



*Technology leadership: Our customers consider the Isovolta Energy team as the partner or choice for providing optimized solutions based on state-of-the-art technologies and consistent world-class processes.*

## TESTING AND TRAINING

**I**TTTC has been specializing in testing high and low voltage applications. Over the last decades ISOVOLTA invested in state-of-the-art equipment and expanded its laboratories constantly.

Electrical insulation materials (EIM) and electrical insulation systems (EIS) are fully tested according to international standards as well as according to particular customer specifications.

Besides testing, analyzing, evaluating and benchmarking materials and systems, ITTC offers tailor-made technical trainings for customers and employees.

Located at the global competence center in Werndorf (AUSTRIA), the ITTC team closely cooperates with the R&D, production and quality assurance department to support and exchange know-how.



## TEST CENTER

**P**roviding optimal technical support requires experience in applying and processing insulation materials, executing tests and evaluating results.

ITTC conducted a great many test programs for a lot of customers all over the world, which strengthened the relationship and their trust. The test center also carries out important tests on newly developed materials and monitors and benchmarks the performance of ISOVOLTA products and provides customer support.

*„Our best reference is our customer's confidence and feedback over many decades. “*

## TEST FACILITIES

**T**he test center comprises an area of approximately 700 m<sup>2</sup> and is equipped with modern laboratories and state-of-the-art measuring instruments.

- ⚡ Laboratory VPI plant
- ⚡ Hydraulic presses
- ⚡ Automatic and semi-automatic taping machines
- ⚡ High voltage test cells for up to 150 kV AC and 60 kV DC
- ⚡ Voltage endurance test cells for up to 50 kV AC
- ⚡ Equipment to conduct multi-stress tests (TEAM)
- ⚡ Analytic devices
- ⚡ Machining facilities

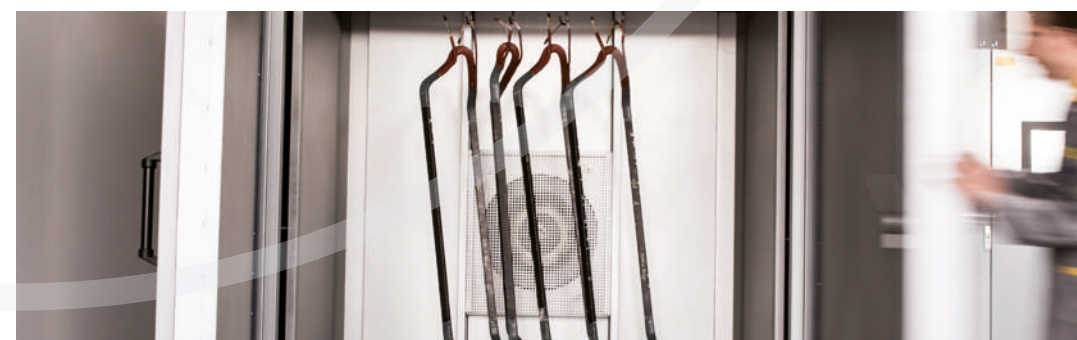
## VPI LABORATORY PLANT

**O**ur modern Vacuum Pressure Impregnation (VPI) plant enables us to handle different kinds of impregnating resins like epoxy-anhydride systems, single component epoxy resins and polyester imide or silicone resins. Process parameters can be adjusted very easily according to the components and applications used because of the high flexibility in changing and varying machine settings.

Bars and coils of up to a maximum length of 1.6 m or small stators, rotors and mock-ups can be impregnated and cured

accordingly. All important parameters (vacuum level, pressure, temperature, capacity, plant settings) are recorded and reproducible.

Our experienced operators gained a lot of practical know-how by performing several hundred impregnations over many years, which assists in adapting and improving the entire impregnating process.







