IEC 61347-2-3

Edition 3.0 2024-05
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

~~Lamp control gear –~~
Controlgear for electric light sources – Safety –
Part 2-3: Particular requirements – AC or DC supplied electronic controlgear for fluorescent lamps

IEC 61347-2-3:2024-05 RLV(en)

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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 61347-2-3:2011+AMD1:2016 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 61347-2-3 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lighting. It is an International Standard.

This third edition cancels and replaces the second edition published in 2011 and Amendment 1:2016. 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 where appropriate;

b) clarification of sample item numbers;

c) alignment of clause numbers with those of IEC 61347-1.

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

Draft	Report on voting
34C/1586/CDV	34C/1594/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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

~~This second edition of IEC 61347-2-3, published in conjunction with IEC 61347-1, represents an review of the first edition of IEC 61347-2-3. The formatting into separately published parts provides for ease of future amendments and revisions. Additional requirements will be added as and when a need for them is recognized.~~

~~This standard, 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 intended to be self-contained and, therefore, do not include references to each other. However, for the case of emergency lighting lamp control gear, some cross-referencing has been necessary.~~

~~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 control gear covered by this particular part of IEC 61347-2.~~

The technical requirements in this document compared to IEC 61347-2-3:2011 and IEC 61347-2-3:2011/AMD1:2016 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 61347-2-3:2011 and IEC 61347-2-3:2011/AMD1:2016.

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.

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

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

Part 2-3: Particular requirements – AC or DC supplied electronic controlgear for fluorescent lamps

1 Scope

This part of IEC 61347 specifies safety requirements for electronic controlgear for use on AC supplies at 50 Hz or 60 Hz up to 1 000 V ~~and/~~or on DC supplies up to 1 000 V with lamp operating frequencies deviating from the supply frequency, associated with fluorescent lamps as specified in IEC 60081 and IEC 60901, low-pressure UV lamps, and other fluorescent lamps for high-frequency operation.

NOTE 1 Requirements for centrally supplied controlgear for emergency lighting are given in Annex B. This also includes performance requirements as far as they are considered to be safety-related with respect to reliable emergency operation.

NOTE 2 Requirements for emergency lighting controlgear operating from non-centralised power supplies are given in IEC 61347-2-7.

NOTE 3 Performance requirements are the subject of IEC 60929.

~~Performance requirements are the subject of IEC 60929.~~

~~Particular requirements for electronic control gear with means protection against overheating are given in Annex C.~~

~~For emergency lighting operation, particular requirements for control gear operated from a central supply are given in Annex J. Performance requirements appropriate to the safe operation of emergency lighting are also contained in Annex J.~~

~~Requirements for emergency lighting control gear operating from non-centralised power supplies are given in IEC 61347-2-7.~~

~~NOTE Performance requirements detailed by Annex J are those considered to be safety-related with respect to reliable emergency operation.~~

2 Normative references

~~For the purposes of this document, 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 60081:1997, *Double-capped fluorescent lamps – Performance specifications*
IEC 60081:1997/AMD1:2000
IEC 60081:1997/AMD2:2003
IEC 60081:1997/AMD3:2005
IEC 60081:1997/AMD4:2010
IEC 60081:1997/AMD5:2013
IEC 60081:1997/AMD6:2017

IEC 60901:1997, *Single-capped fluorescent lamps – Performance specifications*
IEC 60901:1997/AMD1:1997
IEC 60901:1997/AMD2:2000
IEC 60901:1997/AMD3:2004
IEC 60901:1997/AMD4:2007
IEC 60901:1997/AMD5:2011
IEC 60901:1997/AMD6:2014

IEC 60929:2011, *AC and/or DC-supplied electronic control gear for tubular fluorescent lamps – Performance requirements*
IEC 60929:2011/AMD1:2015

IEC 61347-1:~~2007~~2015, *Lamp controlgear – Part 1: General and safety requirements*
IEC 61347-1:2015/AMD1:~~2010~~2017

IEC 61347-2-7:2011, *Lamp controlgear – Part 2-7: Particular requirements for ~~battery~~ electric source for safety services (ESSS) supplied electronic controlgear for emergency lighting (self-contained)*~~1~~
IEC 61347-2-7:2011 /AMD1:2017
IEC 61347-2-7:2011 /AMD2:2021

IEC 61547, *Equipment for general lighting purposes – EMC immunity requirements*

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
AC supplied electronic controlgear
mains-supplied AC to AC invertor including stabilizing elements for starting and operating one or more fluorescent lamps, generally at high frequency

~~**3.2**~~
~~**maximum value of lamp power (of a controllable control gear)**~~
~~lamp power (light output) which complies with 8.1 of IEC 60929, unless otherwise declared by the manufacturer or responsible vendor~~

3.2
maximum allowed peak voltage
highest permitted peak voltage across any insulation of the output under open-circuit condition and any normal and abnormal operating conditions

Note 1 to entry: The maximum allowed peak voltage is related to the declared RMS working voltage; see Table 1.

~~1 To be published~~

~~**3.4**~~
~~**minimum value of lamp power (of a controllable control gear)**~~
~~lowest percentage of the lamp power defined in 3.2 declared by the manufacturer or responsible vendor~~

~~**3.5**~~
~~**a.c./d.c. supplied electronic control gear for maintained emergency lighting**~~
~~mains/battery-supplied a.c./d.c. to a.c. invertor including stabilizing elements for starting and operating one or more fluorescent lamps, generally at high frequency for emergency lighting~~

3.3
~~**cathode**~~ **dummy cathode resistor**
cathode substitution resistor as specified on the relevant lamp data sheet of IEC 60081 or IEC 60901 or as declared by the relevant lamp manufacturer or by the responsible vendor

3.4
DC supplied electronic controlgear
DC-supplied ~~electronic control gear or invertor includes~~ invertor including stabilization elements for starting and operating one or more tubular fluorescent lamps, generally at high frequency

3.5
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.]

3.6
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]

3.7
emergency lighting
lighting provided for use when the supply to the normal lighting fails

Note 1 to entry: Emergency lighting includes escape lighting and standby lighting.

3.8
rated emergency power supply voltage
rated voltage of the emergency power supply claimed by the manufacturer for the information of the installer or user

3.9
starting aid
device which facilitates the starting of the lamp

EXAMPLE A conductive strip affixed to the outer surface of the lamp and a conductive plate which is spaced within an appropriate distance from a lamp.

3.10
emergency ballast lumen factor
EBLF
ratio of the emergency luminous flux of the lamp supplied by the emergency controlgear to the luminous flux of the same lamp operated with the appropriate reference ballast at its rated voltage and frequency

Note 1 to entry: The emergency ballast lumen factor is the minimum of the values measured at the appropriate time after failure of the normal supply and continuously.

3.11
preheat starting
circuit in which the lamp electrodes are brought to emission temperature before the lamp actually ignites

3.12
non-preheat starting
circuit which utilizes a high open-circuit voltage causing field emission from the electrode

4 General requirements

~~The requirements of Clause 4 of IEC 61347-1 apply, together with the following additional requirement:~~

~~AC/d.c. electronic control gear for emergency lighting shall comply with the requirements of Annex J.~~

IEC 61347-1:2015, Clause 4 applies, together with the following:

– For G5-capped lamps with a diameter of 16 mm, the working voltage between any output terminal and earth shall not exceed 430 V (RMS).

NOTE 1 This requirement is in accordance with IEC 61195:1999, Annex E.

– For centrally supplied controlgear for emergency lighting Annex B applies.

NOTE 2 This includes AC, AC/DC and DC supplied types.

EXAMPLE Central battery systems and generator-based systems.

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

5 General notes on tests

~~The requirements of Clause 5 of 61347-1 apply together with the following additional requirement:~~

~~The following number of specimens shall be submitted for testing:~~

- ~~one unit for the tests of Clause 6 to 12 and 15 to 22;~~
- ~~12 samples with each one or more units for the test of Clause 14, refer to IEC 61347-1, 14.5 (additional units or components, where necessary, may be required in consultation with the manufacturer).~~

~~Tests to meet the safety requirements for a.c./d.c. supplied electronic control gear for emergency lighting are made under the conditions specified in Annex J.~~

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.

– Tests to meet the safety requirements for electronic controlgear for emergency lighting shall be performed under the conditions specified in Annex B.

For information on requalification of products compliant with the previous edition of this document, i.e. IEC 61347-2-3:2011 and IEC 61347-2-3:2011/AMD1:2016, refer to Annex D.

6 Classification

IEC 61347-1:2015, Clause 6 applies.

7 Marking

~~Control gear which forms an integral part of the luminaire need not be marked.~~

7.1 Marking and information

7.1.1 Mandatory marking

~~In accordance with the requirements of 7.2 of IEC 61347-1,~~ Controlgear, other than ~~integrated~~ integral controlgear, shall be ~~clearly and durably~~ marked with the following ~~mandatory markings~~:

– items a), b), c), d), e), f), k), l), m), t) and u) of IEC 61347-1:2015, 7.1 and IEC 61347-1:2015/AMD1:2017, 7.1;

– item s) of IEC 61347-1:2015, 7.1 and IEC 61347-1:2015/AMD1:2017, 7.1;

  This item has priority over the requirements of SELV controlgear in IEC 61347-1:2015, Table L.1 and IEC 61347-1:2015/AMD1:2017, Table L.1;

According to 15.4, the declaration of U_{out} ~~can~~ may be based on a reduced number of measurements.

7.1.2 Information to be provided~~, if applicable~~

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

– items h), i), j) and n) of IEC 61347-1:2015, 7.1;

– for DC supplied controlgear: information regarding voltage polarity reversal protection.

7.2 Durability and legibility of markings

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) of 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.

9 ~~Provisions for~~ Earthing

IEC 61347-1:2015, Clause 9 applies.

10 Protection against accidental contact with live parts

IEC 61347-1:2015, Clause 10 and IEC 61347-1:2015/AMD1:2017, Clause 10 apply.

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:

The leakage current that ~~may~~ can occur from contact with fluorescent lamps operated at high frequency from AC supplied electronic controlgear shall not exceed the values in Figure 5 when measured in accordance with ~~Annex I~~ Annex A. The values are RMS values.

~~The limits of leakage current values for frequencies between the values shown in Figure 5 should be obtained by calculation according to the formula in the figure (under consideration).~~

~~NOTE Limits of leakage current values for frequencies above 50 kHz are under consideration.~~

Compliance with these requirements is checked in accordance with ~~Annex I~~ Annex A.

12 Electric strength

IEC 61347-1:2015, Clause 12 applies.

13 Thermal endurance test for windings of ballasts

There are no requirements.

NOTE The requirements of IEC 61347-1:2015, Clause 13 are not applicable.

14 Fault conditions

IEC 61347-1:2015, Clause 14 and IEC 61347-1:2015/AMD1:2017, Clause 14 apply.

~~An additional fault condition to be applied to d.c. supplied control gear is the supply voltage polarity shall be reversed.~~

For DC supplied controlgear, reversed polarity of the supply voltage shall be tested as additional fault condition.

15 Protection of associated components

15.1 Maximum allowed peak voltage under normal operation conditions

Under conditions of normal operation, verified with dummy cathode resistors inserted and conditions of abnormal operation, as specified in Clause 16, the voltage at the output terminals shall at no time exceed the maximum ~~permitted~~ allowed peak ~~value~~ voltage specified in Table 1.

Table 1 – Relation between RMS working voltage and maximum allowed peak voltage

Voltage at output terminals	
RMS working voltage V	**Maximum ~~permitted~~ allowed peak voltage** V
250	2 200
500	2 900
750	3 100
1 000	3 200
~~NOTE~~ Linear interpolation between the given voltage steps is allowed.	

15.2 Maximum working voltage under normal and abnormal operating conditions

Under normal operating conditions and abnormal operating conditions as specified in Clause 16, except for the rectifying effect, and from 5 s after the switch-on or beginning of the starting process, the voltage at the output terminals shall not exceed the maximum working voltage for which the controlgear is declared.

15.3 Maximum working voltage and rectifying effect

In the case of a rectifying effect, i.e. abnormal operating conditions according to 16.1 d), the RMS voltage at the output terminal shall not exceed the maximum permitted value for which the controlgear is designed for a period longer than 30 s after switch-on, or beginning of the starting process.

For controlgear which make more than one attempt to start a failed lamp, the combined duration of voltages above the maximum working voltage for which the ~~ballast~~ controlgear is declared shall not exceed 30 s.

Circuit for testing the rectifying effect and the information regarding the recovery time t_{rr} of the diode are given in Figure 4 a), Figure 4 b) and Figure 4 c).

15.4 Output voltage and abnormal conditions

For the tests of 15.1 and 15.2, the output voltages measured shall be those between any output terminal and earth. Additionally, voltages that appear between output terminals shall be measured in cases where the voltage is present across insulation barriers within associated components.

For multi-lamp or multi-power controlgear, only the combination that leads to the highest voltage shall be measured.

If, from a similar review or declaration for all controlgear, it becomes clear that the voltage is below 50 V, then only that terminal-terminal or terminal-earth combination is measured.

15.5 Isolation of input terminals of controllable electronic controlgear

For controllable electronic controlgear, the control input shall be isolated from the mains circuit by insulation at least equal to basic insulation.

NOTE This requirement does not apply to those controlgear where control signals are injected via the supply terminals or where the control signals are completely isolated from the ~~ballast~~ controlgear by being transmitted remotely from infra-red or radio wave transmitters.

If SELV is to be used, then double or reinforced insulation is required.

16 Abnormal conditions

16.1 Abnormal conditions for AC and DC controlgear

The controlgear shall not impair safety when operated under abnormal conditions at any voltage between 90 % and 110 % of the rated supply voltage.

Compliance is checked by the following test.

Each of the following conditions shall be applied with the controlgear operating according to the manufacturer's instructions (including a heat sink, if specified) for 1 h:

a) the lamp or one of the lamps is not inserted;

b) the lamp does not start because one of the cathodes is broken;

c) the lamp does not start although the cathode circuits are intact (de-activated lamp);

d) the lamp operates, but one of the cathodes is de-activated or broken (rectifying effect);

e) short-circuit of the starter switch, if any.

For the test simulating operation with a de-activated lamp, a ~~resistor~~ resistance is connected in place of each lamp cathode. The ~~resistor~~ resistance value, expressed in Ω, is derived from the value of the ~~nominal running current of the lamp prescribed~~ (maximum) lamp operating current I_n, specified in the relevant lamp data sheet of IEC 60081 and IEC 60901 and substituted in the following equation:

~~$$R = \frac{11{,}0}{2{,}1 \times I_n} \ \Omega$$~~

~~where~~

~~I_n is the rated lamp current of the lamp.~~

$$R = \frac{5{,}23}{I_n}$$

For lamps not covered by IEC 60081 and IEC 60901, the values declared by the lamp manufacturer shall be used.

When testing electronic ~~ballasts~~ controlgear for the rectifying effect, the circuit shown in Figure 1 is used. The anode of the rectifier is connected to the midpoints of appropriate equivalent resistors; the cathode of the rectifier is connected to the short-circuited lamp electrode. The direction of the rectifying effect is chosen so as to give the most unfavourable conditions. If necessary, the lamp is started using a suitable device.

During and at the end of the tests specified under items a) to e), the controlgear shall show no defect impairing safety nor shall any smoke be produced.

16.2 Additional abnormal conditions for DC supplied electronic controlgear

If the DC supplied electronic controlgear is declared by the manufacturer as a protected controlgear against the reversal polarity of the supply voltage, then the following test is applied:

The DC supplied electronic controlgear shall be connected for 1 h with the reversal supply voltage at the maximum value of the rated voltage with the maximum lamp power declared by the manufacturer.

During and at the end of the test the electronic controlgear shall operate the lamp(s) normally without any defects.

17 Behaviour of the controlgear at end of lamp life

17.1 End of lamp life effects

At the end of lamp life, the controlgear shall behave in such a way that no overheating of lamp cap(s) occurs at any voltage between 90 % and 110 % of the rated supply voltage.

For the test simulating end of lamp life effects, three tests are described:

a) asymmetric pulse test (described in 17.2);

b) asymmetric power dissipation test (described in 17.3);

c) open filament test (described in 17.4).

Any of the three tests may be used to qualify electronic controlgear. The controlgear manufacturer shall determine which of the three tests will be used to test a given controlgear based on the design of that particular controlgear circuit. The chosen test method shall be indicated in the controlgear manufacturer's literature.

NOTE 1 Checking controlgear against their capability to cope with the partial rectifying effect is recommended by IEC 61195:1999, Annex E, and IEC 61199:2011, Annex H and IEC 61199/AMD2:2014, Annex H.

NOTE 2 In Japan, only the requirements of 17.1 b) are applied for electronic controlgear.

Lamps used in the ~~ballast~~ controlgear test circuits shall be new lamps seasoned for 100 h.

17.2 Asymmetric pulse test

The controlgear shall have adequate protection to prevent lamp cap overheating at the end of the lamp life cycle.

Compliance is checked by the following test. The relevant values of lamp power, maximum asymmetric power P_{max} at the cathodes and the designation of lamp cap shall be taken from IEC 60081:1997, Annex E, IEC 60081:1997/AMD4:2010, Annex E and IEC 60081:1997/AMD6:2017, Annex E and IEC 60901:1996, Annex D, IEC 60901:1996/AMD2:2000, Annex D, IEC 60901:1996/AMD5:2011, Annex D and IEC 60901:1996/AMD6:2014, Annex D, respectively.

~~NOTE Amendment 6 of IEC 60081 is under preparation. Stage at the time of publication: IEC CDV 60081 AMD6:2015.~~

Test procedure:

Refer to the schematic diagram in Figure 1.

If only one connection per electrode is available at the controlgear or the lamp or both, T1 shall be removed and then the controlgear shall be connected to J2 and the lamp to J4. The controlgear manufacturer should be asked which of the output terminals has to be connected

to J4 and, in case two output terminals per electrode exist, whether they can be short-circuited or be bridged with a resistor.

1) Close switches S1 and S4, and set switch S2 to position A.
2) Turn on the controlgear under test and allow lamp(s) to warm up for 5 min.
3) Close S3, open S1, and wait for 15 s. Open S4 and wait for 15 s.
4) Measure the sum of the average power dissipated in the power resistors, R1A to R1C and R2A and R2B, and the Zener diodes, D5 to D8.

   ~~NOTE~~ The power should be measured as the average value of the product of the voltage between terminals J5 and J6 times the current flowing from J8 to J7. The voltage should be measured with a differential voltage probe, and the current should be measured with a DC current probe. A digital oscilloscope can be used for the multiplication and averaging functions. If the controlgear operates in a cycling mode, the averaging interval should be set to cover an integer number of cycles. (Each cycle is typically greater than 1 s.) The sampling rate and number of samples included in the calculations should be sufficient to avoid aliasing errors.

   The power dissipation shall be below P_{max}.

   If the power dissipation is greater than P_{max}, the controlgear has failed and the test is discontinued.
5) Close S1 and S4.
6) Set S2 to position B.
7) Repeat steps (2), (3) and (4).

   The controlgear shall pass both position "A" and position "B" tests.
8) For multi-lamp controlgear, repeat steps (1) to (7) for each lamp position.

   A multi-lamp controlgear shall pass the tests for each lamp position.
9) For controlgear that operate multiple lamp types (e.g. 26 W, 32 W, 42 W), each lamp type specified shall be tested. Repeat steps (1) to (8) for each lamp type.

