



# Integrated Hybrid Test Benches including HiL-Simulation

Gregor Krause

**CONVERTEAM**  
THE POWER CONVERSION COMPANY

- **Introduction Converteam**
- **ALSPA C80-HPCi High-Performance control system for open-loop and closed-loop controls**
- **Hybrid Test Bench Applications including HiL-Simulation using ALSPA ProTX inverter**



# Introduction Converteam

**CONVERTEAM**  
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**3 AC Motor  
1889**

**Combustion  
Engine 1862**

**Fuel Cell  
1845**

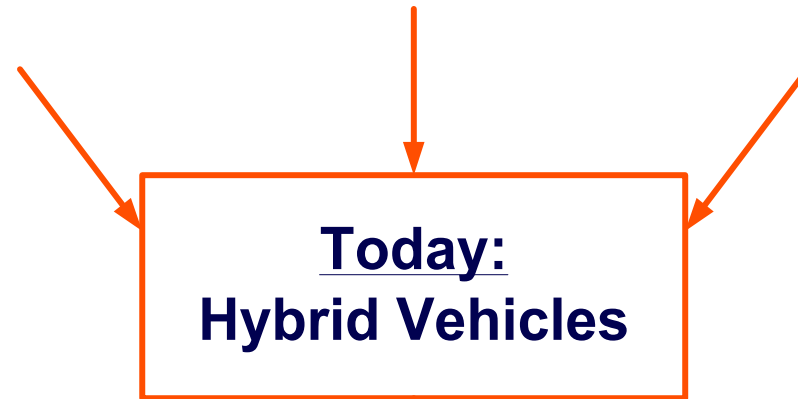
**AEG**



**ALSTOM**



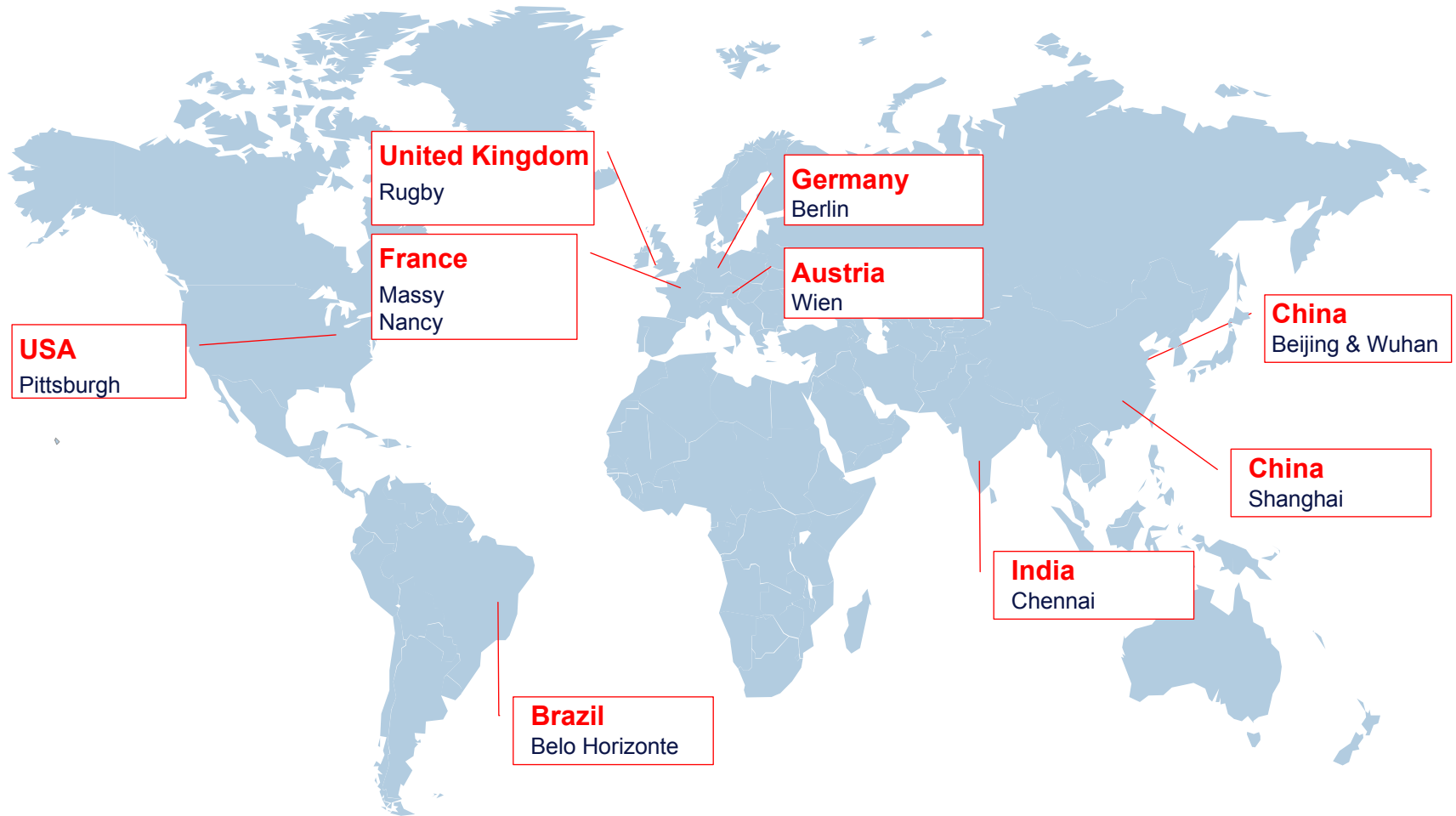
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## KEY FIGURES

