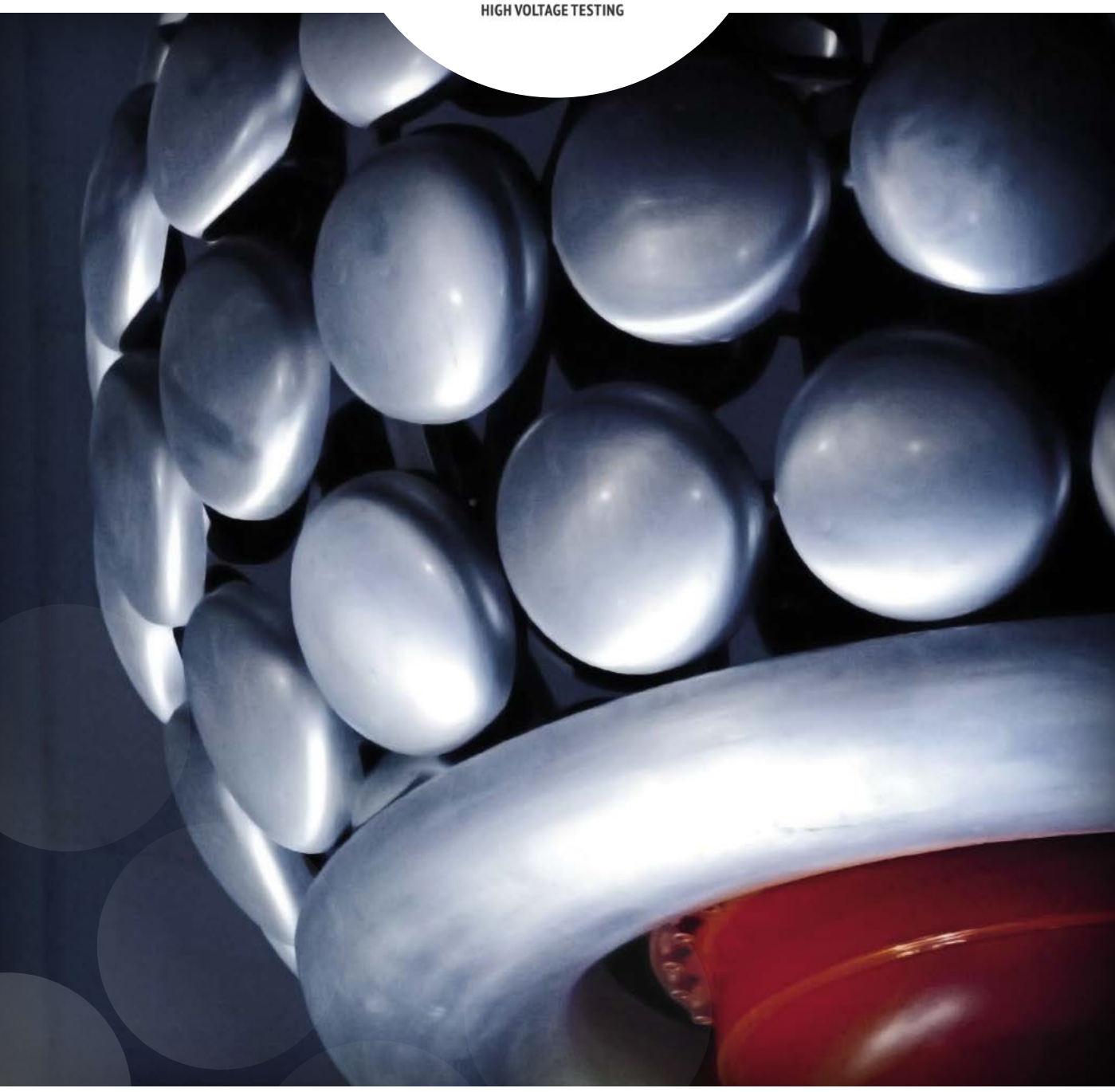
STRI

HIGH VOLTAGE TESTING



STRI TESTING

HIGH VOLTAGE TESTS • TEMPERATURE RISE TESTS • ENVIRONMENTAL TESTS
TESTS AT MULTIPLE STRESSES • PRE-QUALIFICATION TESTING OF CABLES

ABOUT US

STRI is a leading laboratory specializing in high voltage testing. Our clients are mainly manufacturers of electrical equipment all over the world, but also power grid companies, power producers, industries, railway companies, authorities and agencies. Our laboratory is located in Ludvika, Sweden.

