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INTERNATIONAL STANDARD

colour inside

Power installations exceeding 1 kV AC and 1,5 kV DC – Part 1: AC

INTERNATIONAL
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COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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POWER INSTALLATIONS EXCEEDING 1 kV AC AND 1,5 kV DC –

Part 1: ~~Common rules~~ AC

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 commented version (CMV) of the official standard IEC 61936-1:2021 edition 3.0 allows the user to identify the changes made to the previous IEC 61936-1:2010+AMD1: 2014 CSV edition 2.1. Futhermore, comments from IEC TC 99 experts are provided to explain the reasons of the most relevant changes.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

International Standard IEC 61936-1 has been prepared by IEC technical committee 99: Insulation co-ordination and system engineering of high voltage electrical power installations above 1,0 kV AC and 1,5 kV DC.

This third edition cancels and replaces the second edition published in 2010 and Amendment 1:2014. This edition constitutes a technical revision.

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

a) introduction has been rewritten to reflect the status when this document is produced;
b) the scope has been improved to clarify the application of this document;
c) missing and obsolete terms and definitions have been updated including improvement of existing terms;
d) Table 1 has been updated where agreements between supplier and user are needed;
e) requirements of electromagnetic compatibility have been clarified;
f) insulation coordination clause (Clause 5) has improved wording for better clarity and the technical content has an updated coordination to the latest versions of the insulation coordination standards;
g) wording regarding electrical equipment has been improved and made clearer;
h) subclause for fuses has been improved and reworded;
i) requirements have been added for labelling when multiple sources are required to be disconnected;
j) missing requirements for GIS have been reintroduced;
k) subclause regarding ventilation (HVAC) has been improved;
l) figures in Clause 7 have been updated and moved to the corresponding subclause;
m) requirements for transformer installations have been improved including adjustment of editorial typing-errors;
n) clause on protection, automation and auxiliary systems has been restructured and improved;
o) protection against lightning strokes has been extended;
p) clarification of content due to the distinction between erection (and providing electrical safety for the intended use of the electrical power installation) and subsequent activities such as maintenance and repair with safe working procedures;
q) where no provincial, national or regional regulations are available for safe working procedures, an informative guideline is provided in Annex F. This replaces the former parts of Figure 3 in Clause 7.

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

FDIS	Report on voting
99/311/FDIS	99/316/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.

A list of all parts in the IEC 61936 series, published under the general title *Power installations exceeding 1 kV AC and 1,5 kV DC*, can be found on the IEC website.

A document on principles to be observed in the preparation of safety publications regarding high voltage installations is currently under development (IEC TS 61936-0).

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.

The reader's attention is drawn to the fact that Annex G lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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

This part of IEC 61936 contains the minimum requirements for the design, erection, and verification of high voltage power installations greater than 1 kV AC. The rules are intended to provide for the safety of persons, livestock and property against dangers and damage which may arise in the reasonable use of such electrical installations and to provide for the proper functioning of those installations.

There are many provincial, national and regional laws, standards and internal rules dealing with the matter coming within the scope of this document regarding high voltage power installations. These practices have been taken as a basis for this work.

~~This part of IEC 61936 contains the minimum requirements valid for IEC countries and some additional information which ensures an acceptable reliability of an installation and its safe operation.~~

~~The publication of this standard is believed to be a decisive step towards the gradual alignment all over the world of the practices concerning the design and erection of high voltage power installations.~~

This third edition of IEC 61936-1, first published in 2001, follows worldwide feedback to improve clarity. It continues the effort to towards the alignment all over the world of practices concerning the design and erection of high voltage power installations.

Particular requirements for transmission and distribution installations, as well as particular requirements for power generation and industrial installations, are included in this document.

~~The relevant laws or regulations of an authority having jurisdiction takes precedence.~~

While national standards and regulations take precedence, jurisdictions may elect to adopt the requirements of this document.

POWER INSTALLATIONS EXCEEDING 1 kV AC AND 1,5 kV DC –

Part 1: ~~Common rules~~ AC

1 Scope

This part of IEC 61936 provides ~~common rules~~ requirements for the design and the erection of electrical power installations in systems with nominal voltages ~~above~~ exceeding 1 kV AC and nominal frequency up to and including 60 Hz, so as to provide safety and proper functioning for the use intended.

