OP1200

OPAL-RT Lab-Scale MMC Test Bench

Introducing the world's first turnkey Modular Multilevel Converter (MMC) test bench for laboratory research.

The OP1200 provides researchers the ideal platform for performing rapid control prototyping (RCP) of novel power electronics converters on actual hardware. Researching innovative HVDC converter topologies with a test bench has never been easier, giving researchers more time to focus on applications including HVDC transmission and distributed energy resource interconnection.

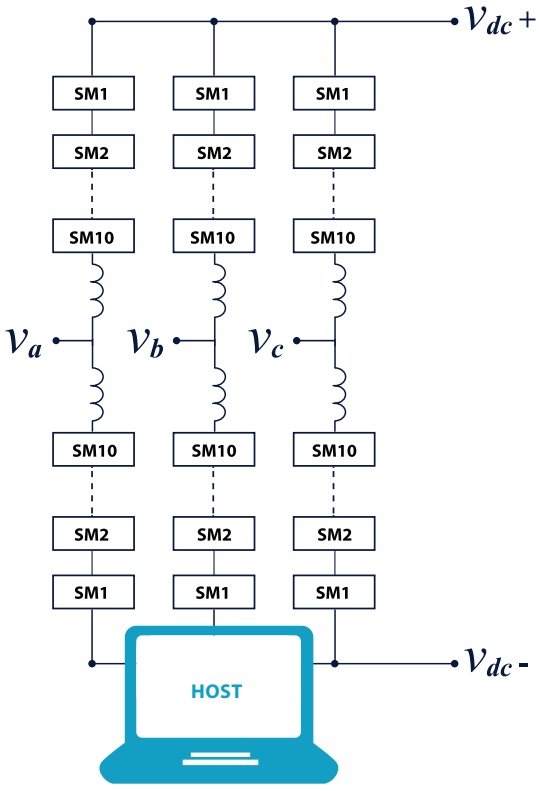
PRODUCT HIGHLIGHTS

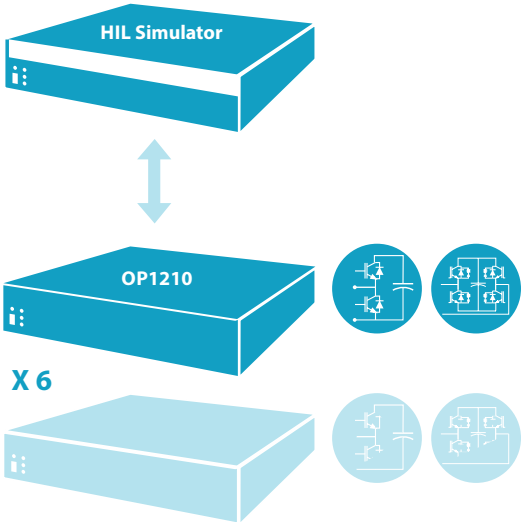
- Turnkey hardware and software solution enables researchers to focus on cutting-edge work and gain time by not having to design and build a test platform and base control models.
- Test bench designed with quality components and high-level protection for conducting research-grade experiments in a safe laboratory environment.
- Onboard low-level protection isolates key components to keep the bench in operation and maintenance free.
- OPAL-RT suite of software allows for automated testing and the connection of the test bench as Hardware-in-the-Loop within sophisticated power system simulations for advanced applications.

APPLICATIONS

The OPAL-RT Lab-Scale MMC Test Bench supports a large number of MMC-based topologies, including:

- High voltage DC (HVDC) converters
- Flexible AC transmission systems (FACTS)
- Static Synchronous Compensators (STATCOM)
- Solid State Transformers
- Power Amplifiers
- Multilevel Matrix Converters





The OPAL-RT Lab-Scale MMC Test Bench is available in different configurations to support applications requiring full and half-bridge topologies including those that require the following specifications:

- Number of levels 11, 21,31
- DC voltage 400 V, 700 V
- Frequency 50 Hz, 60 Hz
- Output power 6 kW, 10 kW, 20 kW

