BSI Standards Publication

# Power installations exceeding 1 kV AC and 1,5 kV DC

Part 1: AC

bsi.

# National foreword

This British Standard is the UK implementation of EN IEC 61936-1:2021+A11:2025. It is derived from IEC 61936-1:2021. It supersedes BS EN IEC 61936-1:2021, which will be withdrawn on 31 December 2028.

The start and finish of text introduced or altered by amendment A11 is indicated in the text by tags. Tags indicating changes to text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A11 is indicated by ⟦A11⟩ ⟨A11⟧.

The UK participation in its preparation was entrusted to Technical Committee PEL/99, Erection and operation of power installations.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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# EUROPÄISCHE NORM

December 2025

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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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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

# 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).

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## 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 60721-2-4 | 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 |

## European foreword to Amendment A11

This document (EN IEC 61936-1:2021/A11:2025) has been prepared by CLC/TC 99X “Power installations exceeding 1 kV a.c. (1,5 kV d.c.)”.

The following dates are fixed:

| | | |
|---|---|---|
| • latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2026-12-31 |
| • latest date by which the national standards conflicting with this document have to be withdrawn | (dow) | 2028-12-31 |

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(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 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 | - | - |

| | | | | |
|---|---|---|---|---|
| | | 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 | - |

# ⟨A11⟩ Annex ZA
(normative)

# Special national conditions

**Special national condition**: National characteristic or practice that cannot be changed even over a long period, e. g. climatic conditions, electrical earthing conditions.

NOTE If it affects harmonization, it forms part of the European Standard.

For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.

| Clause | Special national condition |
|---|---|
| **4.2.4** | **Austria**<br>Values of rated duration of the short-circuit less than 1 s does not apply for electrical power installations design, construction, and erection. |
| **4.3.2** | **Finland**<br>The combinations used in Finland are for example:<br>— – 40 °C without ice and without wind;<br>— – 0 °C with ice and without wind;<br>— – 20 °C with wind.<br>For special projects even value – 50 °C without ice and without wind could be needed. |
| **4.4.2.2 a)** | **Finland**<br>In Finland even class – 50 °C could be needed. |
| **4.4.2.2 g)** | **Ireland**<br>In IE North Atlantic Maritime climatic conditions as per I.S. EN 50341 apply. |
| **6.2.9.6** | **Iceland**<br>Minimum depth of a buried cable is 0,7 m. |
| **7.2.2** | **Finland**<br>Barriers for outdoor installations shall have a minimum height of 2 000 mm. They shall fulfil the same requirements as the external fence. The minimum height of live parts behind a barrier shall be N + 300 mm with a minimum of 800 mm. |
| **7.2.5** | **Finland**<br>The height H for outdoor installations shall be at least H = N + 2 600 mm with a minimum of 2 800 mm. |
| **7.2.5** | **Sweden**<br>The height H for outdoor installations shall be at least H = N + 2 500 mm, with a minimum of 3 000 mm. |
| **7.2.7** | **Finland**<br>The height of the external fence shall be at least 2 000 mm. The local conditions of snow shall be taken into account. |
| **7.2.7** | **Iceland**<br>Minimum height of the external fence is 2 500 mm. |

**7.5.4 Sweden**

Gangways longer than 10 m shall be accessible from both ends. Indoor closed restricted access areas with length exceeding 20 m shall be accessible by doors from both ends.

**7.7 Iceland**

Minimum height H' of live parts above accessible surfaces to the general public shall be H' = 5 500 mm for rated voltages $U_m$ up to 52 kV.

**7.7 Finland**

The minimum height H’ of live parts above surfaces accessible to the general public shall be:

— H’ = 5 500 mm for rated voltages $U_m$ up to 24 kV;

— H’ = N + 5 300 mm (minimum 6 000 mm) for rated voltages $U_m$ above 24 kV.

**9.1 Finland**

Back-up protection for earth fault protection shall be provided according to the national code for high-voltage electrical installations.

**10.3.1 Austria**

In Austria, the design is also complete if UE is less than 2xUTp and the requirements of Table 6 are met. Furthermore, the design is also complete if UE is less than 4xUTp with specified measures M applied and the requirements of Table 6 are met.

Therefore the flowchart of the design process in Annex D is not applicable.

**12 Finland**

In Finland only emergency phone number is required. 〈A11〉

# ⟨A11⟩ Annex ZB
(informative)

# A-deviations

**A-deviation**: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CENELEC national member.

This European Standard does not fall under any Directive/Regulation of the EU.

