

INTERNATIONAL STANDARD



~~Lamp controlgear –~~
~~Controlgear for electric light sources – Safety –~~
~~Part 2-10: Particular requirements for electronic invertors~~
~~and convertors for high-frequency operation of cold start~~
~~tubular discharge lamps (neon tubes)~~ Particular requirements – Electronic
controlgear for high-frequency operation of tubular cold-cathode discharge
lamps (neon tubes)

IEC 61347-2-10:2024

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

~~LAMP CONTROLGEAR –~~ CONTROLGEAR FOR ELECTRIC LIGHT SOURCES – SAFETY –

~~Part 2-10: Particular requirements for electronic invertors and convertors for high-frequency operation of cold start tubular discharge lamps (neon tubes)~~

Particular requirements – Electronic controlgear for high-frequency operation of tubular cold-cathode discharge lamps (neon tubes)

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61347-2-10:2000+AMD1:2008 CSV. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61347-2-10 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lighting. It is an International Standard.

This second edition cancels and replaces the first edition published in 2000 and Amendment 1:2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) introduction of dated references as appropriate;
- b) clarification of sample item numbers.

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

Draft	Report on voting
34C/1584/CDV	34C/1592/RVC

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.

This document is intended to be used in conjunction with IEC 61347-1:2015 and IEC 61347-1:2015/AMD1:2017. Where the requirements of any of the clauses of IEC 61347-1:2015 and IEC 61347-1:2015/AMD1:2017 are referred to in this document by the phrase "IEC 61347-1:2015, Clause n and IEC 61347-1:2015/AMD1:2017, Clause n apply", this phrase is interpreted as meaning that all the requirements of the clause in question of IEC 61347-1:2015 and IEC 61347-1:2015/AMD1:2017 apply, except any which are clearly inapplicable to the specific type of controlgear covered by this document.

NOTE In this document, the following print type is used:

- *compliance statements: in italic type.*

A list of all parts in the IEC 61347 series, published under the general title *Controlgear for electric light sources – Safety*, 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

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

~~This part of IEC 61347, and the parts which make up IEC 61347-2, in referring to any of the clauses of IEC 61347-1, specify the extent to which such a clause is applicable and the order in which the tests are to be performed; they also include additional requirements, as necessary. All parts which make up IEC 61347-2 are self-contained and, therefore, do not include references to each other.~~

~~Where the requirements of any of the clauses of IEC 61347-1 are referred to in this standard by the phrase "The requirements of clause n of IEC 61347-1 apply", this phrase is interpreted as meaning that all requirements of the clause in question of part 1 apply, except any which are clearly inapplicable to the specific type of lamp controlgear covered by this particular part of IEC 61347-2.~~

The technical requirements in this document compared to IEC 61347-2-10:2000 and IEC 61347-2-10:2000/AMD1:2008 are essentially unchanged. Nevertheless, a new edition of this document could not be avoided, as without the introduction of dated references to IEC 61347-1:2015 and IEC 61347-1:2015/AMD1:2017, the fourth edition of IEC 61347-1:—¹ would have been implicitly applicable due to the undated nature of the references to IEC 61347-1 in IEC 61347-2-10:2000 and IEC 61347-2-10:2000/AMD1:2008.

This document, in referring to any of the clauses of IEC 61347-1:2015 and IEC 61347-1:2015/AMD1:2017, specifies the extent to which such a clause is applicable. Additional requirements are also included, as necessary.

In order to check the safety of controlgear, it is necessary to check their performance. However, since no standardization of the characteristics of neon tubes exists, reference loads are specified in this document to ensure reproducible test results.

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¹ Fourth edition under preparation. Stage at the time of publication IEC FDIS 61347-1:2024.

~~LAMP CONTROLGEAR –~~ CONTROLGEAR FOR ELECTRIC LIGHT SOURCES – SAFETY –

~~Part 2-10: Particular requirements for electronic invertors and convertors for high-frequency operation of cold start tubular discharge lamps (neon tubes)~~

Particular requirements – Electronic controlgear for high-frequency operation of tubular cold-cathode discharge lamps (neon tubes)

1 Scope

This part of IEC 61347 specifies ~~particular~~ safety requirements for electronic ~~invertors and convertors~~ controlgear for high-frequency operation of tubular cold-cathode discharge lamps used in signs and luminous discharge tube installations and operating with an output voltage exceeding 1 000 V but not exceeding 10 000 V for direct connection to DC or AC supply voltages not exceeding 1 000 V (at 50 Hz or 60 Hz ~~or 1 000 V d.c~~ in case of alternating current).

NOTE 1 Historically, such types of controlgear were referred to as invertors or convertors.

NOTE 12 In Japan, the ~~output~~ voltage limit for the application of this document is set to 15 000 V ~~is acceptable~~.

