VNL
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TEST CERTIFICATION

VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD.

H-1158-BUDAPEST, VASGOLYÓ UTCA 2-4. HUNGARY

VEIKI-VNL Ltd.

VEIKI-VNL Electric Large Laboratories Ltd., a DEKRA company, is an independent, accredited testing laboratory and product certification body and a member of the Short-circuit Testing Liaison (STL) organization. Its testing activities started in the 1950s when the Hungarian government decided to found the Institute for Electrical Power Research (VEIKI). VEIKI-VNL Ltd. became a DEKRA company in 2017.

VEIKI-VNL Ltd. is accredited by the Hungarian Accreditation Authority (NAH) as a testing laboratory according to ISO/IEC 17025 and as a product certification body according to ISO/IEC 17065. The integrated quality and environmental management system conforms to the requirements of ISO 9001 and ISO 14001, and it is certified by the Hungarian Standards Institution. The testing facilities are unique in Hungary, and cover the whole range of power network equipment. VEIKI-VNL Ltd. consists of four laboratories – the High Voltage Laboratory, the High Power Laboratory, the High Current Laboratory, and the LOCA Laboratory (a laboratory for testing nuclear power plant equipment) – as well as the Certification Office. The company's main activities are laboratory testing, diagnostics, product certification and research & development.

HIGH-VOLTAGE TESTS

The testing activities of the High Voltage Laboratory cover dielectric tests, radio interference (RIV) and corona tests and partial discharge measurements on equipment, cables, cable accessories, insulators, insulator sets and fittings for overhead lines and substations. Impulse voltage tests can be carried out up to 1,800 kV peak in the indoor testing hall and up to 3,400 kV peak at the outdoor test site. The maximum available power frequency voltage is 700 kV RMS in the indoor testing hall and 1,400 kV RMS at the outdoor test site.

MAIN PARAMETERS:

Power-frequency voltage (Continuous current: 1 A)	1400 kV_{rms}
Direct voltage (100 mA)	200 kV_{DC}
Lightning impulse voltage (0.5-5 / 10-100 µs)	3400 kV_{peak}
Switching impulse voltage (250 / 2500 µs)	2800 kV_{peak}
Steep front wave voltage	3000 kV_{peak}/µs
Superimposed single-phase voltages:	
▪ Power-frequency voltage + lightning impulse voltage	1000 kV_{rms} + 3400 kV_{peak}
▪ Power-frequency voltage + switching impulse voltage	1000 kV_{rms} + 2800 kV_{peak}
▪ Power-frequency voltage + power-frequency voltage	700 kV_{rms} + 360 kV_{rms}
Three-phase synchronizing generator:	1000 V_{rms}, 1000 A
Three-phase generator with adjustable frequency	100 Hz, 1000 V_{rms}, 3×25 A
Single-phase transformer for RIV and partial discharge tests (500mA)	700 kV_{rms}, 3 pC, 10 dBµV
Faraday cage (5m x 5m x 4m) for partial discharge test	60 kV_{rms}, 1 pC

SHORT-CRICUIT TESTS

The testing activities of the High Power Laboratory cover short-circuit tests on various equipment, such as making and breaking tests, internal arc tests, power arc tests, short-time withstand current and peak withstand current tests supplied from the 50 Hz power network. The laboratory's synthetic apparatus provides the testing environment for high-voltage circuit breakers including short-line fault tests and terminal fault tests using a single-phase current injection synthetic test circuit with DC recovery voltage.