STRI TESTING

STRI's laboratory is designed and equipped for high voltage tests in accordance with the latest international standards. We perform independent high voltage tests on power products with system voltages up to 800 kV.

Type testing is performed on products such as insulators, cables and their accessories, bushings, breakers, GIS, surge arrestors, disconnectors, instrument transformers, capacitors and HVDC valves. The laboratory has unique facilities for environmental and pollution testing.

POWERFUL TEST RESOURCES

STRI's climate test hall has one of the highest performances in the world enabling pollution testing of 800 kV HVAC and HVDC equipment. Test resources are backed up by advanced equipment for controlling and measuring the test data.

TESTING FACILITIES

STRI's laboratory has five large test halls for indoor testing, additional test chambers, and an outdoor test area including an underground test facility for prequalification testing of HVAC and HVDC cables.

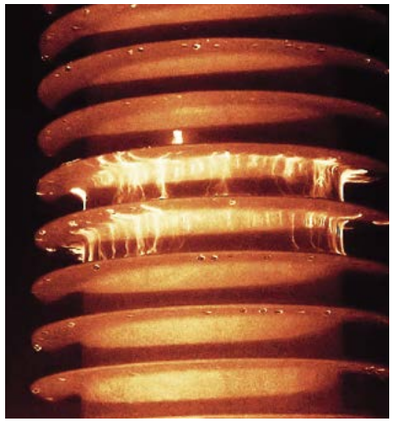
Besides four modern and flexible high voltage test halls there is also a circular climate test hall equipped with steam fog generators and salt fog ramps. The temperature of the hall can be controlled between -10°C and +55°C. AC and DC voltage are available up to 900 kV and 1200 kV respectively.

We also have smaller climate, environment, and ageing test chambers that can be used for long term testing and facilities for material and mechanical testing.

STRI ACCREDITATION

STRI's laboratory is accredited by SWEDAC, the Swedish accreditation body, giving our clients the benefit of knowing that we provide quality testing and competence. STRI is a member of SATS, the Scandinavian Association for Testing of Electric Power Equipment which is a member of the Short Circuit Testing Liaison (STL).

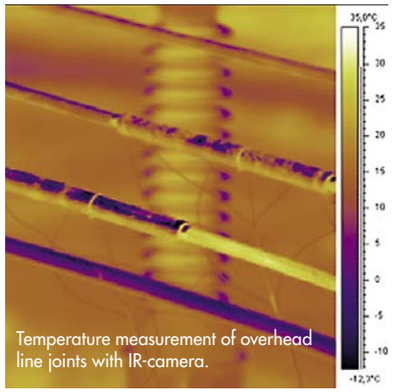
SWEDAC ACKREDITERING
Accred. No. 1297
Testing
ISO/IEC 17025



MULTIPLE STRESS TEST

STRI has two chambers for 5000 h AC and DC tests at multiple stresses in accordance with IEC TR 62730. Environmental factors such as sunlight, rain, humidity, heat, fog and salt fog can easily be controlled. The chambers are equipped for continuous monitoring of voltage, environmental factors and leakage current from individual test objects. Both chambers can run different voltages at the same time.

A larger chamber can be used for the 2000 h electrical environmental accelerated test on insulators according to the TERNA specification.