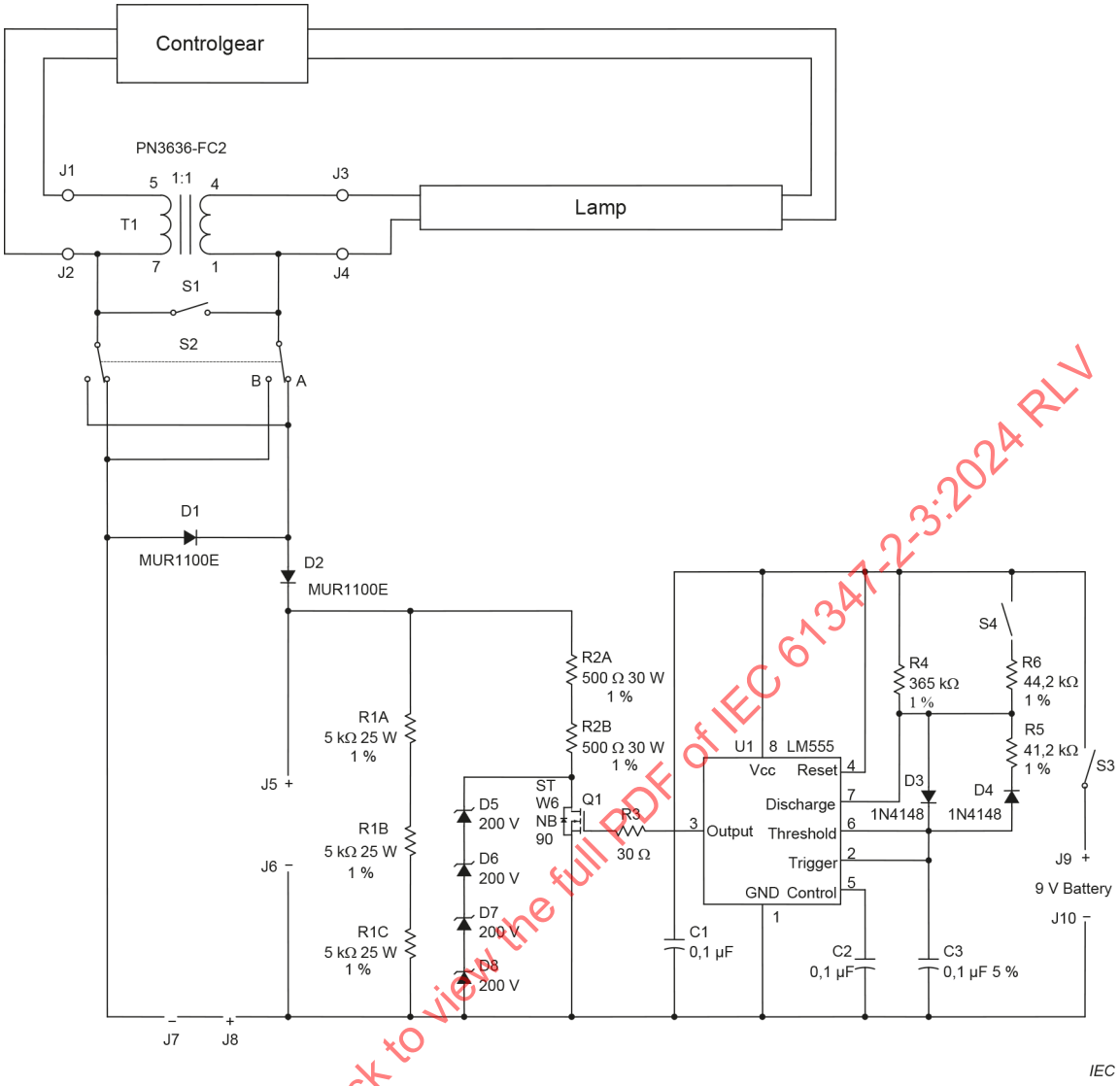


Figure 1 – Asymmetric pulse test circuit

~~NOTE FET~~ Q1 should be on for 3 ms and off for 3 ms when S4 is closed, and on for 27 ms and off for 3 ms when S4 is open.

A list of material and transformer specifications is given in ~~Annex K~~ Annex C. Any other transformer components with the same functionality are permitted.

17.3 Asymmetric power test

The controlgear shall have adequate protection to prevent the lamp cap from overheating at the end of the lamp life cycle.

Compliance is checked by the following test. The relevant values of lamp power, maximum cathode power P_{max} at the cathodes and the designation of lamp cap shall be taken from IEC 60081:1997, Annex E, IEC 60081:1997/AMD4:2010, Annex E and IEC 60081:1997/AMD6:2017, Annex E and IEC 60901:1996, Annex D, IEC 60901:1996/AMD2:2000, Annex D, IEC 60901:1996/AMD5:2011, Annex D and IEC 60901:1996/AMD6:2014, Annex D, respectively.

~~NOTE Amendment 6 of IEC 60081 is under preparation. Stage at the time of publication: IEC CDV 60081 AMD6:2015.~~

Test procedure:

Refer to the schematic diagram in Figure 2.

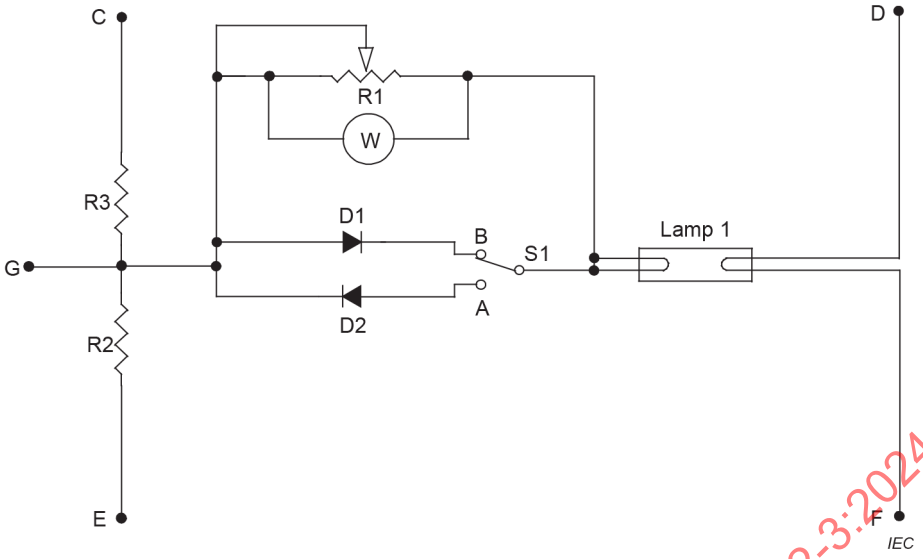
1) Set switch S1 to position A.
2) Set resistance of resistor R1 to 0 (zero) Ω.
3) Start lamp(s) by turning on power to the controlgear under test and allow lamp(s) to warm up for 5 min.
4) Increase the resistance of R1 rapidly (within 15 s) until the power dissipated by resistor R1 equals the test power value of twice the asymmetric power P_{max} in IEC 60081:1997, Annex E, IEC 60081:1997/AMD4:2010, Annex E and IEC 60081:1997/AMD6:2017, Annex E and IEC 60901:1996 , Annex D, IEC 60901:1996/AMD2:2000, Annex D, IEC 60901:1996/AMD5:2011, Annex D and IEC 60901:1996/AMD6:2014, Annex D, respectively. If the controlgear limits the power in R1 to a value less than the test power, set R1 at the value which produces the maximum wattage. If the controlgear switches off before reaching the test power, continue with (5). If the controlgear does not switch off and limits the power in R1 to a value less than the test power, set R1 at the value which produces the maximum power.
5) If the test wattage value was reached in step (4), wait for an additional 15 s. If the test wattage value was not reached in step (4), wait for an additional 30 s. Measure the power in R1.

   The power dissipation in resistor R1 shall be below or equal to P_{max}.

   If the power dissipation in resistor R1 is greater than P_{max}, the controlgear has failed and the test is discontinued.
6) Turn off power to the controlgear. Set switch S1 to position B.
7) Repeat test procedure steps (3) to (5) above.

   The controlgear shall pass both position "A" and position "B" tests.
8) For multi-lamp controlgear, repeat test procedure steps (1) to (7) for each lamp position.

   A multi-lamp controlgear shall pass the tests for each lamp position.
9) For controlgear that operate multiple lamp types (e.g. 26 W, 32 W, 42 W) each lamp type specified shall be tested. Repeat steps (1) to (8) for each lamp type.



NOTE 1 R2 = R3 = x Ω (this resistance is half the resistance of the hot cathode – refer to the relevant lamp data sheet).

NOTE 2 C, D, E and F represent cathode connections for the ~~ballast~~ controlgear.

NOTE 3 For instant start controlgear, connection G is connected to one terminal and the combined D and F are connected to the other terminal.

Figure 2 – Asymmetric power detection circuit

17.4 Open filament test

17.4.1 Selection

The controlgear shall have adequate protection to prevent the lamp cap from overheating at the end of the lamp life cycle under open filament conditions.

Compliance is checked by either test procedure A or B as determined by the value of I_{max} below.

During the test, the following values of maximum lamp current I_{max} apply:

– for 13 mm (T4) lamps, I_{max} = 1 mA;

– for 16 mm (T5) lamps, I_{max} = 1,5 mA.

(Other diameters are under study.)

If these current values are exceeded, test procedure B shall be applied; otherwise, test procedure A shall be applied.

17.4.2 Measurements to be carried out prior to test procedure A

Determine the RMS currents, $I_{LL}(1)$, $I_{LH}(1)$, $I_{LL}(2)$, $I_{LH}(2)$, at the controlgear output terminals by using a current probe and mark the terminals respectively, where:

- $I_{LL}(1)$ is the lower of the RMS currents through the lead-in wire of electrode 1;
- $I_{LH}(1)$ is the higher of the RMS currents through the lead-in wire of electrode 1;
- $I_{LL}(2)$ is the lower of the RMS currents through the lead-in wire of electrode 2;
- $I_{LH}(2)$ is the higher of the RMS currents through the lead-in wire of electrode 2.

Connect the circuit according to Figure 3 a).

17.4.3 Test procedure A

Refer to the schematic diagram in Figure 3 a).

1) Set S to position 1.
2) Turn on the ~~ballast~~ controlgear under test and allow lamp(s) to warm up for 5 min.
3) Set S to position 2 and wait for 30 s.
4) Measure the RMS current value of I_{lamp} with the current probe near to the lamp end. If I_{lamp} is pulsing, the RMS value shall be computed over one complete pulse cycle including the off time.

   The lamp discharge current I_{lamp} shall not be greater than I_{max}.

   If the lamp discharge current is greater than I_{max}, the controlgear has failed and the test is discontinued.

   Refer to Figure 3 b).
5) Set S to position 1.
6) Turn on the controlgear under test and allow lamp(s) to warm up for 5 min.
7) Set S to position 2 and wait for 30 s.
8) Measure the RMS current value of I_{lamp} with the current probe near to the lamp end. If I_{lamp} is pulsing, the RMS value shall be computed over one complete pulse cycle including the off time.

   The lamp discharge current I_{lamp} shall not be greater than I_{max}.
9) For multi-lamp controlgear, repeat test procedure steps (1) to (8) for each lamp position.

   A multi-lamp controlgear shall pass the tests for each lamp position to pass the end-of-lamp-life test.
10) For controlgear that operate multiple lamp types (e.g. 26 W, 32 W, 42 W), each lamp type specified shall be tested. Repeat steps (1) to (9) for each lamp type.

17.4.4 Test procedure B

Connect the lamp as shown in Figure 3 a) and Figure 3 b) with the measurement arrangement according to Figure 3 c). If the controlgear has an isolation transformer, connect the 1 MΩ resistor to the corresponding terminal defined in 17.4.2.

1) Set S to position 1.
2) Turn on the controlgear under test and allow lamp(s) to warm up for 5 min.
3) Set S to position 2 and wait for 30 s.

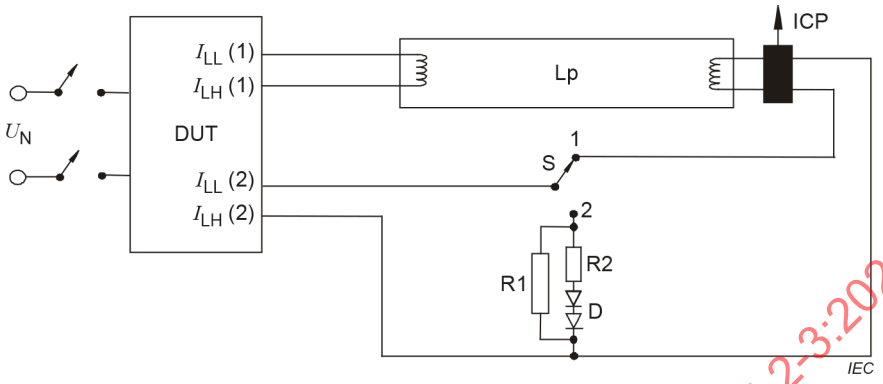
   Measure the RMS voltage value with the differential probe placed as indicated in Figure 3 c). If the voltage is pulsing, the RMS value shall be computed over one complete pulse cycle including the off time.
4) The voltage shall not be greater than 25 % of the rated lamp voltage. If the voltage is greater than 25 %, discontinue the test.

   Refer to Figure 3 b).
5) Repeat test procedure steps (1) to (4) above.
6) For multi-lamp controlgear, repeat test procedure steps (1) to (5) for each lamp position.

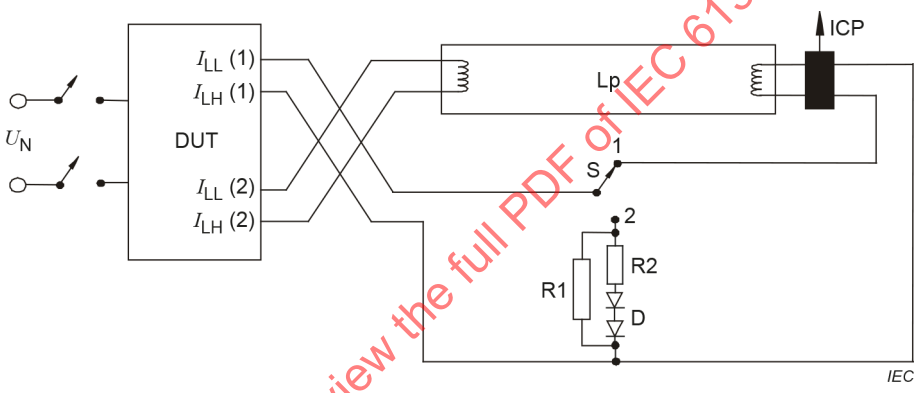
   A multi-lamp controlgear shall pass the test for each lamp position to pass the end-of-lamp-life test.

7) For controlgear which operate multiple lamp types (e.g. 26 W, 32 W, 42 W), each lamp type specified shall be tested.

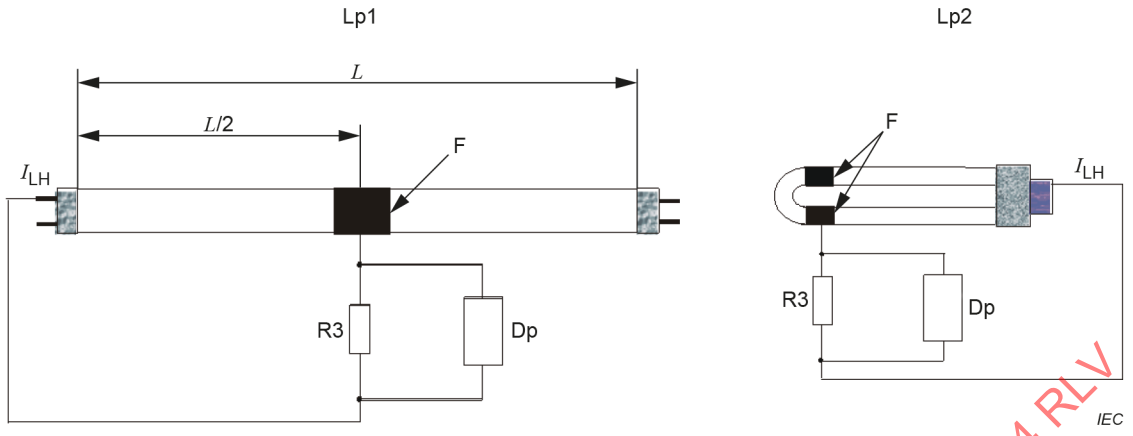
Repeat steps (1) to (6) for each lamp type. A multiple lamp controlgear shall pass the test for each lamp type.



a) Open filament test circuit; electrode (1) check



b) Open filament test circuit; electrode (2) check



c) Detection of lamp current

Key

Lp	lamp	R1 = 10 kΩ	
Lp1	straight lamp; copper foil width 4 cm	R2 = 22 Ω, 7 W	
Lp2	bended lamp (single capped and circular); copper foil width: twice 2 cm; both foils connected together	R3 = 1 MΩ	
U_N	supply	D	fast diodes
F	copper foil	DUT	device (controlgear) under test
ICP	I_{lamp} current probe	Dp	differential probe < 10 pF
		L	lamp length

NOTE In Figure 3 c), terminal I_{LH}(2) of Figure 3 a) or I_{LH}(1) of Figure 3 b) is used.

Figure 3 – Open filament test circuits

18 Construction

IEC 61347-1:2015, Clause 15 applies.

19 Creepage distances and clearances

IEC 61347-1:2015, Clause 16 and IEC 61347-1:2015/AMD1:2017, Clause 16 apply.

20 Screws, current-carrying parts and connections

IEC 61347-1:2015, Clause 17 applies.

21 Resistance to heat, fire and tracking

IEC 61347-1:2015, Clause 18 applies.

22 Resistance to corrosion

IEC 61347-1:2015, Clause 19 applies.

23 Applicable annexes of IEC 61347-1

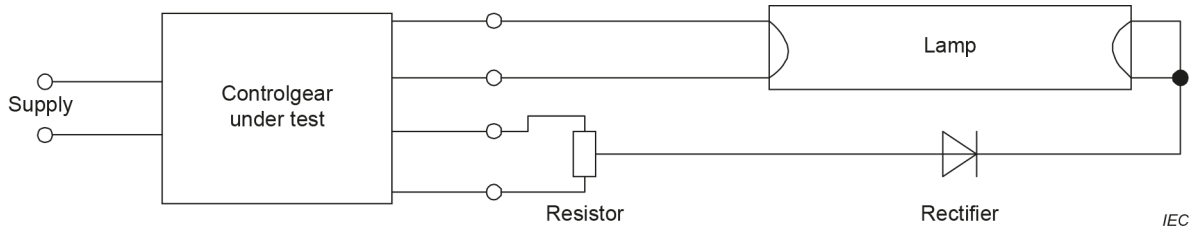
The following annexes of IEC 61347-1:2015 apply:

– Annex A (normative) Test to establish whether a conductive part is a live part which may cause an electric shock;

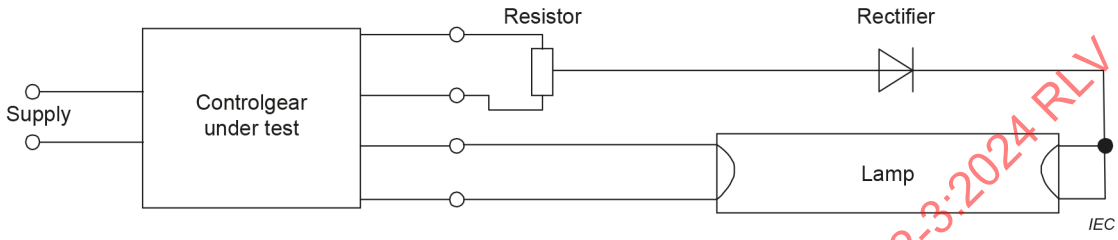
– Annex C (normative) Particular requirements for electronic lamp controlgear with means of protection against overheating;

– Annex D (normative) Requirements for carrying out the heating tests of thermally protected lamp controlgear;

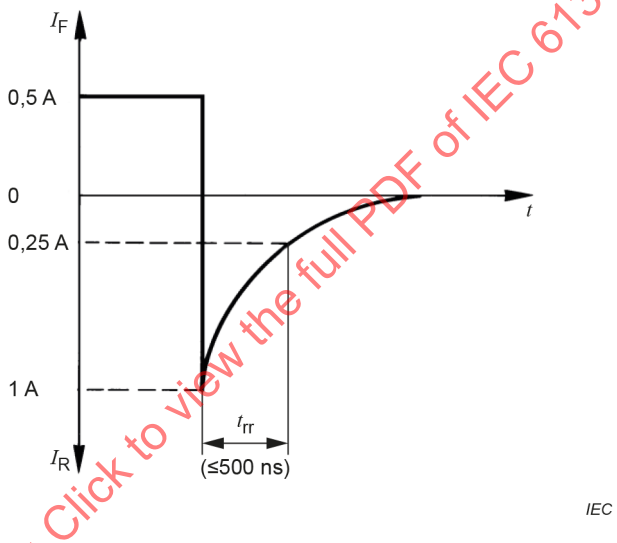
– Annex H (normative) Tests.



