

RDGYB-JD1000 Frequency Domain Dielectric Response Insulation Diagnostic Analyzer

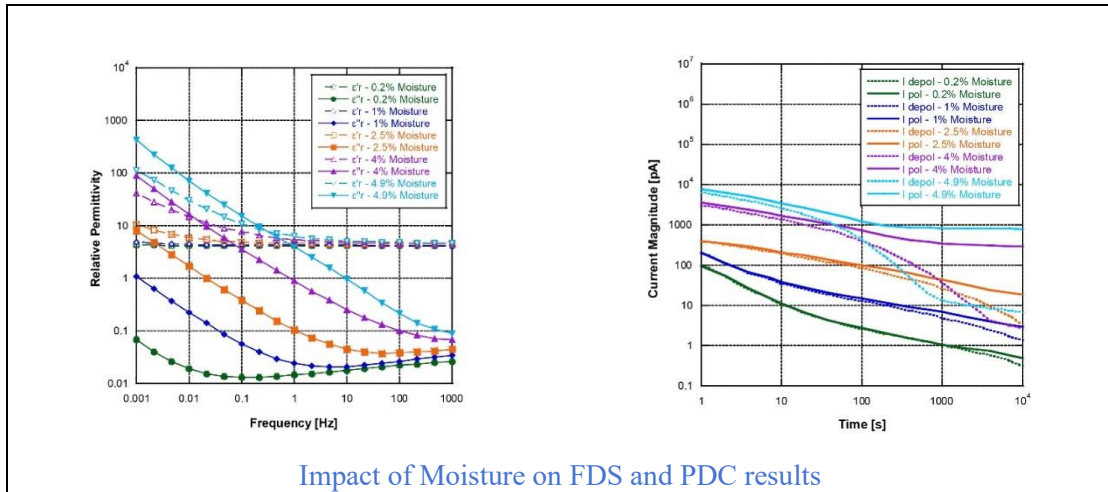


Features

- Integrated with FDS and PDC testing technologies;
- Extended measurement ranges: 0 – 10 kV and 0.1 mHz – 10 kHz;
- Evaluation of average moisture content, uneven moisture distribution, and oil conductivity;
- Reliable temperature correction of measurement results;
- Multi-frequency measurement technique accelerating the measurement;
- Results conversion between time and frequency domains;

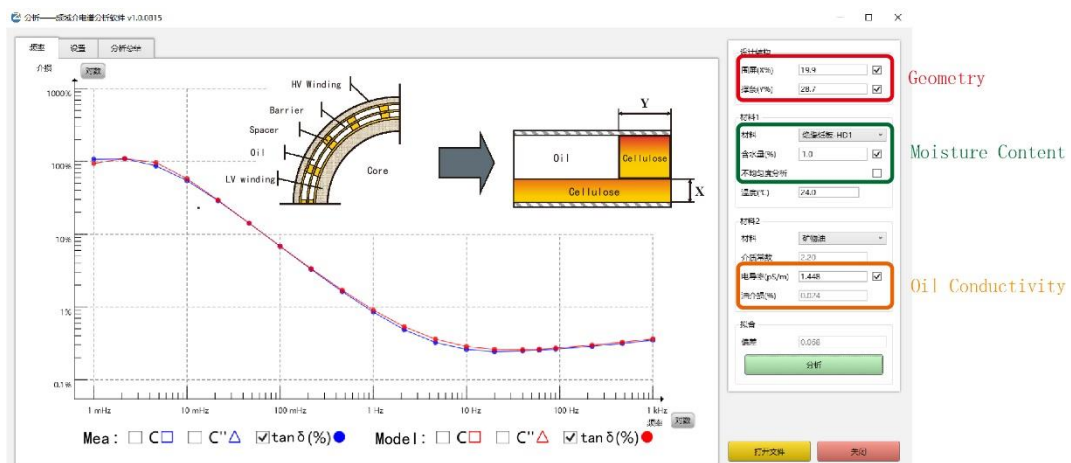
Introduction

The RDGYB-JD1000 is a compact dielectric response testing and analysis system. It is controlled via a tablet computer or laptop. The system integrates two primary testing technologies: Frequency Domain Dielectric Spectroscopy (FDS), also known as Dielectric Frequency Response (DFR), and Polarization/Depolarization Current (PDC). These new technologies are the extension of tan delta/power factor and insulation resistance testing by extending the frequency and time range, respectively. The capacitance and tan delta/power factor as a function of frequency or polarization/depolarization current as a function of time are measured and plotted. The analysis software offers accurate and reliable insulation condition diagnosis of high voltage apparatus such as transformers, bushings, rotating machines, cables, etc. Information such as the moisture content of the insulation paper, aging of the insulation oil, and uneven moisture ingress can be assessed after the measurement. Effective condition diagnostics can extend the apparatus's lifespan and enhance the power grid's operational economy and reliability.



