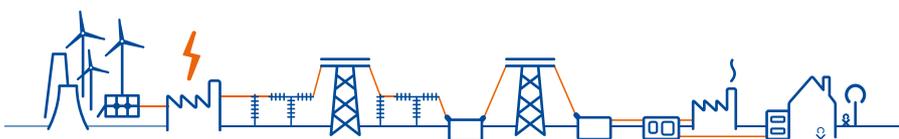


ON-SITE TRANSFORMER TESTING AND DIAGNOSTICS



SGB-SMIT AT A GLANCE

Combined, more than

450



YEARS OF EXPERIENCE

Basis for know-how and
for know-why

More than

2,400



EMPLOYEES

take care of
your project

In more than

80



COUNTRIES

satisfied
customers



READY FOR YOUR MARKET

The SGB-SMIT Group manufactures transformers for applications worldwide. Sales and service centers on all continents ensure optimum processes.

Our products meet the requirements in accordance with the applicable national standards.



PRODUCTS

- large power transformers
- medium power transformers
- large liquid-cooled distribution transformers
- liquid-cooled distribution transformers
- cast resin transformers
- shunt reactors
- series reactors
- phase shifters
- Lahmeyer-Compactstationen®

Transformers from 50 kVA up to incl. 1,200 MVA in the voltage range up to 765 kV.



QUALITY MANAGEMENT

The SGB-SMIT Group is certified in accordance with:

- DIN ISO 9001
- DIN ISO 14001
- DIN ISO 50001
- OHSAS 18001



TECHNOLOGIES

Technologies for conventional and renewable energy.

SMIT TRANSFORMER SERVICE

SMIT Transformer Service (STS) is the service department of Royal SMIT Transformers B.V. and offers the entire service package for oil and cast-resin transformers manufactured both internally and by external suppliers.



SERVICE ACTIVITIES

SMIT Transformer Service (STS) is a division of the SGB-SMIT group based in Nijmegen, the Netherlands. A team of permanent all-round service specialists and project leaders is available to solve every conceivable transformer or tap-changer problem in every model or make. They also carry out effective and efficient work for regular maintenance of the transformer pool.

SMIT Transformer Service is the service representative for Machinefabriek Reinhausen. SMIT Transformer Service's tap-changer specialists hold the MR premium service provider certificate.

Our own oil analysis laboratory directly links the results from oil quality and dissolved gas analyses or ageing inspections to the actual circumstances of the transformer involved. In this way, we do not only provide the numbers, but also the appropriate advice and solutions.

The service activities include the following:

- Sampling and analysis of oil samples
- Sampling and analysis of insulating paper
- Analysis within our own test laboratory
- Diagnostic measurements
- Status assessments
- Consultation
- Maintenance
- Repair
- General overhaul in the factory and on site
- Tap changer service
- Test and replacement of bushings
- Uprating
- Mobile high-voltage test equipment (FAT and SAT)
- Long-term storage (with oil) on our site
- Delivery of spare parts and delivery of customized parts

ON-SITE TRANSFORMER TESTING AND DIAGNOSTICS



CONDITION ASSESSMENT AS PART OF PERIODIC TRANSFORMER MAINTENANCE

Although transformers are usually robust and reliable devices requiring relatively low maintenance, the number of aging transformers in service is growing and thus increasing the potential for failing. A small failure in a transformer can cause major damage to the transformer, its surroundings and people nearby. That is why periodic monitoring of the transformer's condition is an essential part in assuring the operational safety of a transformer for uninterrupted power supply. Combining dissolved gas analysis of transformer oil and electrical measurements gives you the optimal assessment of the condition of a transformer.

SMIT Transformer Service (STS) has a full range of measurement equipment available to carry out on-site testing and diagnostics.

ON-SITE INVESTIGATION OF A POSSIBLE DEFECT

After dissolved gas analysis or electrical measurements have detected a possible defect inside a transformer, an investigation is necessary. STS can carry out a complete range of routine electrical tests, oil analyses, and also has one of the most modern Mobile HV test systems of Europe at its disposal. The Mobile HV test system can be transported to almost any site, which allows the transformer to remain on site during high-voltage testing and diagnostics, avoiding high costs and risks involved with transporting a transformer. This also ensures short response times to carry out an all-important initial diagnostics after a defect in a transformer is detected.

