

Electrical installations for lighting and beaconing of aerodromes - Part 3-4: Safety secondary circuits in series circuits - General safety requirements

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 61820-3-4:2023 sisaldab Euroopa standardi EN IEC 61820-3-4:2023 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 61820-3-4:2023 consists of the English text of the European standard EN IEC 61820-3-4:2023.
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English Version

Electrical installations for lighting and beaconing of aerodromes -  
Part 3-4: Safety secondary circuits in series circuits - General  
safety requirements  
(IEC 61820-3-4:2023)

Installations électriques pour l'éclairage et le balisage des  
aérodromes - Partie 3-4: Circuits secondaires de sécurité  
dans les circuits série - Exigences générales de sécurité  
(IEC 61820-3-4:2023)

Elektrische Anlagen für Beleuchtung und Befeuerung von  
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## European foreword

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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)<sup>1</sup>

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

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Electrical installations for lighting and beaconing of aerodromes –  
Part 3-4: Safety secondary circuits in series circuits – General safety  
requirements**

**Installations électriques pour l'éclairage et le balisage des aérodromes –  
Partie 3-4: Circuits secondaires de sécurité dans les circuits série – Exigences  
générales de sécurité**



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IEC Secretariat  
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CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
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# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Electrical installations for lighting and beaconing of aerodromes –  
Part 3-4: Safety secondary circuits in series circuits – General safety  
requirements**

**Installations électriques pour l'éclairage et le balisage des aérodromes –  
Partie 3-4: Circuits secondaires de sécurité dans les circuits série – Exigences  
générales de sécurité**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL INSTALLATIONS FOR  
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General safety requirements**

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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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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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]