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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)

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ELECTRICAL INSTALLATIONS FOR LIGHTING AND BEACONING OF AERODROMES –

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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- withdrawn, or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

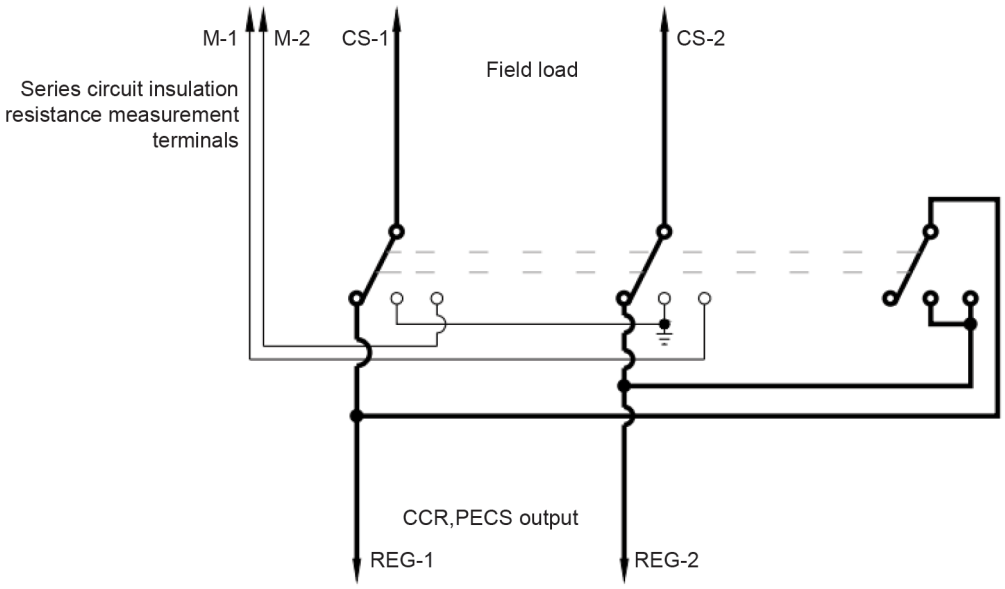
Series circuit power supplies shall be compliant with basic requirements contained within this document.

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.



Mode 1: Working mode, load energized.

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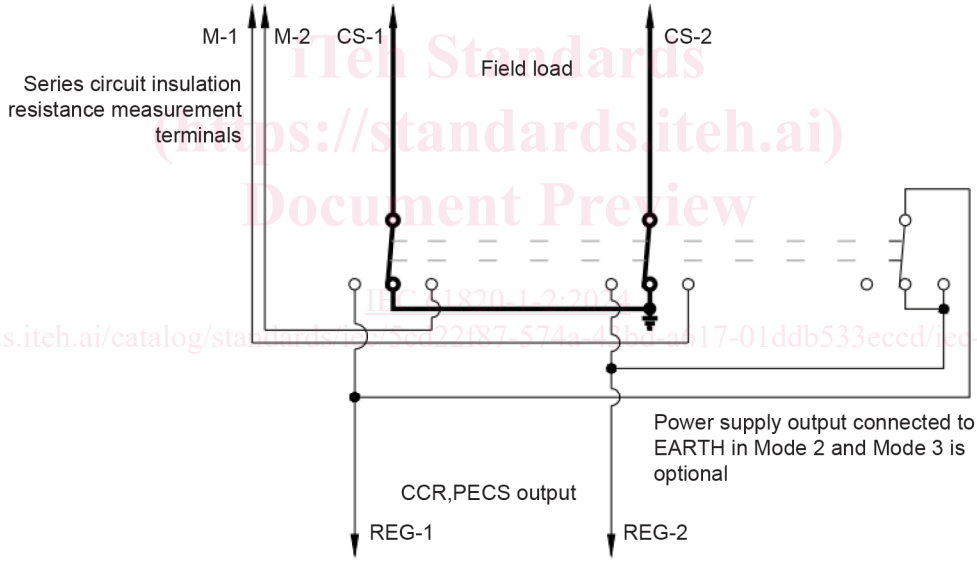
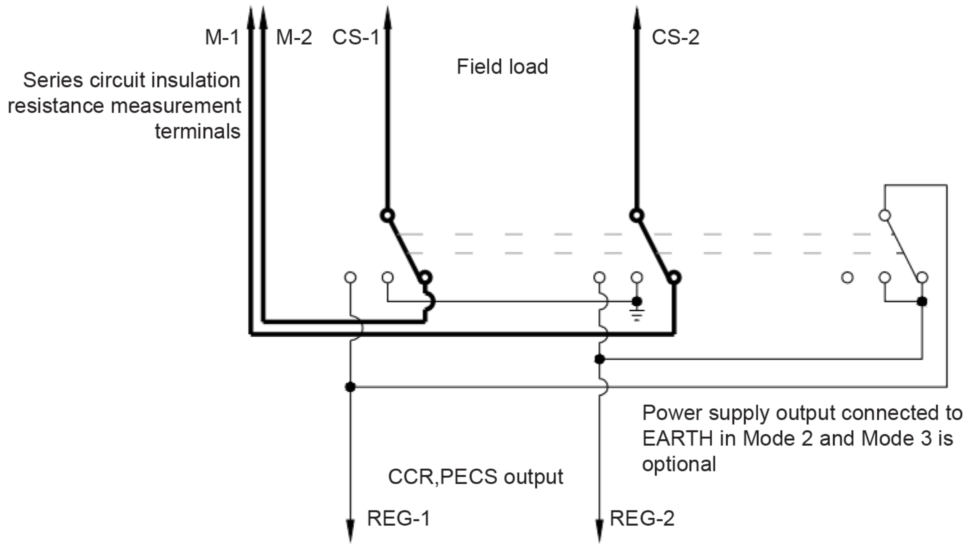


