



BSI Standards Publication

Electrical installations for lighting and beaconing of aerodromes

Part 3-4: Safety secondary circuits in series
circuits — General safety requirements

National foreword

This British Standard is the UK implementation of EN IEC 61820-3-4:2023. It is identical to IEC 61820-3-4:2023.

The UK participation in its preparation was entrusted to Technical Committee EPL/97, Aeronautical ground lighting.

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

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Part 3-4: Safety secondary circuits in series circuits - General
safety requirements
(IEC 61820-3-4:2023)

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aérodromes - Partie 3-4: Circuits secondaires de sécurité
dans les circuits série - Exigences générales de sécurité
(IEC 61820-3-4:2023)

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Flugplätzen - Teil 3-4: Sicherheitssekundärkreise in
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(IEC 61820-3-4:2023)

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Comité Européen de Normalisation Electrotechnique
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European foreword

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The text of the International Standard IEC 61820-3-4:2023 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 standard indicated:

IEC 60364-1:2005 NOTE Approved as HD 60364-1:2008 +A11:2017

IEC 61558-1:2017 NOTE Approved as EN IEC 61558-1:2019 (not modified)

IEC 61558-2-4:2021 NOTE Approved as EN IEC 61558-2-4:2021 (not modified)¹

IEC 61820-1 NOTE Approved as EN IEC 61820-1

¹ Under preparation. Stage at the time of publication: FprEN IEC 61558-2-4:2021.

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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60364-4-41	2005	Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock	HD 60364-4-41	2017
-	-		+ A11	2017
-	-		+ A12	2019
IEC 60417	-	Graphical symbols for use on equipment	-	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
-	-		+ corrigendum May 1993	
+ A1	1999		+ A1	2000
+ A2	2013		+ A2	2013
IEC 61000-6-2	2016	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments	EN IEC 61000-6-2	2019
IEC 61000-6-4	2018	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	EN IEC 61000-6-4	2019
IEC 61140	2016	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2016
IEC 61558-2-6	2021	Safety of transformers, reactors, power supply units and combinations thereof - Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications	EN IEC 61558-2-6 ²	2021

² Under preparation. Stage at the time of publication: FprEN IEC 61558-2-6:2021.

EN IEC 61820-3-4:2023 (E)

IEC 61820-1	2019	Electrical installations for aeronautical ground lighting at aerodromes - Part 1: Fundamental principles	EN IEC 61820-1	2019
IEC 61821	2011	Electrical installations for lighting and beaconing of aerodromes - Maintenance of aeronautical ground lighting constant current series circuits	EN 61821	2011
IEC 61822	2009	Electrical installations for lighting and beaconing of aerodromes - Constant current regulators	EN 61822	2009
IEC 61823	2002	Electrical installations for lighting and beaconing of aerodromes - AGL series transformers	EN 61823	2003
IEC 63067	2020	Electrical installations for lighting and beaconing of aerodromes - Connecting devices - General requirements and tests	EN IEC 63067	2020
CISPR 11	2015	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	EN 55011	2016
+ A1	2016		+ A1	2017
-	-		+ A11	2020
+ A2	2019		+ A2	2021
CISPR 32	2015	Electromagnetic compatibility of multimedia equipment - Emission requirements	EN 55032	2015
-	-		+ A11	2020

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL INSTALLATIONS FOR
LIGHTING AND BEACONING OF AERODROMES –****Part 3-4: Safety secondary circuits in series circuits –
General safety requirements****FOREWORD**

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IEC 61820-3-4 has been prepared by IEC technical committee 97: Electrical installations for lighting and beaconing of aerodromes. It is an International Standard.

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Draft	Report on voting
97/253/FDIS	97/256/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/publications.

A list of all parts in the IEC 61820 series, published under the general title *Electrical installations for lighting and beaconing of aerodromes*, can be found on the IEC website.

Future documents in this series will carry the new general title as cited above. Titles of existing documents in this series will be updated at the time of the next edition.

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

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- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

With a few exceptions, aeronautical ground lighting is designed for series circuit technology operating with a constant current and a maximum input voltage of 5 000 V AC RMS, including tolerances. The input voltage to the series circuit is constantly adjusted by the constant current regulator to maintain the series circuit current irrespective of the variations in the load. The properties and characteristics of the constant current regulators are provided in IEC 61822. Due to the structure of the series circuit, i.e., a series connection of all loads, the usual protective devices for personnel protection of an IT, TT or TN network cannot be applied.