SITE ACCEPTANCE TEST

To ensure that a transformer is operational safe to be connected to the power grid, a Site Acceptance Test can be performed by STS. As part of commissioning of a new transformer or after completed on-site repairs to a transformer, the Mobile HV test system provides the option of HV-tests necessary to ensure the transformer can be taken in operation safely. The measured values during the SAT can be compared and should be within close range to the Factory Acceptance Test. The Mobile HV test system is especially designed for performing testing according to IEC and IEEE standards.



TESTING AND DIAGNOSTICS WITH PORTABLE EQUIPMENT

SMIT Transformer Service can perform a large range of (routine) electrical measurements with portable equipment that can be used on almost every transformer at every location and situation:

- Transformer Turns Ratio and Phase Angle
- DC Winding Resistance
- Dynamic Resistance Measurement [DRM] for OLTC
- Insulation Resistance
- Short-Circuit Impedance / Leakage Reactance
- Frequency Response of Stray Losses
- Demagnetization
- Power/Dissipation Factor of windings and bushings
- Exciting Current
- Current transformer ratio, polarity and excitation current
- FDS+PDC Measurement for moisture determination
- Sweep Frequency Response Analysis [SFRA]
- Acoustical, Electrical and UHF Partial Discharge measurement
- Noise level

MOBILE HV TEST SYSTEM POSSIBILITIES

SMIT Transformer Service can perform the following measurements, tests and diagnostics on-site on almost every transformer at any location and situation:

- Applied voltage [AV]
- Induced Voltage Withstand [IVW]
- No-Load Losses and No-Load Current
- Load Losses
- Electrical Partial Discharge measurement [PD (stand alone) or IVPD (combined with IVW)]
- Acoustical Partial Discharge measurement

The Mobile HV test system can produce voltages up to 360 kV for Applied Voltage testing and up to 80,9 kV 3-phase for Induced Voltage Testing and No-load measurements. Special applications are also possible, please ask for the possibilities.

ADVANTAGES OF OFFLINE TESTING AND DIAGNOSTICS WITH MOBILE HV TEST SYSTEM

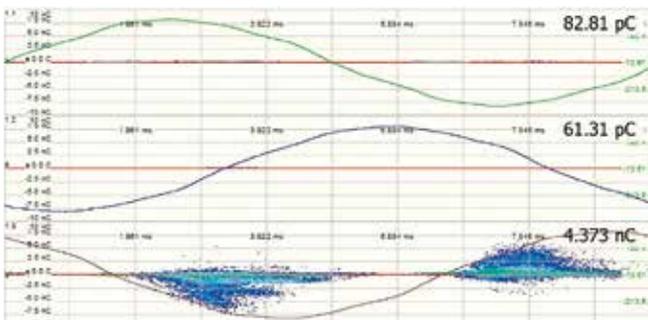
When there is an abnormality inside a transformer that needs investigation, the measurements can be performed on a transformer energized by the grid or energized by the Mobile HV test system.

Performing measurements with the Mobile HV test system has the following major advantages that enable high accuracy diagnostics:

- Feeding with full variable Voltage and frequency, so also below and above rated Voltage;
- Easy to de-energize the transformer for safe sensor (re)placing;
- Partial discharges coming from external parts such as connected lines are limited;
- In case of a breakdown during testing, the Mobile HV test system will safely switch off the supply before major damage to the transformer is done.

100 YEARS EXPERIENCE

The modern Mobile HV Test System, in combination with over 100 years of experience in transformer building and testing, gives you the best possible diagnostics available for your transformer.



WHAT DOES SMIT TRANSFORMER SERVICE NEED TO PREPARE AN OFFER?

To provide you with an offer that includes an optimal combination of tests and measurements required to make a thorough assessment of your transformer, we would like to receive the following information:

- Postal address of the transformer location
- Technical data of the object to be tested:
 - Rating plate, outline drawings, any other specifications
 - Previous measurement data, preferably the original FAT report
 - Insulation levels of the object to be tested
- Reason for testing
- In case of a faulty or tripped transformer:
 - Fault history (what happened and in which order)
 - Oil test reports (before and after transformer trip)
 - Test report of Buchholz-gas analysis after fault
- Information about documents required by SMIT Transformer Service to enter site.