	Fiscal Year 2006 *)
<b>Orders received:</b>	<b>750 million euros</b>
<b>Sales:</b>	<b>650 million euros</b>
<b>Employees:</b>	<b>3.800</b>

\*) preliminary



3800 employees in 8 countries & 25 representatives



**Employees: 685**

as per: January 2007



- Consulting, Project Planning
- Financing
- Design Studies
- Project-Management
- Development and Engineering
- Manufacturing and Testing
- Customer Training
- Erection and Commissioning
- Maintenance and Service



## Our offerings

Drives & automation solutions for Test Bench applications

- Automotive (engines, gearboxes, rolling roads)
- Fuel cells and Hybrids
- Gearboxes for wind turbines
- Aircrafts & wind tunnels
- Locomotive motors

Design and manufacturing including extensive test fields in the factory in Berlin



ALSPA C80-HPCi  
the High-Performance-Controller

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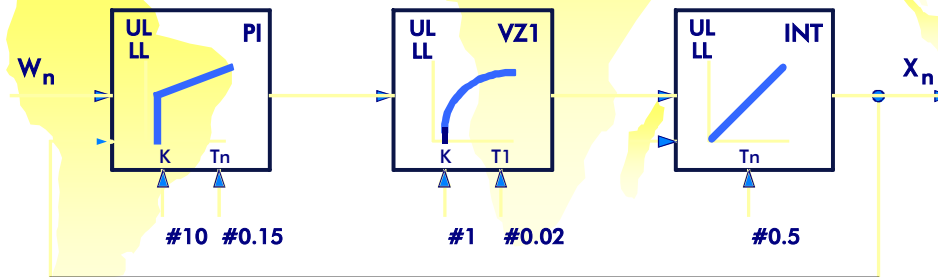
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Modular automation system for tailor made test benches

# ALSPA C80-HPCi

the

## High-Performance Controller



**ONE** Automation System for all applications

## Modular automation system for tailor made test benches



### ALSPA C80 -HPCi

- Multi-Processing capability
- For drive and process control
- For technological control
- For real-time operation and process modeling
- For data acquisition and analysis
- For fast visualization

## ALSPA C80-HPCi – System Architecture





# Hybrid Test Bench Applications including HiL-Simulation using ALSPA ProTX Inverter

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## Modular and compact VVVF inverter for test benches