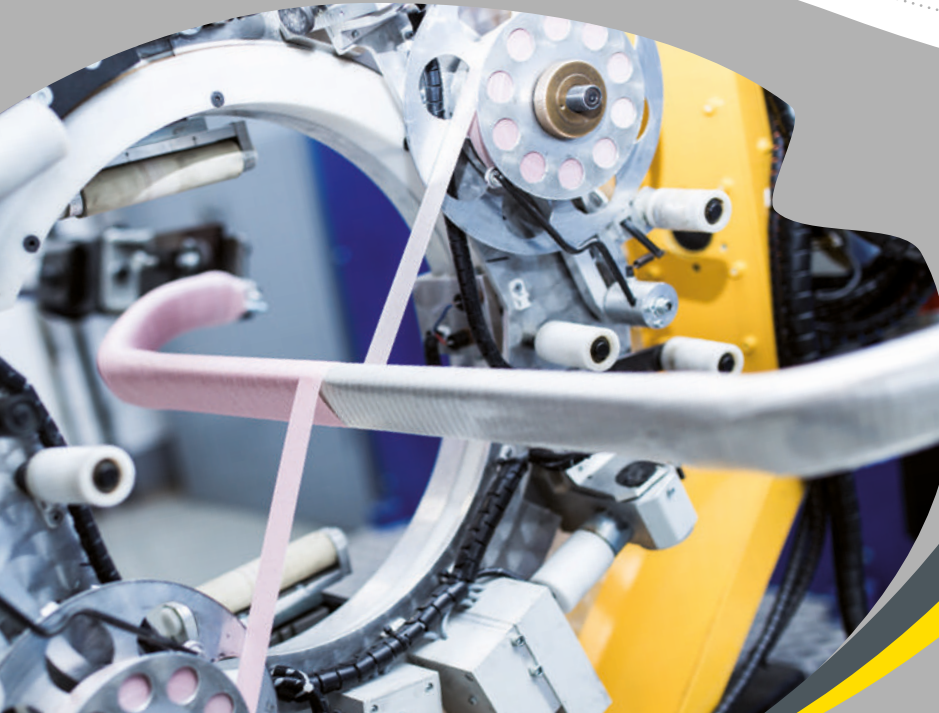
# ITTC WORKSHOP

**I**SOVOLTA produces and tests hundreds of test bars each year. Modern taping machines are used to properly apply insulation material around straight and bended bars. Taping parameters can be changed easily to check the processability of tapes and to adapt settings to achieve optimal results.

B-stage insulation tapes (Resin Rich technology) are pressed and cured in a computer controlled hydraulic press

with a maximum length of 1.5 m. Process parameters (temperature, pressure, time) can be adjusted and optimized according to the insulation material and bar geometry.

The well-equipped workshop allows a huge range of test specimen to be produced, adapted and prepared for testing.



*„ISOVOLTA is more than just a supplier - ISOVOLTA is a trustworthy and reliable technical partner.“*

## ELECTRICAL TESTS

**A**C and DC tests are conducted in several high voltage test laboratories.

- Breakdown test in air and oil
- Partial discharges
- Dielectric dissipation factor and power factor (tip up)
- 50 - 400 Hz test frequency
- AC loss characteristic and permittivity
- Dielectric withstand test
- Surge test
- Testing of turn/conductor insulation
- Determination of electric and magnetic characteristic of insulation materials

## LONG-TERM AGING TESTS

**O**ur voltage endurance test (VET) cells are equipped with powerful transformers, voltage control units, reliable safety devices and clean ozone exhaust systems to guarantee accurate and safe testing.

- VET for up to 50 kV AC
- Combined electrical and thermal aging can be performed with temperature controlled heating panels

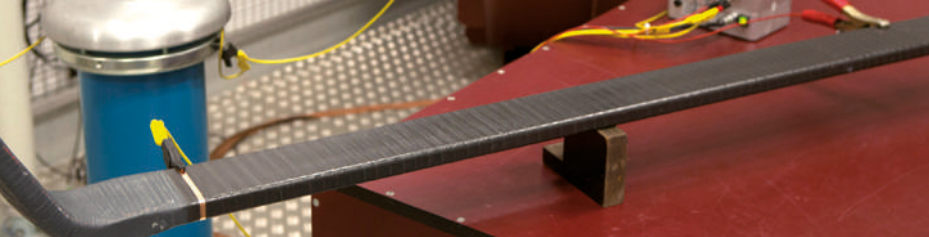
## MULTI-STRESS TESTS

**W**hen evaluating insulation systems, test specimen are sequentially exposed to high temperature, mechanical stress and moisture until failure occurs as determined by the voltage test. Several ovens, a vibrating table and a spacious humidity chamber allow parallel and efficient testing of different systems.