TESTING PARAMETERS:

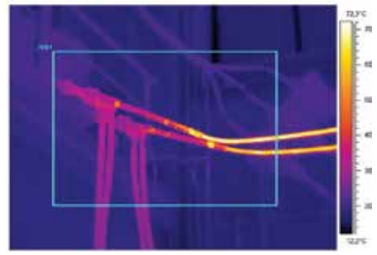
Test frequency	50 Hz
Single-phase short-circuit power	max. 1000 MVA
Three-phase short-circuit power	max. 650 MVA
Synthetic short-circuit current breaking tests	
Highest TRV peak	330 kV
Highest short-circuit current parameters	50 kA_{rms} / 140 kA_{peak}
Parameters of artificial lines (SLF tests)	t_{dL}>=100 ns
Power arc tests on insulator sets	max. 50 kA
Short-circuit tests on (bundled) overhead lines (with or without spacer-dampers)	max. 50 kA_{rms} on 62 m length max. 31.5 kA_{rms} on 135 m length max. 20 kA_{rms} on 250 m length
Short-circuit tests on spacer-dampers	max. 125 kA_{peak} on 62 m bundle length
Short-circuit tests on fittings for substations and overhead lines	max. 63 kA
Short-circuit tests on high-voltage surge-arresters	max. 50 kA
Short-circuit withstand tests supplied from low-voltage	max. 170 kA_{rms}
Short-circuit tests on transformers in three-phase circuit	$U_{r\text{-primary}}$ ≤ 35 kV; S_n ≤ 16 MVA
Short-circuit tests on transformers in single-phase test circuit	35 kV ≤ $U_{r\text{-primary}}$ ≤ 123 kV (145 kV) S_n ≤ 40 MVA
Short-circuit making and breaking tests on low-voltage apparatus	150 kA_{rms}/330 kA_{peak} at < 350V 110kA_{rms}/240 kA_{peak} at 430V-550V 55kA_{rms}/121 kA_{peak} at 690V-1100V

TEMPERATURE-RISE TESTS

Temperature-rise tests on equipment such as transformers, switchgears, prefabricated substations, cables, conductors and fittings for substations and overhead lines are performed in the High Current Laboratory up to 10 kA. This laboratory has individual supply for three-phase short-circuit tests with maximum power of 80 MVA, enabling short-circuit and temperature-rise systems to be combined for special tests. The analog and digital measuring systems can record currents and more than 100 temperature magnitudes.

MECHANICAL TENSILE TESTS

Mechanical tensile tests on conductors, fittings and insulators can be executed up to 300 kN. The laboratories have two tensile machines for stress-strain and breaking strength tests with lengths of 10 m (vertical) and 14 m (horizontal). The tensile machines have optional chambers for thermomechanical tests in the temperature range of between -40°C and +50°C and for electromechanical tests up to 100 kV. Tailor-made mechanical tests can be set up in a special test arrangement for bending, for torsion and for mechanical impact tests or to achieve higher mechanical loads.



TESTS ON OVERHEAD LINES AND ACCESSORIES

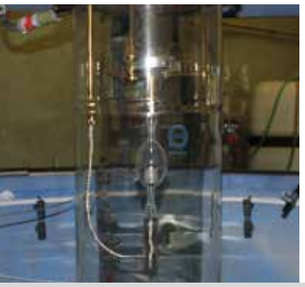
High Voltage Laboratory is able to perform dielectric, corona and radio interference (RIV), short-circuit, temperature-rise, heat-cycle, lightning and mechanical tests as well as stress-strain, breaking strength, individual wire tensile and creep tests on overhead power lines. Corona tests, RIV tests and numerous mechanical tests can also be performed on overhead line accessories such as spacer dampers and stockbridge dampers.

TESTS ON CABLES AND ACCESSORIES

The tests that can be conducted on cables and cable accessories include dielectric, temperature-rise, heat-cycle, electrical ageing in dry or wet environment, short-circuit on core, screen and flammability testing.

