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NB

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

NB/T 10498-2021

Replacing DL/T 5228-2005

**Code for Design of AC 110 kV to 500 kV Power Cable Systems
for Hydropower Station**

水力发电厂交流110 kV~500 kV电力电缆工程设计规范

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Foreword

This document was issued on 7 January 2021 by the National Energy Administration of the PRC and takes effect on 1 July 2021.

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 27.140, Chinese classification P59.

It replaces DL/T 5228-2005, which is superseded.

By Announcement No. 1 of 2021, the National Energy Administration approved and issued 320 energy industry standards, among them NB/T 10498-2021, which replaces DL/T 5228-2005; the approval date is 2021-01-07 and the implementation date is 2021-07-01.

This code was revised by the drafting group in accordance with the requirements of the Notice of the National Energy Administration on Issuing the 2016 Plan for the Formulation (Revision) of Energy Sector Industry Standards (Guo Neng Ke Ji [2016] No. 238), through extensive investigation and research, careful summarisation of practical experience, reference to relevant international standards and wide solicitation of opinions.

The main technical contents of this code are: general provisions, terms and symbols, service conditions, selection of main technical parameters, type and structure, terminations and joints, earthing methods and overvoltage protection for metal sheath, auxiliary facilities, layout and laying, fire prevention, and test.

The main technical changes in this revision are: provisions on cable on-line monitoring devices have been added; provisions on cable fire prevention have been added; a new

chapter 'Test' has been added.

The former contents on voltage, permissible continuous current-carrying capacity and conductor cross-section, rated short-time withstand current and insulation level have been merged into the chapter 'Selection of Main Technical Parameters', and the contents relating to equalizing conductors and oil-filled cables have been deleted.

This code is under the administration of the National Energy Administration, is proposed and routinely managed by China Renewable Energy Engineering Institute, and its specific technical contents are interpreted by the Energy Industry Hydropower Electrical Design Standardization Technical Committee (NEA/TC17).

Comments and suggestions arising during implementation should be sent to China Renewable Energy Engineering Institute (Address: No. 2 Liupukang Beixiaojie, Xicheng District, Beijing, 100120).

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1 Scope

NB/T 10498-2021 is the Chinese design code for AC power cable systems from 110 kV to 500 kV in hydropower stations, replacing DL/T 5228-2005. In a hydropower plant the high voltage connection from the main transformers to the switchyard often cannot run as overhead line: the transformers sit in a cavern or beside a dam, and the route passes through shafts, tunnels and galleries. High voltage cable is the answer, and designing it in those conditions is a discipline of its own. The code sets the general provisions and defined terms, then the selection of cable type - cross-linked polyethylene insulated cables and their construction - and the determination of conductor size from current rating, short circuit withstand, voltage drop and economic criteria. It covers the insulation level and insulation coordination, the metallic sheath and its bonding and earthing schemes including single-point, both-end and cross bonding, and the sheath voltage limiters. Cable accessories follow: terminations to gas insulated switchgear, to transformers and to outdoor structures, and joints with their positioning. The laying conditions receive detailed treatment - in shafts and inclined tunnels, in cable galleries, in trays and on supports - with the fixing,

snaking and thermal expansion arrangements, fire protection and segregation, and the overvoltage protection of the system. Monitoring and testing requirements close the code.

1.0.1 This code is formulated with a view to standardizing the design of AC 110 kV to 500 kV power cable systems for hydropower stations, so as to achieve safety and reliability, advanced technology, economic rationality, and convenience of construction and maintenance.

1.0.2 This code is applicable to the design of power cable systems with a nominal AC voltage of 110 kV to 500 kV and a frequency of 50 Hz for new, reconstructed and extended hydropower stations.

1.0.3 In addition to this code, the design of AC 110 kV to 500 kV power cable systems for hydropower stations shall also comply with the current relevant standards of the nation.

2 Terms and Symbols

2.1.1 Shielding conductor: an insulated conductor or cable running parallel to a single-core cable line and earthed at both ends, which provides a return path to the source for single-phase short-circuit current, so as to reduce the induced overvoltage on the cable metal sheath and protect the insulation of the outer sheath.

2.1.2 Slip fixing: a fixing method that allows the cable, as it expands and contracts thermally, to change its axial angle or move slightly sideways at the fixing point.

2.1.3 Rigid fixing: a clamping fixing method that does not allow any displacement of the cable due to thermal expansion and contraction.

2.1.4 Snaking: a laying method in which the cable is laid in a wave shape according to quantitative parameters, in order to reduce the axial thermal stress of the cable or to retain a reserve length.

2.2 Symbol U_0 : rated power-frequency r.m.s. voltage between each conductor and the screen or metal sheath, for which the cable and accessories are designed.

2.2 Symbol U : rated power-frequency r.m.s. voltage between any two conductors, for which the cable and accessories are designed.

2.2 Symbol U_m : highest power-frequency r.m.s. voltage between any two conductors, for which the cable and accessories are designed.

2.2 Symbol U_{p1} : peak value of the lightning impulse withstand voltage between each conductor and the screen or metal sheath of the cable or accessory adopted in the design.

2.2 Symbol U_{p2} : peak value of the switching impulse withstand voltage between each conductor and the screen or metal sheath of the cable or accessory adopted in the design.