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Technical specification for on-line monitoring device of transformation equipment

Part 1: General technical specification

电力设备在线监测装置技术规范

第 1 部分：通则

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Foreword

The on-line monitoring device of the transformation equipment is generally used for monitoring the conditions of the transformation equipment. In order to determine the relevant technical indicators of such devices, this standard is hereby formulated. In this standard, it proposes the normative requirements for the technical conditions, test methods and test items to be satisfied by the on-line monitoring device of the transformation equipment.

DL/T 1498 “Technical specification for on-line monitoring device of transformation equipment” is divided into five parts:

- Part 1: General technical specification;
- Part 2: Online monitoring device for dissolved gas in transformer oil;
- Part 3: Capacitive equipment and metal oxide surge arrester insulation online monitoring device;
- Part 4: Gas-insulated metal-enclosed switchgear special high-frequency partial discharge online monitoring device:
- Part 5: Online monitoring device for transformer core grounding current.

This part is part 1. This part contains the technical requirements, test, inspection rules, marking, packaging, transportation and storage of on-line monitoring devices, which shall be used in conjunction with the relevant technical specifications for on-line monitoring devices.

This part was proposed by the China Electricity Council.

This part shall be under the jurisdiction of the National Electric Power Equipment State Maintenance and Online Monitoring Standardization Technical Committee.

The responsible drafting organization of this standard: China Electric Power Research Institute.

The participating drafting organizations of this standard: State Grid Zhejiang Electric Power Company, Guangdong Power Grid Company Electric Power Research Institute, North China Electric Power University, Beijing Sifang Automation Co., Ltd., Ningbo Science and Technology Monitoring Technology Co., Ltd., Beijing Shengtai Real-time Electric Technology Co., Ltd.

Technical specification for on-line monitoring device of transformation equipment Part 1: General technical specification

1 Scope

This section specifies the technical requirements, test, inspection rules, marking, packaging, transportation and storage of the on-line monitoring devices of transformation equipment.

This part applies to the on-line monitoring devices of transformers, reactors, circuit breakers, gas insulated metal enclosed switchgear (GIS), capacitive equipment, metal oxide arrester and other transformation equipment; AND other online monitoring devices may make reference to this part.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this Standard.

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 2423.1 Environmental testing for electric and electronic products - Part 2: Test methods - Test A: Cold

GB/T 2423.2 Environmental testing for electric and electronic products - Part 2: Test methods - Test B: Dry heat

GB/T 2423.3 Environmental testing for electric and electronic products - Part 2: Test method - Test Cab: Damp heat steady state

GB/T 2423.4 Environmental testing for electric and electronic products - Part 2: Test method - Test Db: Damp heat, cyclic (12h + 12h cycle)

GB 4208 Degrees of protection provided by enclosure (IP code)

GB 4943.1 Information technology equipment - Safety - Part 1: General requirements

GB/T 9361 Safety requirements for computer field

GB/T 11287 Relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section one: Vibration tests (sinusoidal)

GB/T 14537 Shock and bump tests on measuring relays and protection equipment

GB/T 17626.2-2006 Electromagnetic compatibility (EMC) - Testing and measurement techniques - Electrostatic discharge immunity test

GB/T 17626.3-2006 Electromagnetic compatibility - Testing and measurement techniques - Radiated radio-frequency electromagnetic field immunity test

GB/T 17626.4-2008 Electromagnetic compatibility - Testing and measurement techniques - Electrical fast transient/burst immunity test

GB/T 17626.5-2008 Electromagnetic compatibility - Testing and measurement techniques - Surge immunity test

GB/T 17626.6-2008 Electromagnetic compatibility - Testing and measurement techniques - Immunity to conducted disturbances induced by radio-frequency fields

GB/T 17626.8-2006 Electromagnetic compatibility (EMC) - Part 8: Testing and measurement techniques - Power frequency magnetic field immunity test

GB/T 17626.9-2011 Electromagnetic compatibility - Testing and measurement techniques - Pulse magnetic field immunity test

GB/T 17626.10-1998 Electromagnetic compatibility - Testing and measurement techniques - Damped oscillatory magnetic field immunity test