~~The requirements for two types of invertors and convertors, types A and B, are specified as follows:~~

~~— Type A unit: an invertor or convertor operating within the frequency range 20 kHz to 50 kHz, and having an output voltage (between terminals) not exceeding 5 000 V peak, a maximum output current limited to 35 mA (r.m.s.) and 50 mA (peak value). The supply voltage does not exceed 250 V at 50 Hz or 60 Hz or 250 V d.c.~~

~~NOTE 2 The output current of a type A unit may be considered as not presenting an electric shock hazard due to the limits on the current and frequency range.~~

~~NOTE 3 In Japan, the output voltage of 15 000 V is acceptable.~~

~~— Type B unit: an invertor or convertor having a no-load output voltage not exceeding 5 000 V to earth or 10 000 V between terminals, operating within the frequency range 10 kHz to 100 kHz with a maximum output current limited to 200 mA (r.m.s.) and 400 mA (peak value).~~

~~NOTE 4 Type B units require additional protection in the output circuit.~~

~~NOTE 5 In Japan, a type B unit exceeding 50 mA and/or the secondary grounded is not acceptable.~~

~~In order to check the safety of invertors or convertors, it is necessary to check their performance. However, since no standardization of the characteristics of neon tubes exists, reference loads are specified in this standard to ensure reproducible test results.~~

~~The rated maximum operating temperature of the winding, t_w , is not applicable to this standard.~~

This document applies for controlgear of type A and controlgear of type B, which are specified as follows:

- Type A: controlgear operating within the frequency range 20 kHz to 50 kHz, and having an output voltage not exceeding 5 000 V peak between terminals, with a maximum output current limited to 35 mA (RMS) and 50 mA (peak value) and a supply voltage not exceeding 250 V.

NOTE 3 The output current of a type A unit can be considered as not presenting an electric shock hazard due to the limits on the current and frequency range.

NOTE 4 In Japan, the output voltage of 15 000 V is acceptable.

- Type B: controlgear operating within the frequency range 10 kHz to 100 kHz and having a no-load output voltage not exceeding 10 000 V between terminals or not exceeding 5 000 V to earth, with a maximum output current limited to 200 mA (RMS) and 400 mA (peak value).

NOTE 5 In Japan, a type B controlgear providing an output current exceeding 50 mA is not acceptable.

2 Normative references

~~For the purpose of this part of IEC 61347, the normative references given in clause 2 of IEC 61347-1 which are mentioned in this standard apply, together with the following 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 60417, *Graphical symbols for use on equipment*, available at <https://www.graphical-symbols.info/equipment>

IEC 60598-1:2020, *Luminaires – Part 1: General requirements and tests*

IEC 61347-1:2015, *Lamp controlgear – Part 1: General and safety requirements*
IEC 61347-1:2015/AMD1:2017

~~ISO 3864:1984, *Safety colours and safety signs*~~

ISO 3864-1:2011, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

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3 Terms and definitions

~~For the purpose of this part of IEC 61347, the definitions given in clause 3 of IEC 61347-1, with the exception of definitions 3.14, 3.16 and 3.17 apply, together with the following:~~

For the purposes of this document, the terms and definitions given in IEC 61347-1 and the following 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 tubular cold-cathode discharge lamp neon tube

~~discharge tube having cathodes which may be coated with an electron emitting material and which, during the starting process without external heating, emits electrons by field emission.~~
tubular discharge lamp in which the light is produced by the positive column of a glow discharge

Note 1 to entry: These lamps have a low-pressure filling of a rare gas (or a mixture of rare gases) and possibly mercury vapour. They can have an inside coating of fluorescent materials.

3.2
rated no-load ~~rated~~ output voltage

U_o

rated maximum ~~rated~~ voltage between the output terminals or the ends of the integral connecting leads of the inverter or convertor connected to the rated supply voltage at rated frequency with no load on the output circuit

Note 1 to entry: For sinusoidal wave forms, the rated no-load output voltage is the RMS value or the peak value divided by square root of 2. For other waveforms, it is the RMS value or the equivalent value deduced from the peak value, obtained by mathematical calculation.

Note 2 to entry: For the purposes of this document this definition overrules the one given in IEC 61347-1.

[SOURCE: IEC 61347-1:2015, 3.9, modified – The definition has been adapted for the purposes of this document and the Notes to entry have been added.]

3.3
inverter

electric energy transducer that converts direct current to alternating current

3.4
convertor

unit for the electronic conversion of AC supply at one frequency to an AC supply at another frequency

3.5
earth-leakage protective device

device which removes the output power from ~~an inverter or convertor~~ the controlgear in the event of an earth fault current flowing between any part of the output high-voltage circuit and earth

3.6
open-circuit protective device

device which removes the output power from ~~an inverter or convertor~~ the controlgear in the event of non-operation of the tube load or an interruption in the output high-voltage circuit

Note 1 to entry: An open-circuit protective device may operate by detecting an increase in the output voltage or by other suitable means.

