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## Company presentation

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December 2020



Mobility

Speed drives

DC/DC & Chargers

ICE & Hybrid Control

Supervision

## Power Converters and Electronic Equipments



5 kW to 5 MW



50 V to 50 kV



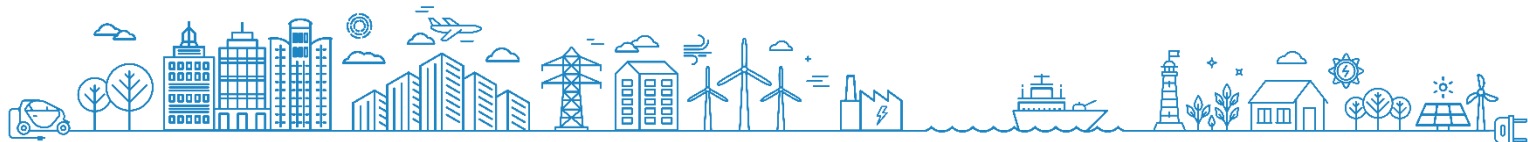
Prototypes up to  
10 kU/year

563 MW set-up

12 000 products

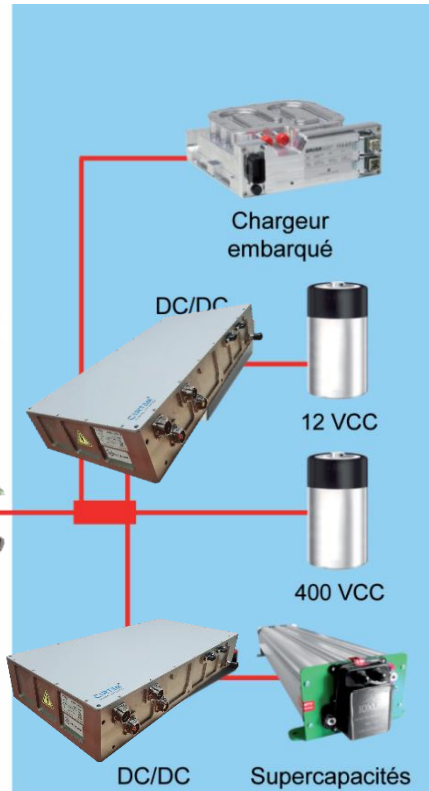
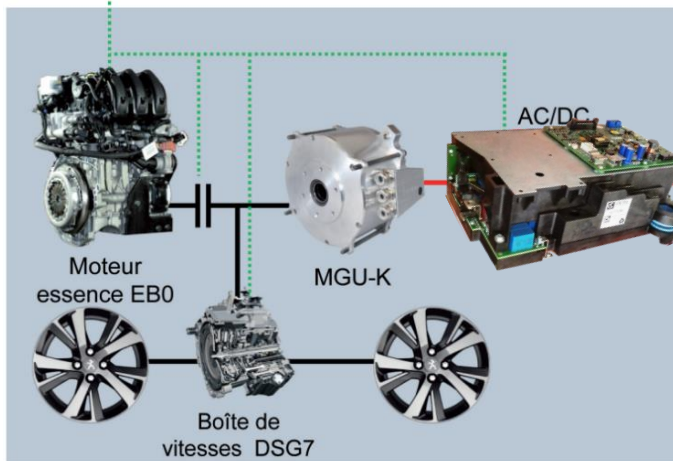
379 projects

