SLOVENSKI STANDARD
SIST EN 50110-1:2023

01-september-2023

Obratovanje električnih postrojev - 1. del: Splošne zahteve

Operation of electrical installations - Part 1: General requirements

Betrieb von elektrischen Anlagen - Teil 1: Allgemeine Anforderungen

Exploitation des installations électriques - Partie 1: Exigences générales

Ta slovenski standard je istoveten z: **EN 50110-1:2023**

ICS:

29.240.01	Omrežja za prenos in distribucijo električne energije na splošno	Power transmission and distribution networks in general

SIST EN 50110-1:2023 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50110-1

June 2023

ICS 29.240.01

Supersedes EN 50110-1:2013

English Version

Operation of electrical installations - Part 1: General requirements

Exploitation des installations électriques - Partie 1: Exigences générales

Betrieb von elektrischen Anlagen - Teil 1: Allgemeine Anforderungen

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

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Ref. No. EN 50110-1:2023 E

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European foreword

This document (EN 50110-1:2023) has been prepared by CLC/BTTF 62-3 “Operation of electrical installations”.

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) 2024-05-29
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2026-05-29

This document supersedes EN 50110-1:2013 and all of its amendments and corrigenda (if any).

EN 50110-1:2023 includes the following significant technical and editorial changes with respect to EN 50110-1:2013:

— simplification of the terms concerning the definitions of persons responsible and level of responsibility;

— improvement of terms and definitions of Clause 3;

— introduction and clarification of supervision;

— improvement of structure of Clause 5 “Operational procedures” ;

— improvement of 6.1.1 – general requirement for working procedures;

— improvement of 6.2 – dead working;

— improvement of 6.3 – live working;

— improvement of 6.4 – Working within the vicinity zone;

— improvement of 6.5 – Working outside the vicinity zone;

— Transfer of Table A.1 from informative Annex A into normative subclause 4.11.2 as Table 1;

— adjunction of Clause A.4 Ergonomic considerations;

— introduction of alphabetic list of defined terms;

— update of the normative references and of the Bibliography.

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Introduction

There are many national laws, standards and internal rules dealing with the matters coming within the scope of EN 50110 and these practices have been taken as a basis for this work.

EN 50110 consists of two parts:

— Part 1 of EN 50110 contains minimum requirements valid for all CENELEC countries and some additional informative annexes dealing with safe working on, with, or near electrical installations;

— Part 2 of EN 50110 consists of a set of normative annexes (one per country) which either specify the present safety requirements or give the national supplements to these minimum requirements.

This concept, following Directive 89/391/EEC, promotes the alignment of the safety levels associated with the operation of, work activity on, with, or near electrical installations in Europe. This document acknowledges the present different national requirements for safety. The intention is, over the course of time, to promote a gradual alignment in Europe of the safety levels against the electrical risk.

Even the best rules and procedures are of no value unless all persons working on, with, or near electrical installations are thoroughly conversant with them and with all legal requirements and comply strictly with them.

1 Scope

This document is applicable to all operation of and work activity on, with, or near electrical installations. These are electrical installations operating at voltage levels from and including extra-low voltage up to and including high voltage.

This latter term includes those levels commonly referred to as medium and extra-high voltage.

These electrical installations are designed for the generation, transmission, conversion, distribution and use of electrical power. Some of these electrical installations are permanent and fixed, such as a distribution installation in a factory or office complex, others are temporary, such as on construction sites and others are mobile or capable of being moved either whilst energised or whilst not energised nor charged. Examples are electrically driven excavating machines in quarries or open-cast coal sites.

This document sets out the requirements for the safe operation of and work activity on, with, or near these electrical installations. The requirements apply to all operational, working and maintenance procedures. They apply to all non-electrical work such as building work near to overhead lines or underground cables as well as electrical work, when there is a risk of electrical danger.

This document does not apply to ordinary persons when using installations and equipment, provided that the installations and equipment comply with relevant standards and are designed and installed for use by ordinary persons.

