Microgrid test bench
From HIL simulation to real power
The OP1300 is a multi-purpose test bench for microgrids. It is able to support both HIL simulation and low-voltage experimentation with an easy-to-use reconfigurable hardware.
... TWO BIRDS!
... power electronics prototyping and in a single cabinet!

With the OP1300, comparing digital simulation and real-world experimental results has never been so easy!

Jean Bélanger, CEO and CTO, Opal-RT technologies
FROM SIMULATION...
A two-steps approach to facilitate and accelerate the development and...

**EASE OF USE**
Jump from real-time simulation to the physical prototyping by simply changing cable connections, without editing your control software.

**TIME TO APPLICATION**
Stop wasting time with technicalities. Focus on your real research objectives and the derivation of meaningful experimental results.

**PERFORMANCE**
Execute fast closed-loop control on the B-Box and run high-performance real-time simulation in RT-Lab. All this can naturally be later validated using real hardware.

**SAFETY**
Rely on the software-independant protections of the B-Box to keep your system safe at all times, even when your software remains incompletely tested.

"The new OP1300 contains everything you need to accelerate your control validation workflow!"

Nicolas Cherix, Chief scientist, Imperix Ltd.
Imagine and develop your control on Matlab Simulink, and instantly download it into the B-Box RCP, a high performance and easy-to-use power electronics controller.

Simulate the power converters and their passive components on the OP4510, a high-fidelity and flexible HIL simulator based on RT-LAB and Matlab Simulink.

By connecting the digital controller to the HIL simulator, test your control algorithms under all operating conditions. Observe any signal and produce insightful results and graphics.

Connect the B-Box RCP to the real power hardware to test your control algorithms live and compare the experimental results with the previous simulation results.
DIGITAL COMPONENTS
High-end devices and software to cover all needs!

B-BOX RCP

KEY FEATURES
- DSP + FPGA processing units
- C/C++ programming
- Simulink-based programming
- Hardware protections

KEY SPECIFICATIONS
- 16x high-performance and highly configurable analog inputs
- 16x fiber-optical PWM outputs
- 8x digital inputs (with encoder)
- 8x digital outputs
- 2x CAN
- 4x analog output

SIMULINK-BASED PROGRAMMING
Thanks to our blockset for Simulink, control design and modeling can be done very easily. Then, once the control has been finely tuned in simulation, all you need is just click on one button to generate executable code and upload it into the B-Box!

REAL TIME MONITORING
Each unit is shipped with B-Box control, a dedicated software allowing to monitor and tune any control variable in real time. It also helps producing data logs and other graphical results directly from the B-Box control platform.

Read more online...

OP4510 REAL TIME SIMULATOR

SMALL BUT STRONG!
The OP4510 is a compact, entry-level simulator that combines all of OPAL-RT’s strengths for high-performance hardware-in-the-loop simulation.

RT-LAB WITH eHS
eHS is a generic and reprogrammable solver. It enables you to run your existing simulation models on FPGA, in real time. Thanks to its full integration with RT-Lab, eHS also guarantees you a great flexibility and a complete control over your simulations, all this with a microsecond-scale time step!

Read more online...
POWER STAGE

The power stage delivers ready-to-use and freely configurable power conversion, thanks to:
- 6x independent half bridge power modules
- Ratings 800V/38A or 400V/50A per module
- Integrated current sensors (LEM)
- Coordinated protection, variable-speed cooling

PASSIVE ELEMENTS

The auxiliary 4U rack is an optional unit for the necessary passive components, filters, etc. The standard configuration features:
- 6x independent inductors (2.5mH, 20A)
- 2x LC-type common-mode filters (3-phase)
PV INVERTER
Grid-tied central inverter for photovoltaic application

Work with a simulated panel to easily control irradiance conditions!

Work with a real PV panel and improve the realism of your setup!

Simulate unbalanced or faulty grid conditions!

Measure real power flows and evaluate efficiency!

POSSIBLE RESEARCH TOPICS

- Current control of boost Cascaded voltage control
- MPPT algorithm
- MEPT (maximum efficiency point tracking)
- PLL implementation
- Vector current control
- Grid voltage forming
- Islanding detection / prevention
- Inertia emulation
- Multi-converter coordination
- Operation in unbalanced grid conditions
- etc.
POSSIBLE RESEARCH TOPICS

- DC link voltage and PF control of the rectifier
- Rotor position with decoder or sensorless
- Scalar control (V/f)
- Field oriented control (FOC)
- Direct torque control (DTC)
- Field weakening strategy
- Highspeed operation
- Different machines (PMSM, BLDC, IM, SRM,...)
- Multi-drive coordination
- Multi-phase machines
- etc.

Work with a **simulated** motor to test any type of electric machine!
Work with a **real motor** and have it spin in your lab!

**Simulate** any load behavior, including abrupt changes!

Measure **real power** flows and evaluate efficiency!

Work with a real motor and have it spin in your lab!

Simulate any load behavior, including abrupt changes!

Measure real power flows and evaluate efficiency!
BATTERY CHARGER
Single-phase inverter with isolated DC/DC converter

POSSIBLE RESEARCH TOPICS
- Pulse generator for phase-shifted waveforms
- Rectangular modulation of DAB
- Trapezoidal modulation of DAB
- PR controller for single-phase rectifier
- Fictive axis emulation (FAE)
- Stored energy recovery (bidirectional converter)
- Battery charging strategy
- BMS dealing with battery SoC, DoD, SoH...
- Transformer design
- etc.

Work with a **simulated** transformer to tune its design parameters!

Work with a **real** transformer and **real** batteries!

Simulate any battery characteristics and state of charge easily!

Measure **real power** flows and evaluate efficiency!
**KITS & BUNDLES**

Flexible configurations for a broad range of needs

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### STARTER KITS

**HARDWARE + SOFTWARE**
- Programmable controller (B-Box RCP)
- C/C++ development tools (CPP SDK)
- Open chassis with 3 x PEB 8024
- 4 x voltage sensors

**OPTIONS**
- Simulink + Plecs blockset
- Other power modules

**VARIANTS**
- Other controller

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### POWER ELECTRONIC BUNDLE

**HARDWARE + SOFTWARE**
- Programmable controller (B-Box RCP)
- C/C++ code development environment
- Converter box with 6 x PEB 8024
- Passives and filters box
- Grid-side panel
- 4 x voltage sensors

**OPTIONS**
- Simulink + Plecs blockset

**VARIANTS**
- Other power modules
- PEB 4046 for more current

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### LITE MMC BUNDLE

**HARDWARE + SOFTWARE**
- 3 x Programmable controller (B-Box RCP)
- Software tools for Simulink and PLECS
- 3 x open chassis with 24 x PEH 2015
- 6 x inductors
- 4 x voltage sensors
- 6 x current sensors

**OPTIONS**
- C/C++ code development environment

**VARIANTS**
- Other power modules

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### MICROGRID TEST-BENCH

**HARDWARE + SOFTWARE**
- Programmable controller (B-Box RCP)
- Software tools for Simulink and PLECS
- Interface for Opal-RT simulators
- Opal-RT OP 4510
- Converter box with 6 x PEB 8024
- Passives and filters box
- Grid connector box

**OPTIONS**
- C/C++ code development environment

**VARIANTS**
- Other simulator
- Power amplifier for PHIL

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*All current prices are on imperix.ch*