SVENSK STANDARD SS-EN IEC 61936-1

Fastställd	Utgåva	Sida	Ansvarig kommitté
2022-04-20	2	1 (1+123)	SEK TK 99

Starkströmsanläggningar med nominell spänning överstigande 1 kV AC – Del 1: Jordning

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

Som svensk standard gäller europastandarden EN IEC 61936-1:2021. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 61936-1:2021.

Nationellt förord

Europastandarden EN IEC 61936-1:2021

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
– **IEC 61936-1, Third edition, 2021 - Power installations exceeding 1 kV AC and 1,5 kV DC – Part 1: AC**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 61936-1, utgåva 1, 2011(sv),
SS-EN 61936-1, utgåva 1, 2011(en) med ändringarna SS-EN 61936-1 AC1:2012,
SS-EN 61936-1 AC2:2013, SS-EN 61936-1/R1:2014 och SS-EN 61936-1/A1:2014,
gäller ej fr o m 2024-08-11.

ICS 29.020.00; 29.080.01

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61936-1

August 2021

ICS 29.020; 29.080.01

Supersedes EN 61936-1:2010 and all of its amendments and corrigenda (if any)

English Version

Power installations exceeding 1 kV AC and 1,5 kV DC - Part 1: AC (IEC 61936-1:2021)

Installations électriques de puissance de tension supérieure à 1 kV en courant alternatif et 1,5 kV en courant continu - Partie 1: Courant alternatif (IEC 61936-1:2021)

Starkstromanlagen mit Nennwechselspannungen über 1 kV AC und 1,5 kV DC - Teil 1: Wechselstrom (IEC 61936-1:2021)

This European Standard was approved by CENELEC on 2021-08-11. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN IEC 61936-1:2021 E

SEK Svensk Elstandard SS-EN IEC 61936-1, utg 2:2022

European foreword

The text of document 99/311/FDIS, future edition 3 of IEC 61936-1, prepared by IEC/TC 99 “Insulation co-ordination and system engineering of high voltage electrical power installations above 1,0 kV AC and 1,5 kV DC” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61936-1:2021.

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) 2022–05–11
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024–08–11

This document supersedes EN 61936-1:2010 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users’ national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61936-1:2021 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 60034-3	NOTE	Harmonized as EN IEC 60034-3
IEC 60038	NOTE	Harmonized as EN 60038
IEC 60068 (series)	NOTE	Harmonized as EN 60068 (series)
IEC 60076-13	NOTE	Harmonized as EN 60076-13
IEC 60092 (series)	NOTE	Harmonized as EN 60092 (series)
IEC 60282-1	NOTE	Harmonized as EN IEC 60282-1
IEC 60364-4-41	NOTE	Harmonized as HD 60364-4-41
IEC 60364-7-729	NOTE	Harmonized as HD 60364-7-729
IEC 60376	NOTE	Harmonized as EN IEC 60376
IEC 60480	NOTE	Harmonized as EN IEC 60480
IEC 60664-1	NOTE	Harmonized as EN IEC 60664-1
IEC 60721 (series)	NOTE	Harmonized as EN 60721 (series)
IEC 60721-2-2	NOTE	Harmonized as EN 60721-2-2