This document has not been developed specifically to apply to the electrical installations listed below. However, if there are no other rules or procedures, the principles of this document could be applied to them:

— on any aircraft and hovercraft moving under its own power, (these are subject to International Aviation laws which take precedence over national laws in these situations);

— on any sea going ship moving under its own power, or under the direction of the master, (these are subject to International Marine laws which take precedence over national laws in these situations);

— electronic telecommunications and information systems;

— electronic instrumentation, control and automation systems;

— at coal or other mines;

— on off-shore installations subject to International Marine laws;

— on vehicles;

— on electric traction systems;

— on experimental electrical research work.

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.

EN 50191, *Erection and operation of electrical test equipment*

EN 61219, *Live working - Earthing or earthing and short-circuiting equipment using lances as short-circuiting device - Lance earthing (IEC 61219)*

EN 61230, *Live working - Portable equipment for earthing or earthing and short-circuiting (IEC 61230)*

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

EN 62271-1, *High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear (IEC 62271-1)*

EN IEC 62271-102, *High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches (IEC 62271-102)*

EN IEC 62271-213, *High-voltage switchgear and controlgear - Part 213: Voltage detecting and indicating system (IEC 62271-213)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1 General

3.1.1
electrical installation
assembly of electrical equipment which is used for the generation, transmission, conversion, distribution and use of electrical energy

Note 1 to entry: The *electrical installation* includes energy sources such as batteries, capacitors and all other sources of stored electrical energy.

Note 2 to entry: This entry was numbered 651-01-04 in IEC 60050-651:1999

[SOURCE: IEC 60050-651:2014, 651-26-01]

3.1.2
operation
combination of activities including *work activities* necessary to permit an *electrical installation* to function

Note 1 to entry: The *operation* includes such matters as switching, controlling, monitoring, verification of the *electrical installation*, inspection and maintenance as well as both electrical work and non-electrical work.

Note 2 to entry: This entry was numbered 651-01-05 in IEC 60050-651:1999. It has been modified as follows: the reference to IEC 60050-151 has been added.

[SOURCE: IEC 60050-651:2014, 651-26-02 modified, the term “verification of the electrical installation” was added in Note 1 to entry.]

3.1.3
risk
combination of the probability of occurrence of harm and the severity of that harm

Note 1 to entry: The term “harm” in this context relates to damage to either persons and/or *electrical installation*s.

[SOURCE: IEC 60050-351:2013, 351-57-03 modified, Note 1 to entry was added.]

3.1.4
electrical hazard
potential source of harm when electric energy is present in an *electrical installation*

Note 1 to entry: The term “harm” in this context relates to damage to either persons and/or *electrical installation*s.

Note 2 to entry: This entry was numbered 651-01-30 in IEC 60050-651:1999. It has been modified to follow the new translation of ISO/IEC Guide 51 and to precise the term “harm”.

[SOURCE: IEC 60050-651:2014, 651-26-05]

3.1.5
electrical danger
risk of electrical injury when electrical energy is present in an *electrical installation*

[SOURCE: IEC 60050-651:2014, 651-26-07]

3.1.6
electrical injury
death or personal injury from electric shock, electric burn, arcing, or from fire or explosion initiated by electrical energy caused by any *operation* of an *electrical installation*

[SOURCE: IEC 60050-651:2014, 651-26-08 modified, the definition was reworded to use the defined terms of this document]

3.2 Personnel, organization and communication

3.2.1
installation manager
IM
designated person with the overall responsibility to ensure the safe *operation* of the *electrical installation* by setting rules and organization or framework

Note 1 to entry: The wording “Person responsible for an electrical installation” was the term used in the previous version EN 50110-1:2013.

Note 2 to entry: This person can be the owner, employer, proprietor or a delegated person or legal entity represented by a natural person.

Note 3 to entry: Some of these duties can be delegated to others as required. For large or complex *electrical installation*s or networks, the duties can be delegated for parts of the installations or the network (see 4.3).