a) Testing the first direction of the rectifying effect



b) Testing the opposite direction of the rectifying effect



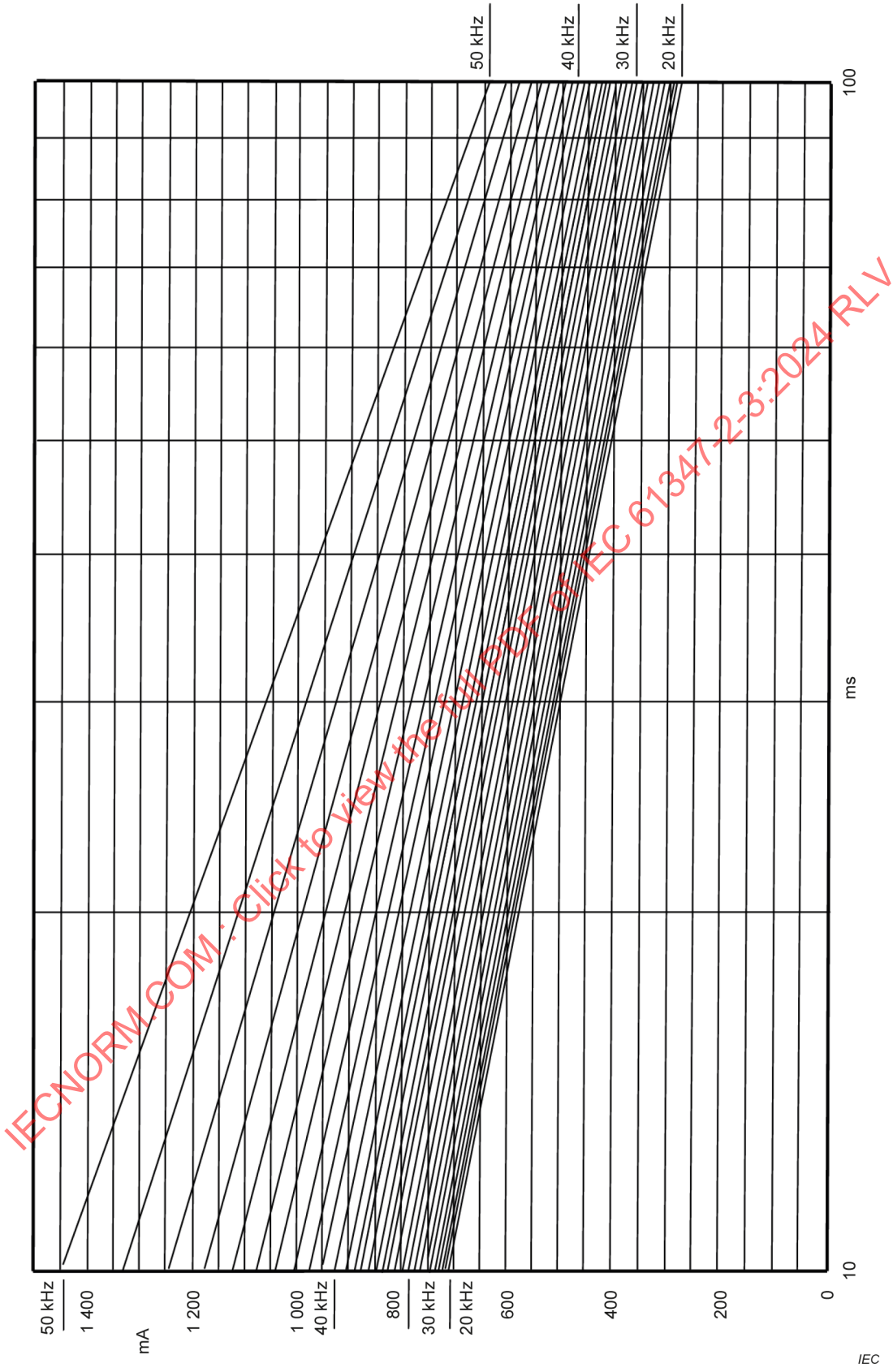
c) Recovery time t_{rr} of the diode

The rectifier characteristics shall be:

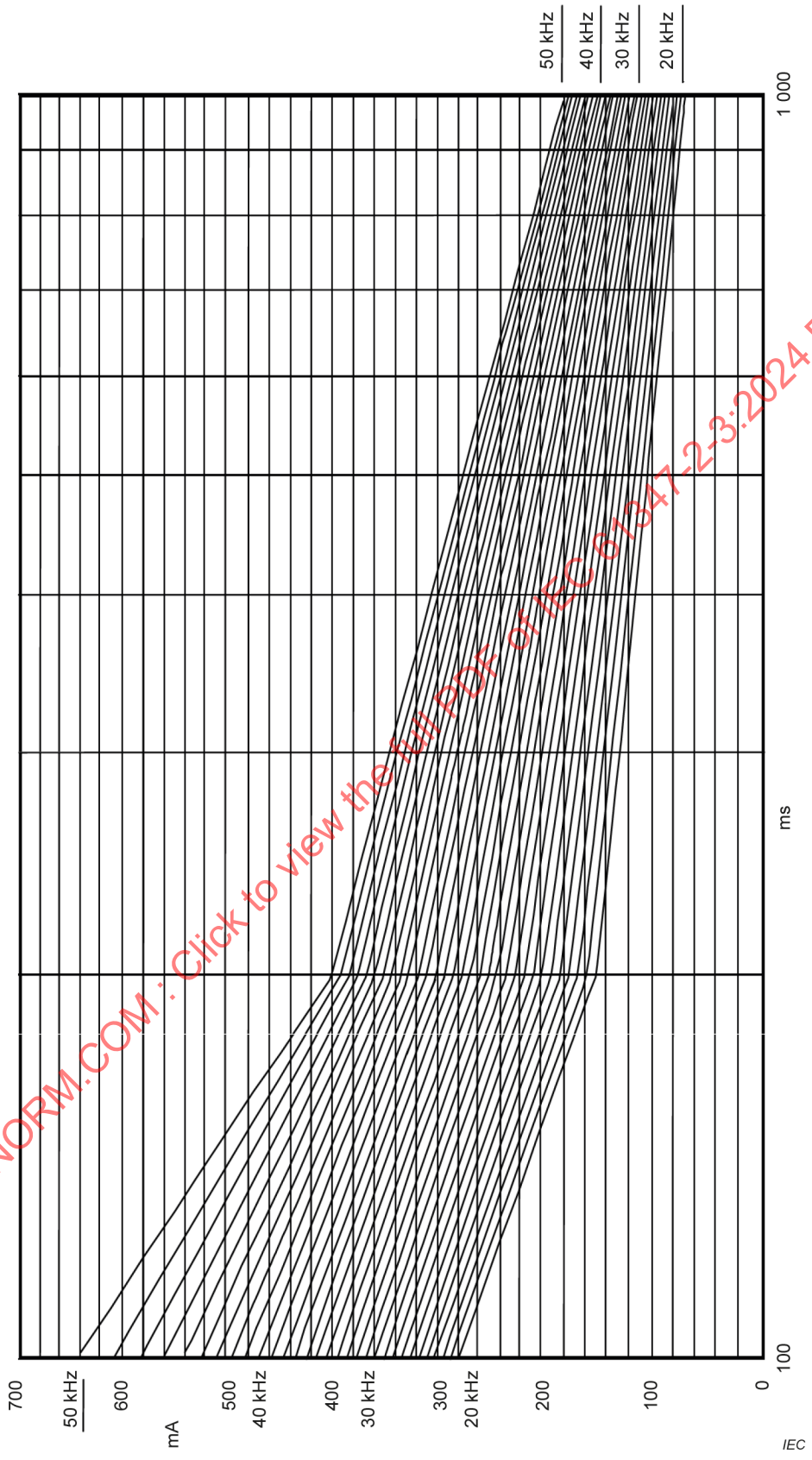
Peak inverse voltage	U_{RRM}	≥	3 000 V
Reverse leakage current	I_R	≤	10 µA
Forward current	I_F	≥	three times nominal lamp running current
Reverse recovery time (maximum frequency: 150 kHz)	t_{rr}	≤	500 ns (measured with I_F = 0,5 A and I_R = 1 A to I_R = 0,25 A)

The following types of diodes (three diodes in series) are recommended as a suitable rectifier: RGP 30 M, BYM 96 E, BYV 16.

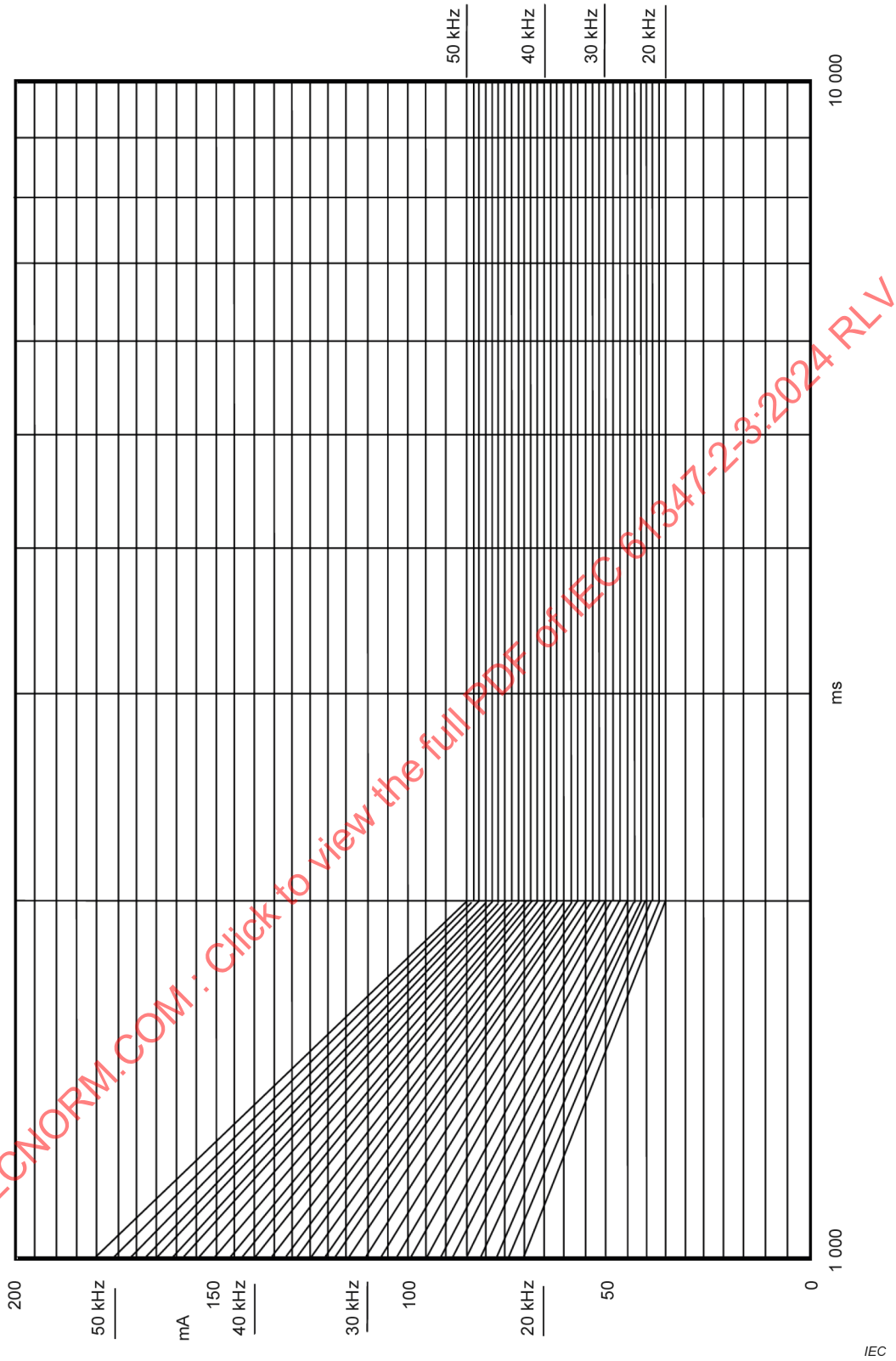
Figure 4 – Circuit for testing rectifying effect



a) Limits for capacitive leakage current (in mA RMS) of HF-operated fluorescent lamps – Range 10 ms to 100 m



b) Limits for capacitive leakage current (in mA RMS) of HF-operated fluorescent lamps – Range 100 ms to 1 000 ms



c) Limits for capacitive leakage current (in mA RMS) of HF-operated fluorescent lamps – Range 1 000 ms to 10 000 ms

Figure 5 – Nomographs for the capacitive leakage current limits of HF-operated fluorescent lamps

~~Annex A~~
~~(normative)~~

~~Test to establish whether a conductive part is a live part which may cause an electric shock~~

~~The requirements of Annex A of IEC 61347-1 apply.~~

~~Annex B~~
~~(normative)~~

~~Particular requirements for thermally protected lamp control gear~~

~~The requirements of Annex B of IEC 61347-1 are not applicable.~~

~~Annex C~~
~~(normative)~~

~~Particular requirements for electronic lamp control gear with means of protection against overheating~~

~~The requirements of Annex C of IEC 61347-1 apply.~~

~~Annex D~~
~~(normative)~~

~~Requirements for carrying out the heating tests of thermally protected lamp control gear~~

~~The requirements of Annex D of IEC 61347-1 apply.~~

~~Annex E~~
~~(normative)~~

~~Use of constant *S* other than 4 500 in t_w tests~~

~~The requirements of Annex E of IEC 61347-1 are not applicable.~~

~~Annex F~~
~~(normative)~~

~~Draught-proof enclosure~~

~~The requirements of Annex F of IEC 61347-1 are not applicable.~~

~~Annex G~~
~~(normative)~~

~~Explanation of the derivation of the values of pulse voltages~~

~~The requirements of Annex G of IEC 61347-1 are not applicable.~~

~~Annex H~~
~~(normative)~~

~~Tests~~

~~The requirements of Annex H of IEC 61347-1 apply.~~

Annex A ~~Annex I~~
(normative)

Measurement of high-frequency leakage current

Electronic controlgear are tested for capacitive high-frequency leakage current, as follows.

The ~~ballast~~ controlgear is tested in the circuit shown in Figure A.1 with two normal lamps, each being connected to the circuit at only one end ("crossed pair of lamps"). This method would also provide the worst-case leakage to earth.

The glass tube of one of the two lamps, whichever gives the worst value, is wrapped with a 75 mm wide metal foil, together with a non-inductive 2 000 Ω resistor and a measuring device suitable for the test circuit.

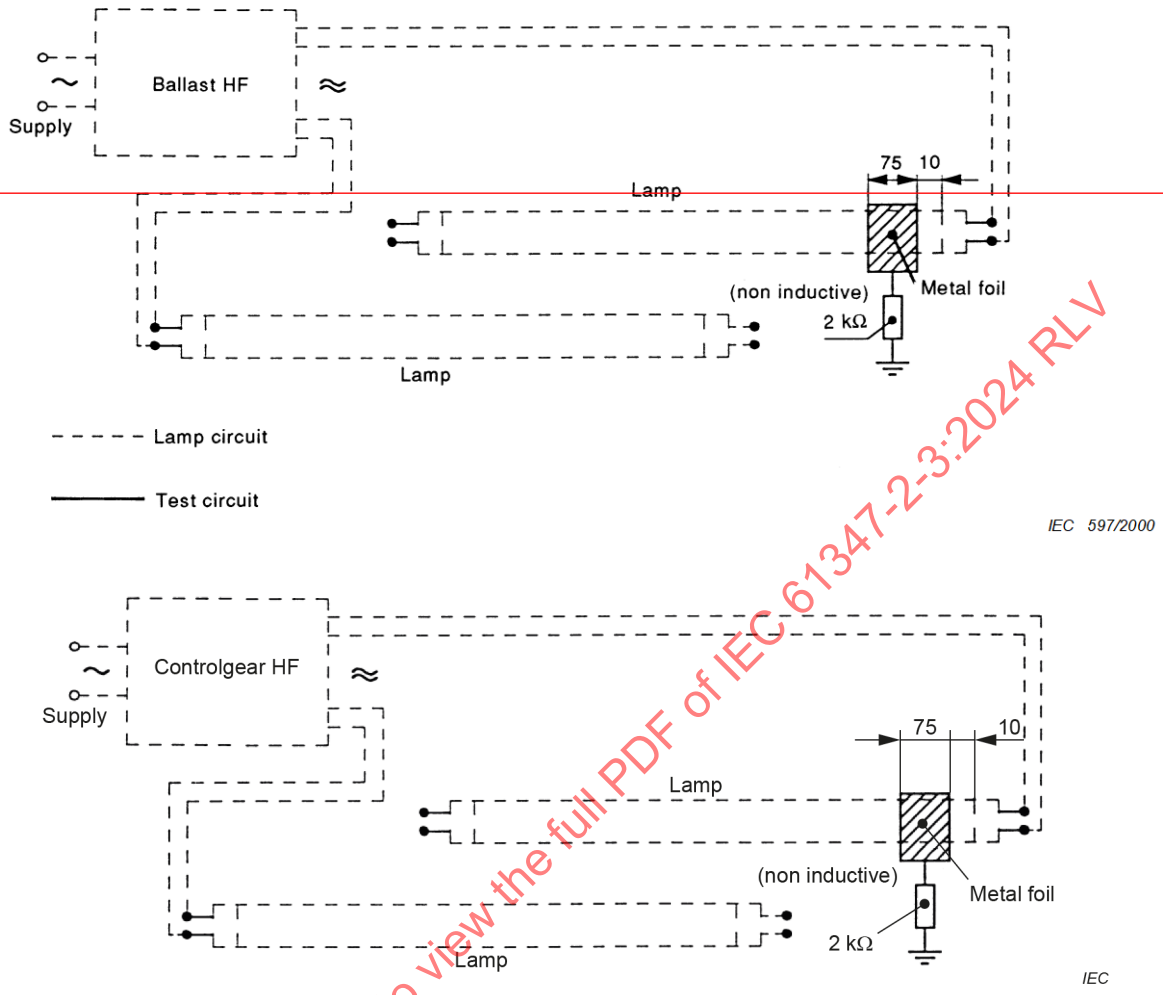
The test shall be conducted with the lamps supported on two 75 mm high wooden blocks and placed on a wooden table, such that no external influence from metallic surfaces is caused.

The leakage current (i.e. the high-frequency current flowing from the metal foil through the 2 000 Ω ± 50 Ω resistor to earth) is measured under the following simulated operating conditions.

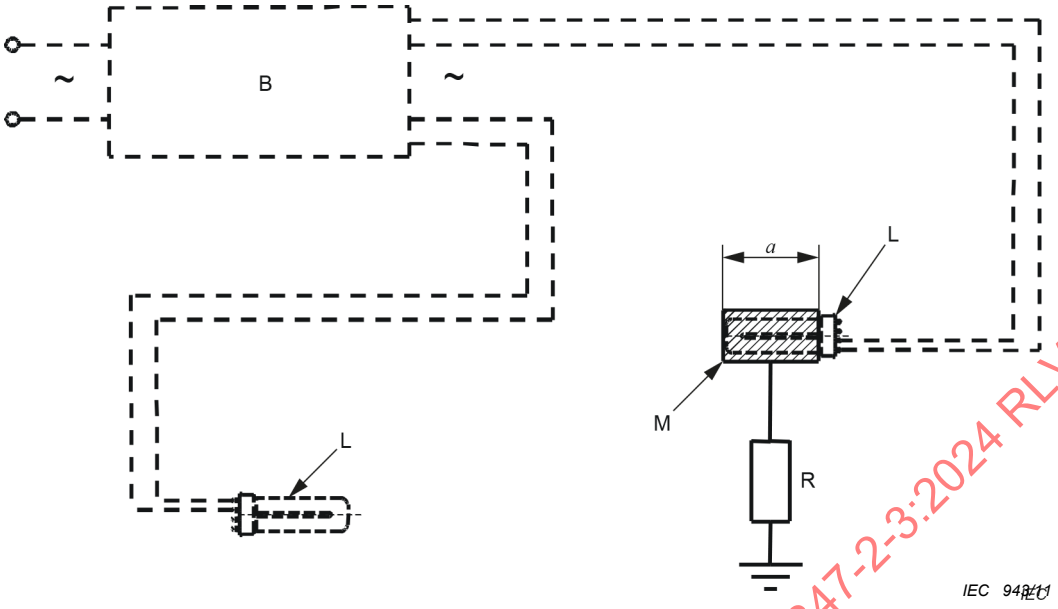
– Two normal lamps, each being inserted at only one end into a pair of holders, with the supply voltage switched on.
– In order to take care of the most adverse condition (that is to ensure that the highest leakage current which ~~may~~ can occur will be measured) the procedure shall be carried out in such a way that all of the four possible holder contact/cap-pin combinations are covered.
– For controlgear with multi-lamp operation, the leakage current from each lamp position is measured separately.
– Where a range of controlgear is submitted for test, each ~~ballast~~ controlgear type shall be checked, not just the higher or lower power variants.
– Under each of the specified operation conditions, the capacitive leakage current measured shall not exceed the limits specified in Figure 5 (with the time ranges given in Figure 5 a), Figure 5 b), and Figure 5 c)).