IEC 60721-2-3	NOTE	Harmonized as EN 60721-2-3
IEC 60721-2-4	NOTE	Harmonized as EN IEC 60721-2-4
IEC 60721-2-7	NOTE	Harmonized as EN IEC 60721-2-7
IEC 60721-3-1	NOTE	Harmonized as EN IEC 60721-3-1
IEC 60721-3-2	NOTE	Harmonized as EN IEC 60721-3-2
IEC 60832 (series)	NOTE	Harmonized as EN 60832 (series)
IEC 60855-1	NOTE	Harmonized as EN 60855-1
IEC 60865-1	NOTE	Harmonized as EN 60865-1
IEC 60909 (series)	NOTE	Harmonized as EN 60909 (series)
IEC 61000 (series)	NOTE	Harmonized as EN IEC 61000 (series)
IEC 61039	NOTE	Harmonized as EN 61039
IEC 61082-1	NOTE	Harmonized as EN 61082-1
IEC 61243 (series)	NOTE	Harmonized as EN 61243 (series)
IEC 61355-1	NOTE	Harmonized as EN 61355-1
IEC 61869 (series)	NOTE	Harmonized as EN IEC 61869 (series)
IEC 62271-4	NOTE	Harmonized as EN 62271-4
IEC 62271-100	NOTE	Harmonized as EN 62271-100
IEC 62271-102	NOTE	Harmonized as EN IEC 62271-102
IEC 62271-103	NOTE	Harmonized as EN 62271-103
IEC 62271-104	NOTE	Harmonized as EN IEC 62271-104
IEC 62271-105	NOTE	Harmonized as EN 62271-105
IEC 62271-206	NOTE	Harmonized as EN 62271-206
IEC 62305 (series)	NOTE	Harmonized as EN 62305 (series)
IEC 81346 (series)	NOTE	Harmonized as EN IEC 81346 (series)
ISO 26800	NOTE	Harmonized as EN ISO 26800

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
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	EN 60060-1	-
IEC 60071-1	2019	Insulation co-ordination - Part 1: Definitions, principles and rules	EN IEC 60071-1	2019
IEC 60071-2	-	Insulation co-ordination – Part 2: Application guidelines	EN IEC 60071-2	-
IEC 60076	series	Power transformers	EN 60076	series
IEC 60079-0	-	Explosive atmospheres - Part 0: Equipment - General requirements	EN IEC 60079-0	-
IEC 60079-10-1	-	Explosive atmospheres - Part 10–1: Classification of areas - Explosive gas atmospheres	EN IEC 60079-10-1	-
IEC 60079-10-2		Explosive atmospheres - Part 10–2: Classification of areas - Explosive dust atmospheres	EN 60079-10-2	
IEC 60255	series	Measuring relays and protection equipment	EN 60255	series
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	EN IEC 60331-1	-
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	series	Tests on electric cables under fire conditions	EN 60332	series

IEC 60364	series	Low-voltage electrical installations	HD 60364	series
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	series	Test on gases evolved during combustion of materials from cables	EN 60754	series
IEC 61034-1	-	Measurement of smoke density of cables burning under defined conditions - Part 1: Test apparatus	EN 61034-1	-
IEC 61219	-	Live working - Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device - Lance earthing	EN 61219	-
IEC 61230	-	Live working - Portable equipment for earthing or earthing and short-circuiting	EN 61230	-
IEC 62271-1	2017	High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear	EN 62271-1	2017
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	EN IEC 62271-200	-
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	EN 62271-201	-
IEC 62271-202	-	High-voltage switchgear and controlgear - Part 202: High-voltage/ low-voltage prefabricated substation	EN 62271-202	-
IEC 62271-203	-	High-voltage switchgear and controlgear - Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	EN 62271-203	-
IEC 62271-207	-	High-voltage switchgear and controlgear - Part 207: Seismic qualification for gas-insulated switchgear assemblies for rated voltages above 52 kV	EN 62271-207	-
IEC 62305	series	Protection against lightning	EN 62305	series
IEC/TR 61000-5-2	-	Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines - Section 2: Earthing and cabling	-	-
IEC/TR 62271-300	-	High-voltage switchgear and controlgear - Part 300: Seismic qualification of alternating current circuit-breakers	-	-
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/TS 61463	-	Bushings - Seismic qualification	-	-
IEC/IEEE 82079-1	-	Preparation of information for use (instructions for use) of products - Part 1: Principles and general requirements	EN IEC/IEEE 82079-1	-

IEC 61936-1

Edition 3.0 2021-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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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

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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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

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*