Note 4 to entry: See Figure B.1, classification **a)**.

3.2.2
operation controller
OC
designated person who is responsible during work activities for the safe *operation* of the *electrical installation*

Note 1 to entry: The wording “Nominated person in control of an electrical installation during *work activities*” was the term used in the previous version EN 50110-1:2013

Note 2 to entry: This person has to judge the possible effects of the work activities on the *electrical installation* or parts of it which are under their responsibility and the effects of the *electrical installation* on persons carrying out the work activities. Some of these duties can be delegated to others as required (see 4.3).

Note 3 to entry: See Figure B.1, classification **b).**

3.2.3
work controller
WC
designated person with direct management responsibility for the work activity at *work location*

Note 1 to entry: The wording “nominated person in control of a *work activity*” was the term used in previous version EN 50110-1:2013.

Note 2 to entry: Parts of this responsibility may be delegated to others as required.

Note 3 to entry: This entry was numbered 651-01-36 in IEC 60050-651:1999. It has been modified as follows: Use of more appropriate English to provide greater clarity to the definition

Note 4 to entry: See Figure B.1, classification **c)**

[SOURCE: IEC 60050-651:2014, 651-26-09 modified, the term “work controller” was added and also the symbol “*WC*”, addition of “work location” in the definition]

3.2.4
worker
W
person carrying out work activities

Note 1 to entry: See Figure B.1, classification **d)**

3.2.5
skilled person, <electricity>
person with relevant education, knowledge and experience to enable them to analyse risks and to avoid hazards which electricity can create

[SOURCE: IEC 60050-651:2014, 651-26-11 modified, the term “training”” was deleted,” perceive” was replaced by “analyse”; “danger” was replaced by “hazard”]

3.2.6
instructed person, <electricity>
person adequately advised by a *skilled person* to enable them to perceive risks as instructed and to avoid hazards which electricity can create

[SOURCE: IEC 60050-651:2014, 651-26-12 modified, the term “supervised” was deleted, “electrically” was deleted “danger” was replaced by “hazard” and added “as instructed”]

3.2.7
ordinary person, <electricity>
person who is neither a *skilled person* nor an *instructed person*

[SOURCE: IEC 60050-826:2004, 826-18-03]

3.2.8
notification
messages or instructions which are either verbal or in writing associated with *operation* of any *electrical installation*

3.3 Working zone

3.3.1
work location
any site, place or area where a *work activity* is to be, is being, or has been carried out

[SOURCE: IEC 60050-651:2014, 651-26-03]

3.3.2
live working zone
space around live parts in which the insulation level to prevent electrical danger is not assured when reaching into or entering it without protective measures

Note 1 to entry: The outer limit of the *live working zone* is denoted as the distance D_L (see Figures 1, 2 and 3).

3.3.3
vicinity zone
limited space outside the *live working zone*

Note 1 to entry: The outer limit of the *vicinity zone* is denoted as the distance D_V (see Figures 1, 2 and 3).

Note 2 to entry: In this zone, specific precautions are taken to avoid encroaching into the *live working zone*.

3.4 Working

3.4.1
work activity
any form of *electrical work* or *non-electrical work* where there is the possibility of an *electrical hazard*

3.4.2
electrical work
work on, with or near an *electrical installation* such as testing and measurement, repairing, replacing, modifying, extending, erecting, maintaining and inspecting

[SOURCE: IEC 60050-651:2014, 651-26-04, modified, the definition was reworded by combining the definition and the Note 1 to entry. Note 2 and 3 were deleted]

3.4.3
non-electrical work
work near to an *electrical installation* such as construction, excavation, cleaning, painting, etc

3.4.4
live working
all work in which a *worker* ***(W)*** deliberately makes contact with live parts or reaches into the *live working zone* with either parts of their body or with tools, equipment or devices being handled

Note 1 to entry: At low voltage, live working is carried out by the *worker (W)*, when making contact with bare live parts. At high voltage, live working is carried out by the *worker (W)*, when entering the *live working zone*, regardless of whether contact is made with bare live parts or not.