GB/T 17626.11-2008 Electromagnetic compatibility - Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

DL/T 860 Communication networks and systems in substations

3 Terms and definitions

The following terms and definitions apply to this document.

c) Environmental relative humidity: 5% ~ 95% (There is neither condensate nor freezing inside the product

d) Atmospheric pressure: 80kPa ~ 110kPa.

e) Maximum wind speed: 35m/s (10m above the ground, 10min average wind speed) (outdoor).

f) Maximum daily temperature difference: 25 °C (outdoor).

g) Sunshine intensity: 0.1W/cm^2 (wind speed 0.5 m/s) (outdoor).

h) Icing thickness: 10mm (outdoor).

i) Site safety requirements: In line with class B safety provisions in GB/T 9361.

j) Monitoring device safety requirements: In line with the relevant provisions of GB 4943.1.

k) Working power supply.

Rated voltage: AC 220V (1 ± 15%);

Frequency: (50 ± 0.5) Hz;

Harmonic content: < 5%.

4.2 Special working conditions

When the working conditions specified in 4.1 are exceeded, it is determined by the user in consultation with the supplier.

5 Technical requirements

5.1 Safety performance

The safety performance requirements of the on-line monitoring device are as follows:

a) The access of the on-line monitoring device shall not alter the connection method of the monitored equipment, not affect the sealing performance and insulation performance of the monitored equipment, AND not affect the safe operation of the field equipment.

c) It shall have such data transmission methods as regular transmission, response call, and active reporting, etc.

d) It is preferable to have the monitored data local reading function.

5.4.2 Data logging function

The data logging function of the on-line monitoring device is as follows:

a) The on-line monitoring device shall, after running, be able to correctly record the dynamic data, AND correctly establish the event identification under such conditions as device abnormality.

b) It shall ensure the safety of recorded data, not lose the recorded dynamic data due to power interruption, fast or slow fluctuations, and fall, AND not delete the recorded dynamic data due to external access; it does not provide the functions of manually deleting or altering the recorded dynamic data; AND pressing down any switch or button will not cause the loss or deletion of the recorded data.

5.4.3 Alarm function

As for the alarming signals issued under different abnormal status, the alarm function limit shall be able to be modified.

5.4.4 Self-test function

It shall have the self-test function, AND be able to transmit the self-test results as required.

5.4.5 Communication function

The communication function requirements of the on-line monitoring device are as follows:

a) The on-line monitoring device communication interface shall meet the requirements of the standard, reliable field industrial control bus, Ethernet bus or wireless network as required for the monitoring data exchange.

b) It is preferable for the on-line monitoring device to adopt the communication protocol complying with DL/T 860.

c) The on-line monitoring device shall use a uniform data format. However, if the self-owned data format is used under special conditions, it shall publicize the used data format AND be responsible to explain its meaning.

b) During the test, if the function or performance is temporarily reduced or lost, BUT it can restore automatically, it can be judged as class B.

c) During the test, if the function or performance is temporarily reduced or lost, AND it can only restore through manual intervention or system reset, it can be judged as class C.

d) During the test, if equipment (element) or software damage (loss of stored data), function loss, or performance degradation occurs, AND it cannot be restored even through manual intervention or system reset, it can be judged as class D.

5.8 Environmental adaptability

5.8.1 Ambient temperature and severity for environmental adaptability test

The ambient temperature and severity for environmental adaptability test are as shown in Table 4.

Table 4 -- Ambient temperature and severity for environmental adaptability test °C

Ambient temperature	Severity	
	Low temperature	High temperature
-25 ~ +45	-25	+70
-40 ~ +45	-40	+70

5.8.2 Low temperature

The device shall be capable of withstanding the low temperature test as specified in GB/T 2423.1. The test temperature shall be the low temperature as specified in Table 4 AND the test time shall be 2h.

5.8.3 High temperature

The device shall be capable of withstanding the high temperature test as specified in GB/T 2423.1. The test temperature shall be the high temperature as specified in Table 4 AND the test time shall be 2h.

