IEC 61820-1-2

Edition 1.0 2024-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrical installations for lighting and beaconing of aerodromes – Part 1-2: Fundamental principles – Particular requirements for series circuits

Installations électriques pour l'éclairage et le balisage dans les aérodromes – Partie 1-2 : Principes fondamentaux – Exigences particulières relatives aux circuits série



IEC 61820-1-2:2024-04(en-fr)



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 61820-1-2

Edition 1.0 2024-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrical installations for lighting and beaconing of aerodromes – Part 1-2:Fundamental principles – Particular requirements for series circuits

Installations électriques pour l'éclairage et le balisage dans les aérodromes – Partie 1-2 : Principes fondamentaux – Exigences particulières relatives aux circuits série

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.140.50, 93.120

ISBN 978-2-8322-8579-4

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 8
4 Requirements 9
4.1 General 9
4.2 Series circuit power supply 9
4.3 Isolation of field circuit 9
4.4 Electrical supply to series circuit power equipment (i.e. CCRs) 11
4.5 Series circuit maximum voltage 11
4.6 Overcurrent protection 11
4.7 Open circuit protection 11
4.8 System insulation resistance 12
4.9 Insulation resistance monitoring 12
4.10 Operational insulation resistance value 12
4.11 Fault protection 12
4.12 Cables 12
4.12.1 General 12
4.12.2 Screened (shielded) cables for the primary circuit 12
4.13 Earthing of equipment 12
5 Selection and installation of AGL equipment and systems 13
5.1 General 13
5.2 Operational conditions 13
5.2.1 Voltage 13
5.2.2 Current 13
5.2.3 Frequency 13
5.2.4 Power 13
5.3 Series circuit communication 13
5.4 Electromagnetic compatibility (EMC) 13
5.5 Impulse withstand voltage 14
5.6 Accessibility 14
5.7 Cable, transformer and duct installation 14
5.8 Primary and secondary connecting devices 14
5.9 Proximity of cables 14
5.10 Labelling 15
6 Inspection and testing 15
6.1 Initial verification 15
6.2 Periodic inspection and testing 15
6.3 Visual inspection 16
6.4 Testing 17
6.4.1 General 17
6.4.2 Conductor continuity 17
6.4.3 Insulation resistance of field circuit 17
6.4.4 SELV and PELV 19
6.4.5 Earth electrode resistance 19

6.4.6 Functional testing 20
6.5 Certification and reporting 20
6.6 Records 20
Annex A (informative) New installation insulation value (under development) 21
Annex B (informative) AGL installation certificate 23
Annex C (informative) Schedule of verification 31
Bibliography 34

Figure 1 – Field circuit isolator modes of operation 11

Table 1 – Test voltages and insulation resistance values 18
Table A.1 – Theoretical leakage currents in series circuit elements as a function of cable voltage class 21
Table B.1 – AGL installation certificate 23
Table B.2 – AGL periodic inspection and testing report 26
Table B.3 – AGL circuit continuity and insulation resistance test results 29
Table C.1 – Schedule of verification 31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ELECTRICAL INSTALLATIONS FOR LIGHTING AND BEACONING OF AERODROMES –

Part 1-2: Fundamental principles – Particular requirements for series circuits

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61820-1-2 has been prepared by IEC technical committee 97: Electrical installations for lighting and beaconing of aerodromes. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
97/267/FDIS	97/268/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.

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, or
- revised.

INTRODUCTION

This document is a part of the IEC 61820 series that describes the minimum requirements for the lifecycle of an aeronautical ground lighting (AGL) system including design, installation, commissioning, maintenance, decommissioning and disposal.

The series circuit normally operates with a constant current and a load dependent variable voltage. The protective measures for series circuits according to this document are adapted to that supply concept and the extreme long cables in the field. They are based in principle on an IT supply concept (floating and separated from ground) and the protection against direct contact to any live part at least for the primary circuit and safety extra low voltage (SELV) or protective extra low voltage (PELV) power supply feeding the light fixtures or other loads of the series circuit. In recognition of possible aviation hazards, an automatic disconnection of the AGL system in case of an electrical failure is not required in general (see details in IEC 61820-1).

People involved in work on AGL electrical systems are knowledgeable of the specific risks and the safety procedures involved in the work related to the applied system design. It is strongly recommended to do a work safety risk analysis considering all local circumstances to define safe work procedures and training to the personnel. Training regarding the hazards of series circuits should be provided to non-electricians (e.g. grass cutters, snow plow operators, etc.)

NOTE 1 For specifications on SELV/PELV power supplies for AGL systems, see IEC 61820-3-4.

NOTE 2 Local/national regulations can be different to these standard provisions.

NOTE 3 In case the power supply is not compliant to SELV or PELV, appropriate measures can be implemented.

NOTE 4 Where the terms "voltage" and "current" are used in this document, they refer to RMS values unless otherwise specified.