For the purpose of interpreting this document, an electrical power installation is considered to be one of the following:

a) substation, including substation for railway power supply;

b) electrical power installations on mast, pole and tower, switchgear and/or transformers located outside a closed electrical operating area;

c) one (or more) power station(s) located on a single site, the electrical power installation includes generators and transformers with all associated switchgear and all electrical auxiliary systems. Connections between generating stations located on different sites are excluded;

d) the electrical system of a factory, industrial plant or other industrial, agricultural, commercial or public premises;

e) electrical power installations ~~erected~~ on offshore ~~platforms~~ facilities for the purpose of generation, transmission, distribution and/or storage of electricity ~~e.g. offshore wind power farms~~; **1**

f) transition towers/poles (between overhead lines and underground lines). **2**

The electrical power installation includes, among others, the following equipment:

– rotating electrical machines;
– switchgear;
– transformers and reactors;
– converters;
– cables;
– wiring systems;
– batteries;
– capacitors;
– earthing systems;
– buildings and fences which are part of a closed electrical operating area;
– associated protection, control and auxiliary systems;
– large air core reactor.

NOTE 1 In general, ~~a standard for an item of~~ equipment standards take precedence over the requirements of this document.

This document does not apply to the design and erection of any of the following:

– overhead and underground lines between separate electrical power installations;

– ~~electric~~ electrified railway tracks and rolling stock; **3**
– mining equipment and installations;
– fluorescent lamp installations;
– installations on ships according to IEC 60092 (all parts) and offshore units according to IEC 61892 (all parts), which are used in the offshore petroleum industry for drilling, processing and storage purposes;
– electrostatic equipment (e.g. electrostatic precipitators, spray-painting units);
– test sites;
– medical equipment, e.g. medical X-ray equipment.

This document does not apply to the design of prefabricated, type-tested switchgear and high voltage/low voltage prefabricated substation, for which separate IEC standards exist.

NOTE 2 The scope of this document does not ~~apply to~~ include the requirements for carrying out live working on electrical power installations. **4**

NOTE 3 The scope of this document considers safety requirements for HV installations and the influences of HV installations on LV installations. ~~If not otherwise required in this standard,~~ For ~~low voltage~~ electrical installations up to 1 kV, IEC 60364 (all parts) applies.

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 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

~~IEC 60034-3, *Rotating electrical machines – Part 3: Specific requirements for synchronous generators driven by steam turbines or combustion gas turbines*~~

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

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

IEC 60071-2~~:1996~~, *Insulation co-ordination – Part 2: Application guidelines*

IEC 60076 (all parts), *Power transformers*

~~IEC 60076-2:1993, *Power transformers – Part 2: Temperature rise*~~

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

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-10-2, *Explosive atmospheres – Part 10-2: Classification of areas – ~~Combustible~~ Explosive dust atmospheres*

IEC 60255 (all parts), *Measuring relays and protection equipment*

IEC 60331-1, *Tests for electric cables under fire conditions – Circuit integrity – Part 1: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm*

IEC 60331-21, *Tests for electric cables under fire conditions – Circuit integrity – Part 21: Procedures and requirements – Cables of rated voltage up to and including 0,6/1,0 kV*

IEC 60332 (all parts), *Tests on electric and optical fibre cables under fire conditions*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC~~/TS~~ 60479-1:~~2005~~2018, *Effects of current on human beings and livestock – Part 1: General aspects*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

~~IEC 60617, *Graphical symbols for diagrams*~~

~~IEC 60721-2-6, *Classification of environmental conditions – Part 2-6: Environmental conditions appearing in nature – Earthquake vibration and shock*~~

~~IEC 60721-2-7, *Classification of environmental conditions – Part 2-7: Environmental conditions appearing in nature. Fauna and flora*~~

IEC 60754 (all parts), *Test on gases evolved during combustion of materials from cables*

~~IEC 60754-1, *Test on gases evolved during combustion of materials from cables – Part 1: Determination of the amount of halogen acid gas*~~

~~IEC 60754-2, *Test on gases evolved during combustion of electric cables – Part 2: Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity*~~

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

IEC TS 60815-2, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 2: Ceramic and glass insulators for a.c. systems*

IEC TS 60815-3, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 3: Polymer insulators for a.c. systems*