Impact of Moisture on FDS and PDC results

The RDGYB-JD1000 is smaller, lighter, and faster than the previous model. It provides high measurement accuracy and good noise immunity in high-interference environments via a clean AC voltage output and good filtering technology. The newly developed software makes the testing more straightforward and faster. It takes only 5 minutes for a quick condition assessment in the field, with a measurement frequency range of 10mHz - 1000Hz. The XY model helps to extract the quantitative parameters of moisture content in cellulose, conductivity/dielectric loss of liquid insulation, and temperature correction factor. Furthermore, the software can also evaluate the uneven moisture distribution properties, which are frequently encountered in apparatus with voltage grading foils, e.g., condenser bushings, instrument transformers, etc. An improved model has been developed based on the extensive lab and field-measured data. This model enables assessing the uneven moisture distribution in the bulk insulation system, providing the maintenance personnel with more information.



Moisture evaluation based on the XY-model

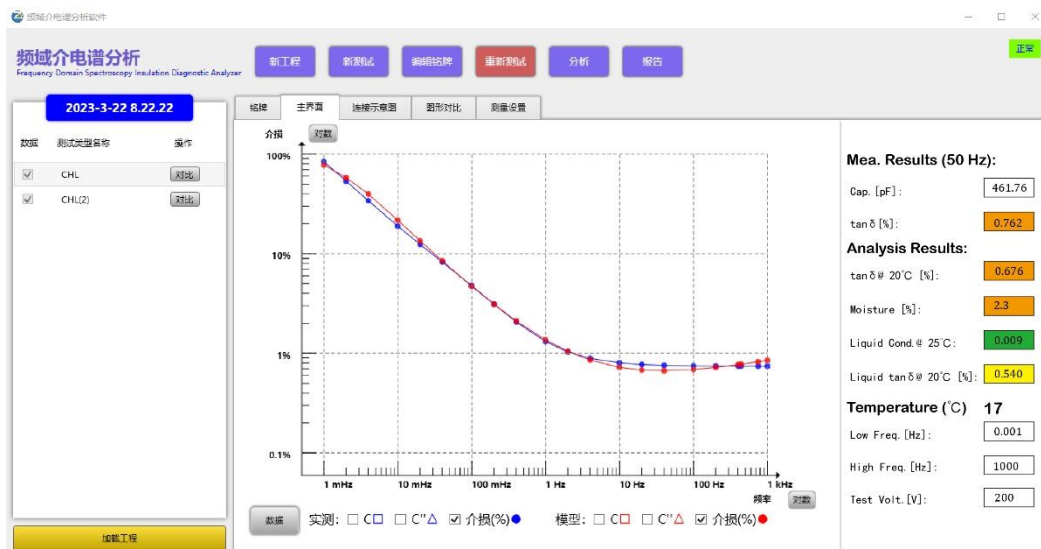
Features and Advantages

- Multi-frequency function reduces the testing period and outage time;
- The software provides the FDS and PDC testing capability, as well as