OVERVIEW OF AVAILABLE TESTS

Routine / Type / Special tests	Limits on object to be tested [MVA]	Testing Capacity	Remarks
Transformer Turns Ratio and Phase Angle		1~ and 3~ / 400 V AC	
Exciting Current		10 kV AC	
DC Winding Resistance		100 A DC	
Dynamich Resistance Measurement (DRM) for OLTC		25 A DC	
Insulation Resistance		10 kV DC	
Short-Circuit Impedance / Leakage Resistance		33 A AC	
Frequency Response of Stray Losses			
Demagnetization		30 A DC	
Power / Dissipation Factor of winding and bushings		12 kV AC / 50 Hz 2 kV AC / 15 - 400 Hz	
Current Transformer: Ratio, Polarity and Excitation Current			
FDS + PDC Measurement for moisture determination		100 - 200 V / 0,1 mHz - 200 kHz	
Sweep Frequency Response Analysis (SFRA)			
Noise level			Sound pressure Sound intensity
Applied voltage (AV)		360 kV / 40 - 300 Hz	
Induced voltage withstand (IVW)	1~ 500 MVA 3~ 750 MVA 1~ 100 MVA 3~ 150 MVA	1~ / 46,7 kV / 40 - 200 Hz / 710 kVA 2~ / 93,4 kV / 40 - 200 Hz / 436 kVA 3~ / 80,9 kV / 40 - 200 Hz / 1000 kVA 1~ / 20,08 kV / 16 ² / ₃ - 40 Hz / 290 kVA 2~ / 40,16 kV / 16 ² / ₃ - 40 Hz / 178 kVA 3~ / 34,79 kV / 16 ² / ₃ - 40 Hz / 430 kVA	800 kVA [3 times daily] 470 kVA [3 times daily] 1400 kVA [3 times daily] 327 kVA [3 times daily] 192 kVA [3 times daily] 602 kVA [3 times daily]
Partial Discharge (PD - stand alone, or IVPD - combined with IVW)		Electrical PD Accoustical PD Ultra High Frequency (UHF) Electrical PD, acoustical PD and UHF can be used in combination with each other for optimal PD localization.	10-channel system in use 3-PARD 4-channel system in use 3D Model Sensor in oil, mounted on a valve DN50 or DN80
No-Load Losses and No-Load Current	3~ 350 MVA 3~ 750 MVA		$U_{THD} < 5\%$ $U_{THD} > 5\%$
Load Losses	3~ 30 MVA		
OLTC	3~ 350 MVA No-load 3~ 30 MVA Load		

CONTACT

 **STARKSTROM-GERÄTEBAU GMBH**
Regensburg • Germany
Phone +49 941 7841-0

 **SÄCHSISCH-BAYERISCHE
STARKSTROM-GERÄTEBAU GMBH**
Neumark • Germany
Phone +49 37600 83-0

 **ROYAL SMIT TRANSFORMERS B.V.**
Nijmegen • The Netherlands
Phone +31 24 3568-911

 **SMIT TRANSFORMER SERVICE**
Nijmegen • The Netherlands
Phone +31 24 3568-626

 **RETRASIB S.A.**
Sibiu • Romania
Phone +40 269 253-269

 **SGB CZECH TRAF0 S.R.O.**
Olomouc • Czech Republic
Phone +420 605 164860

 **SMIT TRANSFORMER SALES INC.**
Summerville, SC • USA
Phone +1 843 871-3434

 **SGB-USA INC.**
Louisville, OH • USA
Phone +1 330 871-2444

 **OTC SERVICES INC.**
Louisville, OH • USA
Phone +1 330 871-2444

 **SGB MY SDN. BHD.**
Nilai • Malaysia
Phone +60 6 799 4014

 **SGB TRANSFORMERS INDIA PVT. LTD.**
Chennai • India
Phone +91 44 45536147

 **SGB CHINA**
Yancheng • P.R. China
Phone +86 515 88392600

SMIT TRANSFORMER SERVICE

Energieweg 16 • 6541 CX Nijmegen • The Netherlands
Phone: +31 24 3568-626
Fax: +31 24 3568-717
e-mail: smit-service@sgb-smit.com

www.sgb-smit.com