

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Power installations exceeding 1 kV AC and 1,5 kV DC –
Part 1: AC
(standards.iteh.ai)

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

<https://standards.iteh.ai/catalog/standards/sist/65d032b9-46e5-44ef-8209-94436d1de561/iec-61936-1-2021>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC online collection - oc.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

(standards.iteh.ai)

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.020; 29.080.01

ISBN 978-2-8322-9887-9

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	11
1 Scope.....	12
2 Normative references	13
3 Terms and definitions	15
3.1 General definitions.....	15
3.2 Definitions concerning electrical power installations.....	17
3.3 Definitions concerning types of electrical power installations.....	18
3.4 Definitions concerning safety measures against electric shock.....	18
3.5 Definitions concerning clearances.....	19
3.6 Definitions concerning control and protection	21
3.7 Definitions concerning earthing	21
4 Fundamental requirements	25
4.1 General.....	25
4.1.1 General requirements	25
4.1.2 Agreements between supplier and user	26
4.2 Electrical requirements	28
4.2.1 Methods of neutral earthing.....	28
4.2.2 Voltage classification.....	28
4.2.3 Current in normal operation	28
4.2.4 Short-circuit current.....	28
4.2.5 Rated frequency.....	29
4.2.6 Corona	29
4.2.7 Electric and magnetic fields	29
4.2.8 Overvoltages	30
4.2.9 Harmonics	30
4.2.10 Electromagnetic compatibility	30
4.3 Mechanical requirements	30
4.3.1 General	30
4.3.2 Tension load.....	31
4.3.3 Erection load	31
4.3.4 Ice load	31
4.3.5 Wind load	31
4.3.6 Switching forces	31
4.3.7 Short-circuit forces	31
4.3.8 Loss of conductor tension.....	31
4.3.9 Seismic loads	31
4.3.10 Dimensioning of structures	32
4.4 Climatic and environmental conditions	32
4.4.1 General	32
4.4.2 Normal conditions.....	32
4.4.3 Special conditions	34
4.5 Particular requirements.....	35
4.5.1 Effects of small animals and micro-organisms.....	35
4.5.2 Noise level.....	35
4.5.3 Transport.....	35

5	Insulation.....	35
5.1	General.....	35
5.2	Selection of insulation level.....	36
5.2.1	General	36
5.2.2	Consideration of methods of neutral earthing.....	36
5.2.3	Consideration of rated withstand voltages.....	36
5.3	Verification of withstand values.....	36
5.4	Minimum clearances of live parts	37
5.4.1	General	37
5.4.2	Minimum clearances in voltage range I	37
5.4.3	Minimum clearances in voltage range II	37
5.5	Minimum clearances between parts under special conditions.....	40
5.6	Tested connection zones	40
6	Electrical equipment	40
6.1	General requirements	40
6.1.1	Electrical equipment safety.....	40
6.1.2	User safety	40
6.2	Specific requirements	41
6.2.1	Switching devices	41
6.2.2	Power transformers and reactors.....	41
6.2.3	Prefabricated type-tested switchgear.....	42
6.2.4	Instrument transformers.....	42
6.2.5	Surge arresters.....	43
6.2.6	Capacitors	43
6.2.7	Line traps.....	44
6.2.8	Insulators	44
6.2.9	Insulated cables	44
6.2.10	Conductors and accessories.....	47
6.2.11	Rotating electrical machines.....	47
6.2.12	Generating units	48
6.2.13	Generating unit main connections.....	48
6.2.14	Static converters.....	48
6.2.15	Fuses	49
6.2.16	Electrical and mechanical interlocking	49
7	Electrical power installations	49
7.1	General.....	49
7.1.1	Common requirements.....	49
7.1.2	Circuit arrangement	50
7.1.3	Documentation	51
7.1.4	Transport routes	51
7.1.5	Aisles and access areas	52
7.1.6	Lighting	53
7.1.7	Operational safety	53
7.1.8	Labelling.....	53
7.2	Outdoor electrical power installations of open design.....	53
7.2.1	General	53
7.2.2	Protective barrier clearances	54
7.2.3	Protective obstacle clearances	54
7.2.4	Boundary clearances	55

