High-voltage switchgear and controlgear - Part 202: AC prefabricated substations for rated voltages above 1 kV and up to and including 52 kV

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 62271-202:2022 sisaldab Euroopa standardi EN IEC 62271-202:2022 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 62271-202:2022 consists of the English text of the European standard EN IEC 62271-202:2022.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 12.08.2022.	Date of Availability of the European standard is 12.08.2022.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 29.130.10

EUROPEAN STANDARD

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EUROPÄISCHE NORM

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English Version

High-voltage switchgear and controlgear - Part 202: AC prefabricated substations for rated voltages above 1 kV and up to and including 52 kV (IEC 62271-202:2022)

Appareillage à haute tension - Partie 202: Postes préfabriqués pour courant alternatif de tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV (IEC 62271-202:2022)

Hochspannungs-Schaltgeräte und -Schaltanlagen - Teil 202: Fabrikfertige Wechselstrom-Stationen für Bemessungsspannungen über 1 kV bis einschließlich 52 kV (IEC 62271-202:2022)

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Ref. No. EN IEC 62271-202:2022 E

European foreword

The text of document 17C/843/FDIS, future edition 3 of IEC 62271-202, prepared by SC 17C "Assemblies" of IEC/TC 17 "High-voltage switchgear and controlgear" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62271-202:2022.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2023-04-27
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2025-07-27

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The text of the International Standard IEC 62271-202:2022 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61936-1:2021	NOTE	Harmonized as EN IEC 61936-1:2021 (not modified)
IEC 60059:1999	NOTE	Harmonized as EN 60059:1999 (not modified)
IEC 60076 (series)	NOTE	Harmonized as EN 60076 (series)
IEC 62271-4:2013	NOTE	Harmonized as EN 62271-4:2013 (not modified)
IEC 60364-4-41:2005	NOTE	Harmonized as HD 60364-4-41:2017 + A11:2017
IEC 60721-3-2:2018	NOTE	Harmonized as EN IEC 60721-3-2:2018 (not modified)
IEC 60068 (series)	NOTE	Harmonized as EN 60068 (series)
IEC/TR 62271-208:2009	NOTE	Harmonized as CLC/TR 62271-208:2010 (not modified)
IEC 60243-1:2013	NOTE	Harmonized as EN 60243-1:2013 (not modified)
ISO 9223	NOTE	Harmonized as EN ISO 9223

ISO 9224	NOTE	Harmonized as EN ISO 9224
IEC 60721-2-6:1990	NOTE	Harmonized as HD 478.2.6 S1:1993 (not modified)
IEC/IEEE 82079-1:2019	NOTE	Harmonized as EN IEC/IEEE 82079-1:2020 (not modified)
ISO 13732-1:2006	NOTE	Harmonized as EN ISO 13732-1:2008 (not modified)
IEC 62430:2019	NOTE	Harmonized as EN IEC 62430:2019 (not modified)
ISO 1460	NOTE	Harmonized as EN ISO 1460
ISO 1461	NOTE	Harmonized as EN ISO 1461
ISO 2081	NOTE	Harmonized as EN ISO 2081
ISO 2409	NOTE	Harmonized as EN ISO 2409
ISO 9227	NOTE	Harmonized as EN ISO 9227
ISO 11997 (series)	NOTE	Harmonized as EN ISO 11997 (series)
ISO 7784 (series)	NOTE	Harmonized as EN ISO 7784 (series)
ISO 12944 (series)	NOTE	Harmonized as EN ISO 12944 (series)
IEC 60865-1:2011	NOTE	Harmonized as EN 60865-1:2012 (not modified)
IEC 60076-3	NOTE	Harmonized as EN 60076-3
IEC 61869 (series)	NOTE	Harmonized as EN IEC 61869 (series)

IEC 62271-202

Edition 3.0 2022-06

INTERNATIONAL STANDARD

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High-voltage switchgear and controlgear – Part 202: AC prefabricated substations for rated voltages above 1 kV and up to and including 52 kV

Appareillage à haute tension – Partie 202: Postes préfabriqués pour courant alternatif de tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV

IEC 62271-202:2022-06(en-fr)

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INTERNATIONAL STANDARD

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 202: AC prefabricated substations for rated voltages above 1 kV and up to and including 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 62271-202 has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear. It is an International Standard.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

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

a) the whole document contents and structure are reviewed with due consideration of IEC 62271-1:2017;
b) modification of the title and scope to include high-voltage switchgear prefabricated substations;
c) inclusion of CEADS as a possible component of MV/LV prefabricated substation;
d) in 7.2.101, the possible influence of surrounding elements on the dielectric performance of high-voltage components as high-voltage switchgear and controlgear and high-voltage interconnections non-metal-enclosed or without earthed screen are now considered;

e) new informative Annex G with testing procedure to evaluate the impact of solar radiation in temperatures inside the enclosure and how to apply it;

f) new informative Annex H for appropriate consideration of installation conditions of electronic equipment;

g) the rated power of a prefabricated substation is now defined as a three-parameter rated value. See 5.101.1;

h) minimum dimensions for access doors to the prefabricated substation in 6.104.4 and for free height of operation aisle in 6.105.3 have been introduced;

i) continuous current (temperature rise) test methods have been revised/clarified where necessary;

j) Figure D.1, which shows the mineral-oil-immersed power transformer load factor inside the enclosure, has been corrected.