ELECTRICAL INSTALLATIONS FOR LIGHTING AND BEACONING OF AERODROMES –

Part 1-2: Fundamental principles – Particular requirements for series circuits

1 Scope

This part of IEC 61820 describes requirements for AGL systems including power supplies, transformation of energy, cables, and any electrical component utilized to produce the light intended to be used as a visual aid for air and ground navigation based on IEC 61820-1, complemented with series circuit specific topics.

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 60060 (all parts), *High-voltage test techniques*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 61000 (all parts), *Electromagnetic compatibility (EMC)*

IEC 61557 (all parts), *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures*

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

IEC 61820-3-2, *Electrical installations for lighting and beaconing of aerodromes – Part 3-2: Requirements for power supplies – Particular requirements for series circuit*

IEC 61820-3-4, *Electrical installations for lighting and beaconing of aerodromes – Safety secondary circuits in series circuits – General safety requirements*

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

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

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

This clause of IEC 61820-1:2019 is applicable, with the following additions:

3.1
AGL system
functional aeronautical ground lighting entity consisting of interoperable components such as power supply, transformers, light fixtures, and other loads, etc.

Note 1 to entry: The general categories for AGL systems are:

– Category 1: The 6,6 A system. An AGL system with a maximum current of 6,6 A at 50/60 Hz utilizing the effective current steps as defined in 61820-3-2.

– Category 2: The current controlled system. An AGL system with current amplitude control similar to the 6,6 A system, but without predefined series circuit effective current steps or waveform characteristics.

– Category 3: The communication-controlled system. An AGL system wherein the luminosity levels are controlled independently of the series circuit effective current, for example via power line communication or by other means of information transmission.

Note 2 to entry: An AGL component can belong to more than one category. All category 1 AGL components are interoperable in any category 1 AGL system installation. AGL components in category 2 or category 3 can be noninteroperable with AGL components in the same category.

3.2
series circuit power supply
apparatus which produces a selectable constant current output and automatically adjusts the voltage for variations in the loads, input voltage and service conditions as specified

Note 1 to entry: For 6,6 A series circuit power supplies, see IEC 61820-3-2 (particular requirements for series circuit power supplies).

3.3
series circuit transformer
apparatus which provides power to light fixtures or other loads from their secondary circuits

Note 1 to entry: The series circuit transformer provides continuity of the primary series circuit in the event of a loss of the load, and electrical separation between the primary circuit and the secondary circuit.

Note 2 to entry: For specifications on series circuits transformers, see IEC 61823. Devices other than transformers meeting the requirements of IEC 61823 can be used to provide continuity and electrical separation.

3.4
primary series cable
screened or unscreened solid or multi-stranded single core cable used to link series transformers and the constant current regulator (CCR) in the primary circuits of series systems for lighting and beaconing of airports

Note 1 to entry: For specifications on 6,6 A AGL system cables, see IEC TS 62100.

Note 2 to entry: Some countries can have national standards for series circuit cables.

3.5
primary cable connecting device
single pole connecting device in accordance with IEC 63067 used to interconnect the different elements in a primary circuit

3.6
secondary cable connecting device
multipole connecting device in accordance with IEC 63067 used to interconnect loads with series transformers

3.7
series load
electrical device designed to be fed by constant current series circuits, such as (but not limited to) light fixtures, signs, detection loops, precision approach path indicators (PAPI), etc.

3.8
light fixture
apparatus which distributes, filters or transforms the light transmitted from one or more light sources

Note 1 to entry: This includes the light source, all the parts necessary for fixing and protecting the light source and, where necessary, circuit auxiliaries together with the means for connecting them to the electrical supply.

4 Requirements

4.1 General

A series circuit shall be designed as one continuous primary loop connected to the output of the series circuit power supply.

The output of the series circuit power supply shall be galvanically separated from the input (e.g. the mains). All live conductors in the primary series circuits shall be insulated from earth.

A primary series circuit can feed multiple secondary circuits according to IEC 61820-1 to supply the light fixtures or other loads. Each individual secondary circuit shall be separated from the primary circuit by series circuit transformers according to IEC 61823 or any other method providing the level of separation as required in IEC 61820-3-4.

4.2 Series circuit power supply

Series circuit power supplies shall be compliant with basic requirements contained within this document.

4.3 Isolation of field circuit

When required, the primary series circuit shall be disconnected from any power supply using an appropriate disconnecting device as indicated in IEC 61820-3-2. The conductors at the open ends of the primary series circuit shall be shorted together and connected to earth for circuit maintenance or open for insulation resistance to earth testing purposes.

When the circuit is earthed for maintenance purposes, the device shall be capable of being locked in either the 'isolated' or 'earthed' position to prevent harm to maintenance personnel. The different modes of operation of a field isolator device are shown in Figure 1.

The field circuit isolator can be installed within the series circuit power supply or as a standalone external unit.