NOTE Leakage currents are derived from IEC 60479-2.

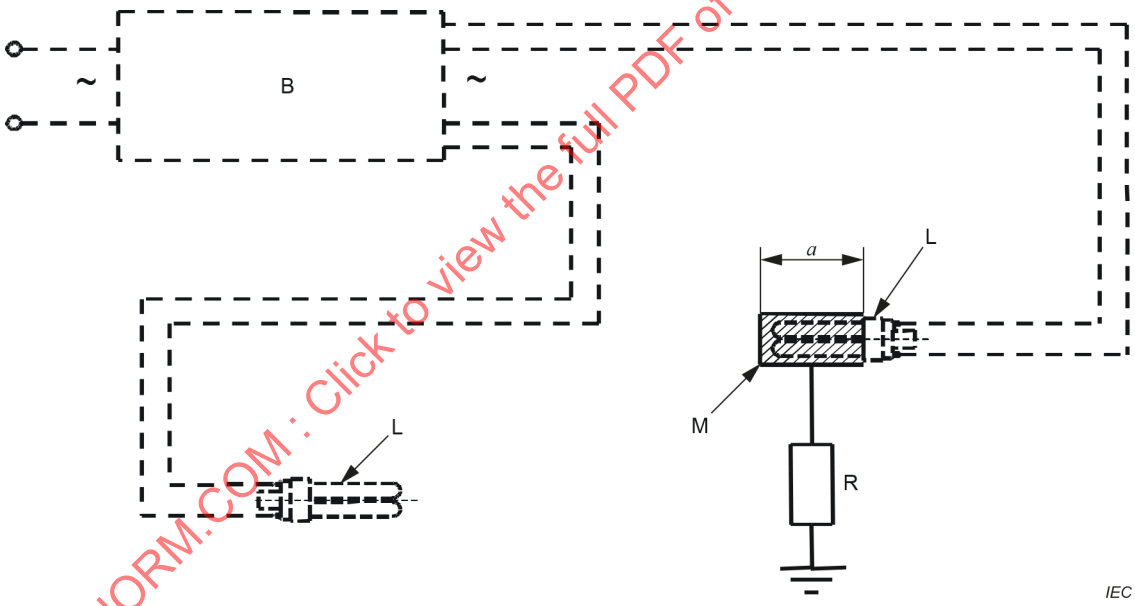
Dimensions in millimeters



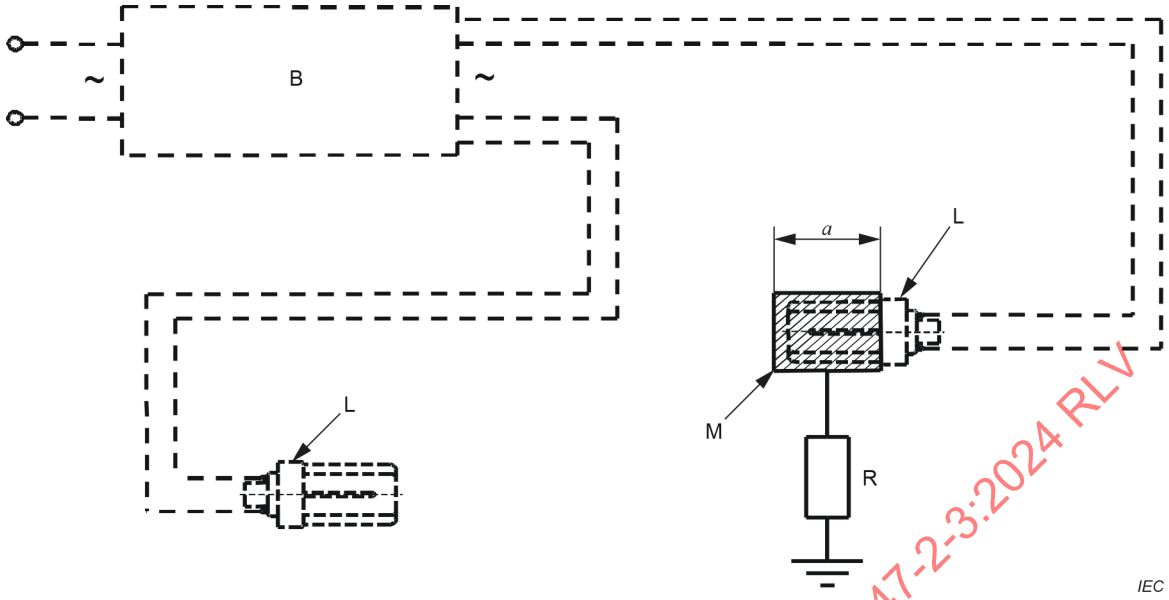
a) Test arrangement for bar-shaped tubular fluorescent lamps



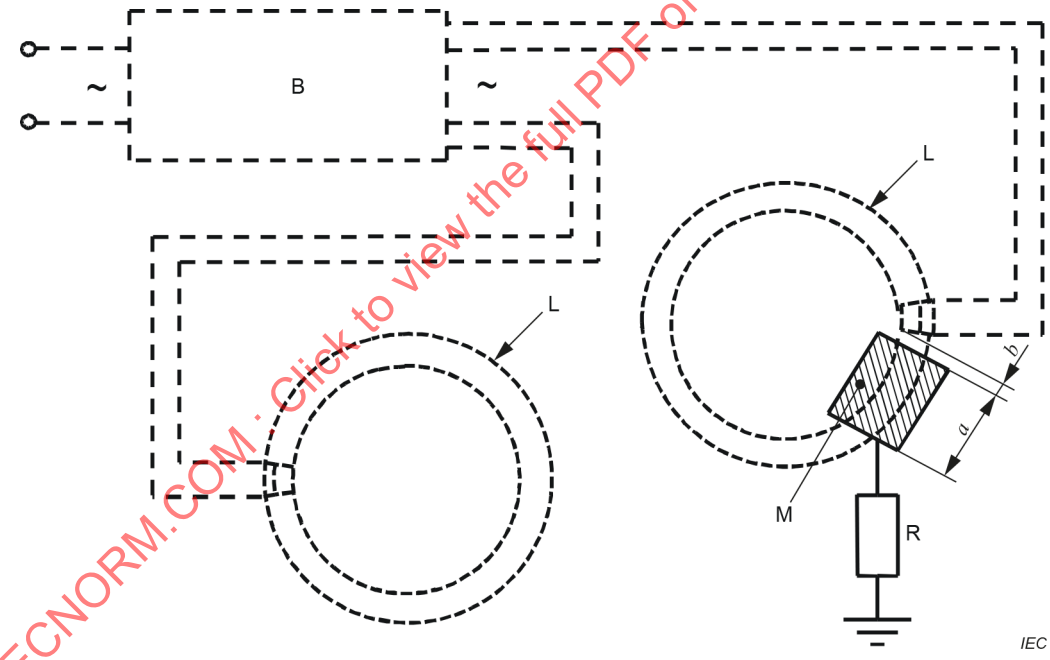
b) Test arrangement for lamps with ILCOS FSD (H)



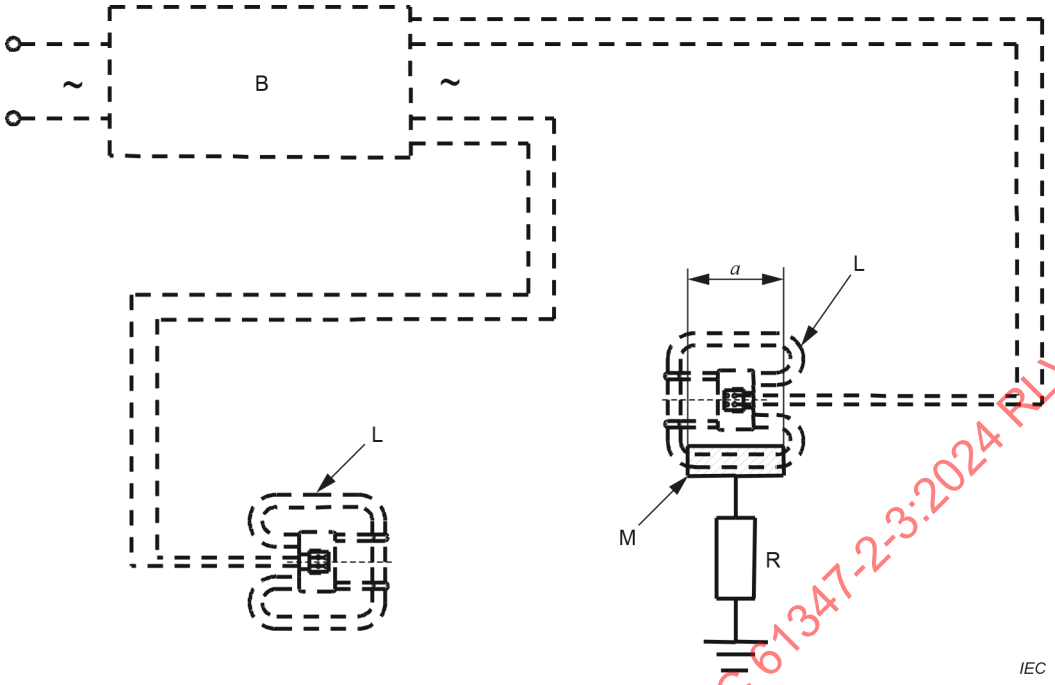
c) Test arrangement for lamps with ILCOS FSQ



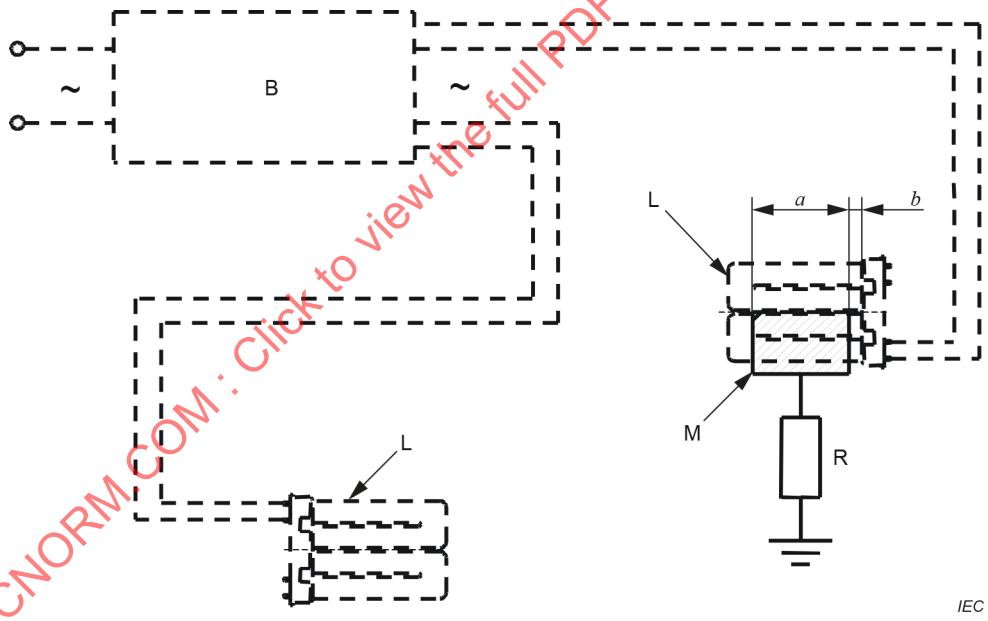
d) Test arrangement for lamps with ILCOS FSM (H)



e) Test arrangement for lamps with ILCOS FSC



f) Test arrangement for lamps with ILCOS FSS and GR10q cap



g) Test arrangement for lamps with ILCOS FSS and 2G10 cap

Key

M	metal foil	– – – –	lamp circuit
L	lamp	———	test circuit
B	~~ballast~~ controlgear HF		
R =	2 kΩ (non inductive)		
a =	length of the metal foil (maximum 75 mm, minimum the length of the lamp)		
b =	10 mm		

Figure ~~I~~A.1 – Leakage current test arrangement for various fluorescent lamps

Annex BAnnex J
(normative)

Particular additional safety requirements for a.c., a.c./d.c. or d.c. supplied electronic Additional requirements for centrally supplied controlgear for emergency lighting

J.1 General

This annex specifies particular safety requirements of a.c., a.c./d.c. or d.c. supplied electronic control gear for emergency lighting purposes intended for connection to a centralised emergency power supply, as, for example, central battery supply system.

It does not apply to electronic control gear used in self-contained emergency lighting luminaires as this is covered by IEC 61347-2-7.

J.2 Terms and definitions

The terms and definitions in Clause 3 apply together with the following.

J.2.1
emergency lighting
lighting provided for use when the supply to the normal lighting fails; it includes escape lighting and standby lighting

J.2.2
rated battery voltage
voltage declared by the battery manufacturer

J.2.3
rated emergency power supply voltage
rated voltage of the emergency power supply claimed by the manufacturer for the information of the installer or user

J.2.4
starting aid
device which facilitates the starting of the lamp

NOTE A conductive strip affixed to the outer surface of the lamp and a conductive plate which is spaced within an appropriate distance from a lamp are examples of starting aids.

J.2.5
ballast lumen factor
ratio of the luminous flux of a reference lamp when the control gear under test is operated at its rated voltage and frequency compared with the luminous flux of the same lamp operated with the appropriate reference ballast supplied at its rated voltage and frequency

J.2.6
emergency ballast lumen factor
EBLF
ratio of the emergency luminous flux of the lamp supplied by the emergency control gear to the luminous flux of the same lamp operated with the appropriate reference ballast at its rated voltage and frequency

~~The emergency ballast lumen factor is the minimum of the values measured at the appropriate time after failure of the normal supply and continuously.~~

~~**J.2.7**~~
~~**total circuit power**~~
~~total power dissipated by ballast and lamp in combination, at rated voltage and frequency of the ballast~~

~~**J.2.8**~~
~~**preheat starting**~~
~~type of circuit in which the lamp electrodes are brought to emission temperature before the lamp actually ignites~~

~~**J.2.9**~~
~~**non-preheat starting**~~
~~type of circuit which utilizes a high open-circuit voltage causing field emission from electrodes~~

~~J.3~~B.1 Marking

~~J.3~~B.1.1 Mandatory markings

Controlgear shall, in addition to the requirements of 7.1, be clearly marked with the following mandatory marking:

a) AC, AC/DC or DC maintained emergency electronic controlgear shall be marked with the symbol:

b) rated emergency power supply voltage and voltage range.

~~J.3~~B.1.2 Information to be provided if applicable

In addition to the above mandatory markings and the requirements of 7.2, the following information shall either be given on the controlgear or be made available in the manufacturer's catalogue or similar:

a) a clear indication regarding the type of starting, i.e. preheat starting or non-preheat starting;
b) indication as to whether a starting aid is ~~needed~~ necessary for the lamp(s);
c) limits of the ambient temperature range within which an independent controlgear will operate satisfactorily at the declared voltage (range);
d) emergency ballast lumen factor (EBLF).

~~J.4~~B.2 General statement

The provisions of IEC 60929:2011, Clause 6 apply at 90 % and 110 % of the rated emergency power supply voltage.

Furthermore, starting and operation of lamps shall be guaranteed across the widest rated voltage range.

NOTE 1 The electrical characteristics, as given on the lamp data sheets of IEC 60081 and IEC 60901 and applying to operation on a reference ballast at rated voltage with a frequency of 50 Hz or 60 Hz, ~~may~~ can deviate when operating on a high-frequency ~~ballast~~ controlgear and the conditions of item c) of B.1.2 above.

NOTE 2 A starting aid is only effective when it has an adequate potential difference from one end of the lamp.

~~J.5~~B.3 Starting conditions

The provisions of IEC 60929:2011, Clause 7 apply at 90 % and 110 % of the rated emergency power supply voltage. Where the controlgear is declared for operation at temperatures lower than 10 °C then the starting condition shall be made at the lowest declared temperature and 90 % of rated voltage.

~~J.6~~B.4 Operating conditions

The provisions of IEC 60929:2011, Clause 8 and IEC 60929:2011/AMD1:2015, Clause 8 apply. In addition, tests shall be made with rated DC supply voltage.

~~J.7~~B.5 Current

At the rated operating voltage, the supply current shall not differ by more than ±15 % from the declared value when the controlgear is operated with a reference lamp.

The supply shall be of low impedance and low inductance.

Compliance is checked by measurement.

~~J.8~~B.6 Maximum current in any lead to a cathode

The provisions of IEC 60929:2011, Clause 11 apply at 90 % and 110 % of the rated emergency power supply voltage.

~~J.9~~B.7 Lamp operating current waveform

The provisions of IEC 60929:2011, Clause 12 apply. In addition, tests shall be made with rated emergency power supply voltage.

~~J.10~~B.8 EMC immunity

For emergency supplied electronic controlgear, the requirements of IEC 61547 apply.

~~J.11~~B.9 Pulse voltage from central battery systems

The DC supplied emergency controlgear shall withstand, without failure, any pulses caused by switching other equipment in the same circuit.

Compliance is checked by operating the ~~ballast~~ controlgear at the maximum voltage of the rated voltage range in association with the appropriate number of lamps and at an ambient temperature of 25 °C. The controlgear shall withstand, without failure, the number of pulse voltages given in Table B.1 superimposed, with the same polarity, on the supply voltage.

Table ~~J~~B.1 – Pulse voltages

Number of voltage pulses	Pulse voltage		Period between each pulse
	Peak value V	Pulse width at half peak ms	 s
3	Equal to design voltage	10	2
NOTE A suitable measuring circuit is shown in IEC 61347-1:2015, Figure G.2.			

~~J.12~~B.10 Tests for abnormal conditions

The provisions of IEC 60929:2011, Clause 14 apply.

~~J.13~~B.11 Temperature cycling test and endurance test

The provisions of IEC 61347-2-7:2011, Clause 26 and IEC 61347-2-7:2011/AMD1:2017, Clause 26 apply.

~~J.14~~B.12 Functional safety (EBLF)

The appropriate lamp associated to the controlgear shall provide the necessary light output after change over to the emergency mode. This is verified if the declared emergency ballast lumen factor (EBLF) is achieved during emergency operation at 25 °C.

Compliance is checked by the following test:

Measurement of EBLF shall be made at 25 °C, using a lamp which has been aged for at least 100 h of the appropriate type and having not been lit for 24 h. The first measurement is made at maximum power supply voltage range after 5 s and 60 s and then in steady conditions at the minimum power supply voltage range.

The lowest value of the values measured at 60 s with maximum power supply voltage or in steady conditions at minimum power supply voltage shall be retained and compared with the one measured with the same lamp operating by the appropriate reference ballast. The ratio shall reach at least the declared EBLF.

The value measured at 5 s at maximum power supply voltage shall reach at least 50 % of the declared EBLF.

NOTE 1 60 s is replaced by 0,5 s for ~~ballasts~~ controlgear declared for use in luminaires for high-risk task area lighting.