Aeronautical ground lighting is defined as any light provided as an aid to air navigation and as such is subject to specific requirements with respect to its resilience, availability, and serviceability levels. Therefore, insulation faults in the series circuit are often tolerated, and do not lead to the automatic disconnection of the electrical supply to the series circuit.

In view of the above, IEC 61821 states that no work of any kind is normally permitted on live series circuits without first conducting a suitable and sufficient risk assessment and using appropriate protective equipment according to IEC 61821.

The electrical characteristics of the constant current series circuits are often confused with those of IT, TT or TN networks, i.e., constant input voltage, equipment connected in parallel, and a load-dependent current. In practice, it is not always easy to assign rated voltages correctly to individual components of the series circuit or to determine possible touch voltages. In a constant current series circuit, the rated voltage of the equipment in the series circuit and the maximum touch voltage frequently exceed the normal mains input voltage.

In a series circuit installation, the series circuit input voltage is divided in proportion to the internal resistances of the various loads. The rated voltage, i.e., the voltage between the input lines of the equipment, is defined by the series circuit current that flows through the equipment and its input impedance. Since input impedance depends on the equipment design and the series circuit current is constant, the input voltage remains the same for each item of equipment. As a result of the provision of current control in the series circuit, the series circuit input voltage is load-dependent and corresponds to the sum of all partial voltages in the series circuit.

This is different to determining the maximum possible touch voltage to earth in a series circuit. Since one or more earth faults of varying resistance to earth may be present, the touch voltage to earth may assume any value up to the maximum series circuit input voltage depending on the location of the earth fault and the equipment installed in the series circuit. Therefore, when determining the dielectric strength against earth potential, it is usual to take the maximum series circuit input voltage. Such peculiarities of the series circuit have been considered in the requirements for lamp systems in this document.

Since there are only a few effective safety features available for personnel protection in series circuit technology, the protective measure "safety extra low voltage (SELV)" and "protective extra low voltage (PELV)" is applied in this document for the supply of lamp systems. This measure is common practice and can resort to the application of well-known and accepted methodology. The introduction of SELV/PELV in this type of application has been made possible by the introduction of new illumination technology that has lower power requirements and hence requires a lower voltage supply.

NOTE This document is based on SELV specification according to IEC 60364-4-41 and IEC 61558-1.

ELECTRICAL INSTALLATIONS FOR LIGHTING AND BEACONING OF AERODROMES –

Part 3-4: Safety secondary circuits in series circuits – General safety requirements

1 Scope

This part of IEC 61820 specifies protective provisions for the operation of lamp systems powered by series circuits in aeronautical ground lighting.

The protective provisions described here refer only to secondary supply systems for loads that are electrically separated from the series circuit.

This document specifies the level of SELV, and alternatively PELV, under consideration of additional personnel protection during work on live secondary circuits by electrically skilled persons. This document also covers the special operational features of aeronautical ground lighting and addresses the level of training and the requirements for maintenance procedures detailed in IEC 61821 and other national or regional regulation.

The requirements and tests are intended to set a specification framework for system designers, system installers, users, and maintenance personnel to ensure a safe and economic use of electrical systems in installations for the beaconing of aerodromes.

This document complements existing IEC aeronautical ground lighting (AGL) standards and can be used as a design specification.

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 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60417, *Graphical symbols for use on equipment*, available at <http://www.graphicalsymbols.info/equipment>

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60529:1989/AMD1:1999

IEC 60529:1989/AMD2:2013

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61000-6-4:2018, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61558-2-6:2021, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications*

IEC 61820-1:2019, *Electrical installations for aeronautical ground lighting at aerodromes – Part 1: Fundamental principles*

IEC 61821:2011, *Electrical installations for lighting and beaconing of aerodromes – Maintenance of aeronautical ground lighting constant current series circuits*

IEC 61822:2009, *Electrical installations for lighting and beaconing of aerodromes – Constant current regulators*

IEC 61823:2002, *Electrical installations for lighting and beaconing of aerodromes – AGL series transformers*

IEC 63067:2020, *Electrical installations for lighting and beaconing of aerodromes – Connecting devices – General requirements and tests*

CISPR 11:2015, *Industrial, scientific, and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 11:2015/AMD1:2016

CISPR 11:2015/AMD2:2019

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms, definitions, and abbreviated terms

3.1 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>

3.1.1

assembly

self-contained, closed functional unit forming a light system together with other assemblies

3.1.2

basic insulation

insulation of hazardous live parts providing basic protection

Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.

