FKH

High Voltage Testing and Engineering Commission

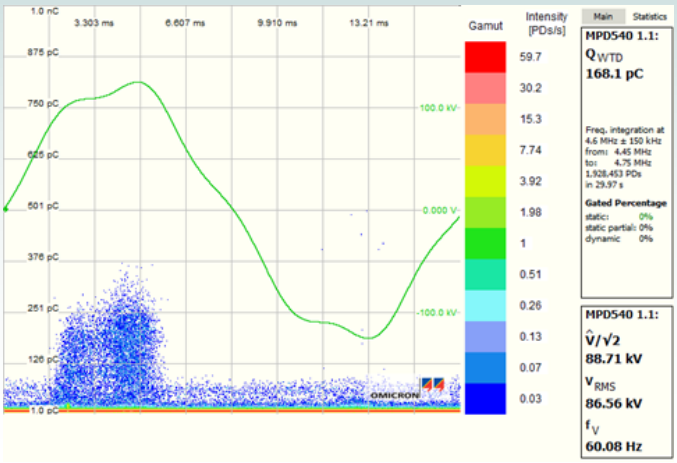
Fachkommission für Hochspannungsfragen

Power transformer diagnostics

FKH offers on-site diagnostic measurements for both new and service-aged power transformers. For measurements in connection with commissioning, the focus is on inspection of assembly, installation and oil impregnation, and also on characterisation of the transformer for subsequent comparisons (fingerprint in new condition). Diagnostic measurements on service-aged transformers are used to determine the condition of the insulation and to arrive at decisions regarding continued operation, the need for maintenance measures and planning of future inspections.

FKH has offered diagnostic measurements on transformers since the 1990s. During this period, important basic knowledge was built up under the auspices of a project undertaken jointly with Switzerland's technical colleges and universities, sponsored by the Project and Study Foundation of the Swiss Electricity Companies (PSEL).

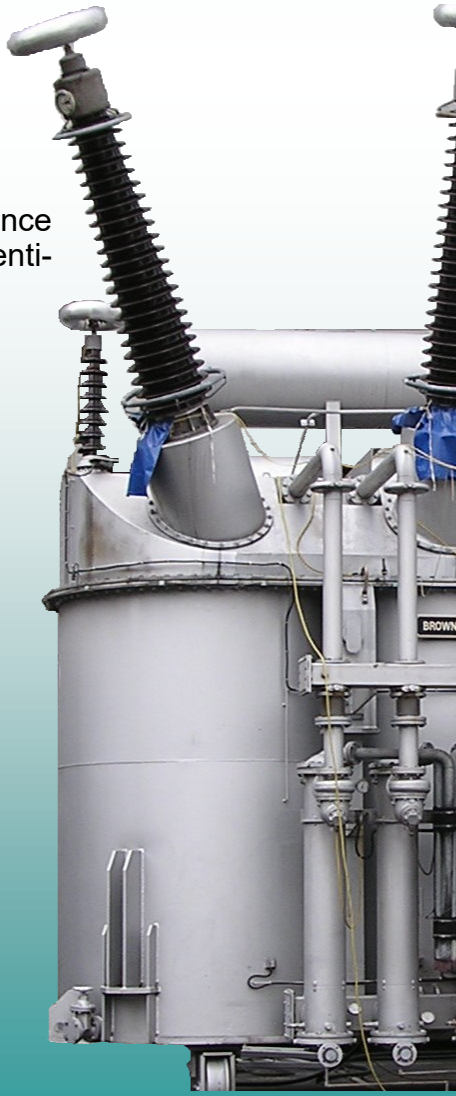
Test methods offered



Partial discharge graph, measured on a transformer

High-voltage partial discharge tests with electrical and acoustic detection during external voltage application or induced voltage testing

Offline partial discharge measurement is the most meaningful test for the detection of local weak points in the insulation and is used to identify faults.



Short-circuit and open-circuit impedance measurements

These measurements allow direct comparisons with the factory acceptance measurements so that major faults on the windings and the core are identified.

Frequency response analysis (FRA)

Frequency response analysis or FRA is a comparative method that indicates geometric changes to windings, caused (for example) by short-circuit forces or shocks and vibrations during transportation.

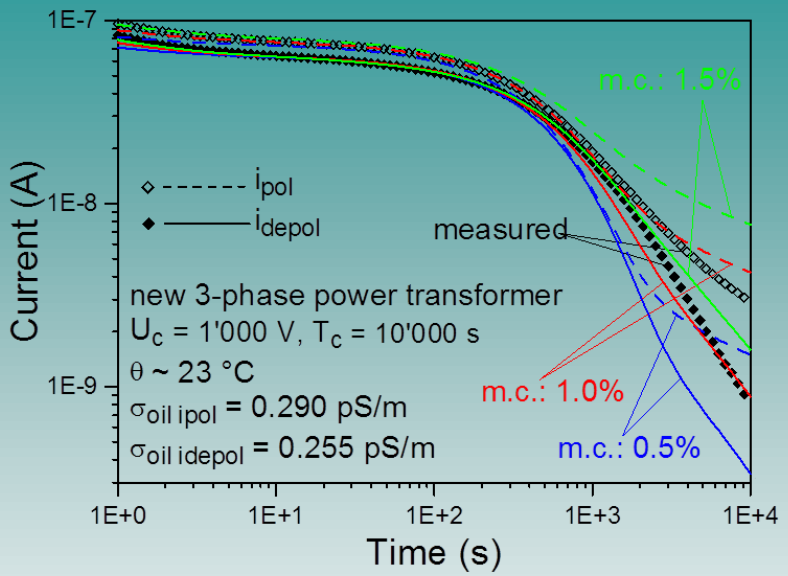
FRA measurements on a 3-phase transformer

Ratio measurement

This measurement is used to detect any coil short-circuits or faults on the onload tap changer.