5.8.4 Constant damp heat

The device shall be capable of withstanding the constant damp heat test as specified in GB/T 2423.3. The test temperature is (40 ± 2) °C AND the relative humidity is (93 ± 3)%, with the test time of 48h.

5.8.5 Alternating damp heat

a) Ambient temperature 15 °C ~ 35 °C (no requirements for outdoor test).

b) Relative humidity 25% ~ 75%.

c) Atmospheric pressure 86Pa ~ 106kPa.

Note: For the equipment which cannot be tested under the aforementioned conditions due to large size or other reasons, it shall record the actual climatic conditions in the test report. When the relevant standards require strictly controlling the environmental conditions, it shall specify it otherwise in these standards.

6.2 Structure and appearance inspection

CONDUCT inspection item by item in accordance with the requirements of 5.3.

6.3 Basic function test

Based on the site configuration plan, FORM an on-line monitoring system; POWER on the monitoring device; APPLY the corresponding signal; respectively TEST the on-line monitoring device to see whether it has the functions as described in 5.4. USE the host computer communication software to conduct communication function test against the on-line monitoring device, AND the device shall correctly respond the host computer, call, and transmit the recorded data.

6.4 Measurement error test

CONDUCT test in accordance with the requirements of the specific technical specifications of the on-line monitoring device of relevant transformation equipment. Before conducting other test items, it shall firstly conduct the measurement error test. After finishing all test items, it may conduct one more measurement error test (selecting one measurement point) as reference.

6.5 Insulation performance test

6.5.1 Insulation resistance test

Under the normal atmospheric test conditions, FOLLOW the requirements of Table 1 to conduct the insulation resistance test against each tested circuit. Before test, it shall disconnect the electrical connection between the tested

CONDUCT this test in accordance with the provisions of clause 8 in GB/T 17626.5-2008. AND it is required that under the conditions of application of interference, the monitoring device shall comply with the performance criteria requirements in Table 3.

6.6.5 Conductive disturbance immunity test of radio frequency field induction

CONDUCT this test in accordance with the provisions of clause 8 in GB/T 17626.6-2008. AND it is required that under the conditions of application of interference, the monitoring device shall comply with the performance criteria requirements in Table 3.

6.6.6 Power frequency magnetic field immunity test

CONDUCT this test in accordance with the provisions of clause 8 in GB/T 17626.8-2006. AND it is required that under the conditions of application of interference, the monitoring device shall comply with the performance criteria requirements in Table 3.

6.6.7 Impulse magnetic field immunity test

CONDUCT this test in accordance with the provisions of clause 8 in GB/T 17626.9-2011. AND it is required that under the conditions of application of interference, the monitoring device shall comply with the performance criteria requirements in Table 3.

6.6.8 Damping oscillation magnetic field immunity test

CONDUCT this test in accordance with the provisions of clause 8 in GB/T 17626.10-1998. AND it is required that under the conditions of application of interference, the monitoring device shall comply with the performance criteria requirements in Table 3.

6.6.9 Voltage dip immunity test

CONDUCT this test in accordance with the provisions of clause 8 in GB/T 17626.11-2008. AND it is required that under the conditions of application of interference, the monitoring device shall comply with the performance criteria requirements in Table 3.

6.7 Environmental adaptability test

6.7.1 Low temperature test

7.4 Handover test

After the installation of the device is completed AND before the formal production, the operating unit shall conduct test AND start production only after the device passes the test.

7.5 Field test

Field test is a test conducted by the field operation unit or a qualified testing unit against the field devices to be tested. AND the field test is generally divided into two cases:

a) Regular routine test, at the test period of 1 year ~ 2 years;

b) If necessary.

8 Marking, packaging, transportation and storage

8.1 Marking

8.1.1 At the prominent positions of the monitoring device it shall have the following markings:

a) Device model;

b) Product full name;

c) Full name and trademark of the manufacturer;

d) Rated parameters;

e) Exit-factory date and number.

8.1.2 At the proper position of the packaging box, it shall have an eye-catching and firm packaging marking, indicating the following information:

a) Name and address of manufacturer;

b) Product name and model;

c) Number of equipment;

d) Packaging box dimensions and gross weight;

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