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# INTERNATIONAL STANDARD

colour inside

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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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

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62271-212:2016. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

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

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- withdrawn,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

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# INTRODUCTION

Traditionally a high-voltage/low-voltage distribution substation has been constructed by installing the main electrical components – high-voltage switchgear and controlgear, ~~distribution~~ power transformer~~(s)~~ and the corresponding low-voltage ~~distribution panel(s)~~ 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 General~~

## 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~~ high-voltage transformer substation, duly interconnected, for AC ~~of rated operating~~ voltages ~~above 1 kV and~~ up to and including 52 kV on the high-voltage side and 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.~~ 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:

~~• 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)).~~

– 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~~:1984~~, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses* (available at www.electropedia.org)

IEC 60050-461~~:2008~~, *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:~~2004~~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 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 60721-1:1990/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:~~1987~~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:~~2007~~2020, *Low-voltage switchgear and controlgear – Part 1: General rules*

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

IEC 61439-1:~~2011~~2020, *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~~2017, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*
~~IEC 62271-1:2007/AMD1:2011~~

IEC 62271-200:~~2011~~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:~~2014~~2022, *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*~~

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

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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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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

## 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

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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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

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

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# 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*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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# 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

## AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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L'IEC 62271-212 a été établie par le sous-comité 17C: Ensembles, du comité d'études de l'IEC 17: Appareillage à haute tension. Il s'agit d'une Norme internationale.

Cette deuxième édition annule et remplace la première édition parue en 2016. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) numérotation des articles alignée sur l'IEC 62271-1:2017;
b) reformulation du titre et du domaine d'application du document;

c) mise en œuvre des modifications relatives à la définition et aux essais d'arc interne en suivant l'évolution du concept de poste préfabriqué conformément à l'IEC 62271-202;

d) examen général des principaux modes opératoires d'essai tels que l'échauffement ou l'essai diélectrique sur les interconnexions, compte tenu des équipements de commande, de la communication, des dispositifs de réseau intelligent et de l'intégration des composants;

e) examen général des exigences d'installation, de fonctionnement, de sécurité et de maintenance.

Le texte de cette Norme internationale est issu des documents suivants:

| Projet | Rapport de vote |
|---|---|
| 17C/845/FDIS | 17C/850/RVD |

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Il convient de lire cette Norme internationale conjointement avec l'IEC 62271-1:2017, à laquelle elle fait référence et qui est applicable, sauf spécification contraire. Pour faciliter le repérage des exigences correspondantes, cette norme utilise une numérotation identique des articles et des paragraphes à celle de l'IEC 62271-1:2017. Les modifications à ces articles et paragraphes sont indiquées sous la même numérotation, alors que les paragraphes additionnels sont numérotés à partir de 101.

Une liste de toutes les parties de la série IEC 62271, sous le titre général *Appareillage à haute tension* se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu du présent document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

**IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.**

# INTRODUCTION

Un poste de distribution haute tension/basse tension est traditionnellement construit par l'installation des principaux composants électriques – appareillage à haute tension, transformateur de puissance et appareillage à basse tension correspondant – dans un local électrique fermé. Il peut s'agir d'une salle dans un bâtiment destiné à d'autres utilisations (non électriques) ou un local séparé (préfabriqué ou non) conçu spécifiquement pour contenir le matériel électrique du poste ou une zone ouverte délimitée par des clôtures.

Il y a quelques années, dans le cadre de la recherche d'un poste plus normalisé et plus compact, le concept de poste préfabriqué a été développé. L'IEC 62271-202 couvre ce type de poste. Conformément au présent document, les principaux composants électriques (appareillage à haute tension, transformateur de puissance et appareillage à basse tension) sont totalement conformes à leur norme de produit respective, et le poste complet, interconnexions et enveloppe comprises, est conçu et soumis à des essais de type puis fabriqué et soumis à des essais individuels de série en usine. La qualité du poste est par conséquent assurée par le constructeur.

Par ailleurs, d'autres types d'ensembles ont également été introduits sur le marché. Il s'agit d'ensembles qui comprennent les principaux composants actifs électriques du poste et leurs interconnexions, livrés sous la forme d'un produit monobloc. Le produit peut par conséquent être soumis à des essais de type, fabriqué, soumis à des essais individuels de série en usine, transporté puis installé dans un local électrique fermé.

Ce type de produit soumis à des essais de type et assemblé en usine est couvert par le présent document sous le nom générique d'Ensemble Compact d'Équipement pour Poste de Distribution (ECEPD). De nombreux agencements sont possibles et le présent document spécifie des recommandations concernant les principaux types d'ensembles qui peuvent être envisagés.

Un ECEPD ne relève pas de l'IEC 61936-1. L'ECEPD est toutefois destiné à faire partie d'un poste de distribution.

Compte tenu de la proximité étroite des principaux composants électriques qui peuvent même partager certaines parties (enveloppe, isolation solide ou par fluide…), il est très pertinent d'être attentif à leur interaction potentielle. Par conséquent, pour un ECEPD, il n'est ni suffisant ni toujours applicable de se reporter aux normes de produits pertinentes. Le présent document couvre toutes les exigences de conception et de construction supplémentaires ainsi que les méthodes d'essai applicables aux différents types d'ECEPD. En plus des caractéristiques spécifiées, une attention particulière a été portée à la spécification concernant la protection des personnes, aussi bien les opérateurs que le grand public.

