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

DL/T 993-2019

Replacing DL/T 993-2006

**General specification for power system out-of-step separation
equipment
(English Translation)**

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Foreword

This standard is compiled in accordance with the rules given in GB/T 1.1-2009.

This standard replaces DL/T 993-2006 "General Technical Requirements for Out-of-Step Splitting Devices of Power Systems", except for editorial changes, and DL/T 993 Compared with 2006, the main technical changes are as follows.

- Updated normative references;
- Add terms and definitions to the standard (see 3);
- The terms of the original standard 3.1 have been modified (see 4.1);
- Increase the requirements for related equipment of smart substations (see 4.14);
- The clauses of 3.6 of the original standard have been modified (see 5.1);
- Clauses f) and g) are deleted from the original standard 3.7;
- Clauses d) and e) in the original standard 3.7 have been modified (see 5.2.7, 5.2.9);
- Four clauses have been added to the original standard 3.7 (see 5.2.2, 5.2.4, 5.2.10, 5.2.13).

This standard was proposed by the Standardization Center of the China Electricity Council.

This standard is under the jurisdiction of the Power Industry Relay Protection Standardization Technical Committee.

The main drafting organizations of this standard. Nanjing Nanrui Relay Electric Co., Ltd.,

State Grid Co., Ltd. Power Dispatching Control Center, South China Fang Grid Co., Ltd. Power Dispatching Control Center, State Grid Co., Ltd. Northwest Branch, State Grid Co., Ltd. Central China Branch, State Grid Co., Ltd.

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1 Scope

This standard specifies the technical requirements, test methods, inspection rules, and the requirements for marking, packaging, transportation, and storage of power system out-of-step splitting devices.

Requirements for deposits and so on.

This standard is applicable to the out-of-step splitting device of the power system (hereinafter referred to as the device) as the scientific research, design, manufacturing, test, Basis for inspection and application.

2 Normative references

The references in the following documents are essential. For dated reference documents, only the dated version applies to this document. Anything not for dated reference documents, the latest version (including all amendments) applies to this document.

GB/T 191 Packaging, storage and transportation pictorial signs GB/T 2423.1 Environmental testing of electric 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 2423.3 Environmental Test Part 2: Test Method Test Cab. Constant Damp Heat Test 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 2423.22 Environmental Test Part 2: Test Method Test N. Temperature Change GB/T 2900.1 Basic terminology for electrical engineering GB/T 2900.17 Electrical terminology measuring relay GB/T 2900.49 Electrician Terminology Power System Protection GB/T 4208 Enclosure protection grade (IP code) GB/T 4798.2 Environmental conditions for application of electrical and electronic products Part 2: Transportation GB/T 7261-2016 Basic test methods for relay protection and safety automatic devices GB/T 9361-2011 Computer site safety requirements GB/T 11287 Electrical Relay Part 21: Vibration, Shock, Impact and Seismic Test of Measuring Relay and

Protection Device Part 1 Article. Vibration Test (Sine) GB/T 13384-2008 General technical requirements for packaging of mechanical and electrical products GB/T 14285-2006 Technical Regulations for Relay Protection and Safety Automatic Equipment GB/T 14537 Impact and collision test for measuring relays and protection devices GB/T 14598.3 Electrical Relay Part 5: Insulation coordination requirements and tests for measuring relays and protection devices GB/T 14598.24-2017 Measuring relays and protection devices-Part 24: Power system transient data exchange (COMTRADE) general format GB/T 14598.26-2015 Measuring Relays and Protection Devices Part 26: Electromagnetic Compatibility Requirements GB/T 17626.8 Electromagnetic compatibility test and measurement technology Power frequency magnetic field immunity test GB/T 17626.17 Electromagnetic compatibility test and measurement technology DC power input port ripple immunity test GB/T 17626.29 Electromagnetic compatibility test and measurement technology DC power input port voltage sag, short-term interruption and voltage change resistance Disturbance test GB/T 19520.12-2009 Mechanical Structure of Electronic Equipment 482.6mm (19in) Series Mechanical Structure Dimensions Part 3-101.Sub-box and its plugin GB/T 26399-2011 Power System Security and Stability Control Technology Guide GB/T 26864-2011 Power System Relay Protection Product Dynamic Model Test GB/T 32901-2016 General technical requirements for intelligent substation relay protection DL/T 478-2013 General technical requirements for relay protection and safety automatic devices DL/T 667-1999 Telecontrol Equipment and System Part 5: Transmission Protocol Part 103: Supporting Standards for Information Interface of Relay Protection Equipment DL/T 860 (all parts) Substation communication network and system

3 Terms and definitions

GB/T 2900.1, GB/T 2900.17, GB/T 2900.49, GB/T 26399-2011, DL/T 478-2013 and the following the terms and definitions apply to this document.

Out-of-step oscillation If the power angle difference between the rotors of the two co-tuned generators with the same value at the center of inertia exceeds 180° , it is judged to be out of synchronization, and then the power angle the difference will change periodically in the range of $0^\circ \sim 360^\circ$, and this process is called out-of-step oscillation.

Out-of-step separation equipment After the out-of-step oscillation occurs in the power system, split the pre-selected transmission lines, generator sets and other components to eliminate the power system Out-of-step oscillation state, a safety automatic device to prevent system breakdown.

4.1.1 Normal working atmospheric conditions

The normal working atmospheric conditions are as follows.

a) Ambient temperature. $-10^\circ\text{C} \sim +55^\circ\text{C}$;

b) Relative humidity. 5% to 95% (there is neither condensation nor freezing inside the device);

c) Atmospheric pressure. 80kPa~106kPa.

4.1.2 Reference test atmospheric conditions

The atmospheric conditions of the benchmark test are as follows.

a) Ambient temperature. $+20^{\circ}\text{C}\pm 5^{\circ}\text{C}$;

b) Relative humidity. 45%~75%;

c) Atmospheric pressure. 86kPa~106kPa.

4.1.3 Ambient temperature for storage and transportation

The ambient temperature for storage and transportation is as follows.

a) The storage environment temperature is $-25^{\circ}\text{C}\sim +55^{\circ}\text{C}$, and the relative humidity is not more than 85%;

b) The transportation environment temperature is $-25^{\circ}\text{C}\sim +70^{\circ}\text{C}$, and the relative humidity is not more than 85%;

When the storage and transportation environmental conditions exceed the above range, it is determined by the user and the manufacturer.

4.1.4 Surrounding environment

The environmental conditions for installation and operation of the device are as follows.

a) It should be shaded, protected from rain and snow, protected from lightning, sand and dust, and ventilated;

b) No electromagnetic interference exceeding 7.4 specified in DL/T 478-2013 is not allowed;

c) The site should meet the requirements of Class B safety requirements in GB/T 9361-2011;

d) The place of use should not have vibrations that exceed the severity level specified by GB/T 11287 as Class I;

e) Non-explosive medium, the surrounding medium should not contain any medium that can corrode metal, destroy insulation, surface plating and coating.

Conductive medium, no obvious water vapor, no serious molds;

f) All reliable grounding points at the installation site shall comply with relevant standards.