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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

High-voltage switchgear and controlgear – Part 212: Compact Equipment Assembly for Distribution Substation (CEADS) for AC voltages up to 52 kV

Appareillage à haute tension – Partie 212: Ensemble compact d'équipement pour poste de distribution (ECEPD) pour les tensions alternatives inférieures ou égales à 52 kV



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 212: Compact Equipment Assembly for Distribution Substation (CEADS) for AC voltages up to 52 kV

FOREWORD

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IEC 62271-212 has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) clause numbering aligned with IEC 62271-1:2017,
b) rewording of title and scope of the document,
c) implement changes on internal arc definition and testing following the evolution of prefabricated substation concept according to IEC 62271-202,
d) general review of main test procedures such as temperature rise or dielectric test on interconnections, considering control equipment, communication, smart grid devices and integration of components,

e) general review of installation, operation, safety and maintenance requirements.

The text of this International Standard is based on the following documents:

Draft	Report on voting
17C/845/FDIS	17C/850/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

This International Standard should be read in conjunction with IEC 62271-1:2017, to which it refers and which is applicable unless otherwise specified. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC 62271-1:2017. Amendments to these clauses and subclauses are given under the same numbering, whilst additional subclauses, are numbered from 101.

A list of all parts of the IEC 62271 series can be found, under the general title *High-voltage switchgear and controlgear*, on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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INTRODUCTION

Traditionally a high-voltage/low-voltage distribution substation has been constructed by installing the main electrical components –high-voltage switchgear and controlgear, power transformer and the corresponding low-voltage switchgear and controlgear- within a closed electrical operating area. It can be a room within a building intended for other usages (non electrical uses) or a separated housing (prefabricated or not) designed specifically to contain the electrical equipment of the substation or an open area limited by fences.

Some years ago in the search for a more standardized and compact substation, the concept of prefabricated substation was developed. IEC 62271-202 covers this type of substation. According to this document, the main electrical components (high-voltage switchgear and controlgear, power transformer and low-voltage switchgear and controlgear) are fully in compliance with their respective product standard, and the whole substation, including interconnections and enclosure is designed and type tested and later manufactured and routine tested in the factory. Correspondingly the quality of the substation is assured by the manufacturer.

Moreover, also other types of assemblies have been introduced in the market. These are assemblies comprising the main electrical active components of the substation and their interconnections, delivered as a single product. The product can therefore be type tested, manufactured, routine tested in the factory, transported and then installed in a closed electrical operating area.

This type of factory assembled and type-tested product is covered by this document receiving the generic name CEADS from Compact Equipment Assembly for Distribution Substation. Numerous arrangements are possible and this document provides guidance on basic types of assemblies, which might be envisaged.

A CEADS is not covered by IEC 61936-1. However, CEADS is intended to become part of a distribution substation.

Taking into account the closer proximity of the main electrical components that even can share some parts (enclosure, solid or fluid insulation…), it is very relevant to take notice of the potential interaction between them. Therefore, to cover CEADS is neither sufficient nor always applicable to refer to the relevant product standards. This document covers any additional design and construction requirements and test methods applicable to the different types of CEADS. In addition to the specified characteristics, particular attention has been paid to the specification concerning the protection of persons, both operators and general public.

The CEADS is also of interest to committee TC 14: Power transformers, and committee TC 121: Switchgear and controlgear and their assemblies for low voltage.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 212: Compact Equipment Assembly for Distribution Substation (CEADS) for AC voltages up to 52 kV

1 Scope

This part of IEC 62271 specifies the service conditions, rated characteristics, general structural requirements and test methods of the assemblies of the main electrical functional units of a high-voltage transformer substation, duly interconnected, for AC voltages up to and including 52 kV on the high-voltage side and service frequency 50 Hz or 60 Hz. The CEADS is cable-connected to the high-voltage network for indoor and outdoor applications of restricted access.