L'ECEPD est aussi un sujet d'intérêt du comité d'études 14: Transformateurs de puissance, et du comité d'études 121: Appareillages et ensembles d'appareillages basse tension.

# 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

## 1 Domaine d'application

La présente partie de l'IEC 62271 spécifie les conditions de service, les caractéristiques assignées, les exigences structurelles générales et les méthodes d'essai des ensembles des principales unités fonctionnelles électriques d'un poste de transformation haute tension, dûment interconnecté, pour les tensions alternatives inférieures ou égales à 52 kV du côté haute tension, et avec une fréquence de service de 50 Hz ou 60 Hz. L'ECEPD est raccordé par câble au réseau à haute tension pour des applications à l'intérieur et à l'extérieur à accès restreint.

Un ECEPD tel que défini dans le présent document est conçu et soumis à des essais comme un produit unique avec un numéro de série unique et un ensemble de documentation.

Les fonctions d'un ECEPD sont les suivantes:

– la transformation haute tension/haute tension ou haute tension/basse tension;

et tout ou partie des fonctions suivantes:

– la connexion et la commande pour le fonctionnement du ou des circuits à haute tension;
– la connexion et la commande pour le fonctionnement du ou des circuits à basse tension;
– la protection de l'unité fonctionnelle du transformateur de puissance.

Les principales fonctions sont intégrées aux unités fonctionnelles suivantes:

– unité fonctionnelle haute tension;
– unité fonctionnelle de transformateur de puissance;
– unité fonctionnelle basse tension.

NOTE Pour les besoins du présent document, un transformateur autoprotégé n'est pas considéré comme un ECEPD, mais comme une unité fonctionnelle, conçue et soumise à un essai de type conformément à sa propre norme de produit IEC 60076-13:2006.

## 2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60050-441, *Vocabulaire électrotechnique international (IEV) – Partie 441: Appareillage et fusibles* (disponible sous www.electropedia.org)

IEC 60050-461, *Vocabulaire électrotechnique international (IEV) – Partie 461: Câbles électriques* (disponible sous www.electropedia.org)

IEC 60076 (toutes les parties), *Transformateurs de puissance*

IEC 60076-1:2011, *Transformateurs de puissance – Partie 1: Généralités*

IEC 60076-2:2011, *Transformateurs de puissance – Partie 2: Échauffement des transformateurs immergés dans le liquide*

IEC 60076-3:2013, *Transformateurs de puissance – Partie 3: Niveaux d'isolement, essais diélectriques et distances d'isolement dans l'air*
IEC 60076-3:2013/AMD1:2018

IEC 60076-5:2006, *Transformateurs de puissance – Partie 5: Tenue au court-circuit*

IEC 60076-7:2018, *Power transformers – Partie 7: Loading guide for mineral-oil-immersed power transformers* (disponible en anglais seulement)

IEC 60076-10:2016, *Transformateurs de puissance – Partie 10: Détermination des niveaux de bruit*

IEC 60076-11:2018, *Transformateurs de puissance – Partie 11: Transformateurs de type sec*

IEC 60076-12:2008, *Transformateurs de puissance – Partie 12: Guide de charge pour transformateurs de puissance de type sec*

IEC 60076-15:2015, *Transformateurs de puissance – Partie 15: Transformateurs de puissance à isolation gazeuse*

IEC 60243-1:2013, *Rigidité électrique des matériaux isolants – Méthodes d'essai – Partie 1: Essais aux fréquences industrielles*

IEC 60364-4-41:2005, *Installations électriques à basse tension – Partie 4-41: Protection pour assurer la sécurité – Protection contre les chocs électriques*
IEC 60364-4-41:2005/AMD1:2017

IEC 60529:1989, *Degrés de protection procurés par les enveloppes (Code IP)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60721-1:1990, *Classification des conditions d'environnement – Partie 1: Agents d'environnement et leurs sévérités*
IEC 60721-1:1990/AMD1:1992
IEC 60721-1:1990/AMD2:1995

IEC 60721-2-2:2012, *Classification des conditions d'environnement – Partie 2-2: Conditions d'environnement présentes dans la nature – Précipitations et vent*

IEC 60721-2-4:2018, *Classification des conditions d'environnement – Partie 2-4: Conditions d'environnement présentes dans la nature – Rayonnement solaire et température*

IEC TS 60815 (toutes les parties), *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions* (disponible en anglais seulement)

IEC 60947-1:2020, *Appareillage à basse tension – Partie 1: Règles générales*

IEC 61439 (toutes les parties)[1], *Ensembles d'appareillages à basse tension*

IEC 61439-1:2020 *Ensembles d'appareillages à basse tension – Partie 1: Règles générales*

IEC 62271-1:2017 *Appareillage à haute tension – Partie 1: Spécifications communes pour appareillage à courant alternatif*

IEC 62271-200:2021 *Appareillage à haute tension – Partie 200: Appareillage sous enveloppe métallique pour courant alternatif de tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV*

IEC 62271-201:2014 *Appareillage à haute tension – Partie 201: Appareillage sous enveloppe isolante solide pour courant alternatif de tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV*

IEC 62271-202:2022, *High-voltage switchgear and controlgear – Part 202: Prefabricated substation* (disponible en anglais seulement)

[1] Cette série remplace certaines parties de la série IEC 60439.