NOTE 2 Other methods ~~may~~ can apply for determining EBLF, in particular methods which record permanently the luminous flux of the lamp associated to the ~~ballast~~ controlgear under test.

Annex C~~Annex K~~
(informative)

Components used in the asymmetric pulse test circuit

See Table C.1 and Table C.2. See also Figure 1.

Table ~~K~~C.1 – Material specification

Reference designation	Description
U1	555 timer ic
T1	1:1 transformer
D1, D2	Ultra-fast recovery diode, 1 000 V, 1 A, 75 ns
D3, D4	Signal diode 75 V 200 mA
D5...D8	200 V Zener diode
Q1	~~Mosfet~~ Metal oxide semiconductor field effect transistor (MOSFET) 900 V 6 A
R1A to R1C	Resistor 5 kΩ 25 W 1 %
R2A and B	Resistor 500 Ω 30 W 1 %
S1, S3, S4	Switch
S2	Switch – double
Battery	Battery 9 V
C1, C2, C3	Capacitor 0,1 µF 50 V 5 %
R3	Resistor 30 Ω ¼ W 5 %
R4	Resistor 365 kΩ ¼ W 1 %
R5	Resistor 41,2 kΩ ¼ W 1 %
R6	Resistor 44,2 kΩ ¼ W 1 %

Table ~~K~~C.2 – Transformer specification

Component	Description
Core	Two EI187 (E19/8/5), Core area 22,6 mm^2, P material or equivalent
Bobbin	8-pin, horizontal mount
Primary winding	38 turns #26 AWG HN, 19 turns/layer. Start pin 5, finish pin 7
Inter-winding insulation	5 layers 3M #56 3/8 in or equivalent
Secondary winding	38 turns #26 AWG HN, 19 turns/layer. Start pin 4, finish pin 1
Wrapper	2 layers 3M #56 3/8 in or equivalent
Inter-winding capacitance	Approximately 22 pF
HIPOT (high potential)	2 500 V RMS

~~Annex L~~
~~(normative)~~

~~Information for control gear design~~
~~(from Annex E of IEC 61195)~~

~~L.1 Guideline for safe lamp operation~~

~~To ensure safe lamp operation, it is essential to observe Clause L.2~~

~~L.2 Limitation of working voltage~~

~~For G5-capped lamps with diameter 16 mm, the working voltage between any lamp terminal and earth shall not exceed 430 V r.m.s.~~

Annex D
(informative)

Schedule of more onerous requirements

Products found compliant with the previous edition of this document do not necessarily require complete requalification for demonstrating compliance with this document. Depending on the nature of the changes introduced, partial retesting or even no retesting may be appropriate, as the case may be.

For this document, no more onerous requirements have been introduced with respect to the previous edition, i.e.IEC 61347-2-3:2011 and IEC 61347-2-3:2011/AMD1:2016.

Bibliography

IEC 60050-151, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices,* available at https://www.electropedia.org

IEC/~~TS~~ 60479-2, *Effects of currents on human beings and livestock – Part 2: Special aspects*

IEC 60598-2-22, *Luminaires – Part 2-22: Particular requirements – Luminaires for emergency lighting*

IEC 61195:1999, *Double-capped fluorescent lamps – Safety specifications*
IEC 61195:1999/AMD1:2012
IEC 61195:1999/AMD2:2014

IEC 61199:2011, *Single-capped fluorescent lamps – Safety specifications*
IEC 61199:2011/AMD1:2012
IEC 61199:2011/AMD2:2014

IEC 61347-2-3:2011, *Lamp control gear – Part 2-3: Particular requirements for a.c. and/or d.c. supplied electronic control gear for fluorescent lamps*
IEC 61347-2-3:2011 /AMD1:2016

IEC 61347-2-3

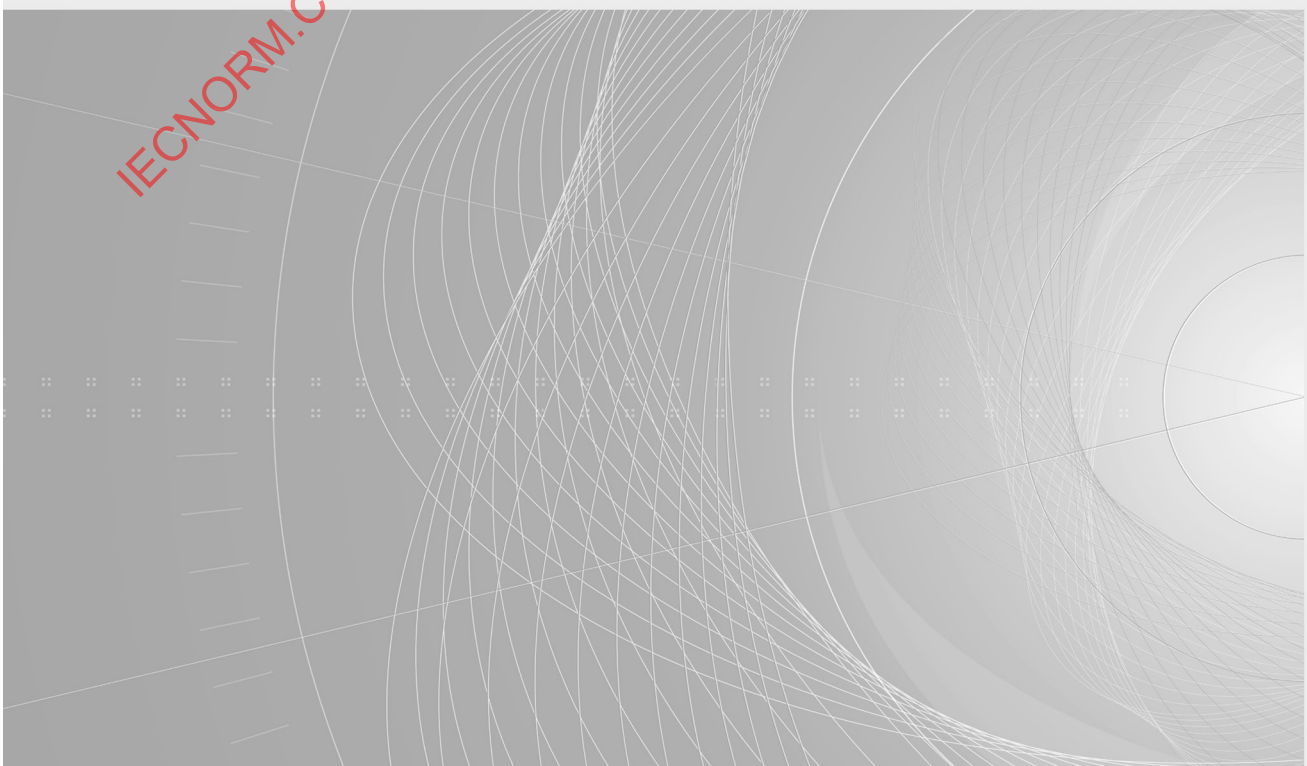
Edition 3.0 2024-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Controlgear for electric light sources – Safety –
Part 2-3: Particular requirements – AC or DC supplied electronic controlgear for fluorescent lamps

Appareillages de commande pour les sources de lumière électriques – Sécurité –
Partie 2-3: Exigences particulières – Appareillages électroniques alimentés en courant alternatif ou en courant continu pour lampes fluorescentes



IEC 61347-2-3:2024-05(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

CONTROLGEAR FOR ELECTRIC LIGHT SOURCES – SAFETY –

Part 2-3: Particular requirements – AC or DC supplied electronic controlgear for fluorescent lamps

FOREWORD

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IEC 61347-2-3 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lighting. It is an International Standard.

This third edition cancels and replaces the second edition published in 2011 and Amendment 1:2016. 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 where appropriate;
b) clarification of sample item numbers;
c) alignment of clause numbers with those of IEC 61347-1.

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

Draft	Report on voting
34C/1586/CDV	34C/1594/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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The technical requirements in this document compared to IEC 61347-2-3:2011 and IEC 61347-2-3:2011/AMD1:2016 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 61347-2-3:2011 and IEC 61347-2-3:2011/AMD1:2016.

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.

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

CONTROLGEAR FOR ELECTRIC LIGHT SOURCES – SAFETY –

Part 2-3: Particular requirements – AC or DC supplied electronic controlgear for fluorescent lamps

1 Scope

This part of IEC 61347 specifies safety requirements for electronic controlgear for use on AC supplies at 50 Hz or 60 Hz up to 1 000 V or on DC supplies up to 1 000 V with lamp operating frequencies deviating from the supply frequency, associated with fluorescent lamps as specified in IEC 60081 and IEC 60901, low-pressure UV lamps, and other fluorescent lamps for high-frequency operation.

NOTE 1 Requirements for centrally supplied controlgear for emergency lighting are given in Annex B. This also includes performance requirements as far as they are considered to be safety-related with respect to reliable emergency operation.

NOTE 2 Requirements for emergency lighting controlgear operating from non-centralised power supplies are given in IEC 61347-2-7.

NOTE 3 Performance requirements are the subject of IEC 60929.

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 60081:1997, *Double-capped fluorescent lamps – Performance specifications*
IEC 60081:1997/AMD1:2000
IEC 60081:1997/AMD2:2003
IEC 60081:1997/AMD3:2005
IEC 60081:1997/AMD4:2010
IEC 60081:1997/AMD5:2013
IEC 60081:1997/AMD6:2017

IEC 60901:1997, *Single-capped fluorescent lamps – Performance specifications*
IEC 60901:1997/AMD1:1997
IEC 60901:1997/AMD2:2000
IEC 60901:1997/AMD3:2004
IEC 60901:1997/AMD4:2007
IEC 60901:1997/AMD5:2011
IEC 60901:1997/AMD6:2014

IEC 60929:2011, *AC and/or DC-supplied electronic control gear for tubular fluorescent lamps – Performance requirements*
IEC 60929:2011/AMD1:2015

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

IEC 61347-2-7:2011, *Lamp controlgear – Part 2-7: Particular requirements for electric source for safety services (ESSS) supplied electronic controlgear for emergency lighting (self-contained)*
IEC 61347-2-7:2011 /AMD1:2017
IEC 61347-2-7:2011 /AMD2:2021

IEC 61547, *Equipment for general lighting purposes – EMC immunity requirements*

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
AC supplied electronic controlgear
mains-supplied AC to AC invertor including stabilizing elements for starting and operating one or more fluorescent lamps, generally at high frequency

3.2
maximum allowed peak voltage
highest permitted peak voltage across any insulation of the output under open-circuit condition and any normal and abnormal operating conditions

Note 1 to entry: The maximum allowed peak voltage is related to the declared RMS working voltage; see Table 1.

3.3
dummy cathode resistor
cathode substitution resistor as specified on the relevant lamp data sheet of IEC 60081 or IEC 60901 or as declared by the relevant lamp manufacturer or by the responsible vendor

3.4
DC supplied electronic controlgear
DC-supplied invertor including stabilization elements for starting and operating one or more tubular fluorescent lamps, generally at high frequency

3.5
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.]

3.6
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]

3.7
emergency lighting
lighting provided for use when the supply to the normal lighting fails

Note 1 to entry: Emergency lighting includes escape lighting and standby lighting.

3.8
rated emergency power supply voltage
rated voltage of the emergency power supply claimed by the manufacturer for the information of the installer or user

3.9
starting aid
device which facilitates the starting of the lamp

EXAMPLE A conductive strip affixed to the outer surface of the lamp and a conductive plate which is spaced within an appropriate distance from a lamp.

3.10
emergency ballast lumen factor
EBLF
ratio of the emergency luminous flux of the lamp supplied by the emergency controlgear to the luminous flux of the same lamp operated with the appropriate reference ballast at its rated voltage and frequency

Note 1 to entry: The emergency ballast lumen factor is the minimum of the values measured at the appropriate time after failure of the normal supply and continuously.

3.11
preheat starting
circuit in which the lamp electrodes are brought to emission temperature before the lamp actually ignites

3.12
non-preheat starting
circuit which utilizes a high open-circuit voltage causing field emission from the electrode

4 General requirements

IEC 61347-1:2015, Clause 4 applies, together with the following:

– For G5-capped lamps with a diameter of 16 mm, the working voltage between any output terminal and earth shall not exceed 430 V (RMS).

NOTE 1 This requirement is in accordance with IEC 61195:1999, Annex E.

– For centrally supplied controlgear for emergency lighting Annex B applies.

NOTE 2 This includes AC, AC/DC and DC supplied types.

EXAMPLE Central battery systems and generator-based systems.

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

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.

– Tests to meet the safety requirements for electronic controlgear for emergency lighting shall be performed under the conditions specified in Annex B.

For information on requalification of products compliant with the previous edition of this document, i.e. IEC 61347-2-3:2011 and IEC 61347-2-3:2011/AMD1:2016, refer to Annex D.

6 Classification

IEC 61347-1:2015, Clause 6 applies.

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), f), k), l), m), t) and u) of IEC 61347-1:2015, 7.1 and IEC 61347-1:2015/AMD1:2017, 7.1;

– item s) of IEC 61347-1:2015, 7.1 and IEC 61347-1:2015/AMD1:2017, 7.1;

  This item has priority over the requirements of SELV controlgear in IEC 61347-1:2015, Table L.1 and IEC 61347-1:2015/AMD1:2017, Table L.1;

According to 15.4, the declaration of U_{out} may be based on a reduced number of measurements.

7.1.2 Information to be provided

The following information, if applicable, shall be given either on the controlgear, or be made available in the manufacturer's catalogue or similar:

– items h), i), j) and n) of IEC 61347-1:2015, 7.1;

– for DC supplied controlgear: information regarding voltage polarity reversal protection.

7.2 Durability and legibility of markings

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) of 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.

9 Earthing

IEC 61347-1:2015, Clause 9 applies.

10 Protection against accidental contact with live parts

IEC 61347-1:2015, Clause 10 and IEC 61347-1:2015/AMD1:2017, Clause 10 apply.

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:

The leakage current that can occur from contact with fluorescent lamps operated at high frequency from AC supplied electronic controlgear shall not exceed the values in Figure 5 when measured in accordance with Annex A. The values are RMS values.

Compliance with these requirements is checked in accordance with Annex A.

12 Electric strength

IEC 61347-1:2015, Clause 12 applies.

13 Thermal endurance test for windings of ballasts

There are no requirements.

NOTE The requirements of IEC 61347-1:2015, Clause 13 are not applicable.

14 Fault conditions

IEC 61347-1:2015, Clause 14 and IEC 61347-1:2015/AMD1:2017, Clause 14 apply.

For DC supplied controlgear, reversed polarity of the supply voltage shall be tested as additional fault condition.

15 Protection of associated components

15.1 Maximum allowed peak voltage under normal operation conditions

Under conditions of normal operation, verified with dummy cathode resistors inserted and conditions of abnormal operation, as specified in Clause 16, the voltage at the output terminals shall at no time exceed the maximum allowed peak voltage specified in Table 1.

Table 1 – Relation between RMS working voltage and maximum allowed peak voltage

Voltage at output terminals	
RMS working voltage V	**Maximum allowed peak voltage** V
250	2 200
500	2 900
750	3 100
1 000	3 200
Linear interpolation between the given voltage steps is allowed.	

15.2 Maximum working voltage under normal and abnormal operating conditions

Under normal operating conditions and abnormal operating conditions as specified in Clause 16, except for the rectifying effect, and from 5 s after the switch-on or beginning of the starting process, the voltage at the output terminals shall not exceed the maximum working voltage for which the controlgear is declared.

15.3 Maximum working voltage and rectifying effect

In the case of a rectifying effect, i.e. abnormal operating conditions according to 16.1 d), the RMS voltage at the output terminal shall not exceed the maximum permitted value for which the controlgear is designed for a period longer than 30 s after switch-on, or beginning of the starting process.

For controlgear which make more than one attempt to start a failed lamp, the combined duration of voltages above the maximum working voltage for which the controlgear is declared shall not exceed 30 s.

Circuit for testing the rectifying effect and the information regarding the recovery time t_{rr} of the diode are given in Figure 4 a), Figure 4 b) and Figure 4 c).

15.4 Output voltage and abnormal conditions

For the tests of 15.1 and 15.2, the output voltages measured shall be those between any output terminal and earth. Additionally, voltages that appear between output terminals shall be measured in cases where the voltage is present across insulation barriers within associated components.

For multi-lamp or multi-power controlgear, only the combination that leads to the highest voltage shall be measured.

If, from a similar review or declaration for all controlgear, it becomes clear that the voltage is below 50 V, then only that terminal-terminal or terminal-earth combination is measured.

15.5 Isolation of input terminals of controllable electronic controlgear

For controllable electronic controlgear, the control input shall be isolated from the mains circuit by insulation at least equal to basic insulation.

NOTE This requirement does not apply to those controlgear where control signals are injected via the supply terminals or where the control signals are completely isolated from the controlgear by being transmitted remotely from infra-red or radio wave transmitters.

If SELV is to be used, then double or reinforced insulation is required.

16 Abnormal conditions

16.1 Abnormal conditions for AC and DC controlgear

The controlgear shall not impair safety when operated under abnormal conditions at any voltage between 90 % and 110 % of the rated supply voltage.

Compliance is checked by the following test.

Each of the following conditions shall be applied with the controlgear operating according to the manufacturer's instructions (including a heat sink, if specified) for 1 h:

a) the lamp or one of the lamps is not inserted;

b) the lamp does not start because one of the cathodes is broken;

c) the lamp does not start although the cathode circuits are intact (de-activated lamp);

d) the lamp operates, but one of the cathodes is de-activated or broken (rectifying effect);

e) short-circuit of the starter switch, if any.

For the test simulating operation with a de-activated lamp, a resistance is connected in place of each lamp cathode. The resistance value, expressed in Ω, is derived from the value of the (maximum) lamp operating current I_n, specified in the relevant lamp data sheet of IEC 60081 and IEC 60901 and substituted in the following equation:

$$R = \frac{5,23}{I_n}$$

For lamps not covered by IEC 60081 and IEC 60901, the values declared by the lamp manufacturer shall be used.

When testing electronic controlgear for the rectifying effect, the circuit shown in Figure 1 is used. The anode of the rectifier is connected to the midpoints of appropriate equivalent resistors; the cathode of the rectifier is connected to the short-circuited lamp electrode. The direction of the rectifying effect is chosen so as to give the most unfavourable conditions. If necessary, the lamp is started using a suitable device.

During and at the end of the tests specified under items a) to e), the controlgear shall show no defect impairing safety nor shall any smoke be produced.

16.2 Additional abnormal conditions for DC supplied electronic controlgear

If the DC supplied electronic controlgear is declared by the manufacturer as a protected controlgear against the reversal polarity of the supply voltage, then the following test is applied:

The DC supplied electronic controlgear shall be connected for 1 h with the reversal supply voltage at the maximum value of the rated voltage with the maximum lamp power declared by the manufacturer.

During and at the end of the test the electronic controlgear shall operate the lamp(s) normally without any defects.

17 Behaviour of the controlgear at end of lamp life

17.1 End of lamp life effects

At the end of lamp life, the controlgear shall behave in such a way that no overheating of lamp cap(s) occurs at any voltage between 90 % and 110 % of the rated supply voltage.

For the test simulating end of lamp life effects, three tests are described:

a) asymmetric pulse test (described in 17.2);

b) asymmetric power dissipation test (described in 17.3);

c) open filament test (described in 17.4).

Any of the three tests may be used to qualify electronic controlgear. The controlgear manufacturer shall determine which of the three tests will be used to test a given controlgear based on the design of that particular controlgear circuit. The chosen test method shall be indicated in the controlgear manufacturer's literature.

NOTE 1 Checking controlgear against their capability to cope with the partial rectifying effect is recommended by IEC 61195:1999, Annex E, and IEC 61199:2011, Annex H and IEC 61199/AMD2:2014, Annex H.

NOTE 2 In Japan, only the requirements of 17.1 b) are applied for electronic controlgear.

Lamps used in the controlgear test circuits shall be new lamps seasoned for 100 h.

17.2 Asymmetric pulse test

The controlgear shall have adequate protection to prevent lamp cap overheating at the end of the lamp life cycle.

