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**INDUSTRY STANDARD OF THE
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**General technical specification for monitoring system of HVDC
earth electrode**

高压直流接地极监测系统通用技术规范

(English Translation)

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009 "Guidelines for Standardization Work Part 1: Standard Structure and Compilation".

Please note that certain contents of this standard may involve patents, and the issuing organization of this standard does not bear the responsibility for identifying these patents.

This standard was proposed by the China Electricity Council.

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

The main drafting organization of this standard. State Grid Electric Power Research Institute Wuhan Nanrui Co., Ltd.

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1 Scope

This standard specifies the system composition, system functions, technical requirements, testing methods, test methods, installation, and Commissioning, inspection, packaging and

transportation, etc.

This standard applies to the design, testing, installation and acceptance, operation and maintenance of high-voltage DC ground electrode monitoring systems.

2 Normative references

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

For undated reference documents, the latest version (including all amendments) is applicable to this standard.

GB/T 191 Packaging, storage and transportation pictorial signs GB/T 2423.1 Environmental testing of electrical and electronic products Part 2: Test method Test A Low temperature GB/T 2423.2 Environmental testing of electrical and electronic products Part 2: Test method Test B. High temperature GB/T 2423.4 Environmental testing of electrical and electronic products Part 2: Test method Test Db. Alternating damp heat (12h + 12h cycle) GB/T 2423.10 Environmental testing of electrical and electronic products Part 2: Test method Test Fc. Vibration (sinusoidal) GB/T 4208 Enclosure protection grade (IP code) GB/T 6587 General Specification for Electronic Measuring Instruments GB/T 17626.2 Electromagnetic compatibility test and measurement technology Electrostatic discharge immunity test GB/T 17626.3 Electromagnetic compatibility test and measurement technology Radio frequency electromagnetic field radiation immunity test GB/T 17626.8 Electromagnetic compatibility test and measurement technology Power frequency magnetic field immunity test GB/T 17626.9 Electromagnetic compatibility test and measurement technology Pulse magnetic field immunity test DL/T 860 Power Automation Communication Network and System

3 Terms and definitions

The following terms and definitions apply to this standard.

HVDC earth electrode the grounding device that can continuously deliver direct current to the high-voltage direct current system is composed of several groups of grounding conductors and active filling materials. installed at the ground electrode on land is called the land ground electrode; the ground electrode installed in the sea or coast is called the marine or coastal ground electrode.

Monitoring system of HVDC earth electrode it can automatically collect data on the operating state of the DC ground electrode, and send the data to the monitoring unit for data processing through the communication unit measuring system.

Earth electrode site the geographical location of the ground electrode.

Data acquisition unit Collect the operating parameters of the ground electrode through the measuring and monitoring devices installed on the ground electrode site, and convert the

analog signal to digital Signal unit.

Remote monitoring unit Integrated communication control, database platform and information release functions, used to receive, store, process and display various monitoring data, for grounding the pole monitoring system provides a unit of human-computer interaction interface.

Communication unit

The unit that transmits the data information collected by the data acquisition unit to the monitoring unit and receives instructions from the monitoring unit.

Power supply unit

A device that provides power to the data acquisition unit, communication unit and other equipment in the ground electrode monitoring system.

Step voltage

When the high-voltage DC grounding electrode is operating, the voltage between any two points of the human body touching the ground and a horizontal distance of 1m. Unit V.

Ampere-hour

Integral of grounding electrode current and running time.

4 General

4.1

The high-voltage DC grounding electrode monitoring system shall meet the technical requirements of the design and operating conditions of the high-voltage DC grounding electrode.

4.2

The high-voltage DC grounding electrode monitoring system shall meet the environmental protection requirements of the current regulations.

5.1 System composition

The high-voltage DC grounding electrode monitoring system should consist of a data acquisition unit, a communication unit, a monitoring unit and a power supply unit (see Appendix A).

5.2 System function

The HVDC ground electrode monitoring system shall have the following functions.

a) Automatically collect the operating state data of the high-voltage DC grounding electrode

through the data acquisition unit, which should include the grounding current of the grounding electrode, soil Temperature and humidity and remote video monitoring, real-time measurement of step voltage, monitoring well water level, water temperature, and central area equipment temperature can be increased according to demand;

- b) The operation status data is transmitted to the converter station monitoring unit through the communication unit;
- c) Real-time display, statistical analysis and storage of operating status data through the monitoring unit, and remote video monitoring and security Protection
- d) The power supply unit provides reliable power for the HVDC ground electrode monitoring system.

6.1 Operating environment conditions

- a) Ambient temperature. ground equipment -40°C~55°C, underground equipment -10°C~90°C;
- b) Relative humidity. 5%~100%;
- c) Atmospheric pressure. 55kPa~106kPa.

6.2.1 Data acquisition unit

- a) Current monitoring device. the resolution is not less than 0.1A, and the error is not more than $\pm(\text{reading} \times 5\% + 0.1A)$;
- b) Step voltage monitoring device. non-polarized electrode should be used for measurement, the resolution is not less than 0.1V, and the error is not more than $\pm 0.05V$;
- c) Water level and water temperature monitoring device. the water level resolution is not less than 1cm, the error is not more than $\pm (\text{range} \times 0.2\%)$; the water temperature resolution is not less than 0.1°C, the error is not more than $\pm 0.5^\circ\text{C}$;
- d) Central area equipment temperature monitoring device. resolution is not less than 0.1°C, error is not more than 1.0°C;
- e) Soil temperature monitoring device. the temperature resolution is not less than 0.1°C, and the error is not more than $\pm 0.4^\circ\text{C}$;
- f) Soil moisture monitoring device. the humidity resolution is not less than 0.1%, and the error is not more than $\pm 3\%$;
- h) Central area safety protection monitoring device. an alarm signal for breaking or short circuit is issued within 3s, with more than 2 defense zones; pulse peak value 5000 V~10000V, pulse period 1s~1.5s, pulse duration $\leq 0.1s$, pulse maximum power $\leq 2.5mC$, pulse maximum energy $\leq 5J$;