PDC measurement; analysis of polarisation and depolarisation currents

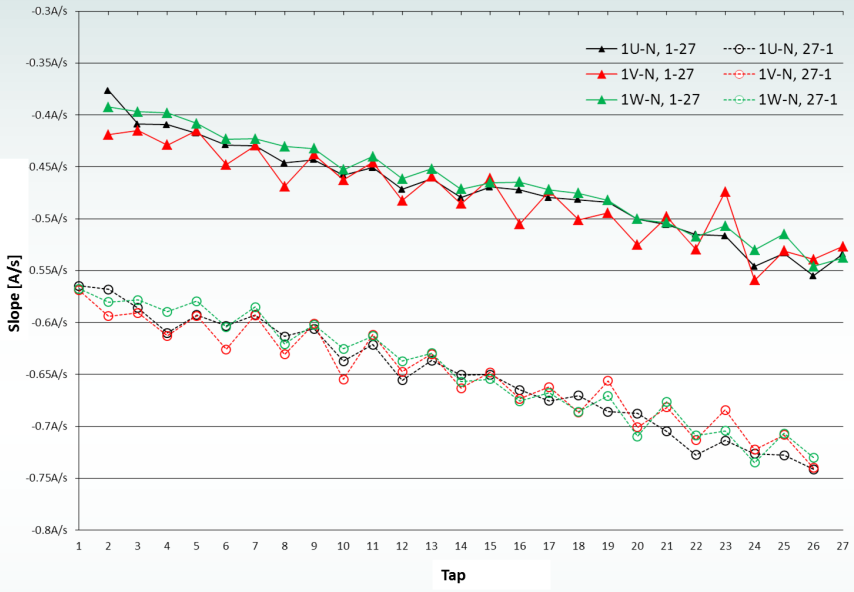
This method is used to determine the proportion of polarisable substances in the insulation. This makes it possible to estimate the water content in the pressboard.



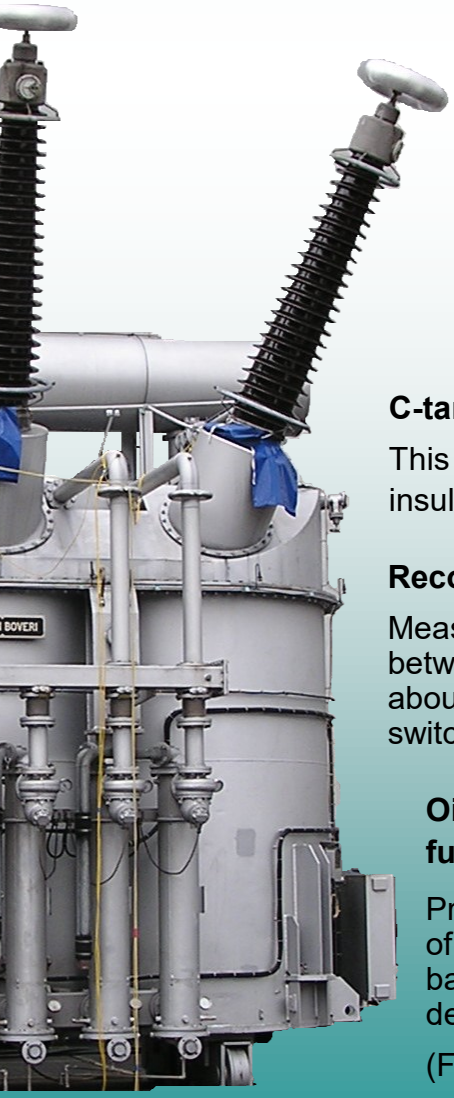
Presentation and evaluation of the PDC measurement

DC (Direct Current) – resistance measurement

This measurement identifies chenges of resistance and coil short-circuits. Contact resistances can also be determined. Recording the switching operations performed by onload tap changers (dynamic measurement) makes it possible to assess whether the contacts are switching correctly.



Characterisation of an onload tap changer, dynamic measurement of current rising slope in A/s



C-tan(δ) measurement of bushings

This measurement is used to determine the ageing condition of the bushing insulation.

Recording of inrush current

Measurements of switch-on current provide information about the interaction between the transformer core, the grid and the protective devices, and also about the mechanical stress on the windings when the transformer is switched on.

Oil analyses (e.g. dielectric-chemical oil analysis, gas-in-oil analysis, furan analysis)

Procedures to analyse oil deliver specific information about many aspects of the condition of the insulation: general condition of the oil, fault detection based on the composition of the dissolved gases, indications of cellulose decomposition and other ageing processes.

(For more details, see our brochure on "Insulating oil analyses".)

Partial discharge measurement on a regulating unit of a grid interconnection transformer in a substation; applied voltage test with the help of our resonance system

Partial discharge measurement on a grid interconnection transformer in a substation; self-excitation by means of supply from a diesel generator

On-site impulse voltage test on a transformer, using FKH's mobile impulse generator

FKH

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