~~IEC 60826, *Design criteria of overhead transmission lines*~~

~~IEC 60865-1, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*~~

~~IEC 60909 (all parts), *Short-circuit currents in three-phase a.c. systems*~~

~~IEC 60949, *Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effects*~~

IEC TR 61000-5-2, *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 2: Earthing and cabling*

IEC 61034-1, *Measurement of smoke density of cables burning under defined conditions – Part 1: Test apparatus*

~~IEC 61082-1, *Preparation of documents used in electrotechnology – Part 1: Rules*~~

~~IEC 61100, *Classification of insulating liquids according of fire-point and net calorific value*~~

~~IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*~~

IEC 61219, *Live working – Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device – Lance earthing*

IEC 61230, *Live working – Portable equipment for earthing or earthing and short-circuiting*

~~IEC 61243 (all parts), *Live working – Voltage detectors*~~

IEC TS 61463, *Bushings – Seismic qualification*

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

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

IEC 62271-203, *High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV*

~~IEC 62271-206, *High-voltage switchgear and controlgear – Part 206: Voltage presence indicating systems for rated voltages above 1 kV and up to and including 52 kV*~~

IEC 62271-207, *High-voltage switchgear and controlgear – Part 207: Seismic qualification for gas-insulated switchgear assemblies for rated voltages above 52 kV*

IEC TR 62271-300, *High-voltage switchgear and controlgear – Part 300: Seismic qualification of alternating current circuit-breakers*

~~IEC/TR 62271-303, *High-voltage switchgear and controlgear – Part 303: Use and handling of sulphur hexafluoride (SF_6)*~~

IEC 62305 (all parts), *Protection against lightning*

~~IEC 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures*~~

~~IEC 82079-1, *Preparation of instructions for use – Structuring, content and presentation – Part 1: General principles and detailed requirements*~~

IEC/IEEE 82079-1, *Preparation of information for use (instructions for use) of products – Part 1: Principles and general requirements*

~~IEC Guide 107, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications*~~

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

~~ISO 1996-1, *Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures*~~

~~IEEE 80, *Guide for safety in AC substation grounding*~~

~~IEEE 980, *Guide for containment and control of oil spills in substations*~~

~~Official Journal of the European Communities, No. C 62/23 dated 28.2.1994: *Interpretative document, Essential requirements No. 2, "safety in case of fire"*~~

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Power installations exceeding 1 kV AC and 1,5 kV DC – Part 1: AC

Installations électriques de puissance de tension supérieure à 1 kV en courant alternatif et 1,5 kV en courant continu – Partie 1: Courant alternatif



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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POWER INSTALLATIONS EXCEEDING 1 kV AC AND 1,5 kV DC –

Part 1: AC

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International Standard IEC 61936-1 has been prepared by IEC technical committee 99: Insulation co-ordination and system engineering of high voltage electrical power installations above 1,0 kV AC and 1,5 kV DC.

This third edition cancels and replaces the second edition published in 2010 and Amendment 1:2014. This edition constitutes a technical revision.

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

a) introduction has been rewritten to reflect the status when this document is produced;
b) the scope has been improved to clarify the application of this document;
c) missing and obsolete terms and definitions have been updated including improvement of existing terms;
d) Table 1 has been updated where agreements between supplier and user are needed;
e) requirements of electromagnetic compatibility have been clarified;

f) insulation coordination clause (Clause 5) has improved wording for better clarity and the technical content has an updated coordination to the latest versions of the insulation coordination standards;

g) wording regarding electrical equipment has been improved and made clearer;

h) subclause for fuses has been improved and reworded;

i) requirements have been added for labelling when multiple sources are required to be disconnected;

j) missing requirements for GIS have been reintroduced;

k) subclause regarding ventilation (HVAC) has been improved;

l) figures in Clause 7 have been updated and moved to the corresponding subclause;

m) requirements for transformer installations have been improved including adjustment of editorial typing-errors;

n) clause on protection, automation and auxiliary systems has been restructured and improved;

o) protection against lightning strokes has been extended;

p) clarification of content due to the distinction between erection (and providing electrical safety for the intended use of the electrical power installation) and subsequent activities such as maintenance and repair with safe working procedures;

q) where no provincial, national or regional regulations are available for safe working procedures, an informative guideline is provided in Annex F. This replaces the former parts of Figure 3 in Clause 7.

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

FDIS	Report on voting
99/311/FDIS	99/316/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.

