



Together
we move



Powerlab Zürich

High voltage laboratory to develop, test, verify and maintain power electronics

Since its opening in 2009, the Bombardier Transportation Powerlab Zürich is one of the most modern and innovative laboratories for power electronics and high-performance drives. 1900 m² floor area is available for carrying out a wide range of tests on power converters, motors and energy storage systems. The Powerlab Zürich consists of a test hall with seven main test benches complying with applicable safety regulations and a machine hall for transformers, motors and load machines. It also contains prototype assembly infrastructure and specialized test

benches, for example to develop air- and water-cooling systems.

Zürich is known to be one of the most attractive and innovative cities worldwide. The Powerlab Zürich is ideally situated near leading universities (ETH Zürich and other academic institutions) and technology parks for start-up enterprises. The short distance enables close collaboration in research and development. The site is easily accessible by public and individual transportation.

1900 m²

floor area for testing power electronics, including machine and multi-purpose halls.

7

main test benches.

Great expertise and a broad range of applications

Our extensive experience in high voltage testing dates back to our predecessor companies MFO, BBC, ABB and Adtranz. Originally specialized for propulsion equipment for railway vehicles, the Powerlab Zürich now provides services to external businesses, education and research institutions, focusing on testing your innovations in power electronics with professional support from our highly qualified experts.



DC/DC converter with silicon carbide technology

Expertise and support

Our highly qualified employees have university degrees and sustained practical experience. In addition, young professionals are trained in the fields of mechanical engineering, electrical engineering and automation.

As a service provider we offer professional consultancy during preparation and execution of tests, supporting for product certifications, as well as screening and analyzing test results in order to agree on the next steps towards achieving a maturity level to start serial production.

The Powerlab Zürich offers testing and other services which go beyond traction for railway vehicles. Fully equipped office space with access to the Internet is available.

Powerlab Zürich power supplies

15 kV / 16.7 Hz (SBB grid) and 25 kV / 50 Hz, 8 MVA

0 ... 4.2 kV DC

3 x 400 V / 50 Hz, up to 2000 kVA

We can provide setups which require powerful batteries, diesel aggregates and other alternative energy sources

Additional voltages are available upon request

Powerlab Zürich application areas

New forms of electric mobility

Renewable energies: generation, storage, transmission and distribution concepts

Powerful electric machines

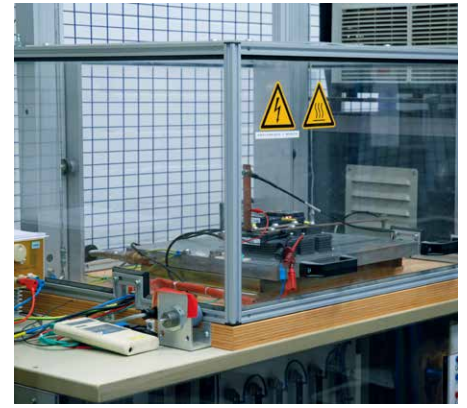
Innovative and future-oriented research projects

Root cause analysis in faulty products

Prototype assembly

Optimizing integration of high-power semiconductors in power electronic systems

Supporting product development where power semiconductors undergo a generation change, e.g. transition from IGBT to silicon carbide (SiC)



Seven main test benches

A total power of 8 MVA is available where 5 MVA is provided for every system test bench in order to carry out a wide variety of different tests.

Prototype assembly

We offer support for prototype assembly and efficient preparation for series production.

Two system test benches

The test benches are for comprehensive testing of power converters in realistic operating conditions, together with supply transformers, drives and alternative energy sources:

Type tests (IEC 61287-1)

Combined tests (IEC 61377-1)