7.2.5	Minimum height over access area	56
7.2.6	Clearances to buildings	57
7.2.7	External fences or walls and access doors	59
7.3	Indoor electrical power installations of open design	59
7.4	Installation of prefabricated type-tested switchgear	60
7.4.1	General	60
7.4.2	Additional requirements for gas-insulated metal-enclosed switchgear	60
7.5	Requirements for buildings	62
7.5.1	General	62
7.5.2	Structural provisions	62
7.5.3	Rooms for switchgear	63
7.5.4	Maintenance and operating areas	63
7.5.5	Doors	63
7.5.6	Draining of insulating liquids	64
7.5.7	Heating, ventilation and air conditioning (HVAC)	64
7.5.8	Buildings which require special consideration	65
7.6	High voltage/low voltage prefabricated substations	65
7.7	Electrical power installations on mast, pole and tower	65
8	Safety measures	65
8.1	General	65
8.2	Protection against direct contact	66
8.2.1	General	66
8.2.2	Measures for protection against direct contact	66
8.2.3	Protection requirements	67
8.3	Means to protect persons in case of indirect contact	68
8.4	Means to protect persons working on or near electrical power installations	68
8.4.1	General	68
8.4.2	Electrical equipment for isolating installations or apparatus	68
8.4.3	Devices to prevent reclosing of isolating devices	69
8.4.4	Devices for determining the de-energized state	69
8.4.5	Devices for earthing and short-circuiting	69
8.4.6	Equipment acting as protective barriers against adjacent live parts	70
8.4.7	Storage of personal protection equipment	71
8.5	Protection from danger resulting from arc fault	71
8.6	Protection against direct lightning strokes	71
8.7	Protection against fire	72
8.7.1	General	72
8.7.2	Transformers, reactors	73
8.7.3	Cables	79
8.7.4	Other equipment with flammable liquid	79
8.8	Protection against leakage of insulating liquid and SF ₆	80
8.8.1	Insulating liquid leakage and subsoil water protection	80
8.8.2	SF ₆ leakage	82
8.8.3	Failure with loss of SF ₆ and its decomposition products	83
8.9	Identification and marking	83
8.9.1	General	83
8.9.2	Information plates and warning plates	84
8.9.3	Electrical hazard warning	84

8.9.4	Electrical power installations with incorporated capacitors	84
8.9.5	Emergency signs for emergency exits.....	84
8.9.6	Cable identification marks.....	84
9	Protection, automation and auxiliary systems	84
9.1	Protection systems.....	84
9.2	Automation systems.....	85
9.3	Auxiliary systems	86
9.3.1	AC and DC supply circuits	86
9.3.2	Compressed air systems.....	87
9.3.3	SF ₆ gas handling plants	88
9.3.4	Hydrogen handling plants	88
9.4	Basic rules for electromagnetic compatibility of control systems.....	88
9.4.1	General	88
9.4.2	Electrical noise sources in electrical power installations	89
9.4.3	Measures to be taken to reduce the effects of high frequency interference	89
9.4.4	Measures to be taken to reduce the effects of low frequency interference	89
9.4.5	Measures related to the selection of electrical equipment	90
9.4.6	Other possible measures to reduce the effects of interference	91
10	Earthing systems.....	91
10.1	General.....	91
10.2	Fundamental requirements.....	91
10.2.1	Safety criteria	91
10.2.2	Functional requirements.....	92
10.2.3	High and low voltage earthing systems.....	92
10.3	Design of earthing systems	93
10.3.1	General	93
10.3.2	Power system faults.....	94
10.3.3	Lightning and transient overvoltages.....	94
10.4	Construction work on earthing systems	95
10.5	Measurements	95
10.6	Maintainability.....	95
10.6.1	Inspections	95
10.6.2	Measurements.....	95
11	Inspection and testing.....	96
11.1	General.....	96
11.2	Verification of specified performances.....	96
11.3	Tests during installation and commissioning	97
11.4	Trial running	97
12	Operation and maintenance manual	97
Annex A (informative) Values of rated insulation levels and minimum clearances based on current practice in some countries		98
Annex B (normative) Method of calculating permissible touch voltages		101
Annex C (normative) Permissible touch voltage according to IEEE 80.....		102
Annex D (normative) Earthing system design flow chart.....		103