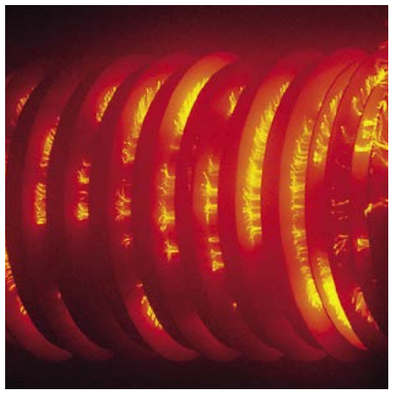
Temperature measurement of overhead line joints with IR-camera.

TEMPERATURE RISE TESTS

Temperature rise tests can be performed with currents up to 8000 A AC and 8400 A DC. The temperatures are registered with loggers handling a great number of channels.

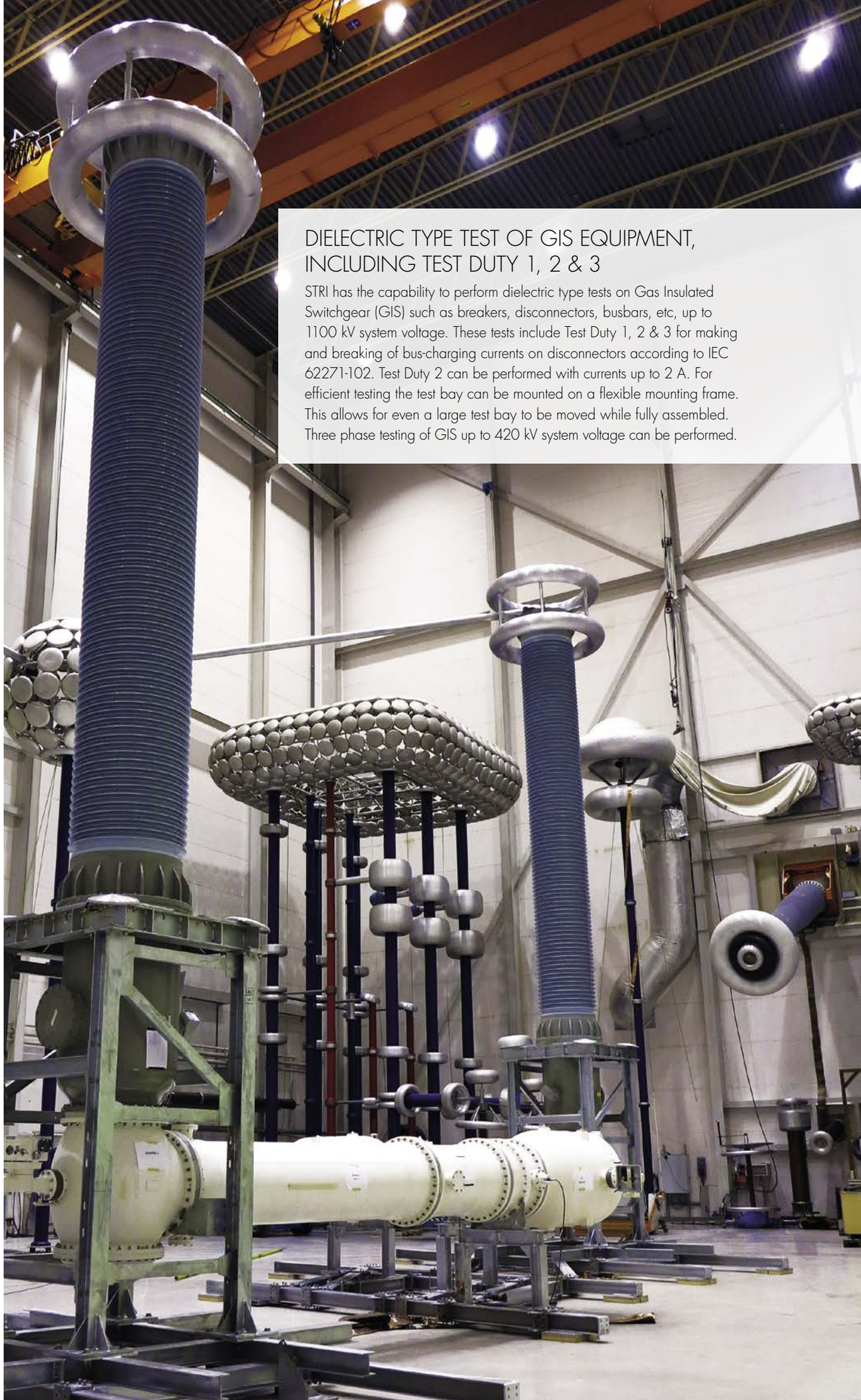
Temperature rise tests can be performed at elevated surroundning temparatures up to 60°C.