A list of all parts in the IEC 61936 series, published under the general title *Power installations exceeding 1 kV AC and 1,5 kV DC*, can be found on the IEC website.

A document on principles to be observed in the preparation of safety publications regarding high voltage installations is currently under development (IEC TS 61936-0).

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.

The reader's attention is drawn to the fact that Annex G lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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

This part of IEC 61936 contains the minimum requirements for the design, erection, and verification of high voltage power installations greater than 1 kV AC. The rules are intended to provide for the safety of persons, livestock and property against dangers and damage which may arise in the reasonable use of such electrical installations and to provide for the proper functioning of those installations.

There are many provincial, national and regional laws, standards and internal rules dealing with the matter coming within the scope of this document regarding high voltage power installations. These practices have been taken as a basis for this work.

This third edition of IEC 61936-1, first published in 2001, follows worldwide feedback to improve clarity. It continues the effort to towards the alignment all over the world of practices concerning the design and erection of high voltage power installations.

Particular requirements for transmission and distribution installations, as well as particular requirements for power generation and industrial installations, are included in this document.

While national standards and regulations take precedence, jurisdictions may elect to adopt the requirements of this document.

POWER INSTALLATIONS EXCEEDING 1 kV AC AND 1,5 kV DC –

Part 1: AC

1 Scope

This part of IEC 61936 provides requirements for the design and the erection of electrical power installations in systems with nominal voltages exceeding 1 kV AC and nominal frequency up to and including 60 Hz, so as to provide safety and proper functioning for the use intended.

For the purpose of interpreting this document, an electrical power installation is considered to be one of the following:

a) substation, including substation for railway power supply;

b) electrical power installations on mast, pole and tower, switchgear and/or transformers located outside a closed electrical operating area;

c) one (or more) power station(s) located on a single site, the electrical power installation includes generators and transformers with all associated switchgear and all electrical auxiliary systems. Connections between generating stations located on different sites are excluded;

d) the electrical system of a factory, industrial plant or other industrial, agricultural, commercial or public premises;

e) electrical power installations on offshore facilities for the purpose of generation, transmission, distribution and/or storage of electricity;

f) transition towers/poles (between overhead lines and underground lines).

The electrical power installation includes, among others, the following equipment:

– rotating electrical machines;
– switchgear;
– transformers and reactors;
– converters;
– cables;
– wiring systems;
– batteries;
– capacitors;
– earthing systems;
– buildings and fences which are part of a closed electrical operating area;
– associated protection, control and auxiliary systems;
– large air core reactor.

NOTE 1 In general, equipment standards take precedence over the requirements of this document.

This document does not apply to the design and erection of any of the following:

– overhead and underground lines between separate electrical power installations;
– electrified railway tracks and rolling stock;
– mining equipment and installations;

– fluorescent lamp installations;
– installations on ships according to IEC 60092 (all parts) and offshore units according to IEC 61892 (all parts), which are used in the offshore petroleum industry for drilling, processing and storage purposes;
– electrostatic equipment (e.g. electrostatic precipitators, spray-painting units);
– test sites;
– medical equipment, e.g. medical X-ray equipment.

This document does not apply to the design of prefabricated, type-tested switchgear and high voltage/low voltage prefabricated substation, for which separate IEC standards exist.

NOTE 2 The scope of this document does not include the requirements for carrying out live working on electrical power installations.

NOTE 3 The scope of this document considers safety requirements for HV installations and the influences of HV installations on LV installations. For electrical installations up to 1 kV, IEC 60364 (all parts) applies.

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 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

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

IEC 60071-2, *Insulation co-ordination – Part 2: Application guidelines*

IEC 60076 (all parts), *Power transformers*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-10-2, *Explosive atmospheres – Part 10-2: Classification of areas – Explosive dust atmospheres*

IEC 60255 (all parts), *Measuring relays and protection equipment*

IEC 60331-1, *Tests for electric cables under fire conditions – Circuit integrity – Part 1: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm*

IEC 60331-21, *Tests for electric cables under fire conditions – Circuit integrity – Part 21: Procedures and requirements – Cables of rated voltage up to and including 0,6/1,0 kV*

IEC 60332 (all parts), *Tests on electric and optical fibre cables under fire conditions*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60479-1:2018, *Effects of current on human beings and livestock – Part 1: General aspects*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60754 (all parts), *Test on gases evolved during combustion of materials from cables*