Annex E (informative) Protection measures against direct lightning strokes	104
E.1 General.....	104
E.2 Shield wires	104
E.3 Lightning rods	104
Annex F (informative) Considerations of design for safe working	107
Annex G (informative) List of notes concerning particular conditions in certain countries.....	109
Bibliography.....	115
Figure 1 – Minimum approach distance for transport within closed electrical operating areas	52
Figure 2 – Protection against direct contact by protective barriers or protective obstacles within closed electrical operating areas	55
Figure 3 – Boundary distances and minimum height at the external fence/wall.....	56
Figure 4 – Minimum heights within closed electrical operating areas.....	57
Figure 5 – Approaches with buildings within closed electrical operating areas	58
Figure 6 – Separating walls between transformers	75
Figure 7 – Fire protection between transformer and building	77
Figure 8 – Example for small transformers without gravel layer and catchment tank	80
Figure 9 – Sump with integrated catchment tank	81
Figure 10 – Sump with separate catchment tank	82
Figure 11 – Sump with integrated common catchment tank.....	82
Figure 12 – Permissible touch voltage U_{Tp}	95
Figure C.1 – Permissible touch voltage U_{Tp} according to IEEE 80	102
Figure E.1 – Single shield wire.....	105
Figure E.2 – Two shield wires	105
Figure E.3 – Single lightning rod	106
Figure E.4 – Two lightning rods	106
Figure F.1 – Working clearances within closed electrical operating areas	108
Table 1 – References to subclauses where agreement between supplier and user is required	27
Table 2 – Minimum clearances in air – Voltage range I ($1 \text{ kV} < U_m \leq 245 \text{ kV}$)	38
Table 3 – Minimum clearances in air – Voltage range II ($U_m > 245 \text{ kV}$).....	39
Table 4 – Guide values for outdoor transformer clearances	74
Table 5 – Minimum requirements for the installation of indoor transformers	78
Table 6 – Minimum requirements for interconnection of low-voltage and high-voltage earthing systems based on EPR limits	93
Table A.1 – Values of rated insulation levels and minimum clearances in air for $1 \text{ kV} < U_m \leq 245 \text{ kV}$ for highest voltage for installation U_m not standardized by the IEC based on current practice in some countries	98
Table A.2 – Values of rated insulation levels and minimum clearances in air for $1 \text{ kV} < U_m \leq 245 \text{ kV}$ for highest voltage for installation U_m not standardized by the IEC based on current practice in some countries	99

Table A.3 – Values of rated insulation levels and minimum clearances in air for $U_m > 245$ kV for highest voltages for installation U_m not standardized by the IEC based on current practice in some countries 100

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 61936-1:2021](https://standards.iteh.ai/catalog/standards/sist/65d032b9-46e5-44ef-8209-94436d1de561/iec-61936-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/65d032b9-46e5-44ef-8209-94436d1de561/iec-61936-1-2021>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POWER INSTALLATIONS EXCEEDING
1 kV AC AND 1,5 kV DC –****Part 1: 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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

<https://standards.itec.org/standards/sist/61936-1-2021/iec-61936-1-2021>

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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 61936-1:2021](https://standards.iteh.ai/catalog/standards/sist/65d032b9-46e5-44ef-8209-94436d1de561/iec-61936-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/65d032b9-46e5-44ef-8209-94436d1de561/iec-61936-1-2021>

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.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[IEC 61936-1:2021](https://standards.iteh.ai/catalog/standards/sist/65d032b9-46e5-44ef-8209-94436d1de561/iec-61936-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/65d032b9-46e5-44ef-8209-94436d1de561/iec-61936-1-2021>

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*