A CEADS as defined in this document is designed and tested to be a single product with a single serial number and one set of documentation.

The functions of a CEADS are:

– high-voltage/high-voltage or high-voltage/low-voltage transformation;

and some or all the following:

– switching and control for the operation of the high-voltage circuit(s);
– switching and control for the operation of the low-voltage circuit(s);
– protection of the power transformer functional unit.

The main functions are integrated in the following functional units:

– high-voltage functional unit;
– power transformer functional unit;
– low-voltage functional unit.

NOTE For the purpose of this document a self-protected transformer is not considered as a CEADS, but as a functional unit, designed and type tested to its own product standard IEC 60076-13:2006.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-441, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses* (available at www.electropedia.org)

IEC 60050-461, *International Electrotechnical Vocabulary (IEV) – Part 461: Electric cables* (available at www.electropedia.org)

IEC 60076 (all parts), *Power transformers*

IEC 60076-1:2011, *Power transformers – Part 1: General*

IEC 60076-2:2011, *Power transformers – Part 2: Temperature rise for liquid-immersed transformers*

IEC 60076-3:2013, *Power transformers – Part 3: Insulation levels, dielectric tests and external clearances in air*
IEC 60076-3:2013/AMD1:2018

IEC 60076-5:2006, *Power transformers – Part 5: Ability to withstand short circuit*

IEC 60076-7:2018, *Power transformers – Part 7: Loading guide for mineral-oil-immersed power transformers*

IEC 60076-10:2016, *Power transformers – Part 10: Determination of sound levels*

IEC 60076-11:2018, *Power transformers – Part 11: Dry-type transformers*

IEC 60076-12:2008, *Power transformers – Part 12: Loading guide for dry-type power transformers*

IEC 60076-15:2015, *Power transformers – Part 15: Gas-filled power transformers*

IEC 60243-1:2013, *Electrical strength of insulating materials – Test methods – Part 1: Tests at power frequencies*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*
IEC 60364-4-41:2005/AMD1:2017

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60721-1:1990, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*
IEC 60721-1:1990/AMD1:1992
IEC 60721-1:1990/AMD2:1995

IEC 60721-2-2:2012, *Classification of environmental conditions – Part 2-2: Environmental conditions appearing in nature – Precipitation and wind*

IEC 60721-2-4:2018, *Classification of environmental conditions – Part 2-4: Environmental conditions appearing in nature – Solar radiation and temperature*

IEC TS 60815 (all parts), *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions*

IEC 60947-1:2020, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 61439 (all parts)[1], *Low-voltage switchgear and controlgear assemblies*

IEC 61439-1:2020, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*

[1] This series supersedes some parts of IEC 60439 series.

IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*

IEC 62271-200:2021, *High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

IEC 62271-201:2014, *High-voltage switchgear and controlgear – Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

IEC 62271-202:2022, *High-voltage switchgear and controlgear – Part 202: Prefabricated substation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-441, IEC 62271-202 and the following apply.

NOTE Some standard terms and definitions are recalled here for ease of reference.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General terms and definitions

3.1.101
closed electrical operating area
room or location for operation of electrical installations and equipment to which access is intended to be restricted to skilled or instructed persons or to lay personnel under the supervision of skilled or instructed persons

[SOURCE: IEC 61936-1:2021, 3.2.1, modified – In the definition, "power installations" replaced with "installations", and "ordinary persons" replaced with "personnel".]

3.2 Assemblies of switchgear and controlgear

3.2.101
Compact Equipment Assembly for Distribution Substation
CEADS
factory assembled and type-tested equipment comprising functional units, described in Clause 1, duly interconnected

Note 1 to entry: Three types of CEADS are considered: grouped, associated and integrated (see Annex C for details).

3.2.101.1
grouped type CEADS
CEADS-G
CEADS with functional units are standalone equipment fully complying with their respective product standards, where these functional units are placed close to each other in a specified layout