Compliance is checked by the following test. The relevant values of lamp power, maximum asymmetric power P_{max} at the cathodes and the designation of lamp cap shall be taken from IEC 60081:1997, Annex E, IEC 60081:1997/AMD4:2010, Annex E and IEC 60081:1997/AMD6:2017, Annex E and IEC 60901:1996, Annex D, IEC 60901:1996/AMD2:2000, Annex D, IEC 60901:1996/AMD5:2011, Annex D and IEC 60901:1996/AMD6:2014, Annex D, respectively.

Test procedure:

Refer to the schematic diagram in Figure 1.

If only one connection per electrode is available at the controlgear or the lamp or both, T1 shall be removed and then the controlgear shall be connected to J2 and the lamp to J4. The controlgear manufacturer should be asked which of the output terminals has to be connected to J4 and, in case two output terminals per electrode exist, whether they can be short-circuited or be bridged with a resistor.

1) Close switches S1 and S4, and set switch S2 to position A.

2) Turn on the controlgear under test and allow lamp(s) to warm up for 5 min.

3) Close S3, open S1, and wait for 15 s. Open S4 and wait for 15 s.

4) Measure the sum of the average power dissipated in the power resistors, R1A to R1C and R2A and R2B, and the Zener diodes, D5 to D8.

   The power should be measured as the average value of the product of the voltage between terminals J5 and J6 times the current flowing from J8 to J7. The voltage should be measured with a differential voltage probe, and the current should be measured with a DC current probe. A digital oscilloscope can be used for the multiplication and averaging functions. If the controlgear operates in a cycling mode, the averaging interval should be set to cover an integer number of cycles. (Each cycle is typically greater than 1 s.) The sampling rate and number of samples included in the calculations should be sufficient to avoid aliasing errors.

   The power dissipation shall be below P_{max}.

   If the power dissipation is greater than P_{max}, the controlgear has failed and the test is discontinued.

5) Close S1 and S4.

6) Set S2 to position B.

7) Repeat steps (2), (3) and (4).

   The controlgear shall pass both position "A" and position "B" tests.

8) For multi-lamp controlgear, repeat steps (1) to (7) for each lamp position.

   A multi-lamp controlgear shall pass the tests for each lamp position.

9) For controlgear that operate multiple lamp types (e.g. 26 W, 32 W, 42 W), each lamp type specified shall be tested. Repeat steps (1) to (8) for each lamp type.

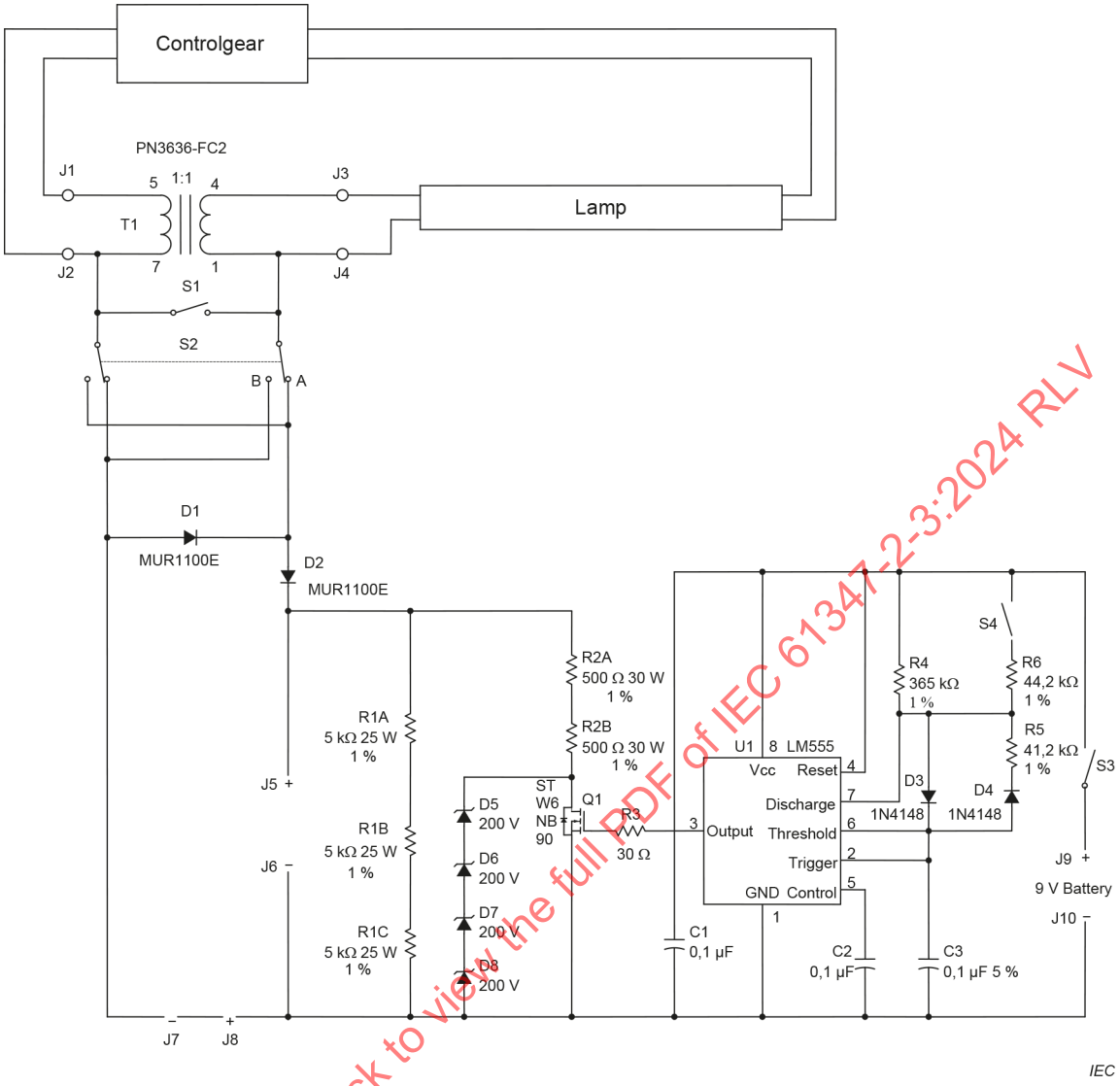


Figure 1 – Asymmetric pulse test circuit

Q1 should be on for 3 ms and off for 3 ms when S4 is closed, and on for 27 ms and off for 3 ms when S4 is open.

A list of material and transformer specifications is given in Annex C. Any other transformer components with the same functionality are permitted.

17.3 Asymmetric power test

The controlgear shall have adequate protection to prevent the lamp cap from overheating at the end of the lamp life cycle.

Compliance is checked by the following test. The relevant values of lamp power, maximum cathode power P_{max} at the cathodes and the designation of lamp cap shall be taken from IEC 60081:1997, Annex E, IEC 60081:1997/AMD4:2010, Annex E and IEC 60081:1997/AMD6:2017, Annex E and IEC 60901:1996, Annex D, IEC 60901:1996/AMD2:2000, Annex D, IEC 60901:1996/AMD5:2011, Annex D and IEC 60901:1996/AMD6:2014, Annex D, respectively.

Test procedure:

Refer to the schematic diagram in Figure 2.

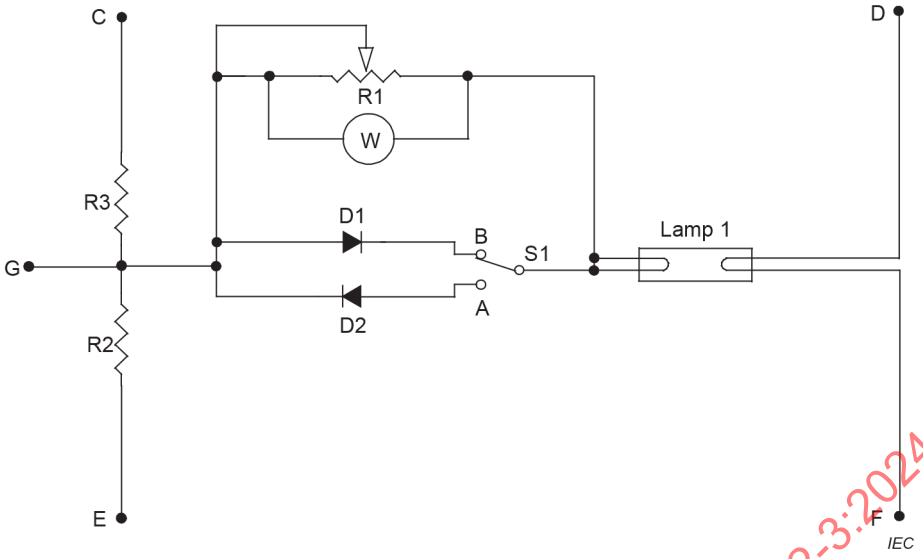
1) Set switch S1 to position A.
2) Set resistance of resistor R1 to 0 (zero) Ω.
3) Start lamp(s) by turning on power to the controlgear under test and allow lamp(s) to warm up for 5 min.
4) Increase the resistance of R1 rapidly (within 15 s) until the power dissipated by resistor R1 equals the test power value of twice the asymmetric power P_{max} in IEC 60081:1997, Annex E, IEC 60081:1997/AMD4:2010, Annex E and IEC 60081:1997/AMD6:2017, Annex E and IEC 60901:1996, Annex D, IEC 60901:1996/AMD2:2000, Annex D, IEC 60901:1996/AMD5:2011, Annex D and IEC 60901:1996/AMD6:2014, Annex D, respectively. If the controlgear limits the power in R1 to a value less than the test power, set R1 at the value which produces the maximum wattage. If the controlgear switches off before reaching the test power, continue with (5). If the controlgear does not switch off and limits the power in R1 to a value less than the test power, set R1 at the value which produces the maximum power.
5) If the test wattage value was reached in step (4), wait for an additional 15 s. If the test wattage value was not reached in step (4), wait for an additional 30 s. Measure the power in R1.

   The power dissipation in resistor R1 shall be below or equal to P_{max}.

   If the power dissipation in resistor R1 is greater than P_{max}, the controlgear has failed and the test is discontinued.
6) Turn off power to the controlgear. Set switch S1 to position B.
7) Repeat test procedure steps (3) to (5) above.

   The controlgear shall pass both position "A" and position "B" tests.
8) For multi-lamp controlgear, repeat test procedure steps (1) to (7) for each lamp position.

   A multi-lamp controlgear shall pass the tests for each lamp position.
9) For controlgear that operate multiple lamp types (e.g. 26 W, 32 W, 42 W) each lamp type specified shall be tested. Repeat steps (1) to (8) for each lamp type.



NOTE 1 R2 = R3 = x Ω (this resistance is half the resistance of the hot cathode – refer to the relevant lamp data sheet).

NOTE 2 C, D, E and F represent cathode connections for the controlgear.

NOTE 3 For instant start controlgear, connection G is connected to one terminal and the combined D and F are connected to the other terminal.

Figure 2 – Asymmetric power detection circuit

17.4 Open filament test

17.4.1 Selection

The controlgear shall have adequate protection to prevent the lamp cap from overheating at the end of the lamp life cycle under open filament conditions.

Compliance is checked by either test procedure A or B as determined by the value of I_{max} below.

During the test, the following values of maximum lamp current I_{max} apply:

– for 13 mm (T4) lamps, I_{max} = 1 mA;

– for 16 mm (T5) lamps, I_{max} = 1,5 mA.

(Other diameters are under study.)

If these current values are exceeded, test procedure B shall be applied; otherwise, test procedure A shall be applied.

17.4.2 Measurements to be carried out prior to test procedure A

Determine the RMS currents, $I_{LL}(1)$, $I_{LH}(1)$, $I_{LL}(2)$, $I_{LH}(2)$, at the controlgear output terminals by using a current probe and mark the terminals respectively, where:

- $I_{LL}(1)$ is the lower of the RMS currents through the lead-in wire of electrode 1;
- $I_{LH}(1)$ is the higher of the RMS currents through the lead-in wire of electrode 1;
- $I_{LL}(2)$ is the lower of the RMS currents through the lead-in wire of electrode 2;
- $I_{LH}(2)$ is the higher of the RMS currents through the lead-in wire of electrode 2.

Connect the circuit according to Figure 3 a).

17.4.3 Test procedure A

Refer to the schematic diagram in Figure 3 a).

1) Set S to position 1.
2) Turn on the controlgear under test and allow lamp(s) to warm up for 5 min.
3) Set S to position 2 and wait for 30 s.
4) Measure the RMS current value of I_{lamp} with the current probe near to the lamp end. If I_{lamp} is pulsing, the RMS value shall be computed over one complete pulse cycle including the off time.

   The lamp discharge current I_{lamp} shall not be greater than I_{max}.

   If the lamp discharge current is greater than I_{max}, the controlgear has failed and the test is discontinued.

   Refer to Figure 3 b).
5) Set S to position 1.
6) Turn on the controlgear under test and allow lamp(s) to warm up for 5 min.
7) Set S to position 2 and wait for 30 s.
8) Measure the RMS current value of I_{lamp} with the current probe near to the lamp end. If I_{lamp} is pulsing, the RMS value shall be computed over one complete pulse cycle including the off time.

   The lamp discharge current I_{lamp} shall not be greater than I_{max}.
9) For multi-lamp controlgear, repeat test procedure steps (1) to (8) for each lamp position.

   A multi-lamp controlgear shall pass the tests for each lamp position to pass the end-of-lamp-life test.
10) For controlgear that operate multiple lamp types (e.g. 26 W, 32 W, 42 W), each lamp type specified shall be tested. Repeat steps (1) to (9) for each lamp type.

17.4.4 Test procedure B

Connect the lamp as shown in Figure 3 a) and Figure 3 b) with the measurement arrangement according to Figure 3 c). If the controlgear has an isolation transformer, connect the 1 MΩ resistor to the corresponding terminal defined in 17.4.2.

1) Set S to position 1.
2) Turn on the controlgear under test and allow lamp(s) to warm up for 5 min.
3) Set S to position 2 and wait for 30 s.

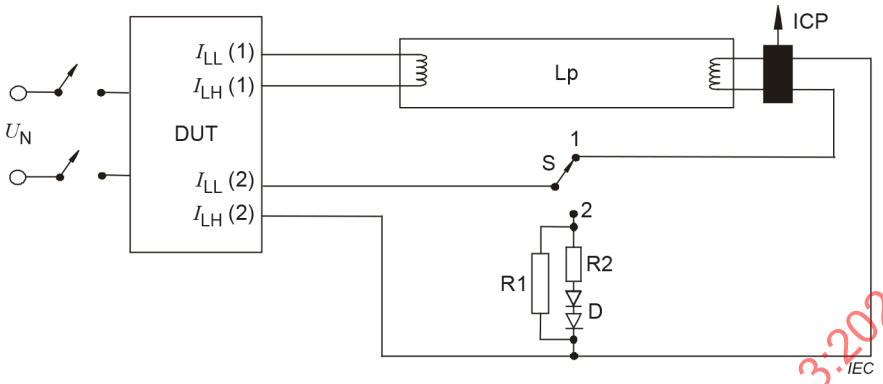
   Measure the RMS voltage value with the differential probe placed as indicated in Figure 3 c). If the voltage is pulsing, the RMS value shall be computed over one complete pulse cycle including the off time.
4) The voltage shall not be greater than 25 % of the rated lamp voltage. If the voltage is greater than 25 %, discontinue the test.

   Refer to Figure 3 b).
5) Repeat test procedure steps (1) to (4) above.
6) For multi-lamp controlgear, repeat test procedure steps (1) to (5) for each lamp position.

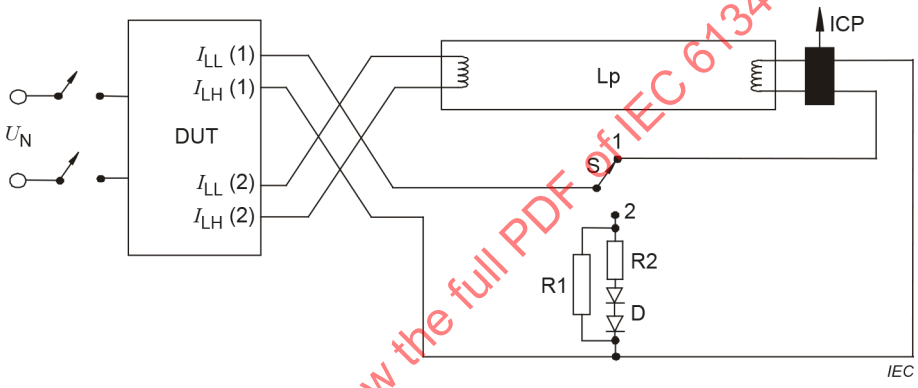
   A multi-lamp controlgear shall pass the test for each lamp position to pass the end-of-lamp-life test.

7) For controlgear which operate multiple lamp types (e.g. 26 W, 32 W, 42 W), each lamp type specified shall be tested.

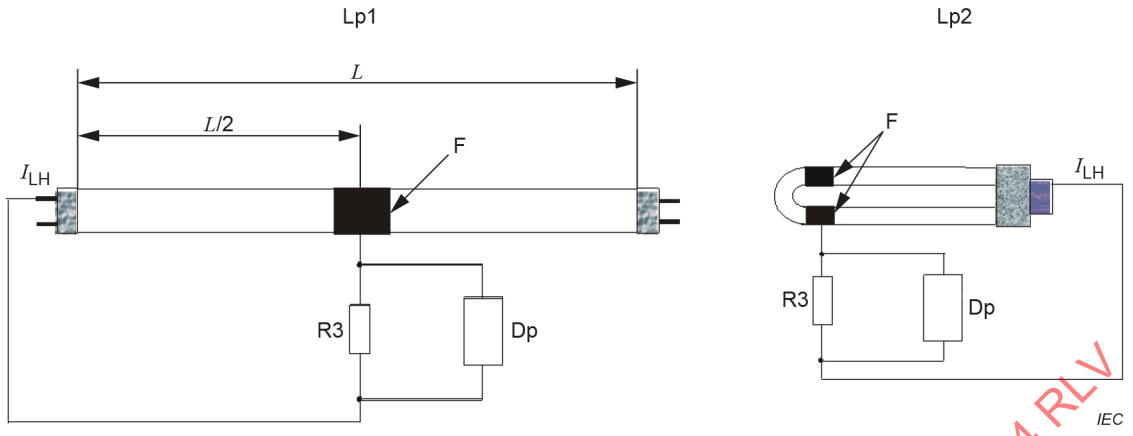
Repeat steps (1) to (6) for each lamp type. A multiple lamp controlgear shall pass the test for each lamp type.



a) Open filament test circuit; electrode (1) check



b) Open filament test circuit; electrode (2) check



c) Detection of lamp current

Key

Lp	lamp	R1 = 10 kΩ	
Lp1	straight lamp; copper foil width 4 cm	R2 = 22 Ω, 7 W	
Lp2	bended lamp (single capped and circular); copper foil width: twice 2 cm; both foils connected together	R3 = 1 MΩ	
U_N	supply	D	fast diodes
F	copper foil	DUT	device (controlgear) under test
ICP	I_{lamp} current probe	Dp	differential probe < 10 pF
		L	lamp length

NOTE In Figure 3 c), terminal I_{LH}(2) of Figure 3 a) or I_{LH}(1) of Figure 3 b) is used.

Figure 3 – Open filament test circuits

18 Construction

IEC 61347-1:2015, Clause 15 applies.

19 Creepage distances and clearances

IEC 61347-1:2015, Clause 16 and IEC 61347-1:2015/AMD1:2017, Clause 16 apply.

20 Screws, current-carrying parts and connections

IEC 61347-1:2015, Clause 17 applies.

21 Resistance to heat, fire and tracking

IEC 61347-1:2015, Clause 18 applies.

22 Resistance to corrosion

IEC 61347-1:2015, Clause 19 applies.

