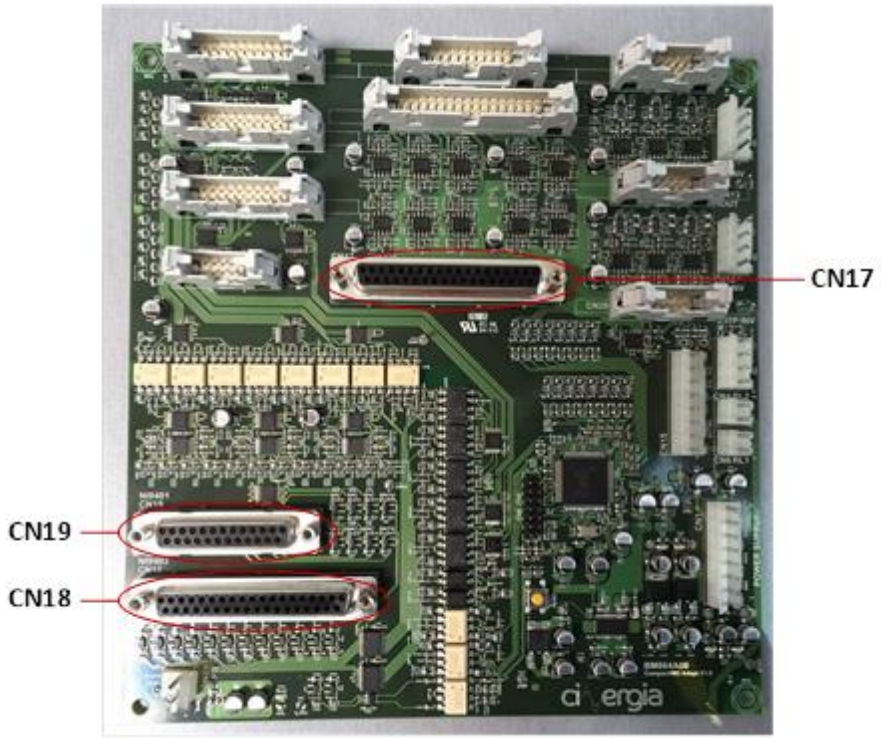
2. Open Converter unit connected the RTSS for RCP



- Mechanical interface between the RTCS and the internal connectors of the device
- Isolates digital&analogue signals
- Hardware protection of the power platform through a dedicated microprocessor (overvoltage, overcurrent, overtemperature and shortcircuit)
- In alarm status, the PWM signals are disabled automatically

RCP and PHIL platforms

2. Open Converter unit connected the RTSS for RCP



- Mechanical interface between the RTCS and the internal connectors of the device
- Isolates digital&analogue signals
- Hardware protection of the power platform through a dedicated microprocessor (overvoltage, overcurrent, overtemperature and shortcircuit)
- In alarm status, the PWM signals are disabled automatically

RCP and PHIL platforms

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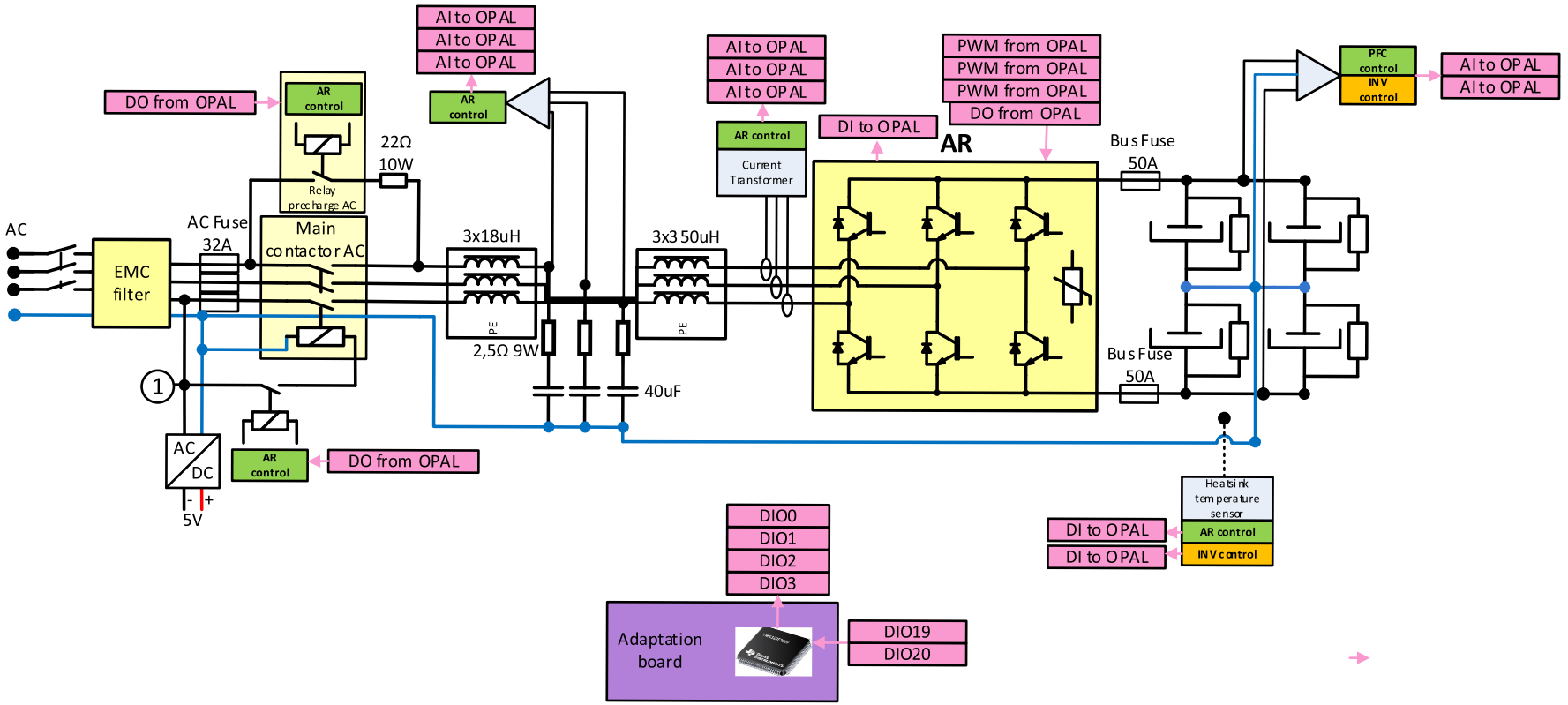
2. Open Converter unit connected the RTSS for RCP