### ALSPA ProTX

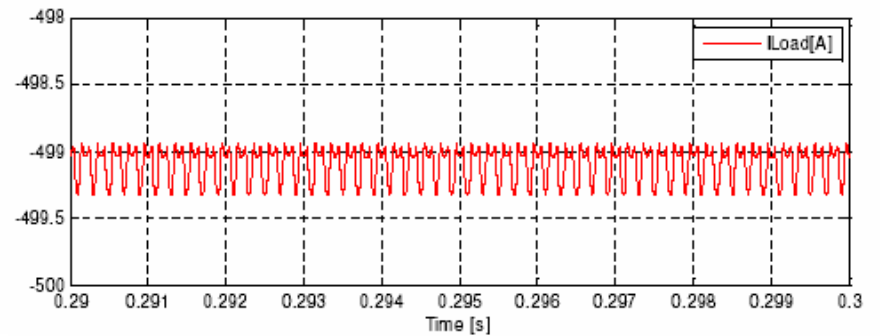
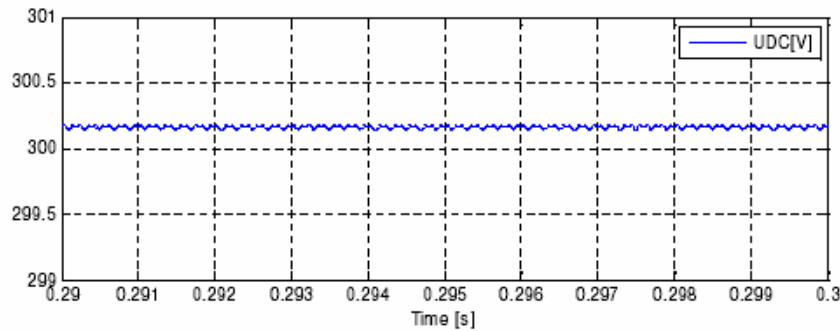
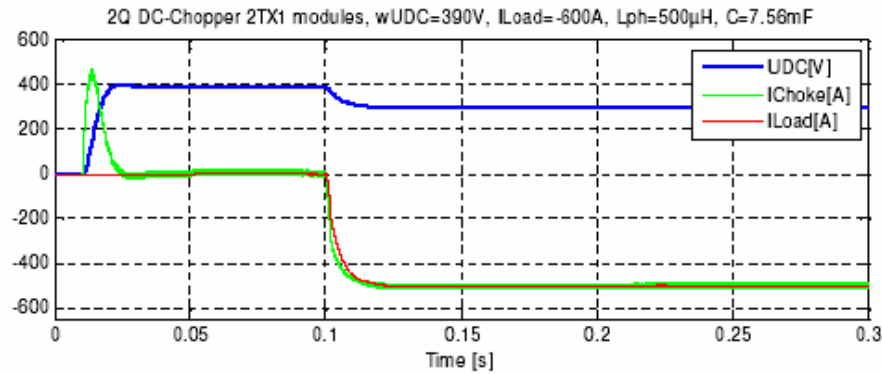
- Advanced technology derived from more than 1000 installed test benches
- Power Range from 15 kW – 4500 kW
- Flexible design thanks to standardised components and modules
- 4 Quadrant operation (Active Energy Management)
- User-friendly construction and high reliability
- Space reduced by 30 %