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

IEC TS 60815-2, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 2: Ceramic and glass insulators for a.c. systems*

IEC TS 60815-3, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 3: Polymer insulators for a.c. systems*

IEC TR 61000-5-2, *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 2: Earthing and cabling*

IEC 61034-1, *Measurement of smoke density of cables burning under defined conditions – Part 1: Test apparatus*

IEC 61219, *Live working – Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device – Lance earthing*

IEC 61230, *Live working – Portable equipment for earthing or earthing and short-circuiting*

IEC TS 61463, *Bushings – Seismic qualification*

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

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

IEC 62271-203, *High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV*

IEC 62271-207, *High-voltage switchgear and controlgear – Part 207: Seismic qualification for gas-insulated switchgear assemblies for rated voltages above 52 kV*

IEC TR 62271-300, *High-voltage switchgear and controlgear – Part 300: Seismic qualification of alternating current circuit-breakers*

IEC 62305 (all parts), *Protection against lightning*

IEC/IEEE 82079-1, *Preparation of information for use (instructions for use) of products – Part 1: Principles and general requirements*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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INSTALLATIONS ÉLECTRIQUES DE PUISSANCE DE TENSION SUPÉRIEURE À 1 kV EN COURANT ALTERNATIF ET 1,5 kV EN COURANT CONTINU –

Partie 1: Courant alternatif

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La Norme internationale IEC 61936-1 a été établie par le sous-comité 99 de l'IEC: Installations électriques de tension supérieure à 1,0 kV en courant alternatif et 1,5 kV en courant continu: Coordination de l'isolement et conception.

Cette troisième édition annule et remplace la deuxième édition parue en 2010 et l'Amendement 1:2014. Cette édition constitue une révision technique.

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

a) l'introduction a été remaniée pour refléter la réalité au moment de la rédaction du présent document;
b) le domaine d'application a été amélioré pour clarifier l'application du présent document;

c) les termes et définitions manquants et obsolètes ont été mis à jour, et les termes existants ont été améliorés;

d) le Tableau 1 a été mis à jour pour tenir compte des situations qui nécessitent des accords entre le fournisseur et l'utilisateur;

e) les exigences en matière de compatibilité électromagnétique ont été clarifiées;

f) la formulation de l'Article 5) relatif à la coordination de l'isolement a été améliorée et la coordination de son contenu technique avec les dernières versions des normes de coordination de l'isolement a été mise à jour;

g) la formulation concernant les matériels électriques a été améliorée et clarifiée;

h) le paragraphe relatif aux fusibles a été amélioré et reformulé;

i) des exigences en matière d'étiquetage ont été introduites lorsque des sources multiples doivent être déconnectées;

j) les exigences manquantes pour les postes sous enveloppe métallique (PSEM) ont été réintroduites;

k) amélioration du paragraphe relatif à la ventilation (CVC, chauffage, ventilation et climatisation);

l) mise à jour des chiffres dans l'Article 7 et leur déplacement vers le paragraphe correspondant;

m) les exigences relatives aux installations de transformateurs ont été améliorées, et les fautes de frappe ont été corrigées;

n) restructuration et amélioration de l'article relatif aux systèmes de protection, d'automatisation et auxiliaires;

o) la protection contre les coups de foudre a été étendue;

p) clarification du contenu en raison de la distinction entre les activités de montage (et l'assurance de la sécurité électrique pour l'utilisation prévue de l'installation électrique) et les activités consécutives (par exemple, la maintenance et la réparation) avec des procédures de travail sûres;

q) présence d'une ligne directrice informative dans l'Annexe F en l'absence de réglementation locale, nationale ou régionale sur les procédures de travail sûres. Cette modification se substitue aux anciennes parties de la Figure 3 à l'Article 7.

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

FDIS	Rapport de vote
99/311/FDIS	99/316/RVD

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

La version française de cette norme n'a pas été soumise au vote.

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.

Une liste de toutes les parties de la série IEC 61936, publiées sous le titre général *Installations électriques de puissance de tension supérieure à 1 kV en courant alternatif et 1,5 kv en courant continu*, peut être consultée sur le site web de l'IEC.

Un document portant sur les principes à respecter dans l'élaboration des publications de sécurité concernant les installations à haute tension est actuellement en cours de rédaction (IEC TS 61936-0).

