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Codes for the Inspection of Buchholz Relay

气体继电器检验规程

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Codes for the Inspection of Buchholz Relay

1 Scope

This document specifies the inspection conditions, inspection methods and inspection requirements, etc. of Buchholz relays for transformers.

This document is applicable to the inspection of Buchholz relays for transformers (hereinafter referred to as the relays). The inspection of Buchholz relays installed on other oil-filled electrical equipment may take this document as a reference.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 4208-2017 Degrees of Protection Provided by Enclosure (IP code)

GB/T 7595 Quality of Transformer Oils in Service

DL/T 573-2021 Maintenance Guide for Power Transformers

DL/T 2255 Technical Specification for Buchholz Relay Test Equipment

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 setting of the flow rate

The present oil flow rate value for the operation of the relay signal contact.

3.2 operating value of the flow rate

During the inspection, evenly and steadily increase the flow rate to the steady-state oil flow rate value, at which, the relay signal contact operates.

3.3 operating value of the gas volume

During inspection, slowly inflate or drain the relay filled with transformer oil, until the gas volume reaches the value, at which, the relay signal contact operates.

3.4 insulating liquid loss contact

When the transformer continues to lose oil and the oil level drops to near the bottom of the connecting pipeline, the relay electrical contact operates.

4 Inspection Conditions

4.1 Requirements for Inspection Equipment

4.1.1 The test pipeline of the inspection device shall be consistent with the caliber of the relay under test, and the accuracy class of the inspection device shall not be lower than Class 2.0.

4.1.2 The technical requirements for the inspection device shall comply with the provisions of DL/T 2255.

4.1.3 The flow velocity inspection range of the inspection device is: $\phi 25$: 0.6 m/s ~ 4.0 m/s; $\phi 50$: 0.6 m/s ~ 3.0 m/s; $\phi 80$: 0.6 m/s ~ 2.0 m/s.

4.1.4 The gas volume inspection range of the inspection device is: 0 mL ~ 500 mL.

4.1.5 Inspection parameters for the sealing performance of the inspection device: 0.2 MPa; 20 min.

4.1.6 During inspection, the oil temperature shall be controlled between 25 °C ~ 40 °C.

4.1.7 Users with special requirements for the inspection device may specify them themselves.

4.2 Requirements for Other Instruments and Equipment

4.2.1 Insulation resistance meter (megohmmeter): output voltage is 1,000 V and maximum output current is not less than 1 mA.

4.2.2 Withstand voltage tester: frequency is 50 Hz and output voltage is not less than 2,000 V.

4.2.3 DC resistance tester: when the measurement range is $0\ \Omega \sim 2\ \Omega$, the test current is 100 mA, and the absolute value of the measurement error is not greater than 0.01 Ω .

4.2.4 Vacuum gauge: when the measurement range is 10 Pa ~ 1,000 Pa, the absolute value of the relative error of the indication is not greater than 10%.

4.2.5 All measuring instruments used for the inspection shall be verified or calibrated.

4.3 Environmental Conditions of Inspection

4.3.1 Ambient temperature: 0 °C ~ +40 °C.

4.3.2 Relative humidity: $\leq 75\%$.

4.4 Working Medium of Inspection

Transformer oil that complies with GB/T 7595.

5 Inspection Methods

5.1 Appearance and Structural Inspection

5.1.1 The relay nameplate shall be durable and not prone to corrosion; the nameplate shall be firmly fixed, and the writing shall be clear; the nameplate content shall include the manufacturer or trademark, product name, model, exit-factory No., serial No. of production standard, contact capacity and production date, etc.

5.1.2 The surface of the relay housing shall be smooth, without paint peeling or rust; the glass window scale shall be clear; the outlet terminal shall be structurally intact, with complete accessories and no damaged threads; the screw shall not be loose, and the vent valve and probe shall be intact; the oil flow direction mark shall be clear and intact.

5.1.3 The relay outlet terminals shall be clearly marked.

5.1.4 The operation of the vent valve and probe shall be flexible; the operating probe shall be able to normally disconnect and conduct the dry reed contact.

5.1.5 Parts that need to be rotated shall flexibly move, and without any jamming during operation.

5.1.6 When the baffle is turned to the end position, the dry reed contact shall be reliably engaged.

5.1.7 If necessary, the following inspections may be carried out:

- a) The internal parts of the relay shall be intact, without burrs, metal chips and other defects; the fasteners shall be firmly connected, the fixing brackets shall be firm and reliable, and the welds shall be well welded without any lack of weld;
- b) The dry reed switch is firmly fixed and has a buffer sleeve; the glass tube shall be intact without oil leakage, the root lead wire shall be reliably welded, the dry reed switch pin cannot be bent, and shall be arranged and fixed in an oil-resistant insulating tube, and the permanent magnet shall be firmly fixed in the frame;
- c) The dry reed contact movable piece faces the permanent magnet and remains parallel.

5.2 Insulation Performance Test

5.2.1 Between the outlet terminals of the same dry reed switch, between the outlet terminals and the ground, and between the outlet terminals without electrical connection, a 1,000 V insulation resistance meter shall be used to measure the insulation resistance, which shall not be less than 300 MΩ.

5.2.2 Between the outlet terminals and the ground, and between the outlet terminals without

5.5 Inspection of Operating Value of the Gas Volume

5.5.1 The gas volume operating range of the $\phi 50$ and $\phi 80$ relays is 250 mL ~ 300 mL; the gas volume operating range of the $\phi 25$ relay with the gas volume alarm function is 200 mL ~ 250 mL.

5.5.2 After the relay is filled with transformer oil, close both ends and horizontally place it. When measuring the light gas signal contact, there shall be no signal output. Open the relay vent valve and slowly inflate or drain the relay, until a signal action is output. Measure the volume of the discharged oil, which is the operating value of the gas volume of the relay. Repeat the inspection three times, and the relay's operating value each time shall meet the requirements of 5.5.1. The absolute value of the difference between the three measured operating values and the gas volume scale value on the relay window shall not be greater than 10% of the operating value.

5.5.3 When the operating value of the gas volume of the relay does not meet the requirements in the inspection, if the conditions are met, adjustments can be made to meet the requirements.

5.6 Inspection of Insulating Liquid Loss Contact

The inspection of the insulating liquid loss contact can be simultaneously carried out with the inspection of the operating value of the gas volume. When the relay is full of transformer oil, measure the insulating liquid loss contact, and there shall be no signal output. After the inspection of the operating value of the gas volume is completed, the relay continues to drain oil, until when it is close to the bottom of the connecting pipeline, there shall be a signal action output.

5.7 Inspection of Reverse Oil Flow

At the maximum setting of the flow rate of the relay, apply reverse shock 3 times, each time lasting 5 minutes. There shall be no deformation, displacement or damage to the components and parts in the relay. Then, carry out the inspection of the operating value of the flow rate, the inspection of the operating value of the gas volume and the insulation performance test again, and its performance shall still meet the requirements.

5.8 Inspection of Sealing Performance

5.8.1 Inspection of positive pressure sealing performance

Fill the relay with transformer oil, pressure it to 0.2 MPa, stabilize the pressure for 20 minutes, and then, check the vent valve, probe, dry reed switch, float, outlet terminal, housing and sealing parts, which shall have no leakage.

5.8.2 Inspection of vacuum sealing performance

Evacuate the inside of the relay to an absolute pressure of not higher than 133 Pa, and maintain it for 5 minutes. While maintaining the vacuum state, fill the inside of the relay with transformer

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