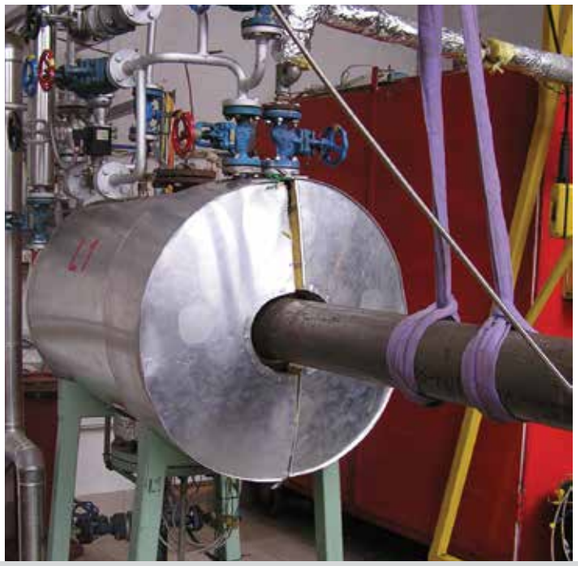
POLLUTION AND AGEING TESTS

Ageing, heat-cycle ageing, accelerated ageing and pollution tests can be carried out in the laboratories on cables, fittings for conductors or substations, insulators or materials and on special equipment. Hermetically closed test chambers facilitate various tests in humid, wet, salt-fog, clear-fog, high-temperature, low-temperature, high-pressure or high-intensity-UV environments while the electrical properties of the test specimen are monitored.



‘LOCA’ TESTS FOR NUCLEAR POWER PLANTS

The purpose of the Loss Of Coolant Accident (LOCA) tests is to verify the operability of electrical equipment in case of malfunction for environments which require very high reliability, such as nuclear power plants. A malfunction can be modeled in the accident simulation chambers with variable thermo-hydraulic parameters (temperature, pressure, steam, humidity and condensation).



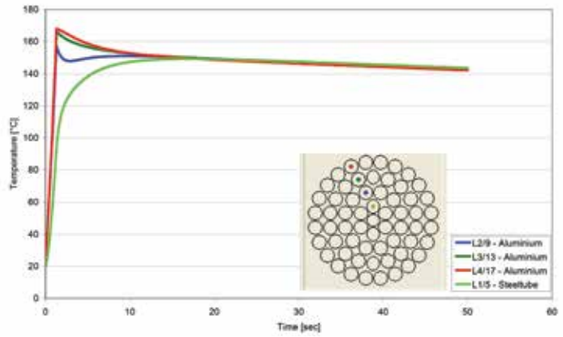
DEVELOPMENT OF TESTING EQUIPMENT AND METHODS

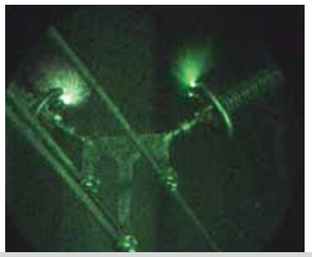
VEIKI-VNL Ltd. has a division supporting the advancement of measuring techniques and develops new testing or diagnostics equipment and software as follows:

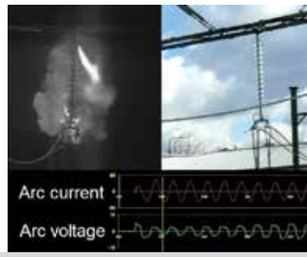
- Method for power line diagnostics
- Software for the short-circuit temperature-rise calculation of conventional and OPGW conductors
- Database management and evaluation software for overhead line diagnostics
- Rogowski coil current measuring system up to 200 kA with accuracy of 0.5%
- Micro-ohmmeter with max. test current of 200 ADC with accuracy of 0.2%
- Modular multichannel optical transient recorder with sampling rate of 500 kHz with accuracy of 0.1%

