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

GB/T 45648.1-2025

**Controllable self-restoring energy dissipation devices - Part 1:
DC side**

高压直流输电用消能装置技术规范 第1部分：直流可控自恢复消能装置

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1. Structure and drafting rules for standardization documents" Drafting. This document is part 1 of GB/T 45648 Technical Specification for Energy Dissipation Devices for High Voltage Direct Current Transmission. GB/T 45648 has been published. The following parts.

--- Part 1: DC controllable self-restoring energy dissipation device;

--- Part 2: AC controllable self-restoring energy dissipation device. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document was proposed by the China Electrical Equipment Industry Association. This document is under the jurisdiction of the National Technical Committee for Standardization of High Voltage Direct Current Transmission Equipment (SAC/TC333). This document was drafted by: China Electric Power Research Institute Co., Ltd., Xi'an High Voltage Electric Equipment Research Institute Co., Ltd., Xi'an Xidian Lightning Device Co., Ltd., State Grid Economic and Technical Research Institute Co., Ltd., Jinguan Electric Co., Ltd., Pinggao Toshiba (Langfang) Lightning Arrester Co., Ltd. Co., Ltd., China Southern Power Grid Energy Development Research Institute Co., Ltd., Nanjing NARI Relay Protection Engineering Technology Co., Ltd., China Southern Power Grid Scientific Research Institute Co., Ltd., Xuji Electric Co., Ltd., Changzhou Borui Electric Automation Equipment Co., Ltd., Beijing Jiaotong University, State Grid Hubei Provincial Electric Power Co., Ltd. Electric Power Research Institute, State Grid Jibei Electric Power Co., Ltd., Hunan Fude Electric Co., Ltd.,

Xinjiang Uygur Autonomous Region Quality Foundation Development Research Institute, China Southern Power Grid Co., Ltd. Ultra-High Voltage Transmission Company. The main drafters of this document are. Gao Chong, Zhou Huigao, Wang Xiuhuan, He Jimou, Huang Chao, Du Shangan, Jia Tao, Xu Xueting, Li Minggang, Mi Pu, Xu Fan, Li Tingting, Wang Peiren, Qin Kang, Zhang Yiming, Wang Dechang, Zhang Boyu, Wu Wenxiang, Shen Xiaolin, Chang Peng, Feng Junjie, Zhang Wenbo, Ma Junjie, Yang Xiaohui, Zhang Hongtao, Yao Ning, Chen Peng, Liu Xiaowei, Xiao Mian, Ji Yirun, Wang Chenxing, Sun Mei, Liao Hanqing, Fan Weiqiang, Guan Baolin, Yao Yao, Zhang Changhong.

Energy dissipation devices for high voltage direct current transmission are used to limit the overvoltage level caused by direct current system faults and consume surplus energy to achieve fault Crossing to ensure the reliable operation of the DC system. GB/T 45648 aims to standardize the design, manufacture and use of energy dissipation devices for high-voltage direct current transmission, and currently consists of two parts.

--- Part 1: DC controllable self-restoring energy dissipation device. The purpose is to standardize the terms and definitions of DC controllable self-restoring energy dissipation devices, Requirements for operating conditions, performance, key components, tests, etc.

--- Part 2: AC controllable self-restoring energy dissipation device. The purpose is to standardize the terms and definitions of AC controllable self-restoring energy dissipation devices, Requirements for operating conditions, performance, key components, tests, etc. Technical specification for energy dissipation devices for high voltage direct current transmission Part 1: DC controllable self-restoring energy dissipation device

1 Scope

Part 1 of China's national standard for controllable self-restoring energy dissipation devices, covering those on the DC side of HVDC converter stations at plus or minus 100 kV and above. The device exists because of a problem specific to sending renewable power over long DC links. If the receiving end faults, the DC link cannot deliver its power, but the wind farms and solar plants at the sending end continue to generate - and that surplus energy has to go somewhere within milliseconds or it will overspeed the machines and drive the voltage past the point at which the converters trip, collapsing the whole export. A dissipation device absorbs it, dumping the energy into resistors under fast control and then restoring itself ready for the next event without intervention. The standard defines the terminology and specifies the operating conditions, performance, key components, testing, marking, packaging, transport, storage and installation requirements.

This document defines the terms and definitions of DC controllable self-restoring energy dissipation devices (hereinafter referred to as energy dissipation devices), and specifies the operation and operation of energy dissipation devices. Requirements on operating conditions, performance, key components, testing, marking, packaging, transportation, storage and installation. This document is applicable to energy dissipation devices used on

the DC side of high-voltage DC converter stations of $\pm 100\text{kV}$ and above.

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 191 Pictorial markings for packaging, storage and transportation

GB/T 1094.11-2022 Power transformers Part

3 Terms and definitions

The terms and definitions defined in GB/T 2900.12, GB/T 2900.20, GB/T 2900.32, GB/T 13498 and the following terms and definitions apply to this document.

11 Dry-type transformers

GB/T 1984-2024 High voltage AC circuit breaker

GB/T 2900.12 Electrical terminology Lightning arresters, low voltage surge protectors and components

GB/T 2900.20 Electrical terminology High-voltage switchgear and control equipment

GB/T 2900.32 Electrical terminology Power semiconductor devices

GB/T 3859.1-2013 General requirements for semiconductor converters and grid-commutated converters Part 1-