

ABB Laboratories, Ratingen, Germany  
PEHLA Testing Laboratories, Ratingen,  
Germany

# Introducing Laboratories Ratingen

Since 1954, the laboratories of ABB AG – Calor Emag Medium Voltage Products have performed tests on medium voltage equipment. Our laboratories, which are located in Ratingen, Germany, contain all the facilities necessary for tests in the medium voltage range.

The ABB Laboratories Ratingen and PEHLA Testing Laboratories Ratingen are accredited by the German Accreditation Authority (DAkkS). As a shareholder of PEHLA GbR we are also a member laboratory of the Short-circuit Testing Liaison. We provide our customers with high performance and independent testing carried out in accordance with customer requirements or national and international standards.



# Why testing at Laboratories Ratingen?

With 60 years of experience we know how to perform tests professionally. Starting with the planning and preparation phase we cooperate closely with our customers in order to ensure an optimal testing. Our organization provides flexible planning which ensures short-term reservation.

When testing at the Laboratories Ratingen our customers may choose to either prepare the test objects on their own or make use of our assembly and installation service. By request an on-site testing can be performed in the customer's facilities. All test results will be evaluated by our team of highly qualified and experienced experts in close cooperation with the customers. Our laboratories are equipped with a SF<sub>6</sub> module to handle and recycle the gas for environmental safety. The accreditation as ABB Laboratories Ratingen and as PEHLA Testing Laboratories Ratingen ensures that all tests are fully independent.

## Services we provide:

- On-site testing and diagnostics with mobile test equipment
- Independent witnessing of tests
- Inspections, examinations and diagnostics
- Manufacturing of prototypes and individual parts
- Assembly of prototypes and test objects
- Assembly and installation work
- Calibration of electrical and mechanical measuring equipment



# Our documentation to the customers

When testing at Laboratories Ratingen different types of documentation can be issued.

## **Type test certificate**

A type test certificate is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

## **Test document**

A test document is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

## **Test report**

A test report is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients' instructions. Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the test object, and its condition after the tests.

## **Test confirmation**

A test confirmation is issued immediately after the tests. It confirms that the tests have been conducted and is valid only until publishing the detailed results in an entire document.



# Development tests, type tests or acceptance tests

Laboratories Ratingen are able to offer any kind of test your company needs.

The laboratories are fully equipped to perform complete type tests on medium voltage equipment with state-of-the-art technology. All tests can be carried out as ABB tests or as PEHLA tests.

## Tests we provide

- Type tests
- Development tests
- Acceptance tests (also in other test laboratories)
- Certification tests

## Our test portfolio:

Tests	Products											
	MV circuit-breaker	Metal enclosed switchgear	Power transformer	Disconnector & earthing switch	Switch fuse unit	Earthing facility	Bushing	Instrument transformer	Fuse	Cable accessory	Auxiliary circuit	Substation
Making and Breaking test	●	●		●	●				●		●	●
STC test	●	●	●	●		●	●	●		●	●	●
Internal arc test		●										●
Capacitive switching test	●			●								
Temperature rise test	●	●		●	●	●	●	●	●	●	●	●
Climatic test	●	●	●	●	●	●	●	●	●	●	●	
Dielectric test	●	●		●	●	●	●	●	●	●	●	●
IP/IK-coding test	●	●										●
Partial discharge test	●	●		●	●	●	●	●		●		●
Mechanical operation test	●	●		●	●						●	
Mechanical endurance test	●			●	●						●	
High and low temperature test	●	●		●			●		●		●	
Tightness test	●	●		●			●					
Pressure test	●	●		●								