[SOURCE: IEC 60050-651:2014, 651-21-01, modified, the definition was reworded; the three Notes to entry deleted and a new Note 1 to entry is created]

3.4.5
working within the vicinity zone
all *work activity* in which a *worker (W)* with part of their body, with a tool or with any other object enters into the *vicinity zone* without encroaching into the *live working zone*

3.4.6
isolate, verb
disconnect completely a device or an electric circuit from other devices or electric circuits

[SOURCE: IEC 60050-151:2001, 151-15-37]

3.4.7
dead, adj,
at an electric potential equal to or not significantly different from that of earth at the worksite

Note 1 to entry: This entry was numbered 651-01-15 in IEC 60050-651:1999

[SOURCE: IEC 60050-651:2014, IEV 651-21-09]

3.4.8
dead working
work activity on *electrical installation*s which are neither live nor charged, carried out after having taken all measures to prevent electrical danger

3.4.9
authorization
formal approval to perform planned work, in writing or instruction

3.4.10
permission to start work
direct instruction to the *workers **(W)*** at *work location* to commence work after all safety measures are taken

3.4.11
supervision
task to apply electrical safety control to the work activity

3.5 Protective devices

3.5.1
screen
any device, which may be insulated or not, which is used to prevent approach to any equipment or part of *electrical installation* which presents *electrical danger*

3.5.2
barrier
part providing protection against direct contact from any usual direction of access

[SOURCE: IEC 60050-826:2004, 826-12-23 modified by deleting the words “(electrically)” and “protective”]

3.5.3
insulating covering
rigid or flexible cover made of insulating material used to cover live and/or un-energised parts and/or adjacent parts in order to prevent accidental contact

3.5.4
enclosure
part providing protection of equipment against certain external influences and, in any direction, protection against direct contact

3.5.5
voltage detector
portable device used to detect reliably the presence or the absence of the operating voltage and used to verify that the electrical installation is ready for earthing

Note 1 to entry: These devices are generally described as either capacitive types or resistive types.

[SOURCE: IEC 60050-651:2014, 651-24-02, modified by replacing “diagnostic” by “portable” and by completing the definition with the following words: “and used to verify that the electrical installation is ready for earthing”]

3.5.6
portable equipment for earthing and short-circuiting
equipment which is portable and is connected by insulating component(s) to parts of an *electrical installation* for earthing, short-circuiting or earthing and short-circuiting purposes

Note 1 to entry: The *portable equipment for earthing and short-circuiting* comprises earthing components, short-circuiting components and one or more insulating components, for instance earthing sticks

Note 2 to entry: This entry was numbered 651-14-01 in IEC 60050-651:1999. It has been modified to precise the definition and make use of preferred terms

[SOURCE: IEC 60050-651:2014, 651-25-01]

3.5.7
personal protective equipment
PPE
any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards

Note 1 to entry: This entry was numbered 651-07-01 in IEC 60050-651:1999. It has been modified for greater clarity on the role of *PPE*

[SOURCE: IEC 60050-651:2014, 651-23-01, modified by “whilst performing live working” was deleted]

3.6 Voltages

3.6.1
extra-low voltage
ELV
normally not exceeding 50 V alternating current AC or 120 V ripple free direct current DC whether between conductors or to earth

Note 1 to entry: This definition includes SELV, PELV and FELV (see HD 60364-4-41).

3.6.2
low voltage
LV
normally not exceeding 1 000 V AC or 1 500 V DC

3.6.3
high voltage
HV
normally exceeding 1 kV AC or 1,5 kV DC

3.6.4
operating voltage
value of the voltage under normal conditions, at a given instant and a given point of the system or an electrical installation

Note 1 to entry: This value can be expected, estimated or measured.

[SOURCE: IEC 60050-601:2001, 601-01-22 modified by adding: “or an electrical installation”]

3.7 Distances

3.7.1
live working limit distance
D_L
distance defining the outer limit of the live working zone