STRI also has test tanks for testing of oil/air bushings.



TRACKING AND EROSION TESTS

STRI has different chambers for 1000 h tracking and erosion tests. Besides a larger chamber with the dimensions 3x3x5 m (lxwxh) with a test voltage up to approximately 160 kV, a smaller chamber can be used for tests with at lower test voltage levels. Tests are often performed according to IEC 62217 on insulators and according to IEC 60099-4 on surge arresters (weather ageing test).



DIELECTRIC TYPE TEST OF GIS EQUIPMENT, INCLUDING TEST DUTY 1, 2 & 3

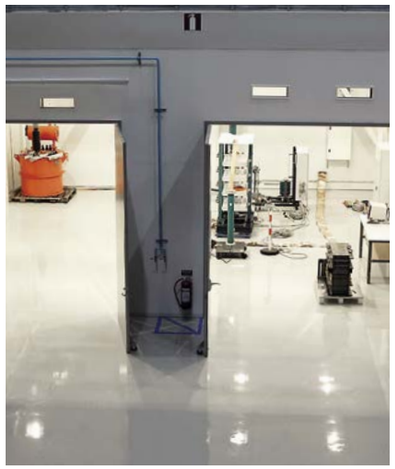
STRI has the capability to perform dielectric type tests on Gas Insulated Switchgear (GIS) such as breakers, disconnectors, busbars, etc, up to 1100 kV system voltage. These tests include Test Duty 1, 2 & 3 for making and breaking of bus-charging currents on disconnectors according to IEC 62271-102. Test Duty 2 can be performed with currents up to 2 A. For efficient testing the test bay can be mounted on a flexible mounting frame. This allows for even a large test bay to be moved while fully assembled. Three phase testing of GIS up to 420 kV system voltage can be performed.

CABLE TESTING

STRI has powerful cable testing facilities to perform various electrical tests on AC and DC transmission cable systems to meet all present needs, including:

- Tests of AC cables according to IEC, IEEE, ICEA, etc.
- Long term heating cycle voltage tests of AC and DC cable systems.
- Electrical type tests for HVDC cables according to Cigré TB 496, Electra 72 or Electra 189.
- Prequalification testing of AC and DC cables in a controlled environment.

Combined with STRI's material and mechanical testing facilities complete type tests on cables and accessories can be performed.



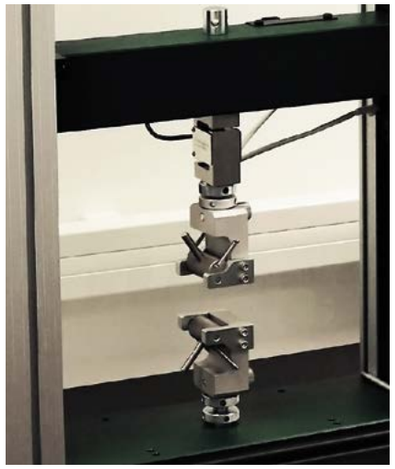
MEDIUM VOLTAGE TESTING

STRI has two test cells for medium voltage testing. They are equipped with a 400 kV impulse generator and a 100 kV AC transformer. The cells cover a total of 100 m^2 where type tests on cables and cable accessories can be carried out according to international, national and client specific standards; for example IEC 60502.

The test cells are also suitable for testing other MV products.