97 customers



# System Projects

## Hybrid Labcar Realization

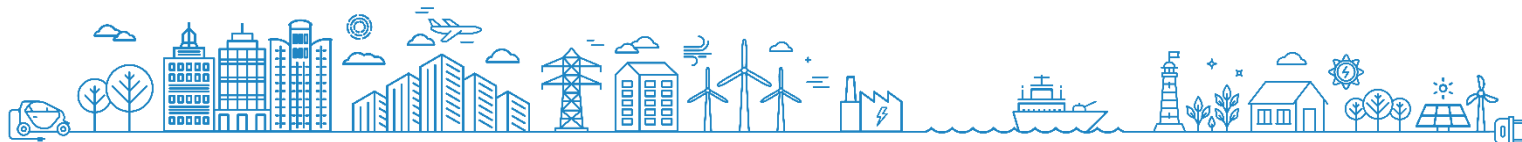


### Powertrain:

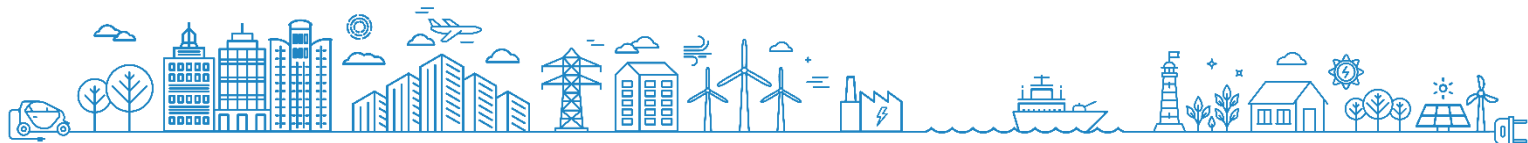
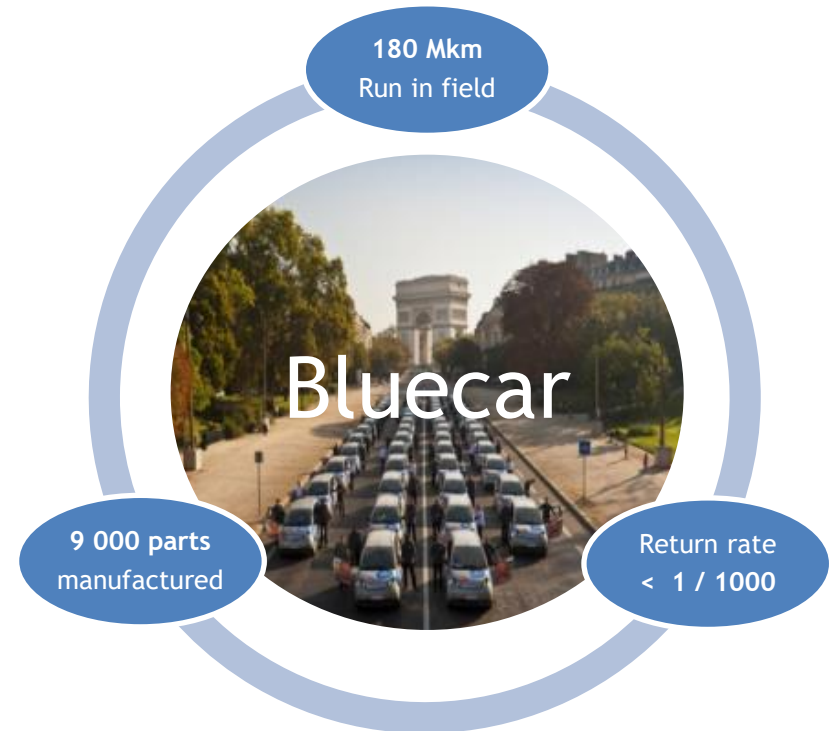
- P2 parallel hybrid architecture
- ICE PSA EBO 1.0l 50 kW
- Electric motor 28 kW
- Gear box VW DSG7

### Electric architecture:

- 2 Li-ion batteries 400 V, 2.2 kW.h, 4 kW
- Ultra caps 100 V, 100 W.h
- Embedded charger
- 400 V high voltage bus



- ▶ **3-phase IGBT motor drive** for permanent magnet synchronous motor
- ▶ **Freescale MPC 5534** control
- ▶ Specs :
  - 450 V DC battery / 170 A by phase
  - Liquid cooling
  - 2 CAN buses

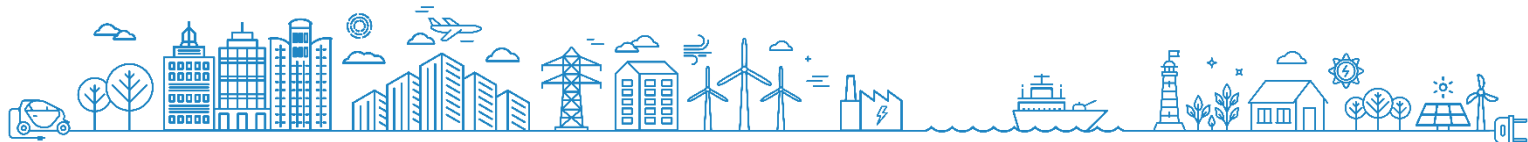




## Electron II (GRUAU)

### Inverter 70 kW<sub>nom</sub>

- For synchronous motor (MSAP)
- 3-Phase IGBT inverter
- $\mu$ C control
- Water cooled
- Max Power 90 kW
- $U_{dc}$  max 450 V