## DC-Supply for Fuel-Cell-Simulation

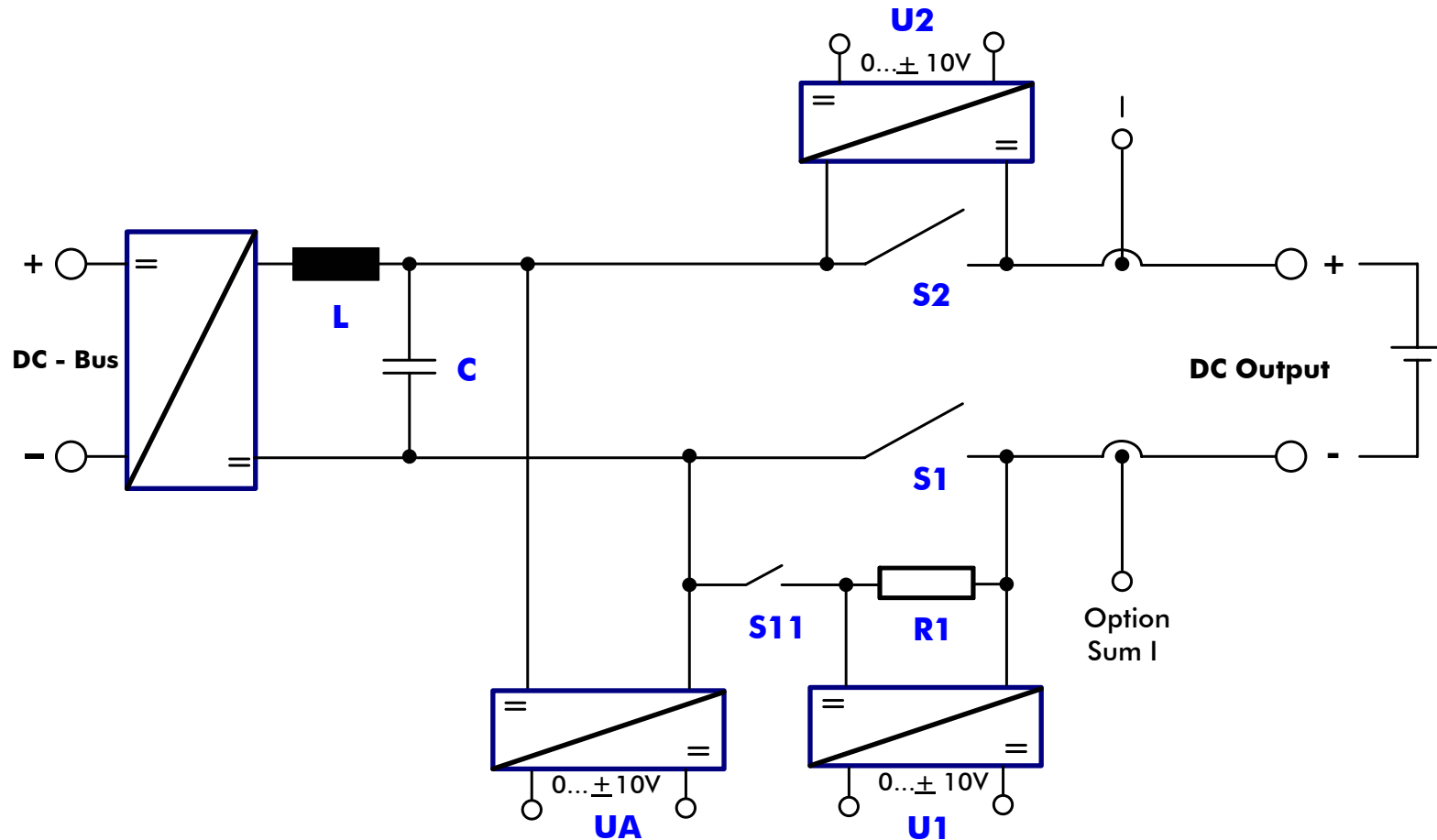
### ALSPA ProTX DC-Application

- Rated DC-Power 250 kW and more
- Maximum DC-Power ca. 300 kW
- Output DC-Voltage 10...600...900 V DC
- Output DC-Current  $\pm 600$  A
- Overload for 60 sec. Factor 1,2
- $< 1$  % von Tolerance of Voltage/Current
- Rise Time Voltage/Current approx. 10 ms
- Potential free Design included Isolation Transformer
- Standard Design of the ALSPA ProTX-Family
- Circuit Breaker in Feeding Cubicle