3.7
upper shut-down limit

output voltage of ~~an inverter or convertor~~ the controlgear at which an open-circuit protective device operates

3.8
output high-voltage circuit

that part of the circuit consisting of

- a) cables between the output terminals of the ~~convertor or inverter~~ controlgear and the discharge tubes,
- b) discharge tubes,
- c) any series connections between the discharge tubes,

~~It does not include any internal components or wiring of the inverter or convertor.~~ but not including any internal components or wiring of the controlgear

3.9
sample

one or more sampling items intended to provide information on the population or on the material provided by the manufacturer or responsible vendor

[SOURCE: IEC 60050-151:2001, 151-16-19, modified – "provided by the manufacturer or responsible vendor" has been added.]

3.10 sample item

one of the individual items in a population of similar items, or a portion of material forming a cohesive entity and taken from one place and at one time

[SOURCE: IEC 60050-151:2001, 151-16-18]

4 General requirements

IEC 61347-1:2015, Clause 4 applies.

For electronic lamp controlgear with means of protection against overheating, additionally IEC 61347-1:2015, Annex C applies.

Provisions for the rated maximum temperature of the winding t_w , are not applicable.

5 General notes on tests

IEC 61347-1:2015, Clause 5, applies, together with the following:

- IEC 61347-1:2015, Annex H applies.
- One sample item shall be used for all tests, unless otherwise specified in the corresponding clause.

To allow for parallel testing and reduced test times, additional sample items may be used except where the outcome of the test can be affected by preceding tests, for example the tests of Clause 11 and Clause 12.

Specially prepared sample items may be used where required.

For information on requalification of products compliant with the previous edition of this document, i.e. IEC 61347-2-10:2000 and IEC 61347-2-10:2000/AMD1:2008, refer to Annex B.

6 Classification

IEC 61347-1:2015, Clause 6 applies, together with the following:

~~Inverters and converters~~ Additionally, controlgear shall be classified according to their rated no-load output voltage, the rating of the operating frequency and output current range, as one of the following:

- a) type A ~~inverter or converter~~ controlgear;
- b) type B ~~inverter or converter~~ controlgear.

Type B ~~inverters or converters~~ controlgear may have more than one output. In this case, each output shall comply with the above.

7 Marking

7.1 Marking and information

7.1.1 ~~Items to be marked~~ Mandatory marking

~~Electronic invertors and converters for high-frequency operation of cold start tubular discharge lamps shall be clearly and durably marked, in accordance with the requirements of 7.2 of IEC 61347-1, with the following markings:~~

Controlgear, other than integral controlgear, shall be marked with the following:

- items a), b), c), d), e) and f) of IEC 61347-1:2015, 7.1 and IEC 61347-1:2015/AMD1:2017, 7.1;
- on independent ~~electronic invertors and converters~~ controlgear, a warning notice for high voltage, e.g. "HIGH VOLTAGE" and a symbol in the form of an arrow in accordance with IEC 60417-6042:2010-11 and ~~figure 1 of ISO 3864~~ ISO 3864-1:2011, Figure 3.

This marking shall be placed on the outside of the enclosure of the ~~electronic inverter or converter~~ controlgear so that it is clearly visible.

~~NOTE—It is not necessary to mark integral invertors or converters separately as their marking is the subject of relevant sign or luminaire standards.~~

- type A or type B as applicable.

If the electronic inverter or converter consists of more than one separate unit, the units providing the output shall be marked with the necessary information about other associated units such as DC power supplies or capacitors.

7.1.2 ~~Durability and legibility of marking~~ Information to be provided

~~In addition to the above mandatory marking,~~ The following information, if applicable, shall be given on the ~~electronic inverter or converter~~ controlgear, or be made available in the manufacturer's catalogue or similar:

- items h), k), m), n) and o) of IEC 61347-1:2015, 7.1;
- ~~— if the electronic inverter or converter consists of more than one separate unit, the units providing the output shall be marked with necessary information about other associated units such as d.c power supplies or capacitors;~~
- the range and number of tube types, diameters and lengths recommended for the ~~inverter or converter~~ controlgear;
- where the ~~inverter or converter~~ controlgear is not supplied with integral leads (tails), details of the recommended cable types and maximum cable lengths;
- details of suitable types of mounting surfaces and recommended mounting arrangements;
- details of earthing arrangements, including connections to the ~~inverter or converter~~ controlgear output winding, where appropriate;
- details of any protective circuits incorporated in the ~~inverter or converter~~ controlgear;
- the following ~~nominal~~ electrical characteristics:
 - 1) ~~output~~ rated no-load output voltage. This marking shall be in the following terms:
 - if the output terminal is not connected to an earthing terminal: "...kV" (e.g. 4 kV),
 - if one output terminal is connected to an earthing terminal: "E -...kV" (e.g. E – 4 kV),
 - if the centre point of the output winding is referred to an earthing terminal: "... - E -...kV" (e.g. 3 – E – 3 kV);