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

Draft	Report on voting
17C/843/FDIS	17C/849/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 document is to 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.

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INTRODUCTION

A prefabricated substation is defined as a high-voltage type-tested assembly comprising an enclosure containing at least a power transformer and/or a high-voltage switchgear and controlgear, and, in general, all or some of the following main components: low-voltage switchgear and controlgear, electrical high-voltage interconnection and low-voltage interconnection. The prefabricated substation can include all necessary auxiliary and control equipment for its operation. The purpose being to supply low-voltage power from a high-voltage system and/or vice versa (high-voltage/low-voltage transformer substation) or distribute electric power in a high-voltage network (high-voltage switchgear substation).

These prefabricated substations can be in locations accessible to the public and should ensure protection not only to authorized persons but also to general public under the specified service conditions.

Therefore, in addition to the specified characteristics, ratings and relevant test procedures, particular attention has been paid to the specification concerning the protection of persons, both operators and general public. Use of type-tested components and suitable design and construction of the assembly contributes to this protection. The correct design and performance of the prefabricated substation is verified by means of relevant type and routine tests described in this document, including internal arc tests (if applicable).

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 202: AC prefabricated substations for rated voltages above 1 kV and up to and including 52 kV

1 Scope

This part of IEC 62271 specifies the service conditions, rated characteristics, general structural requirements and test methods of enclosed high-voltage prefabricated substations. These prefabricated substations are cable-connected to AC high-voltage networks with an operating voltage up to and including 52 kV and power frequencies up to and including 60 Hz. They can be manually operated from inside (walk-in type) or from outside (non-walk-in type). They are designed for outdoor installation at locations with public accessibility and where protection of personnel is provided.

These prefabricated substations can be situated at ground level or partially or completely below ground level. The last are also called "underground prefabricated substations".

In general, two types of prefabricated substations are considered in this document:

– high-voltage switchgear prefabricated substations;
– high-voltage/low-voltage transformer prefabricated substations (step-up and step-down).

A high-voltage switchgear prefabricated substation comprises an enclosure containing in general the following electrical components:

– high-voltage switchgear and controlgear;
– auxiliary equipment and circuits.

A high-voltage/low-voltage transformer prefabricated substation comprises an enclosure containing in general the following electrical components:

– power transformer(s);
– high-voltage and low-voltage switchgear and controlgear;
– high-voltage and low-voltage interconnections;
– auxiliary equipment and circuits.

However, relevant provisions of this document are applicable to designs where not all these electrical components exist (for example, a prefabricated substation consisting of power transformer and low-voltage switchgear and controlgear).

The listed electrical components of a high-voltage/low-voltage transformer prefabricated substation can be incorporated in the prefabricated substation either as separate components or as an assembly type CEADS according to IEC 62271-212.

This document covers only designs using natural ventilation. However, relevant provisions of this document are applicable to designs using other means of ventilation except the rated power of the prefabricated substation and associated class of enclosure (see 5.101), the continuous current tests (see 7.5) and all temperature rise related requirements, which would need an agreement between manufacturer and user.

NOTE 1 IEC 61936-1 [1][1] provides general rules for the design and erection of high-voltage power installations. As well, it specifies additional requirements for the external connections, erection and operation at the place of installation of high-voltage prefabricated substations compliant with IEC 62271-202, which are regarded as a component of such installation. Non-prefabricated high-voltage substations, are generally covered by IEC 61936-1 [1].

NOTE 2 High-voltage switchgear prefabricated substations can include instrument transformers, according to IEC 61869 (all parts). These substations are not high-voltage/low-voltage transformer prefabricated substations.

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 60050-461:2008, *International Electrotechnical Vocabulary (IEV) – Part 461: Electric cables*

IEC 60068-2-5:2018, *Environmental testing – Part 2-5: Tests – Test S: Simulated solar radiation at ground level and guidance for solar radiation testing and weathering*

IEC 60071-1:2019, *Insulation co-ordination – Part 1: Definitions, principles and rules*

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

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

IEC 60076-5:2006, *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 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

[1] Numbers in square brackets refer to the Bibliography.

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 60721-3-4, *Classification of environmental conditions – Part 3-4: Classification of groups of environmental parameters and their severities – Stationary use at non-weather protected locations*

IEC TS 60815-1:2008, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles*

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

IEC 61180-1:1992, *High-voltage test techniques for low voltage equipment – Part 1: Definitions, test and procedure requirements*[2]

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

IEC 61439-1:2020, *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 62271-1:2017, *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 62271-212:2016, *High-voltage switchgear and controlgear – Part 212: Compact Equipment Assembly for Distribution Substation (CEADS)*

ISO 1182:2010, *Reaction to fire tests for products – Non-combustibility tests*

ISO 1716:2018, *Reaction to fire tests for products – Determination of the gross heat of combustion (calorific value)*

ISO 6508-1:2016, *Metallic materials – Rockwell hardness test – Part 1: Test method*

EN 10025-2:2019, *Hot rolled products of structural steels – Part 2: Technical delivery conditions for non-alloy structural steels*

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2 This publication has been partially replaced with IEC 61180:2016.