Mode 2: Maintenance mode, field circuit is earthed.

IEC



Mode 3: Test mode, field circuit insulation test mode or output current test mode.

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Figure 1 – Field circuit isolator modes of operation

4.4 Electrical supply to series circuit power equipment (i.e. CCRs)

Power supply to series circuit power supply equipment shall be provided in accordance with IEC 60364 series provisions.

4.5 Series circuit maximum voltage

The maximum voltage rating of a series circuit shall be defined by the maximum conductor to earth voltage that could be delivered by the series circuit power supply.

4.6 Overcurrent protection

The series circuit power supply shall be provided with a means to prevent overcurrent in accordance with IEC 61820-3-2.

The overcurrent cut off level shall be sufficient to prevent damages to any circuit equipment and can include protective devices. The overcurrent cut off values set by the manufacturer of the constant current regulator shall be documented by the supplier and made available to the maintenance personnel.

4.7 Open circuit protection

An open primary circuit shall be detected by the constant current regulator supplying the primary circuit in accordance with IEC 61820-3-2. This shall cause the CCR to automatically cut off the series circuit power supply in a maximum of 1 s.

The open primary circuit detection shall reliably detect the opening of the primary cable line and capacitive leakages due to long primary circuits shall not prevent open-circuit protection.

Any open secondary circuit shall not disturb the primary open circuit protection.

NOTE The open primary circuit does not allow any use of the AGL and represents a high risk for an electrical shock at the point of the line opening. The energy cut off is as fast as possible but robust enough to prevent miss detection. For a constant current regulator (CCR), IEC 61820-3-2 describes a sufficient test for the open primary circuit protection.

4.8 System insulation resistance

A primary series circuit shall be designed so that a new installation provides a minimum insulation resistance in accordance with 6.4.3.

4.9 Insulation resistance monitoring

The insulation level to earth of an active primary series circuit shall be monitored according to IEC 61820-1.

4.10 Operational insulation resistance value

To declare the system functional, the circuit shall have a minimum operational insulation resistance value to earth according to Table 1.

4.11 Fault protection

Adoption of fault protection against electrical hazards is highly recommended to ensure personal safety and mitigate the risk of potentially fatal accidents. Refer to IEC 61820-3-4.

4.12 Cables

4.12.1 General

Rated insulation voltage of cables shall be in accordance with the voltage class the cable shall be used with.

For the primary circuit, the maximum output voltage of the power supply shall be used for the voltage level to earth.

Cable selection shall be chosen to be suitable for the circuit nominal current.

NOTE Information on series cable used for 6,6 A AGL systems is given in IEC TS 62100.

4.12.2 Screened (shielded) cables for the primary circuit

Where screened cables are used, the screen shall be continuous over the full length of the cable and be bonded to earth using ground rods, at regular intervals along the entire circuit loop. Bonding the cable screen to the inside of a steel base can is acceptable provided the base cans are connected to ground rods are regular intervals along the entire circuit loop.

NOTE Where shielded cables and powerline communications are used, the manufacturer of the powerline communication system is consulted on shield specifications.

4.13 Earthing of equipment

According to local regulation, earthing of equipment can be required.

When earthing is not possible and safety conditions would have required it, alternative solutions should be evaluated, such as the application of non-easily removable protections, obstacles or other solutions. For example, isolating transformers powering an approach lighting tower outside the airport premises shall be in a locked enclosure, or non-earthed equipment located outside the airport premises be in a fenced area with a key-access gate.