RCP and PHIL platforms

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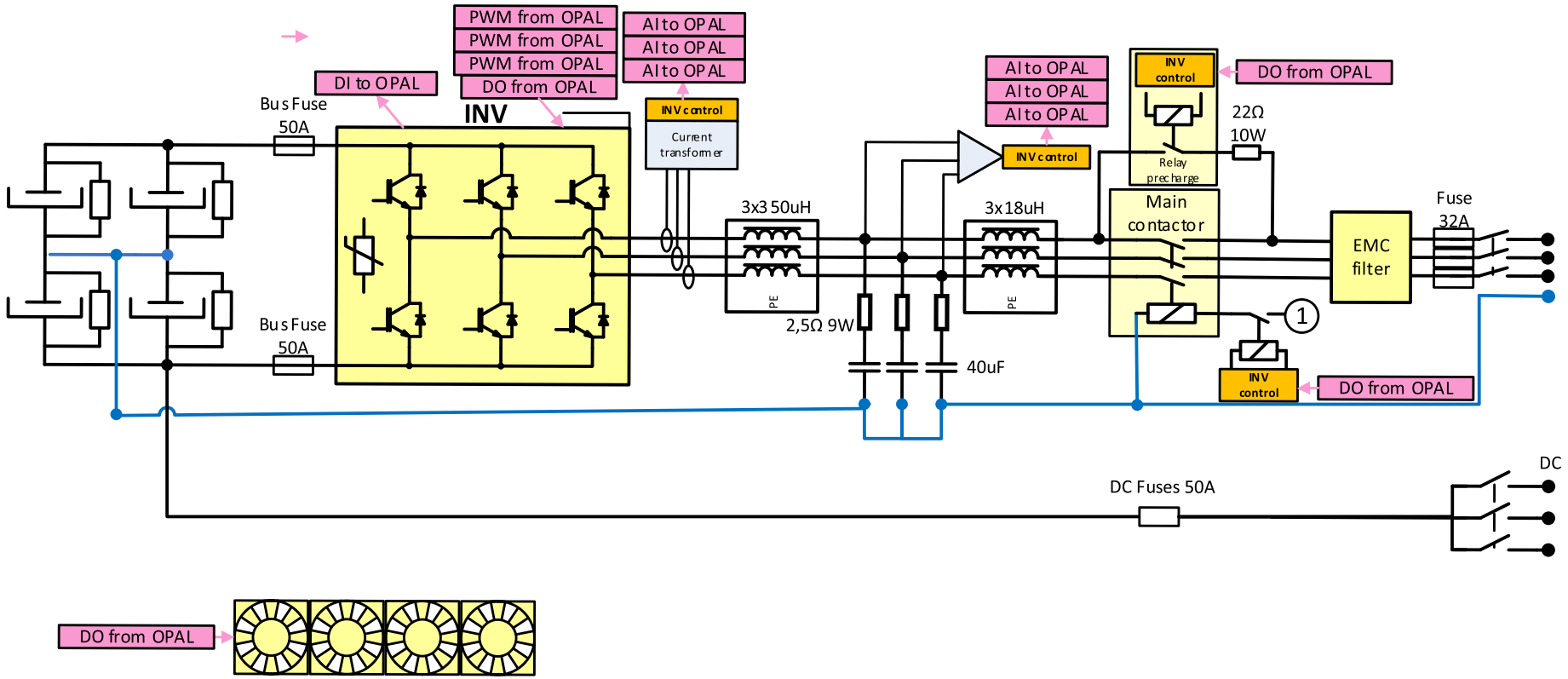
2. Open Converter unit connected the RTSS for RCP



Many thanks for your attention!