In the relevant CEN and/or CENELEC countries, these A-deviations are valid instead of the respective provisions of the European Standard until the national situation causing the A-deviation has changed.

| Clause | Special national condition |
|---|---|
| **General** | **France** |

In France many laws and decrees are mandatory for the design, the construction, the verification, and the control of HV installations.

The application of the French safety and legal requirements, mainly driven by the ministry of industry (e.g. arrêté du 17 mai 2001), the ministry of labor (Décrets n° 2010-1017 du 30 août 2010 et 2010-1118 du 22 septembre 2010) and the Technical Reference Documents (DTR) for HV and MV public networks is mandatory in France and they cannot by superseded by the EN, which is providing only general rules.

The additional rules to be compliant with the French legal requirements are covered by three national standards NF C 13-100, NF C 13-200 and NF C 11-201.

EN IEC 61936-1 cannot be used in France as a contracting basis between various players involved in HV installation, since there can be discrepancies with mandatary regulations.

Mandatory rules of conception and installation:

— rules for HV substations interfacing private installation to public grid;

— rules for structural design of HV installations;

— rules concerning neutral systems;

— rules concerning design and construction of a global earthing system;

— rules concerning the protection against direct and indirect contact;

— rules concerning the protection against fire and explosion;

— rules concerning operation on HV installations;

— rules dedicated to the protection against over voltages, under voltages, temporary loss of supply, harmonics;

— rules concerning protection against the noise;

— rules dedicated to HV cables sizing;

— rules for selection, installation and protection of generators, motors and transformers;

— rules for electrical energy measurement according to requirements of grid operators;

— dedicated rules to the data to be exchanged with the grid operator system and associated communication equipment;

— rules for verification and control of HV installations;

— rules for classification of environmental conditions.

Main A-deviations: see appropriate (sub)clause number.

**General** **Spain**

In Spain many laws and regulations are mandatory for the design and the erection of high voltage electrical power installations.

The main additional rules and deviations from EN IEC 61936-1 are covered by the following Royal Decrees:

— Royal Decree (RD) 337/2014, of 9 May 2014, approving the regulation of technical and safety conditions for high-voltage power installations and its supplementary technical instructions ITC-RAT 01 to 23.

— Royal Decree (RD) 223/2008, of 15 February 2008, approving the regulation of technical and safety conditions for high-voltage electrical lines and its supplementary technical instructions ITC-LAT 01 to 09.

— Royal Decree (RD) 614/2001, of 8 June 2001, establishing the minimum health and safety requirements for the protection of workers against electrical risk.

**4.2.4** **Norway**

(Regulation on electrical network and with guide to the regulation. FEF 2006 § 4-3)

One phase to earth fault shall be disconnected as fast as possible and within:

Solid earthed net: 8 s

Resistance earthed net: 30 s

Isolated neutral and resonant earthed net:

Overhead line and mixed cable/aerial network with distribution transformer: 10 s

Overhead line and mixed cable/aerial network without distribution transformer: 120 min

Cable grid (without aerial conductor) with global earthing: 240 min

Net shall be monitored continuously, and the process to find and disconnect the earth fault shall be activated immediately.

**4.2.7** **Norway**

(Regulation on electrical network and with guide to the regulation. FEF 2006 § 2-9)

In private houses, kindergartens and schools maximum 0,4 μT.

**4.3.7** **France**

Short-circuit mechanical stresses are not taken into account for the design of foundations in France. They are considered to be second order effects and covered by other stress limit.

**4.5.2** **France**

According to the French regulation (arrêté technique du 17 mai 2001 – Article 12), in France the noise level is defined and measured in conformity with the French national standard NF S 31-010.

**Clause 5** **Norway**

(Regulation on electrical network and with guide to the regulation. FEF 2006 § 4-2)

Insulated and coil earthed cable and overhead line network with voltage less or equal to 24 kV shall have a minimum transition resistance towards earth. If the resistance is less then this value, operator shall be warned automatically, alternatively the installation can be disconnected.

The values are:

— Cable grid minimum 1 000 Ω;

— Overhead line network and mixed network minimum 3 000 Ω.

**5.4.1** **Denmark**

Clearances indicated in Table 2 are not allowed by national regulation for operation of electrical installations exceeding 1kV AC. See also description of clearance in clause 7.1.1.