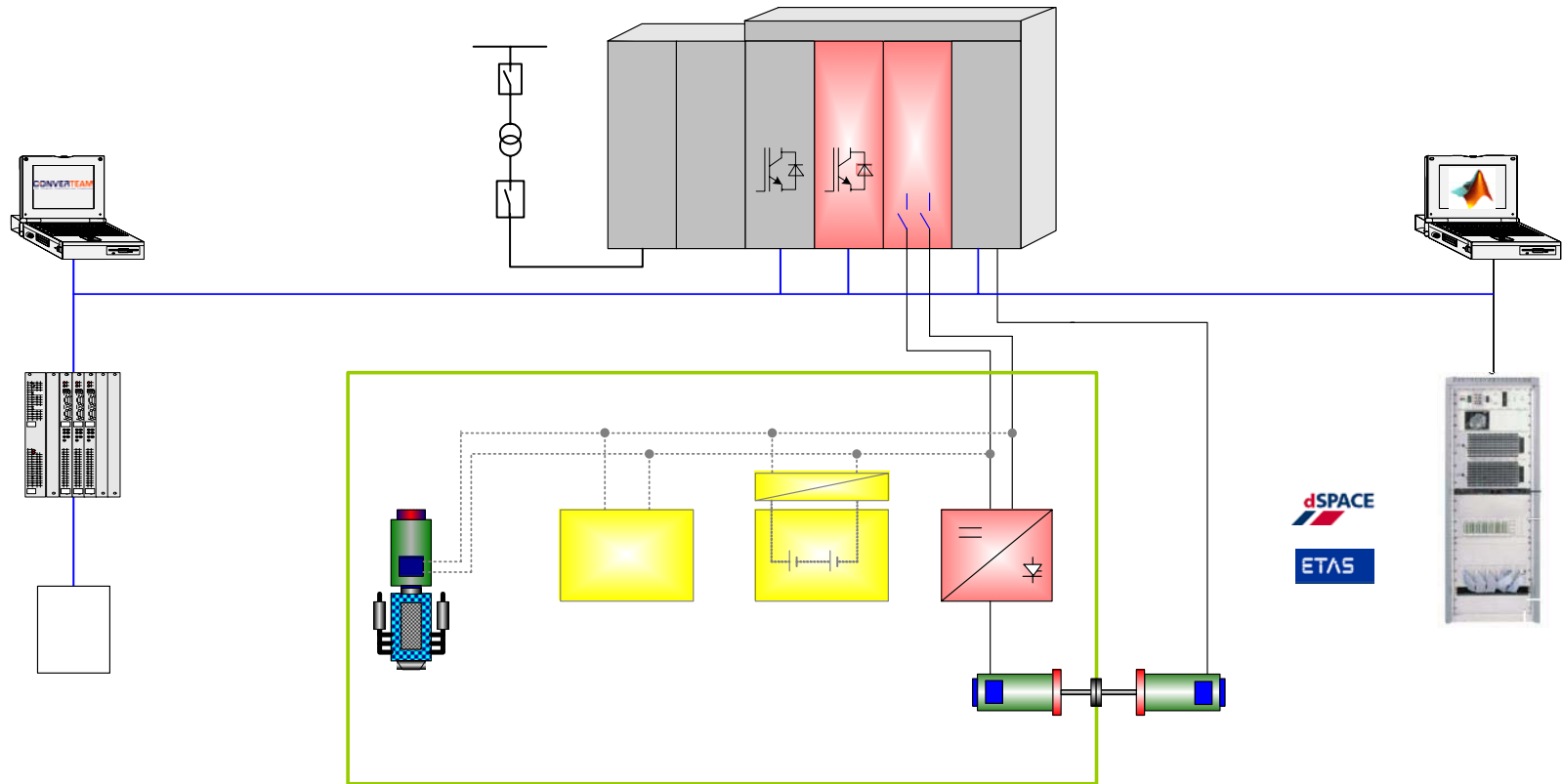
## Simulation results