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.

L'attention du lecteur est attirée sur le fait que l'Annexe G énumère tous les articles traitant des différences à caractère moins permanent inhérentes à certains pays, concernant le sujet du présent document.

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

La présente partie de l'IEC 61936 contient les exigences minimales pour la conception, le montage et la vérification des installations électriques à haute tension supérieure à 1 kV en courant alternatif. Les règles visent à assurer la sécurité des personnes, du bétail et des biens contre les dangers et dommages qui peuvent survenir lors de l'utilisation raisonnable de ces installations électriques et à assurer le bon fonctionnement de ces installations.

Il existe de nombreuses lois locales, nationales et régionales, normes et règles internes qui traitent du sujet relevant du domaine d'application du présent document et concernant les installations électriques à haute tension. Ces pratiques ont été prises en compte lors des travaux.

Cette troisième édition de l'IEC 61936-1, parue pour la première fois en 2001, fait suite à des commentaires à l'échelon mondial qui visent à améliorer la clarté de la norme. Elle poursuit l'effort de mise en cohérence au niveau mondial des pratiques relatives à la conception et au montage des installations électriques à haute tension.

Des exigences particulières pour les installations de transport et de distribution, ainsi que pour les centrales de production et les installations industrielles sont incluses dans le présent document.

Les autorités compétentes peuvent choisir d'adopter les exigences de la présente norme bien que les normes et réglementations nationales prévalent.

INSTALLATIONS ÉLECTRIQUES DE PUISSANCE DE TENSION SUPÉRIEURE À 1 kV EN COURANT ALTERNATIF ET 1,5 kV EN COURANT CONTINU –

Partie 1: Courant alternatif

1 Domaine d'application

La présente partie de l'IEC 61936 fournit des exigences relatives à la conception et au montage des installations électriques dans des systèmes dont les tensions nominales sont supérieures à 1 kV en courant alternatif et la fréquence nominale inférieure ou égale à 60 Hz, afin d'assurer la sécurité et le fonctionnement correct pour l'utilisation prévue.

Pour les besoins d'interprétation du présent document, une installation électrique est considérée comme l'une des suivantes:

a) poste, y compris poste pour alimentation de réseaux ferroviaires;

b) installations électriques sur mât, pylône et tour, appareillage et/ou transformateurs situés à l'extérieur d'une installation électrique fermée;

c) une ou plusieurs centrales électriques placées dans un site unique, l'installation électrique comprend les générateurs et les transformateurs avec tout l'appareillage et tous les auxiliaires électriques associés. Les liaisons entre les centrales situées sur des sites différents sont exclues;

d) le réseau électrique d'une usine, installation industrielle ou autres locaux industriels, agricoles, commerciaux ou publics;

e) les installations électriques mises en œuvre sur des plates-formes offshore, pour la production, le transport, la distribution et/ou le stockage de l'énergie électrique; et

f) les tours/pôles de transition (entre les lignes aériennes et souterraines).

L'installation électrique comprend notamment les matériels suivants:

– machines électriques tournantes;
– appareillage;
– transformateurs et réactances;
– convertisseurs;
– câbles;
– canalisations électriques;
– batteries;
– condensateurs;
– installations de mise à la terre;
– bâtiments et clôtures qui font partie d'une installation électrique fermée;
– systèmes associés de protection, de commande et auxiliaires;
– réactance élevée à noyau d'air.

NOTE 1 En règle générale, les normes de matériels prévalent sur les exigences du présent document.

Le présent document ne s'applique pas à la conception et au montage des éléments suivants:

– lignes aériennes et souterraines entre différentes installations électriques;
– lignes de chemin de fer électriques et matériel roulant;

– matériels et installations de mine;
– installations d'éclairages fluorescents;
– installations sur les bateaux conformément à l'IEC 60092 (toutes les parties) et les unités offshore conformément à l'IEC 61892 (toutes les parties) qui sont utilisées dans l'industrie pétrolière offshore à des fins de forage, de traitement et de stockage;
– matériels électrostatiques (par exemple, précipitateurs électrostatiques, cabines de peinture);
– sites d'essai;
– matériel médical, par exemple, matériel à rayons X.

Le présent document ne s'applique pas à la conception des appareillages préfabriqués soumis à un essai de type et des postes préfabriqués à haute tension/basse tension, pour lesquels des normes IEC spécifiques existent.