ION MIGRATION TESTS

STRI's ion migration test facility enables clients to verify that insulators can cope with 50 years in operation and through varying temperatures. The test facility consists of an oven that can be heated to between 90°C and 150°C and has room to test 50 insulators simultaneously in accordance with IEC 61325 clause 18.



MATERIAL TESTING

STRI can perform non-electrical testing on materials (e.g. resistivity, elongation at break) for cables and other high voltage products.

Testing can be done according to international and national standards e.g. IEC 60840 and IEC 62067. Materials that failed in service can also be analysed in the laboratory.

POLLUTION AND ENVIRONMENTAL TESTING

STRI's climate test hall has one of the highest performances in the world allowing pollution testing of up to 800 kV HVAC and HVDC equipment.

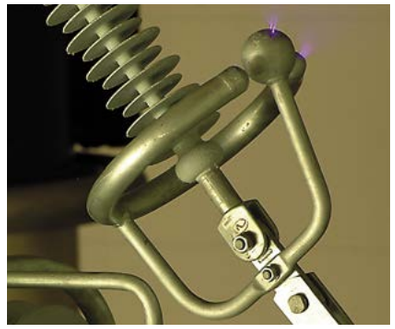
The maximum test voltage in our climate test hall is 900 kV AC and ±1200 kV DC. PD can be measured at low levels, since external interference levels have been reduced.

Our climate test hall has equipment for controlling the temperature and humidity between –10°C and +55°C. The intensity and conductivity of salt fog can be controlled within wide limits. The various test systems have current loading data to make it possible to meet the demands imposed during voltage tests with the simultaneous application of pollution, rain, fog, hoarfrost, snow and different types of ice.

SNOW AND ICE TESTING

In the climate test hall snow and ice tests of insulators, apparatus, and conductors can be performed. Different types of snow and ice with client defined properties can be created.

It is also possible to combine pollution and ice tests. Insulators are first contaminated and then accreted by ice produced from water with certain conductivity. Tests can be performed on full scale AC and DC equipment. STRI also performs standard mechanical ice tests for disconnectors.



WATER DROP CORONA

A high voltage test is available to verify the dimensioning of corona/grading rings on composite insulators based on E-field calculations.

TEST FACILITIES	W x L x H
High voltage test hall	25 x 37 x 30 m
High voltage test hall	18 x 36 x 21 m
High voltage test hall	18 x 18 x 20 m
High voltage test hall	10 x 13 x 12 m
Pollution test hall	ø 18 x 23 m
Medium voltage test cells	10 x 10 x 5 m

TEST HALLS

The test halls are provided with highly effective electromagnetic shielding, which gives a very low background level during PD and radio interference measurements.

STRI has equipment for handling SF6 gas and transformer oil.

TEST	RATINGS	REMARKS
Lightning Impulse Testing	2800 kV	
Switching Impulse Testing Wet/Dry	1850 kV	
AC Testing Wet/Dry	1200 kV	50 Hz 1-phase
DC Testing Wet/Dry	1250 kV	0.3 A continuous current, 2 A pulses
Partial Discharge & RIV Testing	1200 kV	50 Hz 1-phase
Capacitance & Tan δ Testing	1200 kV	50 Hz 1-phase
Temperature Rise Testing	8000 A (AC)/8400 A (DC)	50 Hz 1-phase