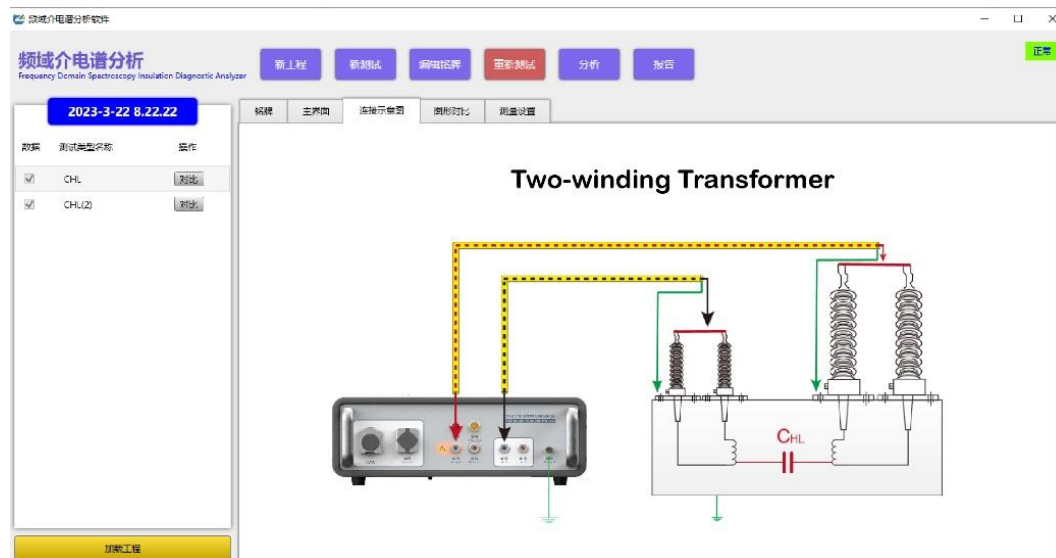
- /power factor results at power frequency;
- The best accuracy reaches 0.02% for the measurement with good noise immunity for testing in HV and EHV substations;
- Combining the XY model with various cellulose material databases enables reliable moisture content and oil conductivity assessment;
- Uneven moisture distribution analysis helps identify localized moisture ingress of power apparatus with voltage grading foils;
- Accurate temperature correction based on the Arrhenius equation;
- Testing wizard with the hook-up diagram makes the test process straightforward;
- The Instrument is designed to be portable and robust;

Software

The software is user-friendly and easy to operate. Functions such as project management, hook-up diagrams, oscilloscope for real-time data presentation, and data analysis are integrated. After completing the testing, the software automatically analyzes the measured data and gives out results, including the insulation system geometry, cellulose moisture content (%), insulation liquid conductivity or $\tan \delta$, uneven moisture distribution, etc.



Software main screen



Hook-up diagram

Applications

Since the introduction of FDS in the early 90s, the FDS technology has gained attention from numerous experts because of its unique advantages in aging assessment and degradation detection for various insulating materials. Compared with testing technologies with single point readings, the FDS results reveal not only the insulation condition information but also external factors e.g., surface leakage, temperature and voltage dependency. It is most frequently used for power apparatus employing the oil-paper insulation system, such as power transformers, bushings, inductors and instrument transformers. The software can give quantitative insulation condition parameters, i.e., geometry of the insulation system, moisture content of cellulose, and oil conductivity. The FDS technology has been recommended by a number of national and industrial standards, such as IEEE PC57.12.200, IEEE C57.161, CIGRE 414, and DL/T 2231-2021.

Optional voltage amplifiers are recommended for rotating machine and XLPE cable diagnosis. High voltage rotating machines typically employ a composite insulation system constituted by an insulating material (epoxy-mica, polyester, resin-mica, etc.) and semi-conductive material. Cross-Linked Polyethylene is commonly used in high-voltage transmission cables and medium-voltage distribution cables. The voltage dependence properties of these solid insulation systems can be obtained by performing FDS measurements at a low voltage and close to the rated voltage. They are helpful in aging evaluation and water tree detection. The abnormal results caused by surface contamination, moisture ingress, and leakages in connectors can also be observed from the FDS trace patterns.

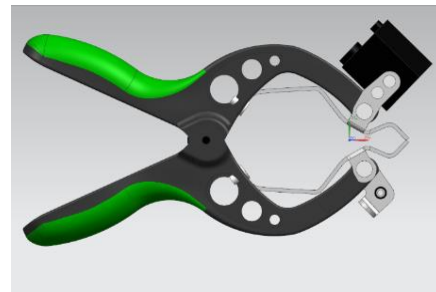
Specifications

Power supply	200V - 230V AC @ 50/60 Hz
Output voltage	0-200V 0-2kV (Optional) 0-10kV (Optional)
Frequency range	0.1mHz - 10kHz
Output current	±50mA
Capacitance range	100pF - 1μF
Capacitance accuracy	±0.5% of readings + 1pF
tan δ range	0 - 100 (0 - 10000%)
tan δ accuracy	< 0.5%+ 0.0002, 45-70Hz, C> 300 pF < 1%+ 0.0003, 1mHz-100Hz, C> 1000pF < 2%+ 0.0005, 100Hz-1 kHz, C> 1000 pF
Operation temperature	-10°C - +55°C
Size	320mm × 340mm × 110mm
Weight	6.2kg (excl. test leads)

Accessories



Transport case



Test clamp



Roll



Test leads