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NB

ENERGY INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

NB/T 42165-2024

Replacing NB/T 42165-2018

Specification for multi-terminal line protection

多端线路保护技术要求

Issued on: May 24, 2024 **Implemented on: November 24, 2024**

Issued by: National Energy Administration of the PRC

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Foreword

This document was issued on 24 May 2024 by the National Energy Administration of the

PRC and takes effect on 24 November 2024.

It is a NB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

It is classified under ICS 29.240.01, Chinese classification K 45.

It replaces NB/T 42165-2018, which is superseded.

This document was drafted in accordance with the rules given in GB/T 1.1-2020 Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents.

This document replaces NB/T 42165-2018 Specification for multi-terminal line protection.

Please note that some of the content of this document may be the subject of patent rights. The issuing body of this document assumes no responsibility for identifying patents.

This document was proposed by, and is under the administration of, the standardization technical committee concerned of the energy industry.

The versions of this document and of the document it replaces are as follows: first issued in 2018 as NB/T 42165-2018; this is the first revision.

1 Scope

NB/T 42165-2024 is the Chinese energy sector specification for the relay protection devices that guard multi-terminal alternating current lines from 10 kV to 220 kV. It exists because the protection scheme that works perfectly on a line with two ends stops being reliable the moment a third end is added, and the Chinese distribution network has been adding third ends at speed. Current differential protection, the workhorse of line protection, rests on a simple accounting identity: whatever current flows into the line must flow out of it, and any difference means a fault inside the protected zone. With two terminals that comparison needs one fibre and two relays. With three or more it needs every terminal to sample at the same instant, to share its measurement with all the others, and to agree on the sum, which turns a point-to-point link into a synchronised network in which any channel failure, any clock drift and any mismatch in the current transformers becomes a possible false trip or a possible failure to trip. Add distributed generation feeding fault current back from what used to be a passive end, and the direction of flow can no longer be assumed. This document sets what such a device has to be and how it is proved. It fixes the environmental conditions, rated electrical parameters, power consumption, overload capability, functional and performance requirements, requirements for the associated instrument transformers and equipment, dynamic simulation, electromagnetic compatibility, insulation, damp heat resistance, protective bonding impedance, continuous energization, and the mechanical, structural, enclosure protection and safety requirements. It then gives eighteen test methods matching those requirements, the inspection rules separating factory inspection from type inspection, the requirements for marking, packaging, transport and storage, and

the quality guarantee period. Four informative annexes cover the typical connection arrangements of the differential protection channel, the typical operating arrangements of fibre-optic differential protection for three-terminal lines and for lines with four or more terminals, and the tests related to channel connection and to switching between operating arrangements. It was issued on 24 May 2024 by the National Energy Administration, took effect on 24 November 2024, and replaces NB/T 42165-2018.

This document specifies the technical requirements, the test methods, the inspection rules and the requirements for marking, packaging, transport, storage and quality guarantee period of relay protection devices for multi-terminal lines at alternating current voltage levels from 10 kV to 220 kV, hereinafter referred to as protection devices.

This document applies to relay protection devices for multi-terminal lines at alternating current voltage levels from 10 kV to 220 kV, and serves as the basis for the development, design, manufacture, testing, inspection and application of that class of protection device.

2 Normative references

The contents of the following documents constitute indispensable provisions of this document through normative reference in the text. For dated references, only the edition corresponding to that date applies to this document. For undated references, the latest edition, including all amendments, applies to this document.

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

GB/T 2900.1 Electrotechnical terminology - Fundamental terms

GB/T 2900.17 Electrotechnical terminology - Measuring relays

GB/T 2900.49 Electrotechnical terminology - Power system protection

GB/T 2900.50 Electrotechnical terminology - Generation, transmission and distribution - General terms

GB/T 4798.2 Classification of environmental conditions - Classification of groups of environmental parameters and their severities - Part 2: Transportation and handling

GB/T 7261-2016 Basic test methods for relay protection and safety automatic equipment

GB/T 9361 Safety requirements for computer sites

GB/T 11287-2000 Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section 1: Vibration tests (sinusoidal)

GB/T 13384 General specifications for packing of mechanical and electrical products

GB/T 14285 Technical code for relaying protection and security automatic equipment

GB/T 14537-1993 Shock and bump tests on measuring relays and protection equipment