Two multi-purpose test benches

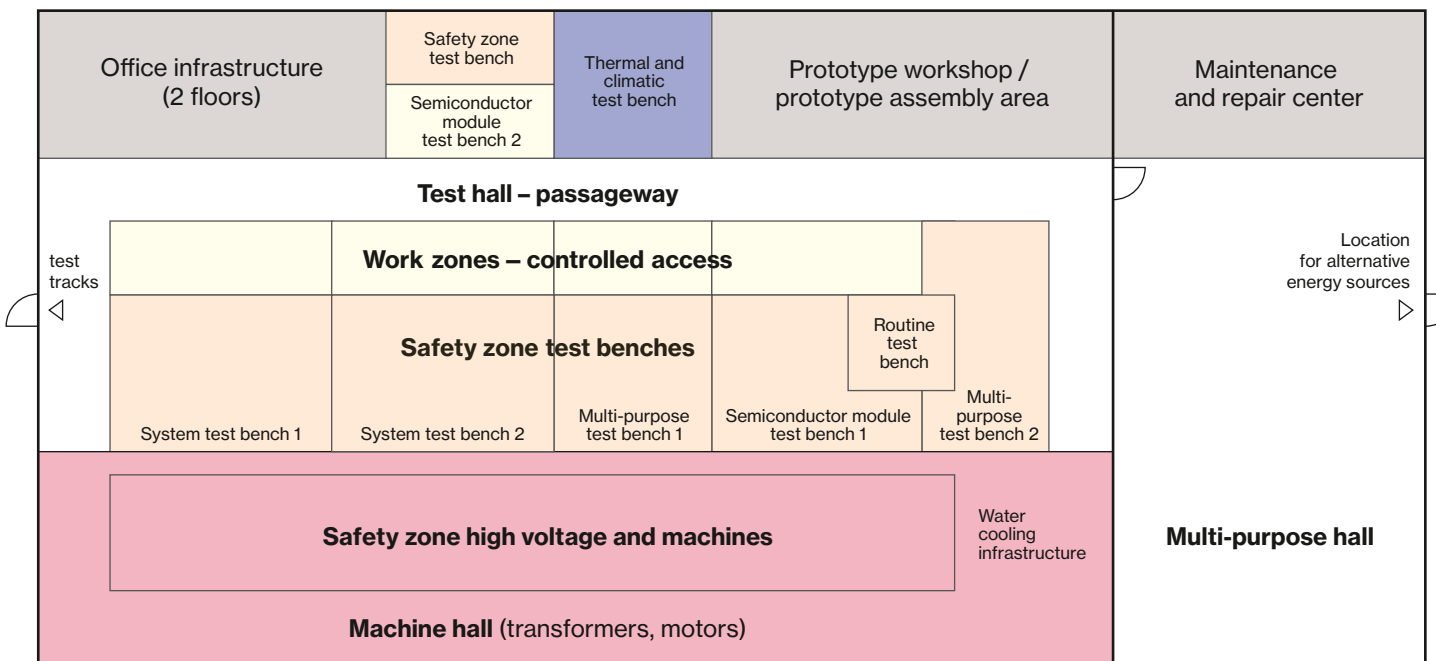
These universal test benches support a wide variety of test methods:

Verification of power semiconductor switching characteristics

Electrical and thermal load tests

Climatic chamber (-50 ... +150 °C)

Long term reliability tests



Powerlab Zürich floor plan



MITRAC Power permanent magnet drive under test



Two semiconductor test benches

Intended for testing power semi-conductors integrated in phase modules:

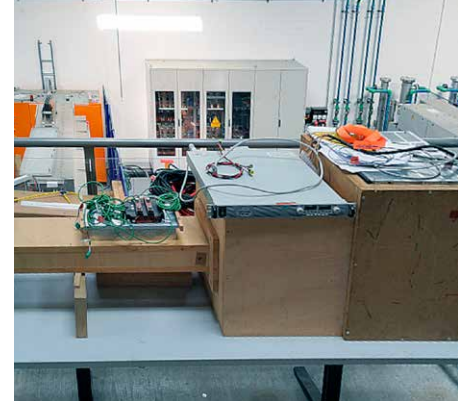
- Characterizing semiconductors
- Optimizing control and improving utilization
- Load cycling tests



One routine test bench

Routine tests of completed and repaired converters and modules:

- Functional tests
- IGBT switching tests
- Light load testing



Climate and thermal test bench

Measuring and verifying the effectiveness of cooling equipment:

- Climatic tests up to +100°C
- Measuring flow rate and pressure drop of air and cooling liquids
- Measuring thermal resistances
- Development of water and air cooled heatsinks

Safety first

The infrastructure of the Powerlab Zürich complies with the Swiss Ordinance on Heavy Current as well as with international standards such as EN 50110 and EN 50191.

All seven separate test benches are equipped with individual access control systems to ensure access for authorized and instructed persons only and to protect your intellectual property from unauthorized viewing.

The layout of the test benches ensures that the products to be tested are located in separated high voltage safety zones while test engineers can carry out and monitor all tests safely from protected working zones.

Periodic safety inspections of the Powerlab Zürich by both internal and external occupational health and safety specialists ensure full compliance with all applicable regulations and standards.



Machine hall

The transformers and drives together with their load machines are located in a separate sound-proofed machine hall. The machine hall can be monitored via CCTV while the tests are running.

Advanced real-time simulator

We offer real-time simulation services using modern hardware-in-the-loop systems. The control electronics under test are embedded in a realistic simulated environment in order to verify functionality and hardware integration.



Maintenance and repair center

The maintenance and repair center for power electronics components is integrated in the Powerlab Zürich building. Our experienced staff offers the following services:

- Failure analysis
- Maintenance
- Periodic overhaul
- Professional cleaning
- Remote diagnostics
- Express repairs
- Modernization
- Product verification



Building infrastructure

Total floor area	1900 m²
• Test hall	880 m ²
• Machine hall	320 m ²
• Multi-purpose hall	700 m ²
Main test benches	7
Additional test benches	1 (climate and thermal test bench)
Industrial cranes	5 t in the test hall 10 t in the machine hall

Water cooling infrastructure (machine hall)

Heat dissipation	450 kW (at 30°C outside air temperature)
Water storage tank	10.8 m ³
Coolants	
• for power electronics	Water with anti-freeze
• for transformers	Transformer oil

Sustainability and energy efficiency

Bombardier Transportation places energy efficiency and efficient use of resources as high priority:

