ALPHA
Material Analyzer

High Grade Frequency Analyzer for Dielectric and Impedance Material Analysis

- **first integrated system** for both **low loss dielectrics** and **low impedance conductors**
- **new innovative digital technology** provides **unmatched application ranges** in combination with **compact design**
- **stand alone instrument**, no additional devices like lock-in amplifiers or frequency response analyzers required
- **broadest frequency range** $3 \cdot 10^{-6}$Hz to 10^{7}Hz
- **widest impedance range** 0.01Ω to 10^{14}Ω
- **highest accuracy** in loss factor tan(δ) < $3 \cdot 10^{-5}$ corresponding to 0.003° phase accuracy
- **highest resolution** in loss factor tan(δ) < 10^{-5} corresponding to 0.001° phase resolution
- **precision gain phase measurements** included
- optional **active sample cell** for **material measurements**
- optional **temperature control** from -160°C to 500°C
- optional MS-Windows **evaluation and control software Novocontrol WinDETA**

New Measurement Solution

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New approach to material analysis

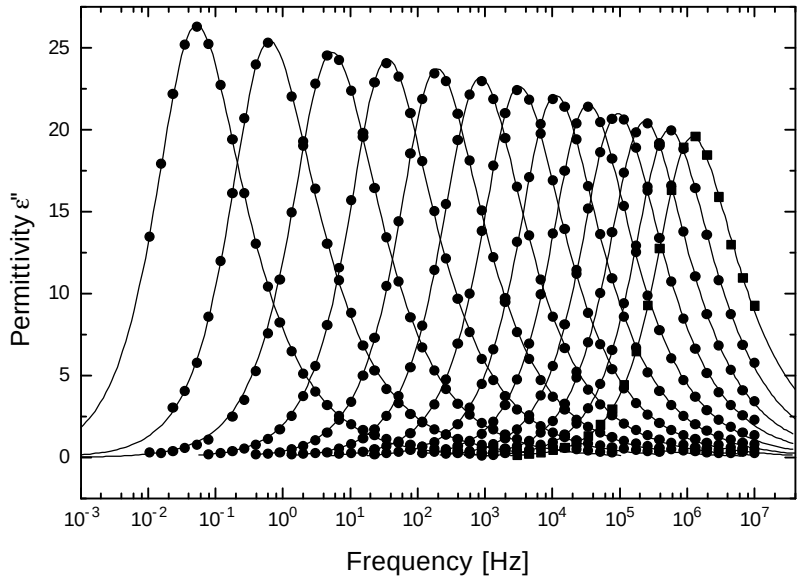
The Alpha measures **complex impedance *Z'+jZ''*** over a wide frequency range. The instrument can be used as a **general purpose precision impedance analyzer**, but has been **especially designed for dielectric/impedance material analysis**. By combining a series of exceptional features in a single, compact case, the Alpha **defines a new milestone in economical high quality instrumentation** .

Characterization of low loss dielectrics

Due to the extraordinary high upper impedance limit of > $10^{14}\Omega$ nearly all kind of dielectrics and isolators can be measured from 10 MHz even down to very low frequencies below the mHz range. The high accuracy in loss factor **tan(δ) < $3 \cdot 10^{-5}$** (resolution < 10^{-5}) **provides access to material properties not available until now**. Even lowest loss materials used in ceramic capacitors, isolators in power industry or weakest molecular relaxations processes can now be analyzed over a wide frequency range.

No limitations : High and low conductive materials

In contrast to other dielectric analysis systems, the Alpha is not limited to high impedance dielectric samples. The lower impedance limit < 0.01Ω allows also to **analyze conductive samples like semiconductors, electrolytes and electro-chemical systems**. As the complete **impedance range of 16 orders of magnitude is available within one device**, even samples with for instance temperature induced metal insulator transitions are accessible.



Dielectric function ε" of Glycerol measured with Alpha analyzer. Temperature range -20°C to -80°C.

Versatile sample cells

Sample cells for dielectric and impedance **material measurements** are available as an option. The cell incorporates an **impedance converter** connected directly to the sample by rigid lines. This set-up guarantees **highest accuracy up to 10 MHz** and enables **optional control of sample temperature**. The **accuracy specification** applies **at the sample position**, offering a **turn key solution** without calibration errors due to cable inductance, contacts, stray capacities, grounding and shielding.

Innovative technology

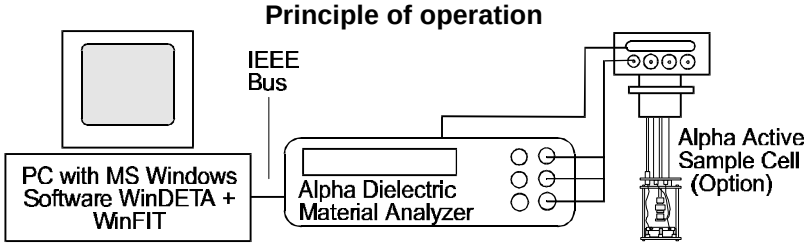
The Alpha was **new developed and completed in 1998** based on **state of the art digital signal processing techniques**. Fully automatic device control with **automatic self calibration** is provided by Novocontrol **MS-Windows software WinDETA with optional temperature control**.

Applications

Impedance analysis and dielectric spectroscopy are valuable characterization tools for ceramics, polymers, liquid crystals, semiconductors, batteries, corrosion analysis, biomedical and biological systems.

Many key aspects of material properties such as molecular relaxations, conductivity, phase separation, phase transitions, activation energy, glass temperature, rate of blending, purity, ageing, curing and many others can be accurately determined by this equipment.

Principle of operation



The sample current is converted by the Alpha-S active sample cell into two voltages which phases and amplitudes are measured by the Alpha analyzer. Device control, calibration, data evaluation, visualization and export are computer supported by the WinDETA / WinFIT software.

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