● Tests at Ratingen possible

■ Tests not applicable to this product

# Overview of standards

<b>High-voltage switchgear and controlgear</b>	IEC 62271-1	IEC 62271-100	IEC 62271-102
	IEC 62271-103	IEC 62271-104	IEC 62271-105
	IEC 62271-106	IEC 62271-110	IEC 62271-111
	IEC 62271-200	IEC 62271-201	IEC 62271-202
	IEC 62271-203	IEC 62271-304	IEC 60529
<b>High-voltage test techniques</b>	IEC 60060-1	IEC 60060-2	IEC 60270
<b>Power transformers</b>	IEC 60076-5	IEC 60076-11	
<b>High-voltage fuses</b>	IEC 60282-1	IEC 60282-2	
<b>Bushings</b>	IEC 60137		
<b>Insulators</b>	IEC 60660		
<b>Instrument transformers</b>	IEC 61869-1	IEC 61869-2	IEC 61869-3
<b>Live working</b>	IEC 60832-1	IEC 60832-2	IEC 61230
<b>Low-voltage switchgear and controlgear</b>	IEC 60947-1	IEC 60947-2	IEC 60947-3
<b>ANSI / IEEE</b>	IEEE C37.04 ANSI C37.54	ANSI C37.06 IEEE C37.60	IEEE C37.09

Other standards on request.

# Testing facilities

The Laboratories Ratingen are coordinating tests very well even if different kind of tests in more than one laboratory are required. Customers, who need various tests, can therefore rely on well-organized test procedures – quickly and at fair conditions.

## High-power testing laboratory

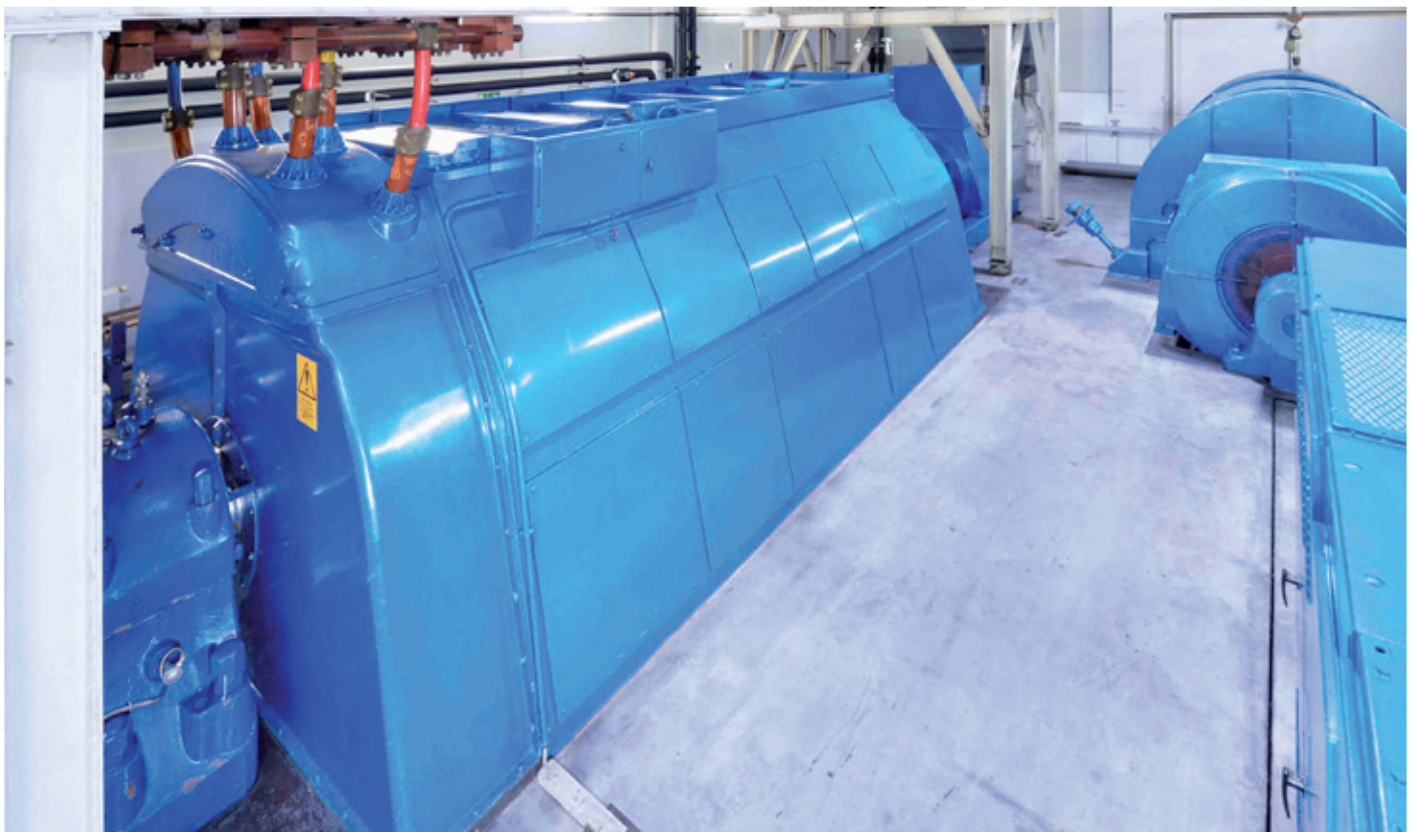
The high power testing laboratory is equipped with a 2800 MVA short-circuit test generator and oil-insulated power transformers and is therefore able to perform making and breaking tests at several voltage- and short-circuit current levels.