## Blue Bus

### Battery booster 90 kW

- Reversible DC/DC
- IGBT interlaced leg chopper
- $\mu$ C control
- Liquid cooling
- Power 90 kW
- $U_{dc}$  max 750 V



# CIRTEM<sup>+</sup>

POWER OPTIMISED



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## Railway Application Projects

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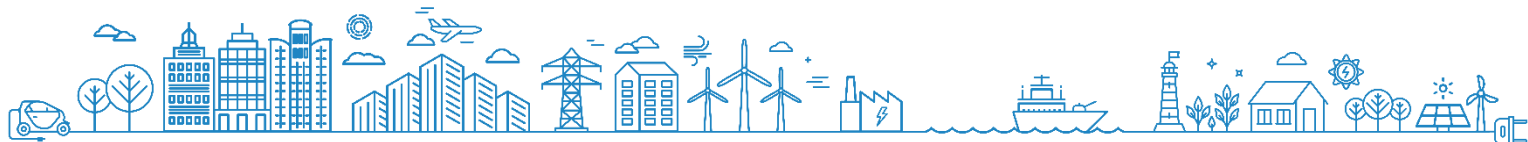


### ► Reversible Rectifier (RRV Project)

- ✓ Goal : on existing 750 V subway / tramway lines, recover train braking energy to reinject it in the power grid and reduce mechanical braking dust
- ✓ 1 MW peak stationary equipment - 3 installations
- ✓ CIRTEM design and manufacturing of a conversion core, on-site development

### ► INSERE HT Project

- ✓ 4 cell chopper, flying cap, 3 kV, 800 A, with IGBT, 20 kHz apparent switching frequency
- ✓ CIRTEM design and realization of conversion core
- ✓ Technology demonstrator
- ✓ Collaborative project : SNCF – RFF – LAPLACE Lab. – SCLE SFE (ENGIE Group) – CIRTEM





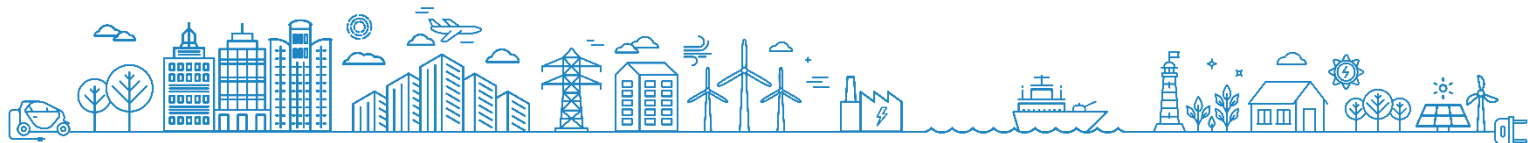
### ► Stationary Converter

- ✓ 25 kV AC to 1 500 V DC - 1,5 MW peak
- ✓ Cirtem control design
- ✓ For SNCF test tracks



### ► HVBS Project

- ✓ 3 MW power compensator for a 20 kV AC line, where the TGV hi-speed train is proceeding
- ✓ Stationary equipment to be installed on problematic areas
- ✓ Collaborative project : SNCF – RFF – LAPLACE Lab. – SCLE SFE (ENGIE Group) – CIRTEM



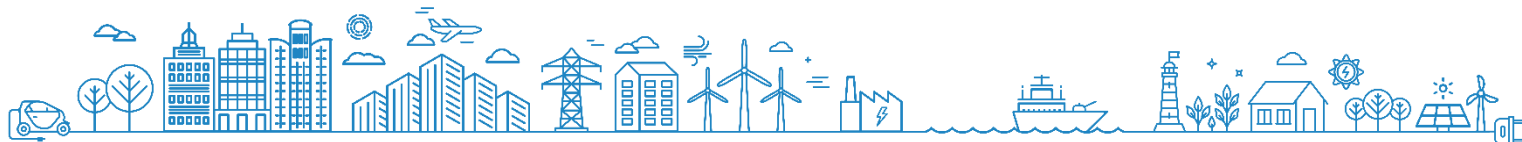


### ► Main features:

- ✓ Reversible
- ✓ Configurable On or Off grid
- ✓ Can accept the connection of 3 types of stacks (130, 145 et 160 cells)
- ✓ Isolated galvanically with a three-phase transformer
- ✓ Rated power up to 188 kVA
- ✓ 10% of surcharge capacity