23 Applicable annexes of IEC 61347-1

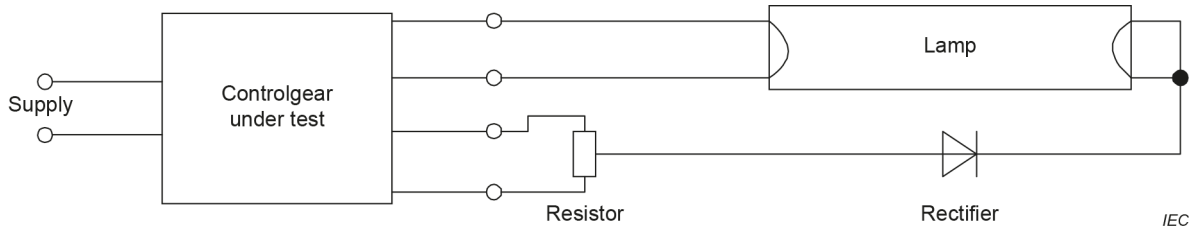
The following annexes of IEC 61347-1:2015 apply:

– Annex A (normative) Test to establish whether a conductive part is a live part which may cause an electric shock;

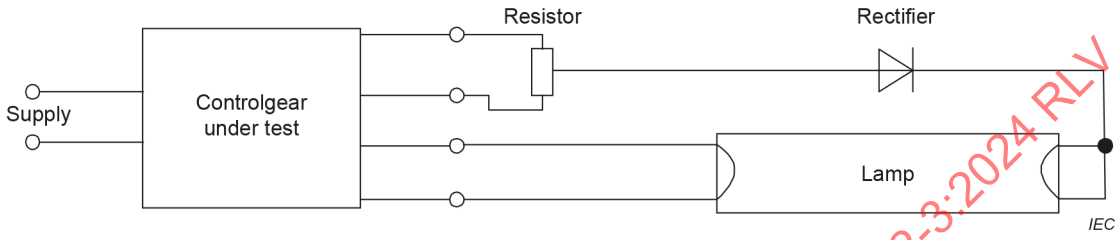
– Annex C (normative) Particular requirements for electronic lamp controlgear with means of protection against overheating;

– Annex D (normative) Requirements for carrying out the heating tests of thermally protected lamp controlgear;

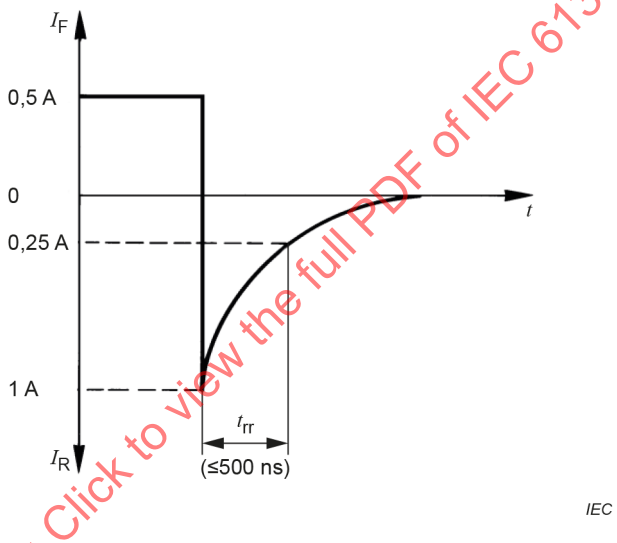
– Annex H (normative) Tests.



a) Testing the first direction of the rectifying effect



b) Testing the opposite direction of the rectifying effect



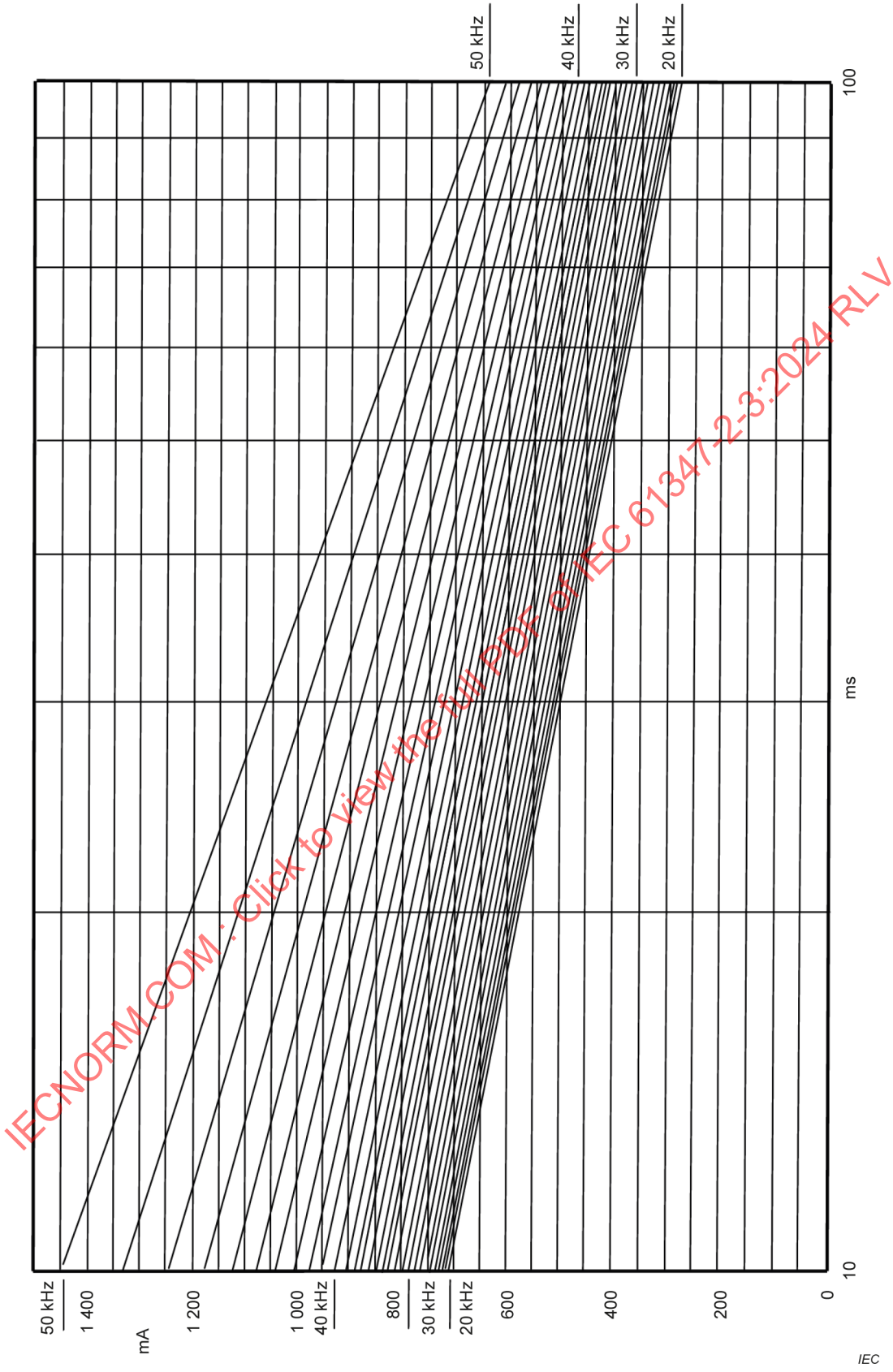
c) Recovery time t_{rr} of the diode

The rectifier characteristics shall be:

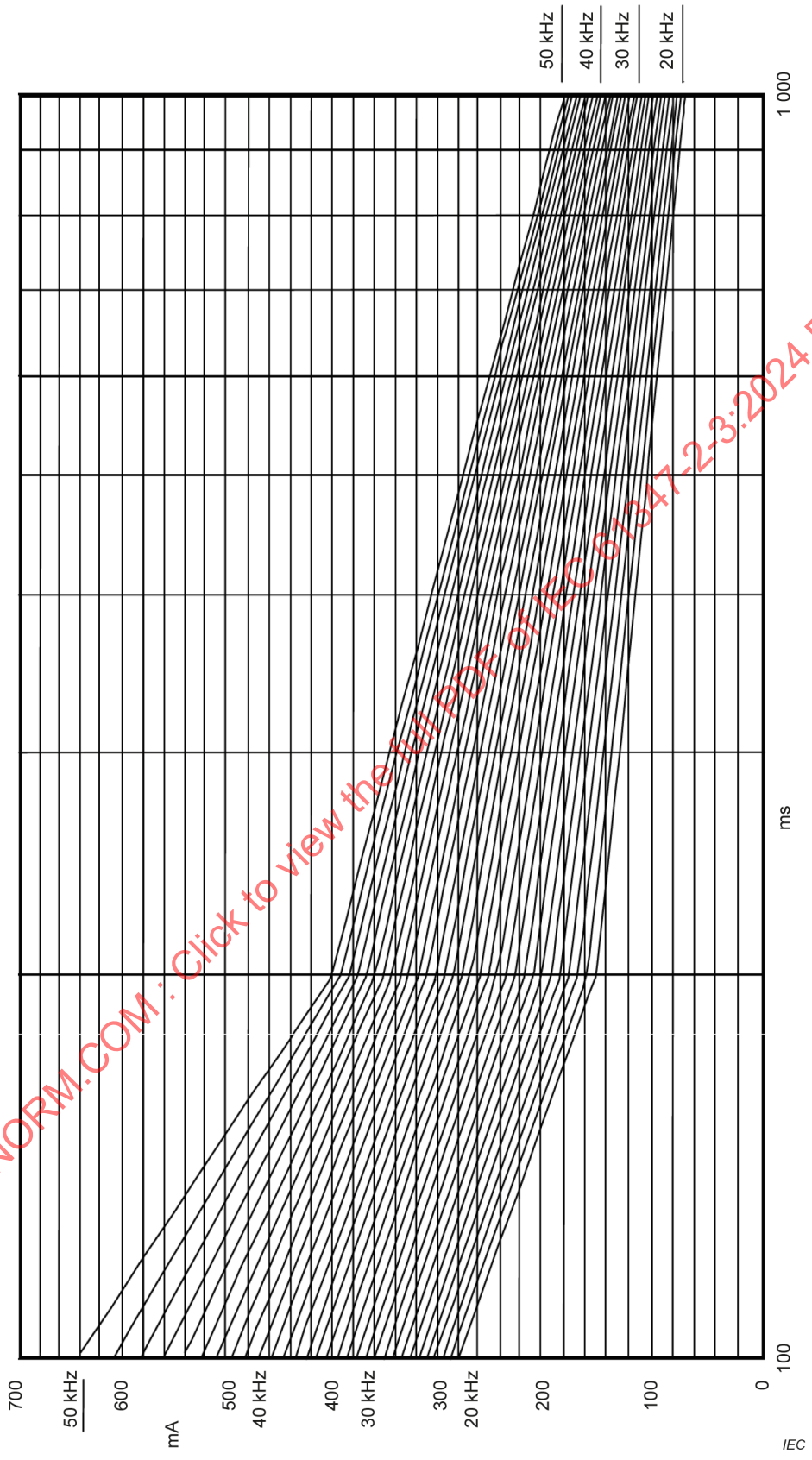
Peak inverse voltage	U_{RRM}	≥	3 000 V
Reverse leakage current	I_R	≤	10 µA
Forward current	I_F	≥	three times nominal lamp running current
Reverse recovery time (maximum frequency: 150 kHz)	t_{rr}	≤	500 ns (measured with I_F = 0,5 A and I_R = 1 A to I_R = 0,25 A)

The following types of diodes (three diodes in series) are recommended as a suitable rectifier: RGP 30 M, BYM 96 E, BYV 16.

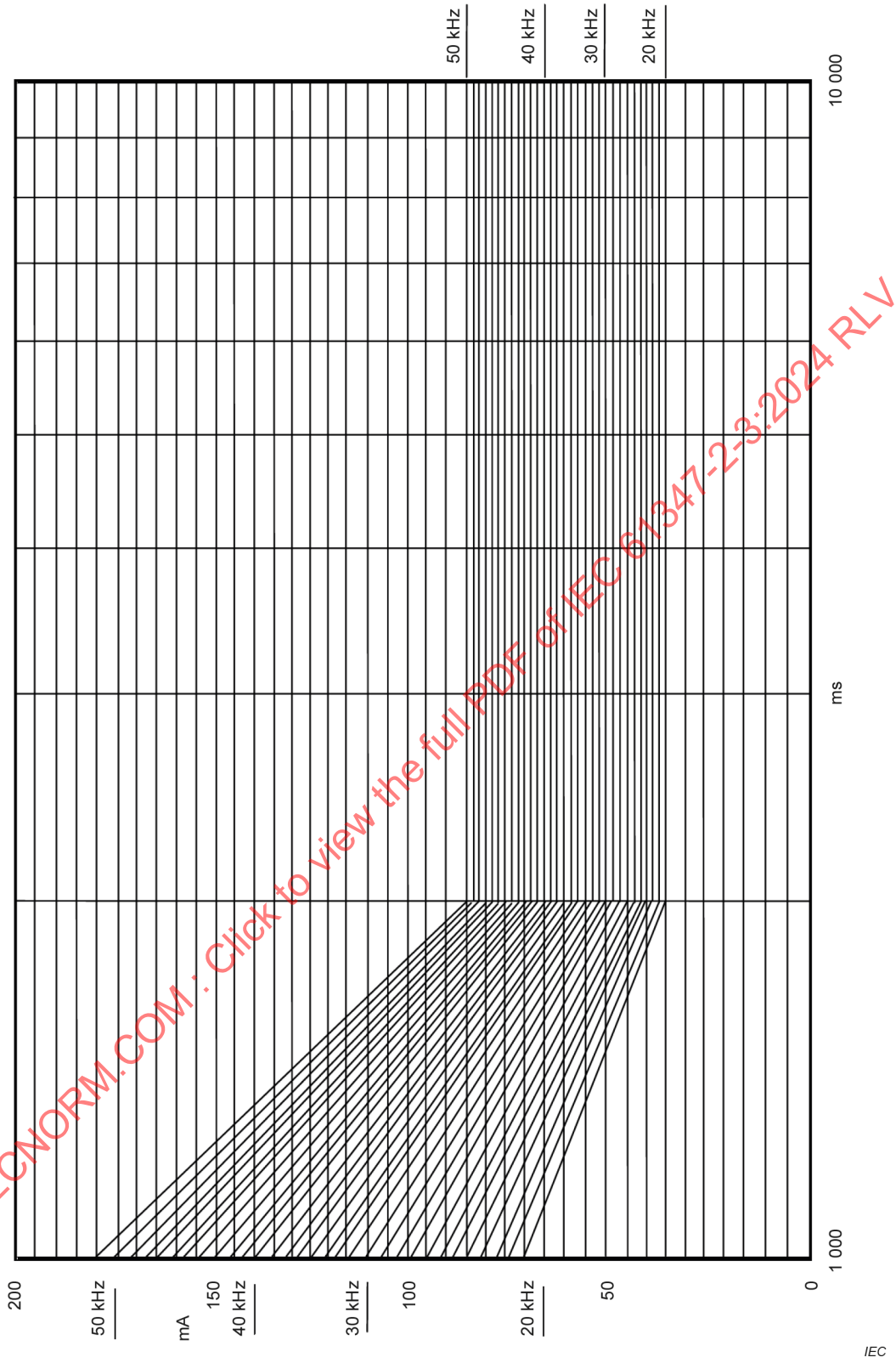
Figure 4 – Circuit for testing rectifying effect



a) Limits for capacitive leakage current (in mA RMS) of HF-operated fluorescent lamps – Range 10 ms to 100 m



b) Limits for capacitive leakage current (in mA RMS) of HF-operated fluorescent lamps – Range 100 ms to 1 000 ms



c) Limits for capacitive leakage current (in mA RMS) of HF-operated fluorescent lamps – Range 1 000 ms to 10 000 ms

Figure 5 – Nomographs for the capacitive leakage current limits of HF-operated fluorescent lamps

Annex A
(normative)

Measurement of high-frequency leakage current

Electronic controlgear are tested for capacitive high-frequency leakage current, as follows.

The controlgear is tested in the circuit shown in Figure A.1 with two normal lamps, each being connected to the circuit at only one end ("crossed pair of lamps"). This method would also provide the worst-case leakage to earth.

The glass tube of one of the two lamps, whichever gives the worst value, is wrapped with a 75 mm wide metal foil, together with a non-inductive 2 000 Ω resistor and a measuring device suitable for the test circuit.

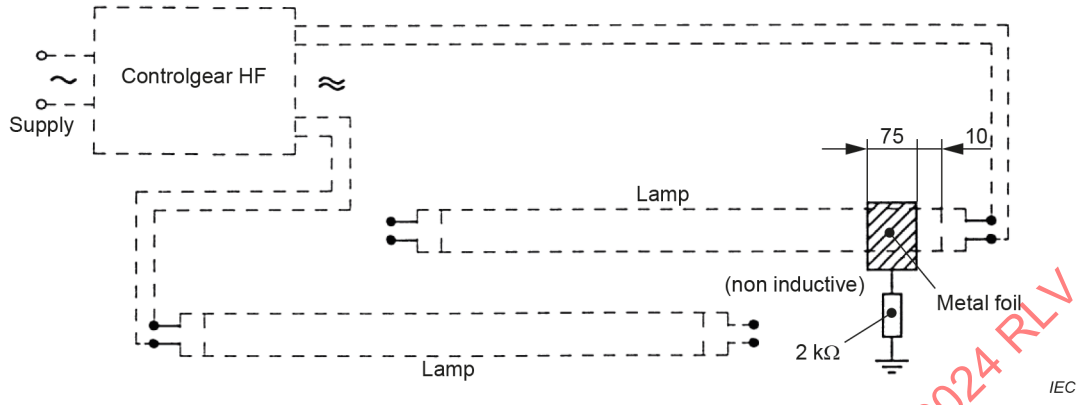
The test shall be conducted with the lamps supported on two 75 mm high wooden blocks and placed on a wooden table, such that no external influence from metallic surfaces is caused.

The leakage current (i.e. the high-frequency current flowing from the metal foil through the 2 000 Ω ± 50 Ω resistor to earth) is measured under the following simulated operating conditions.

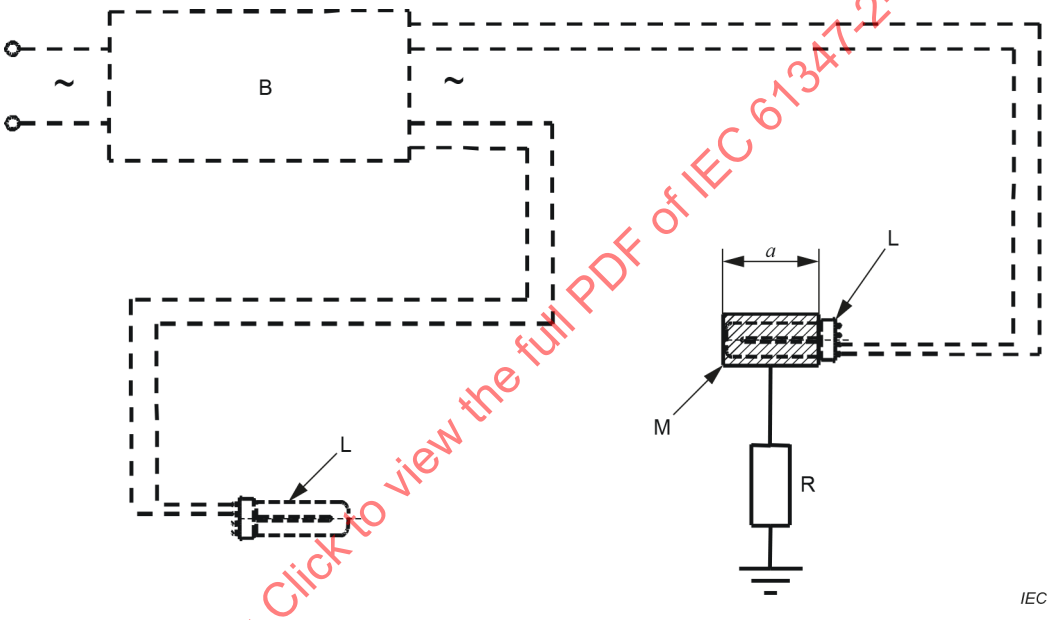
– Two normal lamps, each being inserted at only one end into a pair of holders, with the supply voltage switched on.
– In order to take care of the most adverse condition (that is to ensure that the highest leakage current which can occur will be measured) the procedure shall be carried out in such a way that all of the four possible holder contact/cap-pin combinations are covered.
– For controlgear with multi-lamp operation, the leakage current from each lamp position is measured separately.
– Where a range of controlgear is submitted for test, each controlgear type shall be checked, not just the higher or lower power variants.
– Under each of the specified operation conditions, the capacitive leakage current measured shall not exceed the limits specified in Figure 5 (with the time ranges given in Figure 5 a), Figure 5 b), and Figure 5 c)).