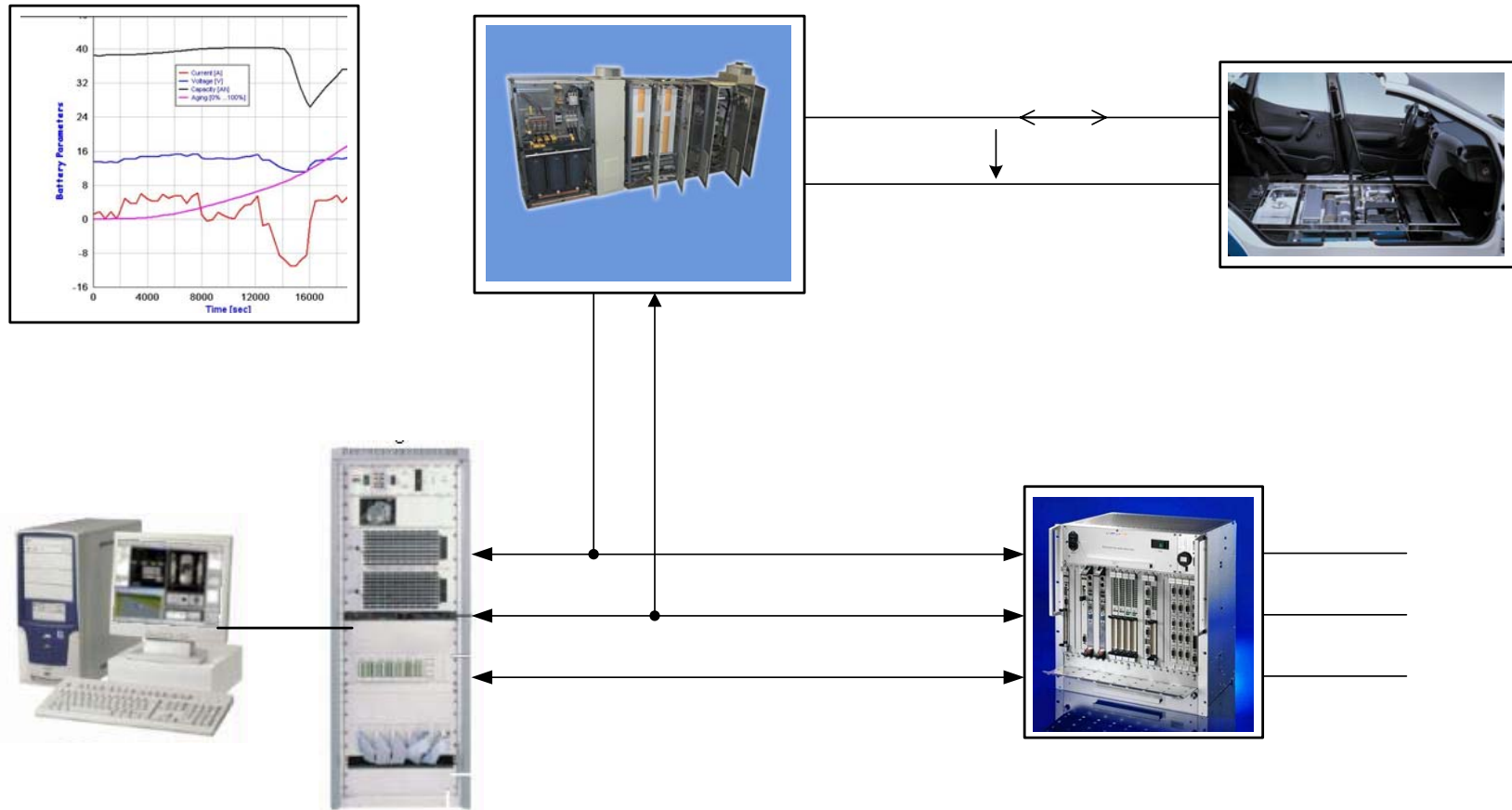


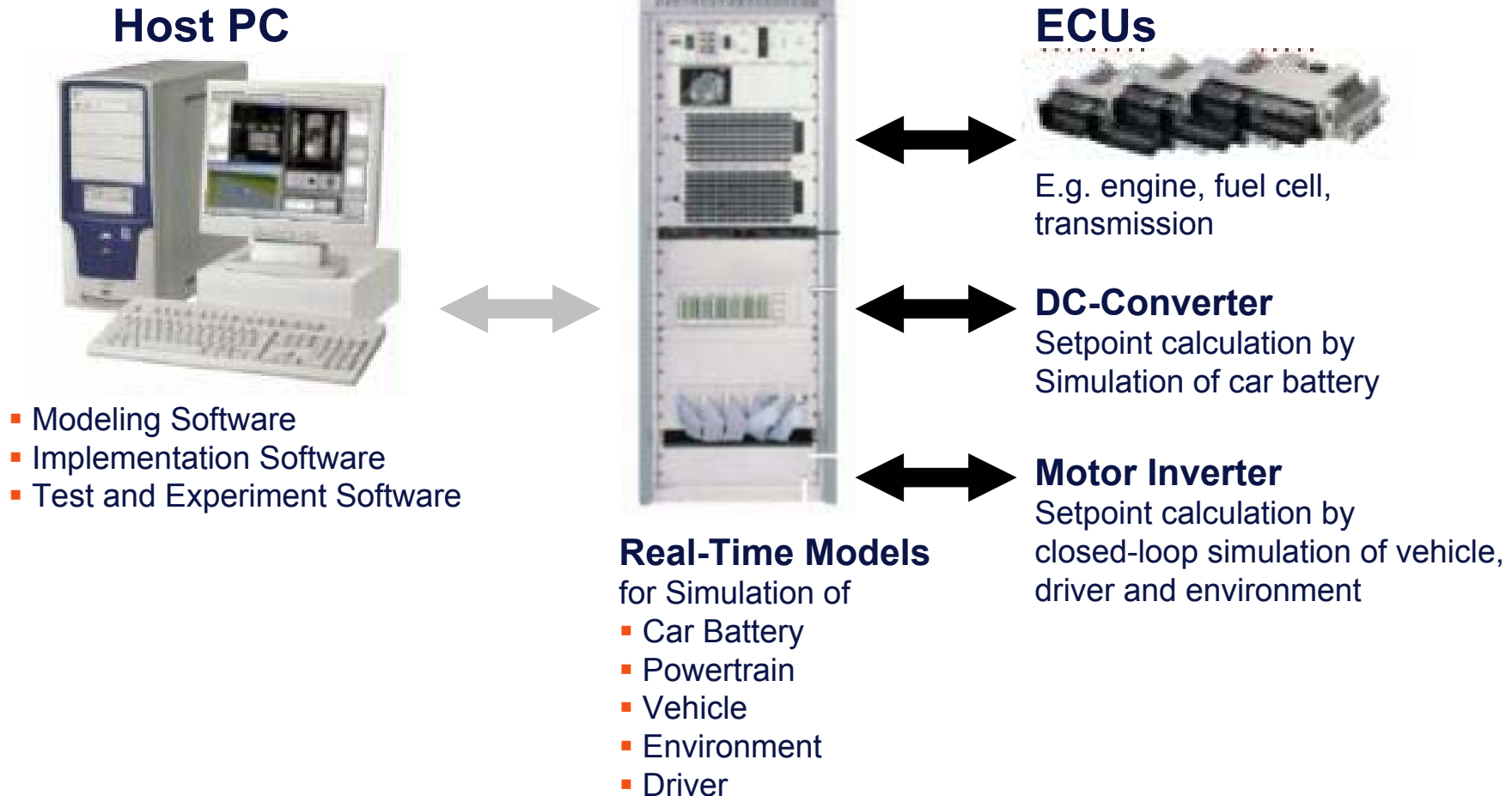
## DC Converter Switch-On Synchronization