A special dry-type power transformer is available to perform peak-withstand current- and short-time withstand current test up to 250 kA and 100 kA r.m.s for three seconds.

Inside the room simulation of the arcing test bay, internal arcing tests can be performed for switchgear, containers or even substations.

A capacitor bank allows to perform different capacitive tests (e.g. line- or cable-charging current switching tests, back-to-back- and single-capacitor-bank current switching tests).

With the miscellaneous equipment like different reactors and resistors, measurement equipment etc., it is possible to perform a wide range of load current switching tests as well.



# Testing facilities

The tests, which can be performed at our high power testing laboratory, are:

- Short-circuit making and breaking capacity test
  - up to
    - 50 kA at 12 kV
    - 31.5 kA at 17.5 kV
    - 25 kA at 24 kV
    - 16 kA at 40.5 kV
- Switching capacity test
  - Load currents
    - Capacitive
    - Inductive
    - Ohmic
    - Inductive-ohmic

- Peak withstand current test
  - Up to 250 kA
- Short-time withstand current test
  - Up to 100 kA and up to 3s (4s)
- Internal arc fault test
  - Up to 50 kA
- Different tests
  - beyond the standards according to client's instructions



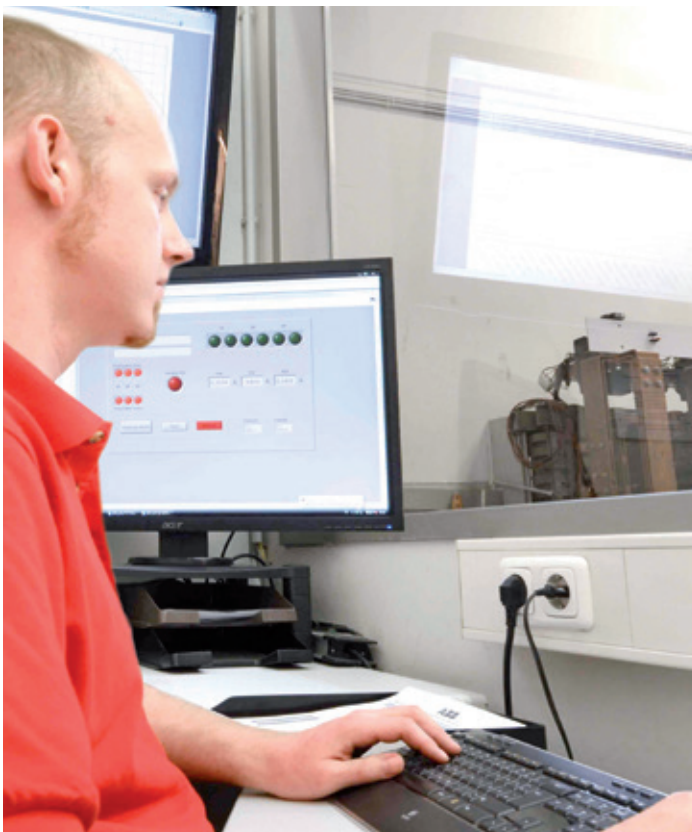


### Temperature-rise testing laboratory

The temperature-rise testing laboratory is suited to perform tests with a continuous current up to 5000 A on switchgear and switching devices. Through automated and computer controlled tests we use our recourses in the most efficient and effective way. Therefore we can offer precise, reliable and quick tests during day and night-time to our customers.

