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**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Guide for dielectric response test on capacitive. type oil-paper
insulation equipment**

电容型油纸绝缘设备介电响应试验导则 清晰版
(English Translation)

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Foreword

This standard is formulated in accordance with the rules of GB/T 1.1-2009 "Standardization Guidelines Part 1: Standard Structure and Compilation".

This standard was proposed by the China Electricity Council.

This standard is under the jurisdiction of the Power Industry High Voltage Test Technology Standardization Technical Committee.

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1 Scope

This standard specifies the frequency domain dielectric response method to detect electrical properties such as the dielectric loss factor of capacitive oil-paper insulated equipment (hereinafter referred to as equipment) Basic requirements for parameters.

This standard applies to capacitive oil-paper insulation such as transformers (reactors), electromagnetic voltage transformers, current transformers, and capacitive bushings.

equipment.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this document.

For undated references, the latest version (including all amendments) applies to this document.

DL/T 474.3 Implementation guidelines for on-site insulation test Dielectric loss factor
tan δ test DL/T 580 Dew point method to determine the average water content in
transformer insulation paper DL/T 596 Preventive test procedures for electrical equipment
DL/T 1154 High-voltage electrical equipment rated voltage dielectric loss factor test guide

3 Terms and definitions

The following terms and definitions apply to this standard.

Frequency domain dielectric response the response characteristics of electrical performance parameters such as the dielectric loss factor of the dielectric change with frequency.

4.1 Test conditions

This test should be carried out under the condition that the equipment and ambient temperature is not lower than 5°C, and the relative air humidity is not more than 80%.

The power supply should meet the following requirements.

-Voltage. $220 \times (1 \pm 10\%) \text{V}$;

-Frequency. $50 \text{Hz} \pm 0.5 \text{Hz}$;

-Waveform. Sine wave, waveform distortion rate is not more than 5%.

4.2 Test preparation

Before the test, all the leads connected to the end of the casing of the tested equipment should be removed, the debris around the equipment should be removed, and the equipment should be fully discharged.

If necessary, clean or dry the insulating surface of the equipment.

Check the status of the equipment under test to ensure that the temperature of the insulating medium inside the equipment remains relatively stable.

4.3 Requirements for test equipment

The test instrument should meet the following requirements.

- a) The maximum output voltage at no load is not less than 200V, and the output frequency range includes 1mHz~1kHz frequency band;
- b) The measurement error of voltage and current is less than 0.2%;
- c) Support the estimation function of the moisture content of the insulation paper of the equipment;
- d) Working environment temperature range -5°C~45°C, humidity range 10%~90%;
- e) The test system should be equipped with dedicated test lines and have self-protection functions.

5.1 General requirements

According to the wiring method of DL/T 474.3 and DL/T 1154 for dielectric loss factor test of electrical equipment, connect the equipment to be tested and the tester. Connect the shielded wire to the ground terminal of the equipment shell nearby. All wiring should be stable and reliable.

When there are more stray interferences on site, appropriately increase the test voltage to reduce the influence of on-site interference factors.

5.2 Transformer

Take the dielectric response test of the insulation between the high and medium voltage windings and the low voltage windings of a single-phase three-winding autotransformer as an example.

The power point must be short-circuited and pressurized, and the low-voltage winding short-circuited and connected to the "Cx" terminal of the dielectric response tester. The test wiring is shown in Figure 1.

5.3 Reactor

The reactor dielectric response test wiring is shown in Figure 2. Pressurized to the tank shell, the winding is short-circuited and connected to the "Cx" of the dielectric response tester Terminal.

5.4 Electromagnetic voltage transformer

Electromagnetic voltage transformer dielectric response test wiring shown in Figure 3. The primary winding is short-circuited and the secondary winding is short-circuited and

connected to the "Cx" terminal of the dielectric response tester.

5.5 Current transformer

The connection of the current transformer dielectric response test is shown in Figure 4. Once the guide rod is pressurized, the lead of the last screen is connected to the "Cx" of the dielectric response tester Terminal.

5.6 Capacitive bushing

Figure 5 shows the wiring of the single-phase dielectric response test of the capacitor bushing of the transformer. Three-phase winding and neutral point of the same voltage level (if neutral

If there is a bushing lead out) must be short-circuited and pressurized, each phase of the non-measured winding is short-circuited to ground, and the end screen lead of the bushing to be tested is connected to the dielectric response tester "Cx" terminal.

6 Test record

Fill in the test data in the data record form (see Appendix A).

7.1 Horizontal comparison

Compare the frequency domain dielectric response characteristic curves of the same type of equipment manufactured by the same manufacturer in the same period to determine whether the internal insulation of the equipment is affected by moisture and Aging state. This method does not require the original frequency domain dielectric response characteristic curve of the equipment, and it is more convenient for field application, but the equipment for comparison should be excluded the possibility of similar changes.

7.2 Longitudinal comparison

Compare the frequency domain dielectric response characteristic curves of the same equipment in different periods to judge the moisture and aging status of the internal insulation of the equipment. The the method has high judgment accuracy, but the original frequency domain dielectric response characteristic curve of the equipment needs to be obtained in advance, and the detection conditions should be excluded.

The impact of changes.

7.3 Analysis of moisture content of insulating paper

The increase of the water content in the insulating paper will cause the relationship between the dielectric loss factor and the frequency to move to the high frequency direction. Through the analysis of the dielectric loss the relationship between consumption