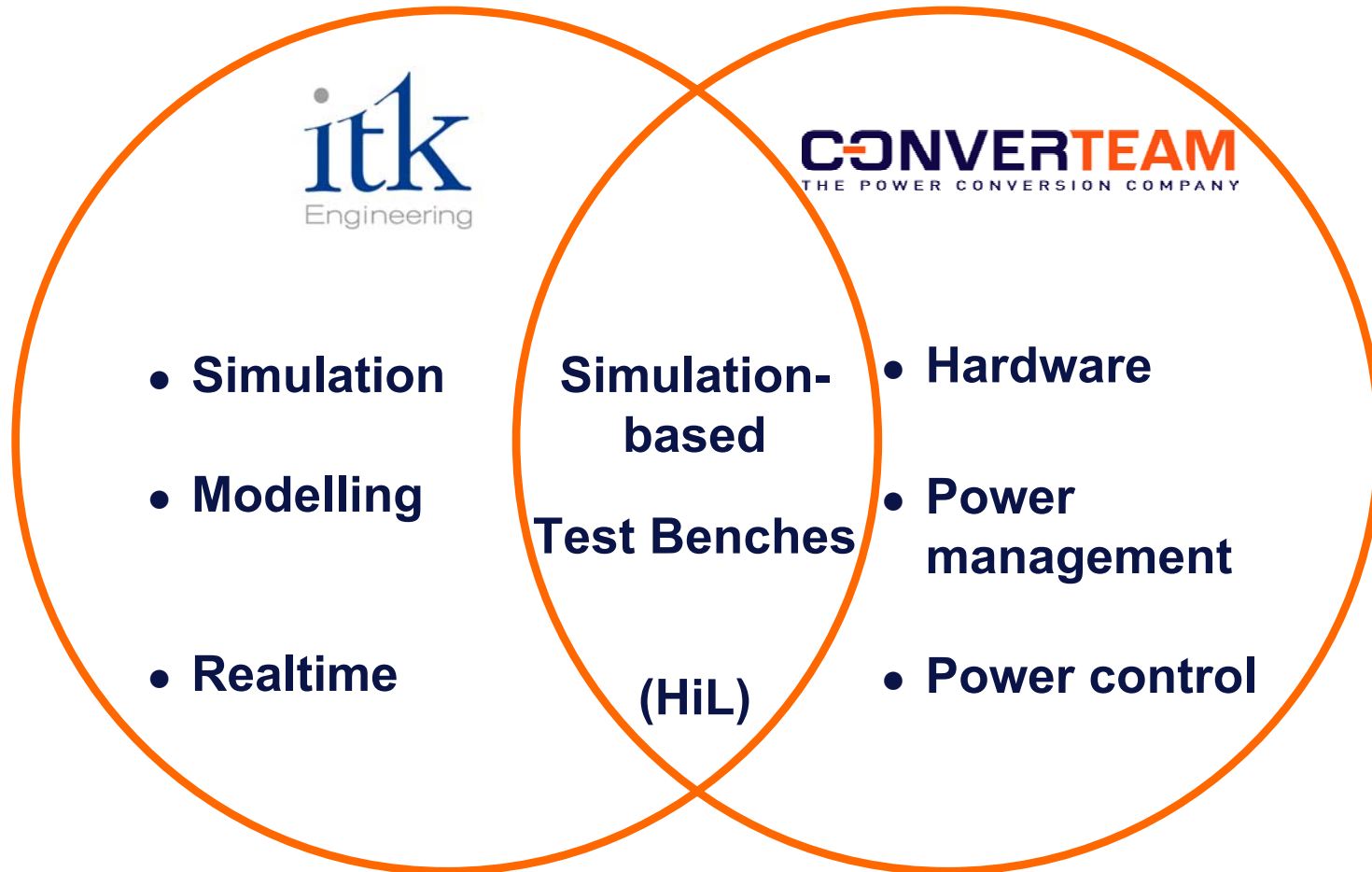
## Schematic overview







## HiL-Simulation



**Partnership of competence**



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