

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Controlgear for electric light sources – Safety –
Part 2-10: Particular requirements – Electronic controlgear for high-frequency
operation of tubular cold-cathode discharge lamps (neon tubes)**

**Appareillages de commande pour les sources de lumière électriques – Sécurité –
Partie 2-10: Exigences particulières – Appareillages électroniques destinés à
l'alimentation en haute fréquence des lampes à décharge tubulaires à cathode
froide (tubes néon)**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONTROLGEAR FOR ELECTRIC LIGHT SOURCES – SAFETY –**Part 2-10: Particular requirements –
Electronic controlgear for high-frequency operation of tubular
cold-cathode discharge lamps (neon tubes)**

FOREWORD

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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.

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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

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.

CONTROLGEAR FOR ELECTRIC LIGHT SOURCES – SAFETY –

Part 2-10: Particular requirements – Electronic controlgear for high-frequency operation of tubular cold-cathode discharge lamps (neon tubes)

1 Scope

This part of IEC 61347 specifies safety requirements for electronic 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 in case of alternating current).

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

NOTE 2 In Japan, the voltage limit for the application of this document is set to 15 000 V.

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

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

3 Terms and definitions

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

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 output voltage

U_o

rated maximum 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.]

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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 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 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 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 controlgear and the discharge tubes,
- b) discharge tubes,
- c) any series connections between the discharge tubes,

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:

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 controlgear;
- b) type B controlgear.

Type B 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 Mandatory marking

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 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 ISO 3864-1:2011, Figure 3.

This marking shall be placed on the outside of the enclosure of the controlgear so that it is clearly visible.

- 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 Information to be provided

The following information, if applicable, shall be given on the 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;
- the range and number of tube types, diameters and lengths recommended for the controlgear;
- where the 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 controlgear output winding, where appropriate;
- details of any protective circuits incorporated in the controlgear;
- the following electrical characteristics:
 - 1) 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);

NOTE In Japan, E -..kV and - E - kV are not used.

For type A units, this is equivalent to the peak value. For type B units this is equivalent to the RMS value or 0,5 times the peak value, whichever is larger.

- 2) rated output current with rated load;
- 3) rated output frequency.

Where appropriate, the details in items 1) and 2) above shall be marked for each independent output circuit of a controlgear.

7.2 Durability and legibility

IEC 61347-1:2015, 7.2 applies.

7.3 Built-in controlgear

For controlgear without an enclosure and classified as built-in (e.g. open printed circuit board assembly), only items a) and b) according to IEC 61347-1:2015, 7.1 shall be marked on the controlgear.

Other mandatory markings shall be provided as information to be given either on the controlgear or made available in the manufacturer's catalogue or similar.

8 Terminals

IEC 61347-1:2015, Clause 8 and IEC 61347-1:2015/AMD1:2017, Clause 8 apply, together with the following:

Controlgear provided with tails shall comply with the relevant requirements of IEC 60598-1:2020.

9 Earthing

IEC 61347-1:2015, Clause 9 applies, together with the following:

For type B controlgear, the earthing terminal shall be connected to a part of the output circuit except where

- the earthing terminal is connected to a part of the output circuit through means to detect earth-fault currents, or
- there is no direct connection between any part of the output circuit and the earth terminal, and for example, part(s) of that output circuit are referenced to earth potential by means of the internal circuits.

Compliance is checked by inspection.

10 Protection against accidental contact with live parts

IEC 61347-1:2015, Clause 10 and IEC 61347-1:2015/AMD1:2017, Clause 10 apply, together with the following:

The remaining charge between terminals in the output circuit of a controlgear following a worst case of disconnection shall not exceed 45 μC .

Compliance is checked by measurement.

Where part(s) of the output circuit of a controlgear is(are) not connected to earth, or is(are) not referenced to earth by means of internal circuits, the insulation barrier between the input and output circuits shall consist of double or reinforced insulation (see test voltages in Clause 12).

Compliance is checked by the test of Clause 12 (see test voltages).

11 Moisture resistance and insulation

IEC 61347-1:2015, Clause 11 and IEC 61347-1:2015/AMD1:2017, Clause 11 apply, together with the following:

For type A controlgear, the capacitance between the output terminals and the metal foil of not less than 100 cm² area placed anywhere on the surface of the enclosure of the controlgear shall not exceed 50 pF. During the test the convertor shall not operate.

Compliance is checked by measurement.

12 Electric strength

IEC 61347-1:2015, Clause 12 applies, together with the following:

The test voltages for all controlgear are:

- twice the rated input voltage plus 1 000 V on the input side, with the output circuits connected to external metal parts;
- twice the no-load rated output voltage on the output side, the input circuits being connected to external metal parts.

NOTE In Japan, 1,5 times the test voltage is approved.

IEC 60598-1:2020, Table 10.2 applies for independent controlgear.

13 Thermal endurance test for windings

Controlgear or its support shall not, under normal or abnormal conditions, have too high a temperature or impair safety.

Compliance is checked by the tests specified in Clause 14, Clause 15 and Clause 16.

14 Normal conditions

The controlgear shall be installed in its normal operating position arranged in accordance with the manufacturer's instructions and mounted as shown in IEC 61347-1:2015, Figure H.1. The test shall be carried out in a draught-free enclosure as specified in IEC 61347-1:2015, Annex F.

The controlgear shall be operated with the tube load replaced by the specified load resistor R_1 (see Annex A) and with nominal supply voltage.

- In the case of controlgear which provide near constant current output, the supply voltage shall be maintained at the nominal value until steady-state temperatures are obtained.