Sustainability and energy efficiency

- Recuperation of electrical power generated from the load machines
- Sustainably designed water-cooling infrastructure
- Very low noise emissions
- Connection to the district heating network

Outside area and test tracks

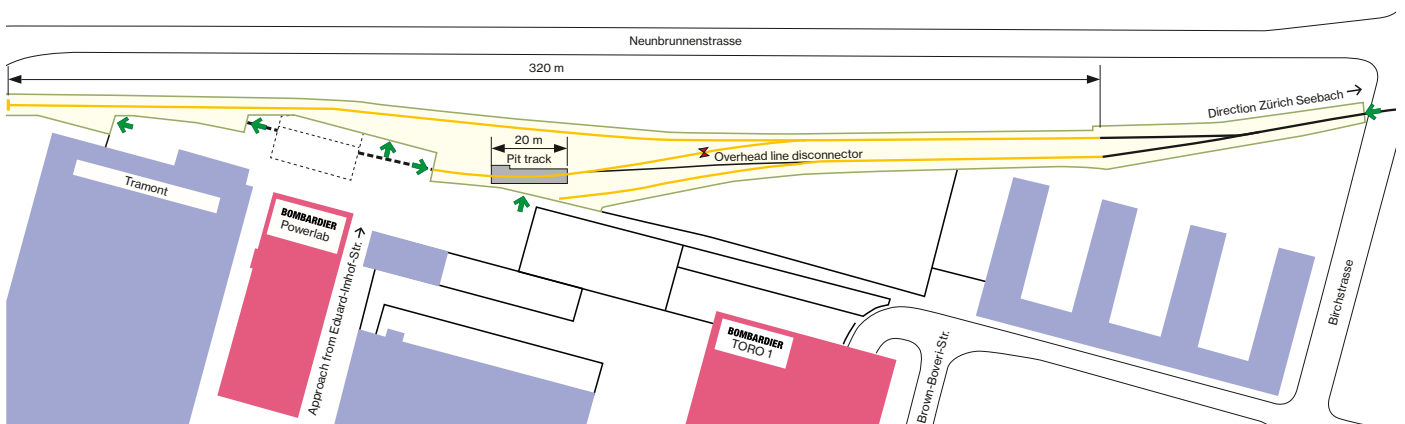
The 400-meter-long electrified test tracks with different track gauges are part of the Powerlab Zürich. All major European electrical systems are supported. One track section provides an inspection pit. A privately-owned shunter locomotive is available.

The test tracks are ideally suited for static and dynamic commissioning under high voltage. Rail access from the SBB station Zürich Seebach allows transportation of heavy items and test objects to the Powerlab Zürich.

Outside area and test tracks

Length	400 m, electrified 0 – 4.2 kV DC, 15 & 25 kV AC
Track gauges	1000, 1435, 1676 mm
Inspection pit length	20 m
Rail access	Station "Zürich Seebach"

- Tracks with overhead line
- Tracks without overhead line
- Fenced track area (with gate)





Key milestones

2009	Opening ceremony of the Powerlab Zürich
2010	Combined test of the traction equipment for BOMBARDIER* ALP*-45DP dual-power locomotives for NJ Transit and AMT with external diesel engine
2011	BOMBARDIER* TRAXX* AC3 locomotives: type test of traction converter and production of first three units
2012	Setup and commissioning of the system test bench and testing of the BOMBARDIER* MITRAC* Power traction converters for BOMBARDIER* TWINDEXX* Express double-deck trains for SBB, covering transformers, converters, and permanent magnet drives
2014	Measurements carried out for the research project "Online monitoring of traction motor insulation" in collaboration with the Technical University Vienna
2017	Type and system test of the traction converters for the newest generation of TRAXX AC locomotives
2018	Type and system test of the traction converters for the BOMBARDIER* TALENT* 3 trains
2019	Verification of a silicon carbide-based power converter for connecting traction batteries, carried out in collaboration with the ETH Zürich
2019	Development and test of an exchange IGBT module for replacing obsolete modules in older vehicles

Certificates

ISO/TS 22163:2017	Quality management and IRIS certificate
ISO 14001:2015	Environmental management systems
ISO 18001:2007	Occupational health and safety assessment series OHSAS
GOST	For traction applications in Russia and in applicable CIS countries

Key projects with propulsion equipment inside

Austria, Italy	TALENT 3 regional trains for ÖBB and STA South Tiro
Switzerland	TWINDEXX Express double-deck trains for SBB
Europe	TRAXX AC, DC and multi-system locomotives
Germany	TRAXX diesel-electric multi-engine locomotives
Sweden	IORE locomotives for heavy haul trains for iron ore
USA, Canada	ALP-45DP dual-power locomotives for New Jersey Transit and AMT Montréal
India	Freight and passenger locomotives
China, Belarus	7.2 and 9.6 MW freight locomotives
Africa, Russia	TRAXX multi-system freight locomotives
Saudi Arabia	Haramain high-speed trains

Do you have questions?

Contact one of our specialists in the Powerlab Zurich:
powerlab_zurich@rail.bombardier.com

<https://rail.bombardier.com/en/about-us/worldwide-presence/switzerland/en.html>

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