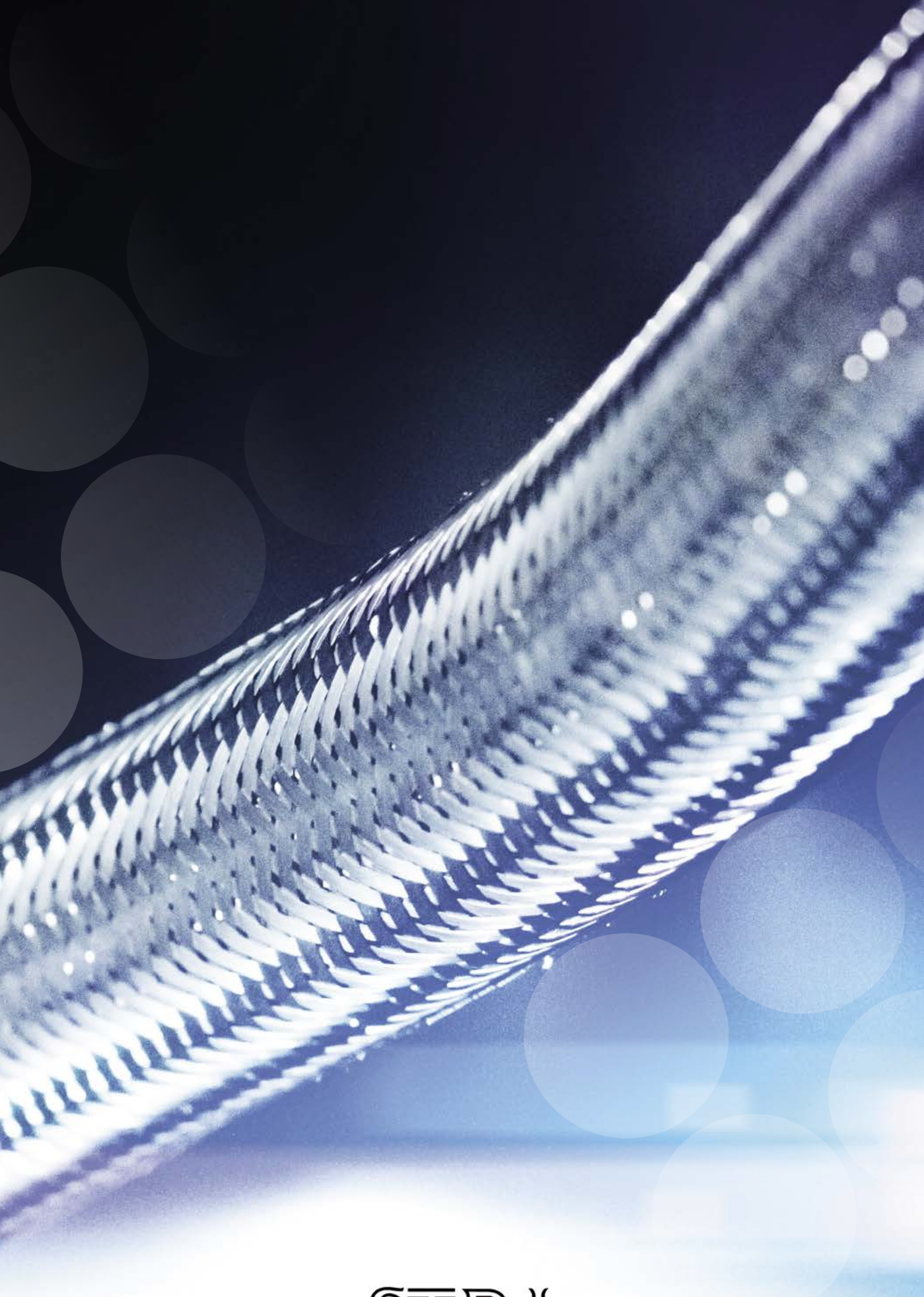
Outdoor test facility with a cable from Nexans.

Current transformers in the underground test facility.

PREQUALIFICATION TEST OF HVDC AND HVAC CABLES

STRI has two indoor test facilities for prequalification testing according to Cigré TB 496, IEC 60840 and IEC 62067. The tests can be performed either in a test hall or in an underground test facility, both with controlled environment, or in an outdoor test facility.

Different media such as water, soil etc. can be introduced in the test circuit. Requirements such as snaking and ducts can also be introducted into the test circuit. Maximum test voltages are 650 kV AC and 1050 kV DC. Heating with either AC or DC current is available.



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Hitachi Energy Sweden AB, STRI, Box 707, SE-771 80 Ludvika, Sweden, Phone +46 240 795 00, stri@stri.se

For more information, please visit our website, **www.stri.se**