During the test, currents and temperatures are checked every 10 minutes. Shorter measurement intervals for currents and temperatures are possible. A control circuit guarantees a constant three-phase current through the entire test. The test is automatically stopped if a temperature limit is exceeded or the test duration is over.

- Temperature-rise tests
  - Up to 180 measuring points can be connected
  - Single-phase and three-phase
    - Up to 5000 A at 50 Hz
    - Up to 4000 A at 60 Hz
- Additionally we can offer
  - Magnetic field measurement
  - Thermal imaging



# Testing facilities

## High-voltage testing laboratory

With the test facilities in our high voltage testing laboratory all dielectric and partial discharge tests for medium voltage equipment can be carried out. For sensitive partial discharge tests a special test chamber is available with a background level  $< 1$  pC.

In order to offer on-site testing the high-voltage laboratory has mobile test equipment.

The high-voltage testing laboratory performs the following tests:

- Standard lightning impulse voltage tests
  - Up to 800 kV
- Power-frequency voltage tests
  - Stationary up to 260 kV
  - Mobile up to 230 kV
- Partial discharge tests
  - Stationary up to 150 kV
  - Mobile up to 230 kV
- Degree of protection tests
- Tests on auxiliary and control circuits



### Mechanical testing laboratory

The mechanical testing laboratory offers different functional, environmental and material tests especially on medium and low voltage equipment and their components.

The functional tests include endurance tests on switching devices, kinematic chain tests and function tests on any kind of interlocking or control system. For long-duration tests automatic control and monitoring systems are available to supervise various signals for diagnostics.

A wide range of measurement equipment is able to record via special sensors many additional data for detailed investigation of the test objects characteristics, like travels, rotation angles, forces, torques, pressures, temperatures, binary signal states and gas densities.

For gas-filled equipment we offer additionally gas-tightness and pressure withstand tests.

The environmental tests combine the above mentioned measurements and functional tests with special conditions during storage and/or operation like extreme temperatures, humidity, vibrations, inclination and other impacts.

Material testing concentrates on load tests like tensile, compression, mechanical impact IK-coding, torsion and bending tests.

High-speed video recording can be used for visual examination of very fast processes (up to 10,000 pic./s).



# Testing facilities

## Material testing laboratory

In this laboratory various climatic tests on materials, components and complete medium voltage switchgear panels can be carried out.

The testing facilities include two accessible climatic / thermo chambers. The main tests offered by the material testing laboratory are:

- Temperature tests
  - Range: -70 °C to +150 °C
  - Test voltage: 95 kV (1-phase)
- Climatic tests
  - Temperature range: +20 °C to +90 °C
  - Humidity range: 10 - 98 %
  - Test voltage: 95 kV (1-phase)
- Corrosion tests
  - Salt fog tests
  - Fog tests with sulfur dioxide
  - Tests with condensed water containing climate

## Calibration service

At the calibration laboratory we are able to calibrate electrical measurement instruments, force measurement instruments, length measurement equipment, torque wrenches and pressure gas equipment.



### Initial sampling inspection

Objects with different size can be digitized with top-quality by 3D-scanning.

The 3D scanner will also be used for

- Quality checks
  - Comparison of nominal/actual measurement data according to CAD data set
  - Measurement of form and position tolerances without complex construction
  - Measurement of free formed surfaces
  - Serial measurement for quality checks, process safety
- Toolroom
  - Generation of drawings for CAD system derives from scan process
  - Check of initial batches



# Workshop of the Laboratories

The workshop manufactures prototypes and test arrangements as well as provides complete assembly and installation service in connection with tests.

If defects occur during tests our workshop offers immediate repair service and manufacturing of spare parts.

In order to offer optimal service the workshop is fully equipped for all kind of metal processing.



# Contacts at the Laboratories Ratingen

If you need more information on Laboratories Ratingen or if you would like to make reservations for a test please contact:

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