NOTE 2 Les exigences relatives aux travaux effectués sous tension sur des installations électriques ne relèvent pas du domaine d'application du présent document.

NOTE 3 Le domaine d'application du présent document inclut les exigences de sécurité relatives aux installations électriques HT, et leurs influences sur les installations BT. Pour les installations électriques jusqu'à 1 kV, l'IEC 60364 (toutes les parties) s'applique.

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 60034-1, *Machines électriques tournantes – Partie 1: Caractéristiques assignées et caractéristiques de fonctionnement*

IEC 60060-1, *Techniques des essais à haute tension – Partie 1: Définitions et exigences générales*

IEC 60071-1:2019, *Coordination de l'isolement – Partie 1: Définitions, principes et règles*

IEC 60071-2, *Coordination de l'isolement – Partie 2: Lignes directrices en matière d'application*

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

IEC 60079-0, *Atmosphères explosives – Partie 0: Appareils – Exigences générales*

IEC 60079-10-1, *Atmosphères explosives – Partie 10-1: Classement des emplacements – Atmosphères explosives gazeuses*

IEC 60079-10-2, *Atmosphères explosives – Partie 10-2: Classement des emplacements – Atmosphères explosives poussiéreuses*

IEC 60255 (toutes les parties), *Relais de mesure et dispositifs de protection*

IEC 60331-1, *Essais pour câbles électriques soumis au feu – Intégrité des circuits – Partie 1: Méthode d'essai au feu avec chocs pour les câbles de tension assignée au plus égale à 0,6/1,0 kV et de diamètre externe supérieur à 20 mm, à une température d'au moins 830 °C*

IEC 60331-21, *Essais de câbles électriques soumis au feu – Intégrité des circuits – Partie 21: Procédures et prescriptions – Câbles de tension assignée jusque et y compris 0,6/1,0 kV*

IEC 60332 (toutes les parties), *Essais des câbles électriques et à fibres optiques soumis au feu*

IEC 60364 (toutes les parties), *Installations électriques à basse tension*

IEC 60479-1:2018, *Effects of current on human beings and livestock – Part 1: General aspects* (disponible en anglais seulement)

IEC 60529, *Degrés de protection procurés par les enveloppes (Code IP)*

IEC 60754 (toutes les parties), *Essai sur les gaz émis lors de la combustion des matériaux prélevés sur câbles*

IEC TS 60815-1, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles* (disponible en anglais seulement)

IEC TS 60815-2, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 2: Ceramic and glass insulators for a.c. systems* (disponible en anglais seulement)

IEC TS 60815-3, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 3: Polymer insulators for a.c. Systems* (disponible en anglais seulement)

IEC TR 61000-5-2, *Compatibilité électromagnétique (CEM) – Partie 5: Guides d'installation et d'atténuation – Section 2: Mise à la terre et câblage*

IEC 61034-1, *Mesure de la densité de fumées dégagées par des câbles brûlant dans des conditions définies – Partie 1: Appareillage d'essai*

IEC 61219, *Travaux sous tension – Appareil de mise à la terre ou de mise à la terre et en court-circuit utilisant des cannes comme dispositif de mise en court-circuit – Mise à la terre au moyen de cannes*

IEC 61230, *Travaux sous tension – Équipements portables de mise à la terre ou de mise à la terre et en court-circuit*

IEC TS 61463, *Bushings – Seismic qualification* (disponible en anglais seulement)

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

IEC 62271-200, *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, *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, *Appareillage à haute tension – Partie 202: Postes préfabriqués haute tension/basse tension*

IEC 62271-203, *Appareillage à haute tension – Partie 203: Appareillage sous enveloppe métallique à isolation gazeuse de tensions assignées supérieures à 52 kV*

IEC 62271-207, *Appareillage à haute tension – Partie 207: Qualification sismique pour ensembles d'appareillages à isolation gazeuse pour des niveaux de tension assignée supérieurs à 52 kV*

IEC TR 62271-300, *Appareillage à haute tension – Partie 300: Qualification sismique des disjoncteurs à courant alternatif*

IEC 62305 (toutes les parties), *Protection contre la foudre*

IEC IEEE 82079-1, *Élaboration des informations d'utilisation (Instructions d'utilisation) des produits – Partie 1: Principes et exigences générales*