### ► Electrical characteristics:

- ✓ Input voltage :  $280 V_{dc} - 750 V_{dc}$
- ✓ Input maximal current :  $540 A_{dc}$
- ✓ Output voltage :  $400 V_{eff} \pm 10\%$
- ✓ Output frequency : 50 Hz
- ✓ Output power (depending on the type of stacks) : 152 kW – 188 kW



# AC/DC Reversible + DC/DC Converter

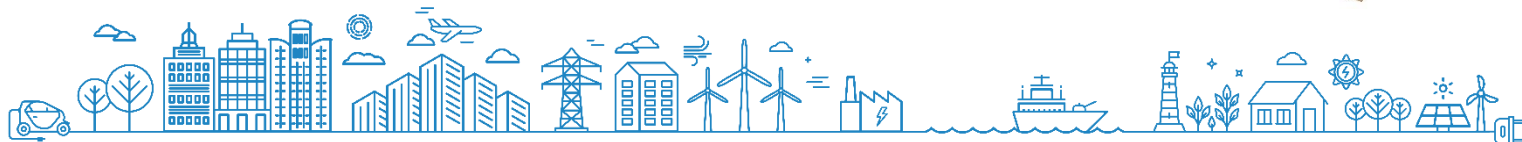
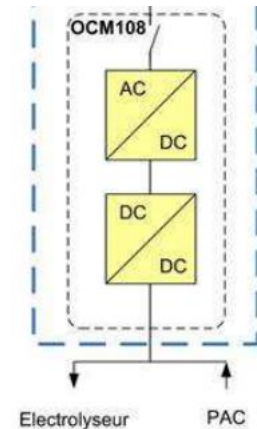
## OCM 108

### ► Main features:

- ✓ Reversible
- ✓ Configurable On or Off grid
- ✓ Possible to parallelize for more power
- ✓ Single phase uninsulated network
- ✓ CAN connectivity

### ► Electrical characteristics:

- ✓ Input voltage range : 80 Va – 265 Va
- ✓ Frequency : 47 to 63 Hz
- ✓ Output voltage range : 100 – 450 Vdc
- ✓ Max continuous output power : 6 – 10 kW
- ✓ Max continuous output current : 40 A
- ✓ Efficiency : Up to 96,5 %

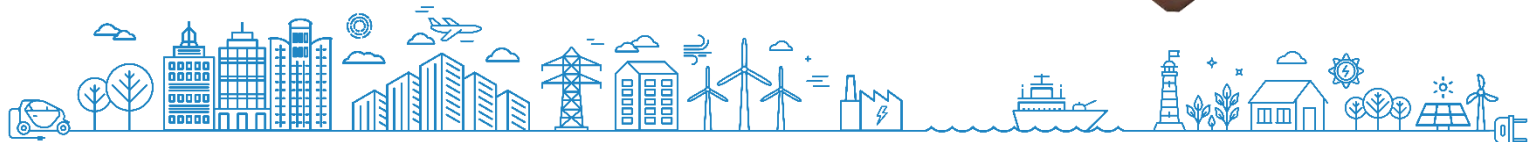


### ► Main features:

- ✓ Interlaced convertor with IGBTs
- ✓ Advanced control algorithm for optimal power module usage and efficiency
- ✓ Bootloader for field upgradeable firmware
- ✓ Liquid cooled
- ✓ IP Protection : ....
- ✓ Can work in mode buck or boost

### ► Electrical characteristics:

- ✓ Input voltage range :  $150 V_{dc} - 750 V_{dc}$
- ✓ Output voltage range :  $40 V_{dc} - 550 V_{dc}$
- ✓ Max continuous output power : 120 kW
- ✓ Max continuous output current : 300 A
- ✓ Efficiency : Up to 97 %



- ▶ **CIRTEM also developed other converters DC/DC with different powers :**
  - ✓ 20kW
  - ✓ 33kW
  - ✓ 100kW
  - ✓ 125kW
- ▶ **Large acceptable voltage range depending on fuel cell types.**
- ▶ **Customized converter development depending on targeted application.**





## Contact

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