FIGURE 1: Typical OP1200 Configuration

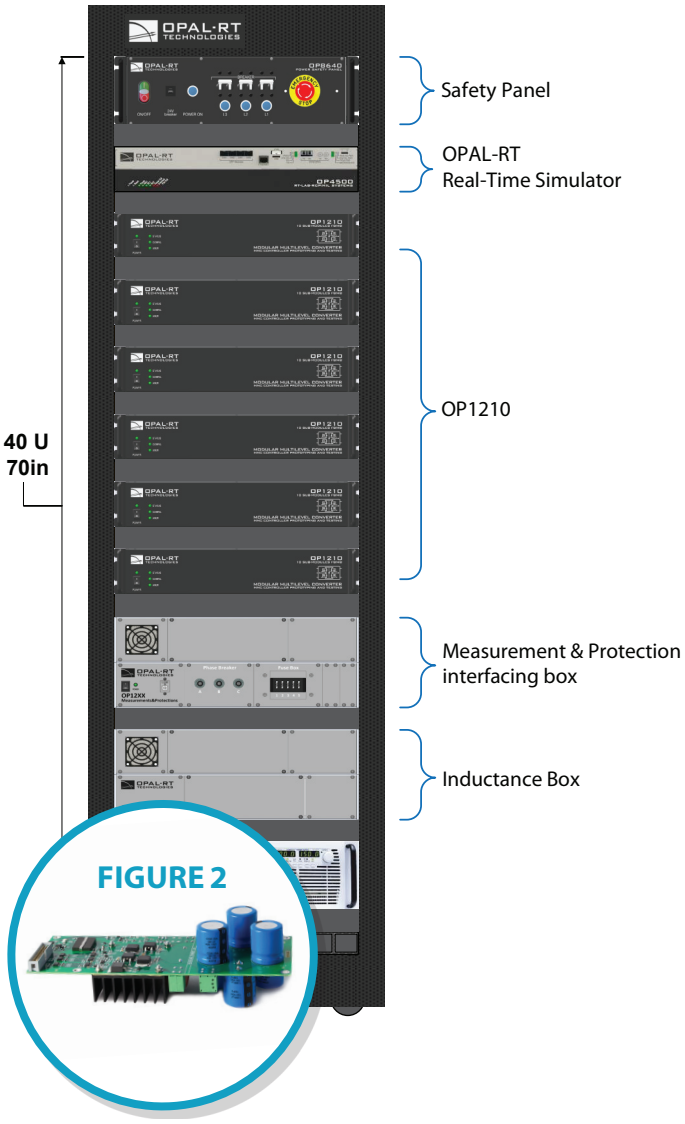


FIGURE 2

A typical configuration of a full-bridge 6 kW, 11-level, 400V three-phase MMC test bench with a total of 60 switching cells is shown in Figure 1, with its specifications listed in table 1. The system allows for each arm to be scaled with up to 10 cells and 10 voltage levels, with upper and lower arms for each phase connected directly in series through an arm inductor.

TABLE 1: Example configuration specifications

DC maximum voltage per 10 cell	400 V
DC maximum current	15 A
Maximum output power	6 KW
Maximum AC voltage for each phase (with index modulation at 0.9)	120/208 V 3ph
Maximum AC RMS current at fundamental frequency	16.7 A
Number of levels	11
Maximum cell voltage	40 V
Cell capacitor	6 mF
Arm inductor	2.5 mH

The 10 cells contained in each OP1210 MMC Module are independent MOSFET H-Bridge submodules with electrolytic capacitors, as shown in Figure 2, with its specifications listed in Table 2.

TABLE 2: H-Bridge submodule specifications

Designed for	40 V, 15 Arms
Maximum switching frequency	≤ 50Khz
Rise/fall times	≤ 65ns
Cell current measurement	500ksps serial sampling ADC
Fixed hardware instantaneous overcurrent detection	
Cell capacitor voltage measurement	12-Bit with up to 500 serial sampling ADC
Cell bypass electronic switch	
Galvanic isolation to control signals	