[SOURCE: IEC 60050-581:2008, 581-21-24]

3.1.3

electrically skilled person

person with relevant education and experience to enable that person to perceive risks and to avoid hazards which electricity can create

[SOURCE: IEC 60050-195:2021, 195-04-01]

3.1.4

extra-low voltage

ELV

voltage not exceeding the relevant voltage limit specified in 4.7.3

3.1.5

safety extra-low voltage

SELV

voltage values which do not exceed values in 4.7.3, between conductors, or between any conductor and reference earth, in an electric circuit which has galvanic separation from the supplying electric power system by such means as a separate-winding transformer

3.1.6

SELV system

electrical system in which the voltage cannot exceed the value of extra-low voltage:

- under normal conditions, and
- under single-fault conditions, including earth faults in other electric circuits

Note 1 to entry: SELV is the abbreviation for safety extra-low voltage.

[SOURCE: IEC 60050-195:2021, 195-06-28]

3.1.7

PELV system

electric system in which the voltage cannot exceed the value of extra-low voltage:

- under normal conditions, and
- under single fault conditions, including earth faults in other electric circuits

Note 1 to entry: PELV is the abbreviation for protective extra low voltage

[SOURCE: IEC 60050-195:2021, 195-06-29]

3.1.8

SELV/PELV power supply

single physical unit or assembly of physical units performing as the power supply according to SELV/PELV definitions

3.1.9

protective separation

separation of one electric circuit from another by means of

- double insulation, or
- basic insulation and electrically protective screening, or
- reinforced insulation

3.1.10

power supply unit

components for the supply and transfer of energy used to operate a lighting unit in a series circuit

3.1.11

electric shock

physiological effect resulting from an electric current passing through a human or animal body

[SOURCE: IEC 60050-195:2021, 195-01-04, modified – Words "human body or livestock" replaced with "human or animal body".]

3.1.12**hazardous live part**

live part which, under certain conditions, can give a harmful electric shock

[SOURCE: IEC 60050-195:2021, 195-06-05, modified – Note to entry deleted.]

3.1.13**touch voltage**

voltage between conductive parts when touched simultaneously by a person or an animal

Note 1 to entry: The value of the effective touch voltage may be appreciably influenced by the impedance of the person or the animal in electric contact with these conductive parts.

[SOURCE: IEC 60050-195:2021, 195-05-11, modified – Words "a human being or livestock" replaced with "person or animal"; "effective" and "appreciably" added in Note 1 to entry.]

3.1.14**single fault condition**

condition in which there is a fault of a single protection (but not a reinforced protection) or of a single component or a device

[SOURCE: IEC 60050-903:2013, 903-01-15, modified – Note 1 to entry deleted.]

3.1.15**light fixture (US)****light fitting (UK)****luminaire**

electrical device used to create artificial light by use of an electric lamp/LED/light source above ground or within the pavement

Note 1 to entry: The luminaire is an apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes all the parts necessary for supporting, aiming, fixing and protecting the lamps, but not the lamps themselves and, where necessary, circuit auxiliaries together with the means for connecting them to supply.

3.1.16**limiter**

device which limits the safety transformer output voltage to a defined maximum value

Note 1 to entry: The probability of electric shock increases with voltage level, surface area of the accessible conductive part or circuit in contact with the skin and the humidity condition of skin.

3.1.17**safety transformer**

isolating transformer with protective separation between the input winding(s) and output winding(s)

[SOURCE: IEC 61558-1:2017, 3.1.2, modified – Word "isolating" replaced with "safety" in the term, and "isolating" added to the definition.]

3.1.18**dry condition**

skin condition of a surface area of contact with regards to humidity of a living person being at rest under normal indoor condition