EXTRA SERVICES

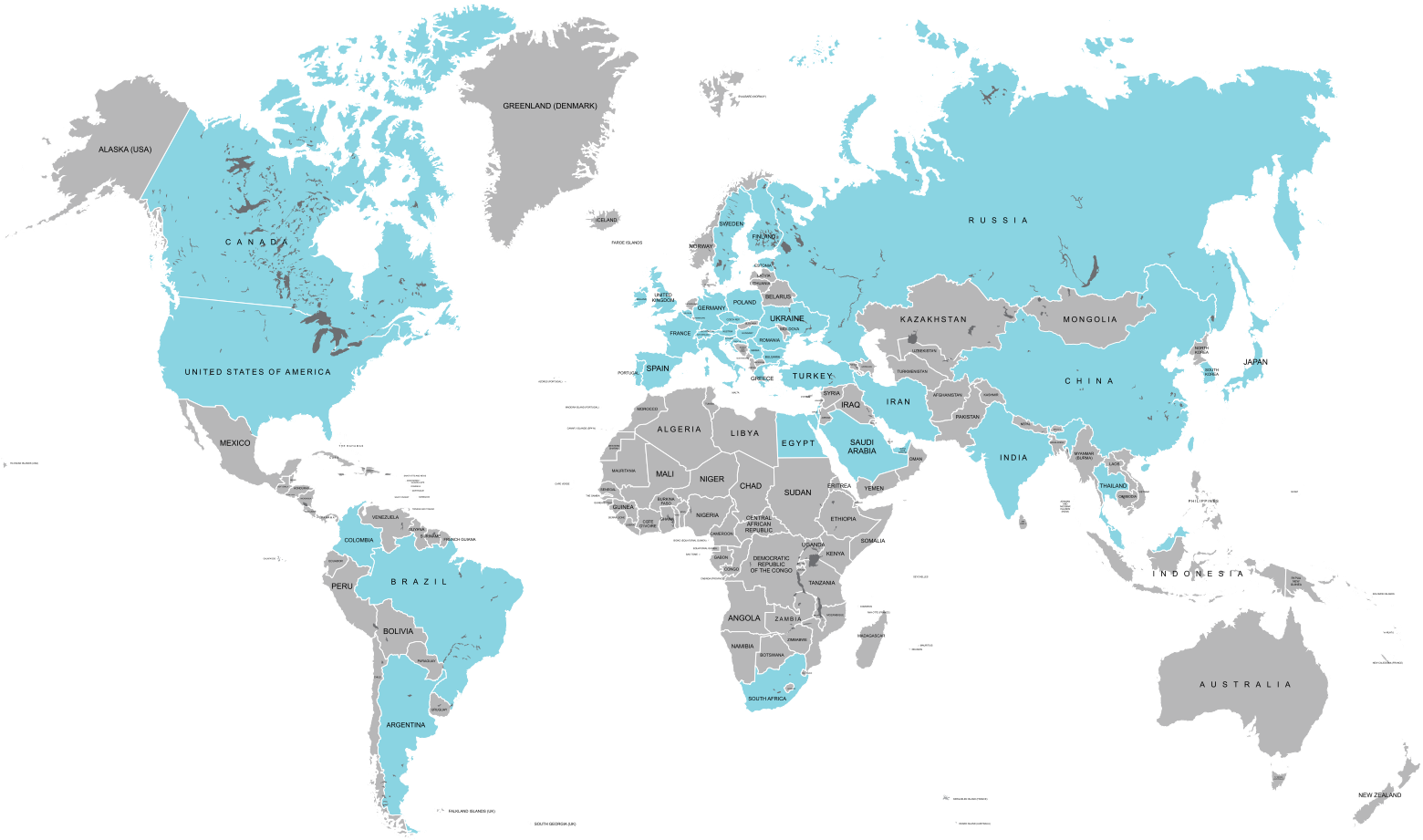
- Binocular, image intensifier (photomultiplier) equipment and daylight UV camera for detection of visible corona
- Digital high-speed video camera up to 6,000 fps (2,000 fps in full resolution) for evaluating flashovers and mechanical tests or the behavior of the plasma channel during the power arc tests on insulator sets
- (Optical) pressure measurements during internal arc tests or breaking tests or for short-circuit tests on liquid-immersed equipment
- Infrared thermo vision camera for detecting hot spots on equipment







REFERENCES /PARTNERS



CONTACTS:

VEIKI-VNL Ltd.
H-1158-Budapest, Vasgolyó utca 2-4. HUNGARY
Phone: +36 1 417 31 57
Fax: +36 1 417 31 63
www.vnl.hu ▪ vnl@vnl.hu

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a DEKRA company