## ANALYTIC & DIAGNOSTIC TESTS

**A**nalyzing the electrical, mechanical and thermal properties of insulation materials and compounds is necessary to evaluate their behavior and interaction during operation.

- Insulation Resistance (IR)
- Dielectric Absorption Ratio (DAR)
- Polarization Index (PI)
- Surface and volume resistance
- Rheometer and viscometer
- Dynamic Mechanical Analysis (DMA)
- Differential Scanning Calorimetry (DSC)
- Thermogravimetric Analysis (TGA)
- Infrared spectroscopy
- Microscopic analysis
- Thermal conductivity



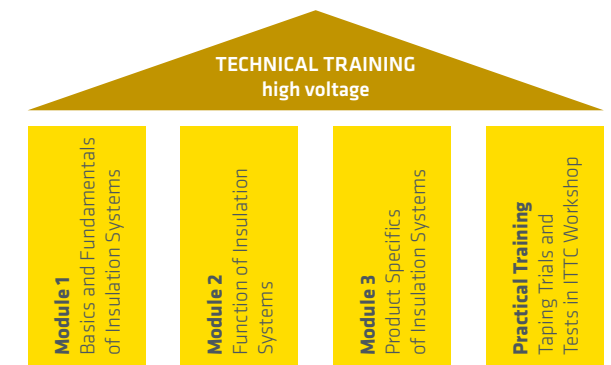


## TEST PROGRAMS

**ITTC performs tests** according to internationally recognized standards and test methods on single components or entire insulation systems for internal and external purposes.

On request, ITTC also provides specially adapted test programs according to customer specifications. Various tests are conducted for application areas like motors, generators, wind and traction.

The test center also cooperates with external parties like resin manufactures and certified bodies e.g. universities and institutes.



## TRAINING CENTER

**ITTC provides** tailor-made customer and employee trainings using modular training sessions. Each module consists of specially selected sessions, which can be combined easily to match the purpose of the training.

Topics like the basics and fundamentals of electrical machines, the function and requirements on electrical insulation systems, as well as specific product information and insulation technologies are covered. During the practical training, participants learn in our workshop how to apply and process insulation material correctly and how to conduct diagnostic tests.

Special courses with keynote speakers focus on selected topics and provide a forum for open discussion.

## TEST METHODS & STANDARDS

**In several high voltage** test laboratories AC and DC tests are conducted.

- ⚡ Breakdown test in air and oil
- ⚡ Electrical insulation system evaluation acc. to IEC 60034-18-1, -31, -32, IEEE 1776
- ⚡ Electrical insulation material evaluation acc. to IEC 60216
- ⚡ Breakdown voltage test acc. to IEC 60243-1 (AC) and IEC 60243-2 (DC), ASTM D 149
- ⚡ Voltage endurance test acc. to IEEE 1043 and IEEE 1553, IEC 60034-18-32 and IEC 60727
- ⚡ Dielectric dissipation factor / permittivity acc. to IEC 60250, ASTM D 150
- ⚡ Power factor tip up acc. to IEEE 286, IEC 60894
- ⚡ Partial discharge test acc. to IEEE 1434, IEC 60270 and IEC 60034-27
- ⚡ Thermal cycling acc. to IEEE 1310, IEC 60034-18-34
- ⚡ Testing of turn insulation acc. to IEEE 522, IEC 60034-15
- ⚡ Insulation resistance acc. to IEEE 43, IEC 60093 and IEC 60167
- ⚡ Thermal conductivity acc. to ASTM E1530
- ⚡ KEMA standards S-13, S-14, S-17-2



*„Technical leadership requires high quality products, state-of-the-art facilities and well trained and well educated employees.“*

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