IEC 62271-212

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

High-voltage switchgear and controlgear – Part 212: Compact Equipment Assembly for Distribution Substation (CEADS)

Appareillage à haute tension – Partie 212: Ensemble Compact d'Equipement pour Postes de Distribution (ECEPD)

IEC 62271-212:2016-10(en-fr)

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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)

FOREWORD

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

The text of this standard is based on the following documents:

FDIS	Report on voting
17C/645/FDIS	17C/650/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This International Standard should be read in conjunction with IEC 62271-1:2007, 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. 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 publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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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, distribution transformer(s) and the corresponding low-voltage distribution panel(s)- within a closed electrical operating area. It can be a room within a building intended for other (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, transformer and low-voltage switchgear) 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 components that even can share some parts (enclosure, solid or fluid insulation…) it is very relevant to pay attention to 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 for the interest of 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)

1 General

1.1 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/low-voltage distribution substation, duly interconnected, for alternating current of rated operating voltages above 1 kV and up to and including 52 kV on the high-voltage side, service frequency 50 Hz or 60 Hz. This assembly is to be cable-connected to the network, and intended for installation within an indoor or outdoor closed electrical operating area.

A Compact Equipment Assembly for Distribution Substation (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:

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

However relevant provisions of this document are also applicable to designs where not all of these functions exist (e.g. equipment comprising only high-voltage/low-voltage transformation and switching and control for the operation and protection of the low-voltage feeder functions or equipment without switching and control for the operation of the high-voltage circuit(s)).

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

1.2 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 60050-441:1984, *International Electrotechnical Vocabulary – Switchgear, controlgear and fuses*

IEC 60050-461:2008, *International Electrotechnical Vocabulary – Part 461: Electric cables*

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

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

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

IEC 60076-11:2004, *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 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60721-1:1990, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*

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

IEC 60721-2-4:1987, *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 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*

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

IEC 61439-1:2011, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*

IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62271-1:2007, *High-voltage switchgear and controlgear – Part 1: Common specifications*
IEC 62271-1:2007/AMD1:2011

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1 This series will supersede some parts of IEC 60439 series.

IEC 62271-200:2011, *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 62271-202:2014, *High voltage switchgear and controlgear – Part 202: High-voltage/low-voltage prefabricated substation*

ISO/IEC Guide 51:2014, *Safety aspects – Guidelines for their inclusion in standards*

2 Normal and special service conditions

2.1 Normal service conditions

Subclause 2.1 of IEC 62271-1:2007 is applicable with the following additions.

Wave shape and symmetry of supply voltage are in accordance with 4.2 of IEC 60076-1:2011.

For high-voltage/low-voltage transformer functional unit, average ambient air temperature limits of 4.2 of IEC 60076-1:2011 for liquid immersed type and 4.2.3 of IEC 60076-11:2004 shall also apply.

For indoor CEADS

- the minimum air ambient temperature is -5 °C;
- equipment shall also be suitable for conditions of humidity in accordance with 7.1.2.1 of IEC 61439-1:2011.

For outdoor CEADS

- the preferred values of minimum air ambient temperature are -10 °C, -25 °C.

NOTE 1 For air ambient below -25 °C, CEADS can be designed or used according to the relevant product standards, where applicable, or according to agreement between manufacturer and user.

NOTE 2 For higher ambient temperatures inside a room, the user has to specify to the manufacturer the specific operating conditions.

When two or more functional units share a common surrounding medium and in some cases even the same enclosure, the real operating service conditions, in particular temperature, of those functional units can differ largely from the normal service conditions (ambient air) due to the interaction between them. This has to be considered where relevant during type test (see e.g. 6.5.2).

2.2 Special service conditions

Subclause 2.2 of IEC 62271-1:2007 is applicable with the following additions.

Refer to the relevant standards for the different functional units.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-441, IEC 62271-1:2007 and in the standards mentioned in 1.2, and the following apply.

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.

3.101
Compact Equipment Assembly for Distribution Substation
CEADS
factory assembled and type-tested equipment comprising functional units, described in 1.1, duly interconnected

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

3.101.1
grouped type CEADS
CEADS-G
CEADS which functional units are stand alone equipment fully complying with their respective product standards, where these functional units are placed close to each other in a specified layout

3.101.2
associated type CEADS
CEADS-A
CEADS which functional units may deviate from existing product standard but not in any aspect that could affect negatively safety and/or operation and where these functional units can either be independent or share part of their frames or enclosures

3.101.3
integrated type CEADS
CEADS-I

CEADS where all or part of high-voltage functional units and the high-voltage/low-voltage transformation functional unit are contained in a single enclosure, sharing the insulating medium

3.102
functional unit
assembly of devices and components performing a given main function of the CEADS

Note 1 to entry: For the purpose of this document functional unit has a different meaning than the meaning in other standards. For example in this document high-voltage functional unit (see the definition below) may comprise several functional units as per IEC 62271-200:2011.

3.102.1
high-voltage functional unit
assembly of the switching devices and other components performing the function of switching and control for the operation of the high-voltage side of the CEADS

Note 1 to entry: It may include switching and control of the high-voltage main circuit of the network and the protection of the high-voltage/low-voltage transformation function.

3.102.2
high-voltage/low-voltage transformer functional unit
assembly of elements that perform the function of high-voltage/low-voltage transformation of the CEADS

3.102.3
low-voltage functional unit
assembly of the switching devices and other components performing the function of switching and control for the operation and protection of the low-voltage feeders of the CEADS