NOTE Leakage currents are derived from IEC 60479-2.

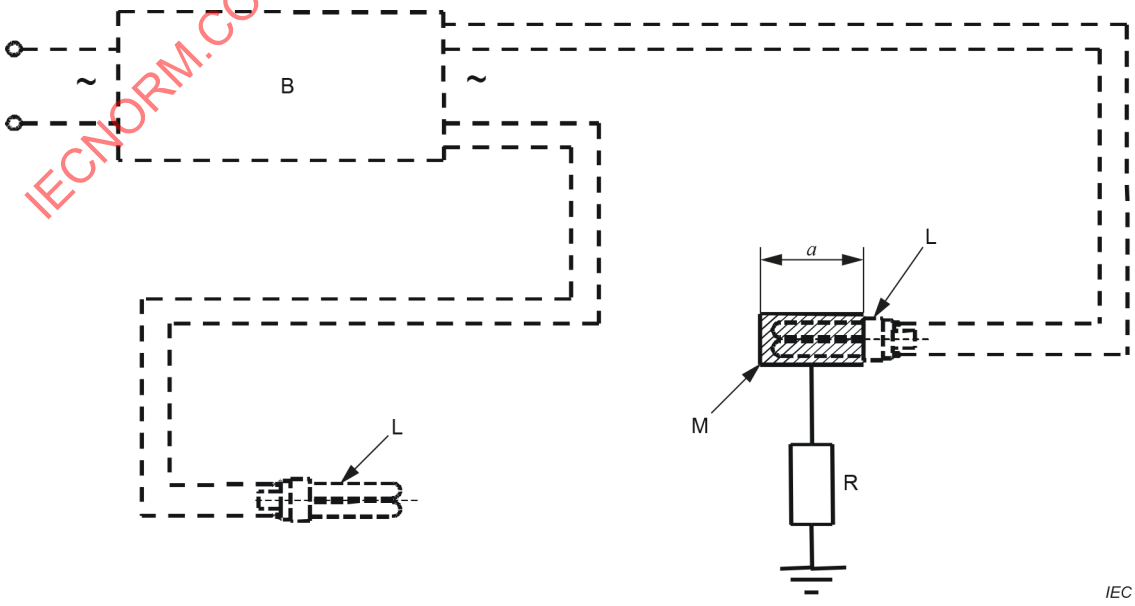
Dimensions in millimetres



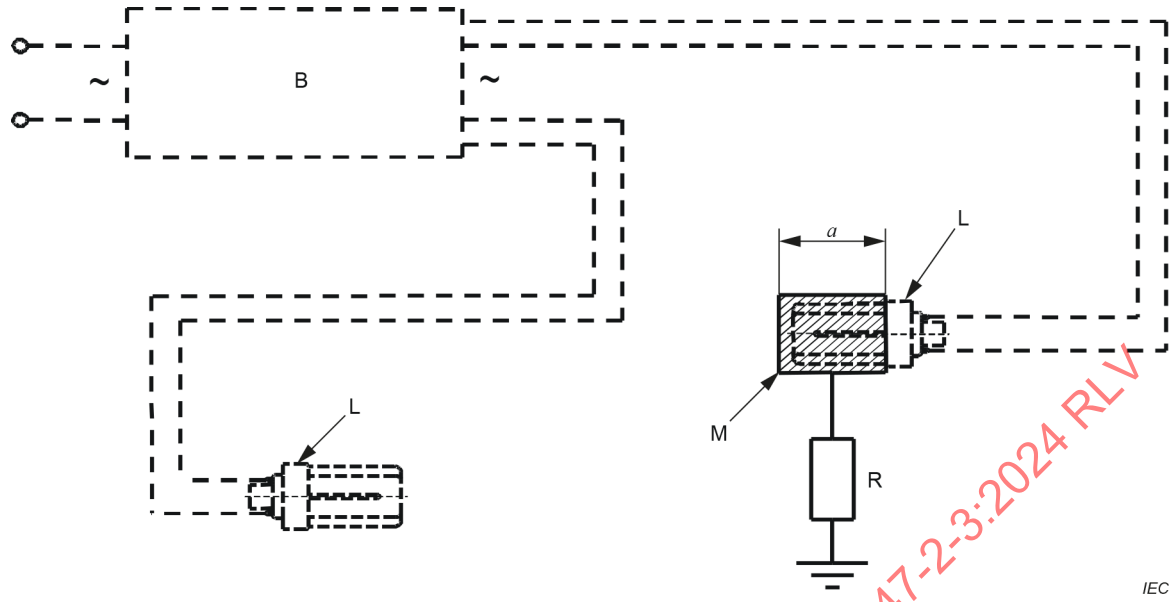
a) Test arrangement for bar-shaped tubular fluorescent lamps



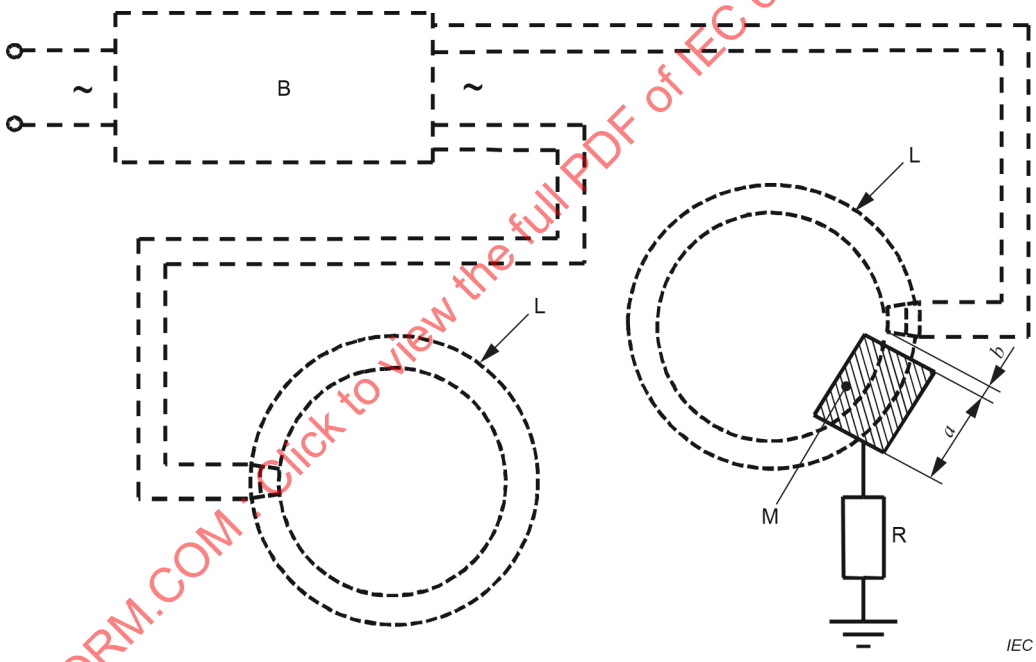
b) Test arrangement for lamps with ILCOS FSD (H)



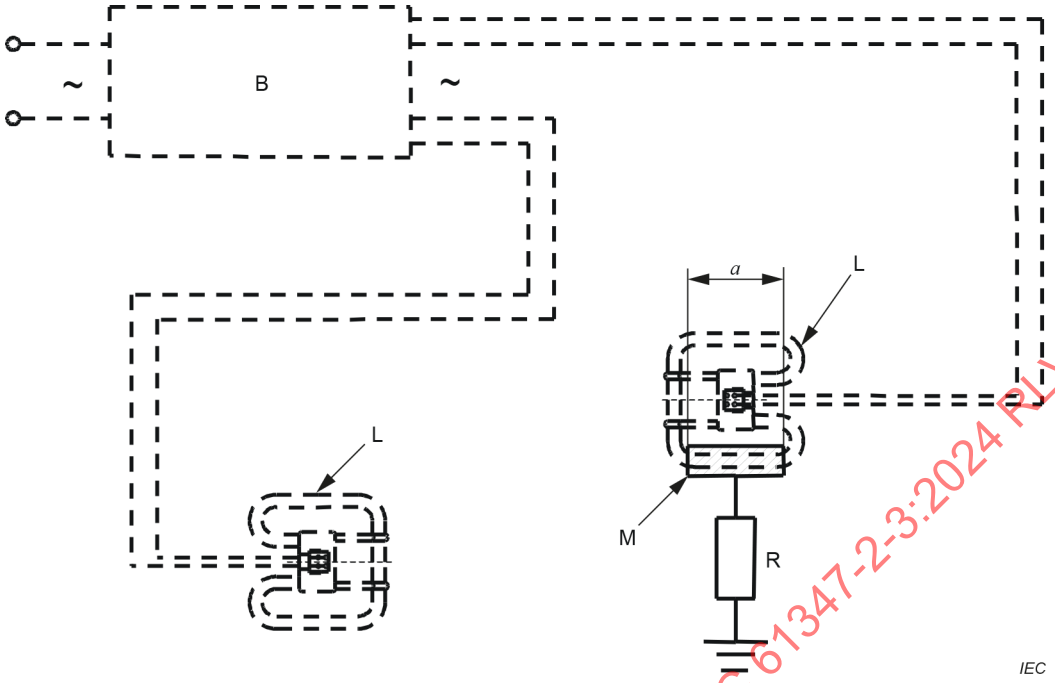
c) Test arrangement for lamps with ILCOS FSQ



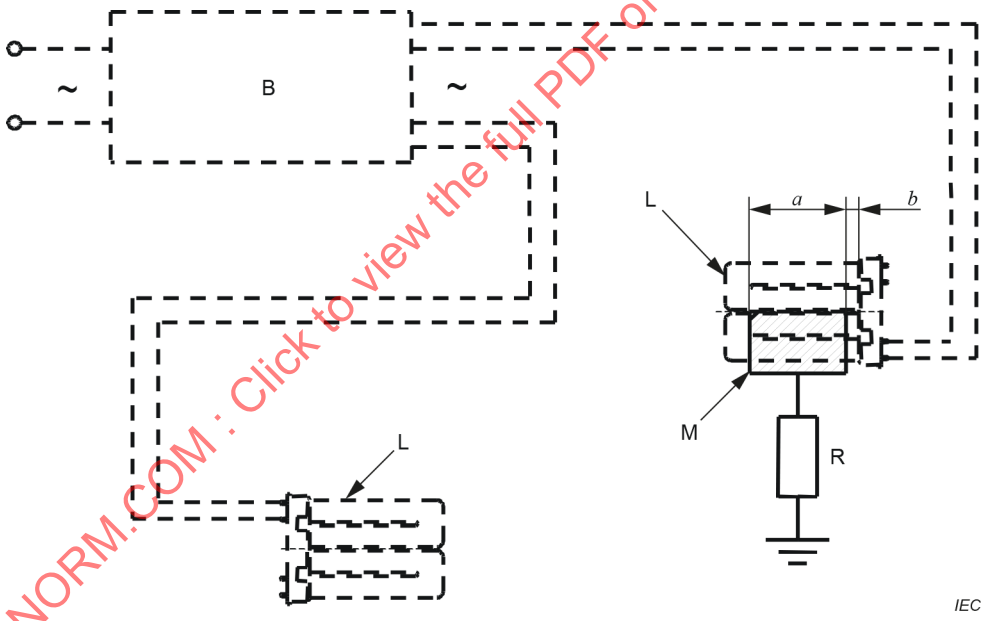
d) Test arrangement for lamps with ILCOS FSM (H)



e) Test arrangement for lamps with ILCOS FSC



f) Test arrangement for lamps with ILCOS FSS and GR10q cap



g) Test arrangement for lamps with ILCOS FSS and 2G10 cap

Key

M	metal foil	– – – –	lamp circuit
L	lamp	———	test circuit
B	controlgear HF		
R =	2 kΩ (non inductive)		
a =	length of the metal foil (maximum 75 mm, minimum the length of the lamp)		
b =	10 mm		

Figure A.1 – Leakage current test arrangement for various fluorescent lamps

Annex B
(normative)

Additional requirements for centrally supplied controlgear for emergency lighting

B.1 Marking

B.1.1 Mandatory markings

Controlgear shall, in addition to the requirements of 7.1, be clearly marked with the following mandatory marking:

a) AC, AC/DC or DC maintained emergency electronic controlgear shall be marked with the symbol:

b) rated emergency power supply voltage and voltage range.

B.1.2 Information to be provided if applicable

In addition to the above mandatory markings and the requirements of 7.2, the following information shall either be given on the controlgear or be made available in the manufacturer's catalogue or similar:

a) a clear indication regarding the type of starting, i.e. preheat starting or non-preheat starting;
b) indication as to whether a starting aid is necessary for the lamp(s);
c) limits of the ambient temperature range within which an independent controlgear will operate satisfactorily at the declared voltage (range);
d) emergency ballast lumen factor (EBLF).

B.2 General statement

The provisions of IEC 60929:2011, Clause 6 apply at 90 % and 110 % of the rated emergency power supply voltage.

Furthermore, starting and operation of lamps shall be guaranteed across the widest rated voltage range.

NOTE 1 The electrical characteristics, as given on the lamp data sheets of IEC 60081 and IEC 60901 and applying to operation on a reference ballast at rated voltage with a frequency of 50 Hz or 60 Hz, can deviate when operating on a high-frequency controlgear and the conditions of item c) of B.1.2 above.

NOTE 2 A starting aid is only effective when it has an adequate potential difference from one end of the lamp.

B.3 Starting conditions

The provisions of IEC 60929:2011, Clause 7 apply at 90 % and 110 % of the rated emergency power supply voltage. Where the controlgear is declared for operation at temperatures lower than 10 °C then the starting condition shall be made at the lowest declared temperature and 90 % of rated voltage.

B.4 Operating conditions

The provisions of IEC 60929:2011, Clause 8 and IEC 60929:2011/AMD1:2015, Clause 8 apply. In addition, tests shall be made with rated DC supply voltage.

B.5 Current

At the rated operating voltage, the supply current shall not differ by more than ±15 % from the declared value when the controlgear is operated with a reference lamp.

The supply shall be of low impedance and low inductance.

Compliance is checked by measurement.

B.6 Maximum current in any lead to a cathode

The provisions of IEC 60929:2011, Clause 11 apply at 90 % and 110 % of the rated emergency power supply voltage.

B.7 Lamp operating current waveform

The provisions of IEC 60929:2011, Clause 12 apply. In addition, tests shall be made with rated emergency power supply voltage.

B.8 EMC immunity

For emergency supplied electronic controlgear, the requirements of IEC 61547 apply.

B.9 Pulse voltage from central battery systems

The DC supplied emergency controlgear shall withstand, without failure, any pulses caused by switching other equipment in the same circuit.

Compliance is checked by operating the controlgear at the maximum voltage of the rated voltage range in association with the appropriate number of lamps and at an ambient temperature of 25 °C. The controlgear shall withstand, without failure, the number of pulse voltages given in Table B.1 superimposed, with the same polarity, on the supply voltage.

Table B.1 – Pulse voltages

Number of voltage pulses	Pulse voltage		Period between each pulse
	Peak value V	Pulse width at half peak ms	 s
3	Equal to design voltage	10	2
NOTE A suitable measuring circuit is shown in IEC 61347-1:2015, Figure G.2.			

B.10 Tests for abnormal conditions

The provisions of IEC 60929:2011, Clause 14 apply.

B.11 Temperature cycling test and endurance test

The provisions of IEC 61347-2-7:2011, Clause 26 and IEC 61347-2-7:2011/AMD1:2017, Clause 26 apply.

B.12 Functional safety (EBLF)

The appropriate lamp associated to the controlgear shall provide the necessary light output after change over to the emergency mode. This is verified if the declared emergency ballast lumen factor (EBLF) is achieved during emergency operation at 25 °C.

Compliance is checked by the following test:

Measurement of EBLF shall be made at 25 °C, using a lamp which has been aged for at least 100 h of the appropriate type and having not been lit for 24 h. The first measurement is made at maximum power supply voltage range after 5 s and 60 s and then in steady conditions at the minimum power supply voltage range.

The lowest value of the values measured at 60 s with maximum power supply voltage or in steady conditions at minimum power supply voltage shall be retained and compared with the one measured with the same lamp operating by the appropriate reference ballast. The ratio shall reach at least the declared EBLF.

The value measured at 5 s at maximum power supply voltage shall reach at least 50 % of the declared EBLF.

NOTE 1 60 s is replaced by 0,5 s for controlgear declared for use in luminaires for high-risk task area lighting.

NOTE 2 Other methods can apply for determining EBLF, in particular methods which record permanently the luminous flux of the lamp associated to the controlgear under test.

Annex C
(informative)

Components used in the asymmetric pulse test circuit

See Table C.1 and Table C.2. See also Figure 1.

Table C.1 – Material specification

Reference designation	Description
U1	555 timer ic
T1	1:1 transformer
D1, D2	Ultra-fast recovery diode, 1 000 V, 1 A, 75 ns
D3, D4	Signal diode 75 V 200 mA
D5...D8	200 V Zener diode
Q1	Metal oxide semiconductor field effect transistor (MOSFET) 900 V 6 A
R1A to R1C	Resistor 5 kΩ 25 W 1 %
R2A and B	Resistor 500 Ω 30 W 1 %
S1, S3, S4	Switch
S2	Switch – double
Battery	Battery 9 V
C1, C2, C3	Capacitor 0,1 µF 50 V 5 %
R3	Resistor 30 Ω ¼ W 5 %
R4	Resistor 365 kΩ ¼ W 1 %
R5	Resistor 41,2 kΩ ¼ W 1 %
R6	Resistor 44,2 kΩ ¼ W 1 %

Table C.2 – Transformer specification

Component	Description
Core	Two EI187 (E19/8/5), Core area 22,6 mm^2, P material or equivalent
Bobbin	8-pin, horizontal mount
Primary winding	38 turns #26 AWG HN, 19 turns/layer. Start pin 5, finish pin 7
Inter-winding insulation	5 layers 3M #56 3/8 in or equivalent
Secondary winding	38 turns #26 AWG HN, 19 turns/layer. Start pin 4, finish pin 1
Wrapper	2 layers 3M #56 3/8 in or equivalent
Inter-winding capacitance	Approximately 22 pF
HIPOT (high potential)	2 500 V RMS

Annex D
(informative)

Schedule of more onerous requirements

Products found compliant with the previous edition of this document do not necessarily require complete requalification for demonstrating compliance with this document. Depending on the nature of the changes introduced, partial retesting or even no retesting may be appropriate, as the case may be.

For this document, no more onerous requirements have been introduced with respect to the previous edition, i.e.IEC 61347-2-3:2011 and IEC 61347-2-3:2011/AMD1:2016.

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IEC 61199:2011/AMD2:2014

IEC 61347-2-3:2011, *Lamp control gear – Part 2-3: Particular requirements for a.c. and/or d.c. supplied electronic control gear for fluorescent lamps*
IEC 61347-2-3:2011 /AMD1:2016

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

_____

APPAREILLAGES DE COMMANDE POUR LES SOURCES DE LUMIÈRE ÉLECTRIQUES – SÉCURITÉ –

Partie 2-3: Exigences particulières – Appareillages électroniques alimentés en courant alternatif ou en courant continu pour lampes fluorescentes

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L'IEC 61347-2-3 a été établie par le sous-comité 34C: Appareils auxiliaires pour lampes, du comité d'études 34 de l'IEC: Éclairage. Il s'agit d'une Norme internationale.

Cette troisième édition annule et remplace la deuxième édition parue en 2011 et l'Amendement 1:2016. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) ajout de références datées le cas échéant;

b) clarification des numéros d'entités d'échantillonnage;

c) alignement des numéros d'articles sur ceux de l'IEC 61347-1.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
34C/1586/CDV	34C/1594/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications/.

Le présent document est destiné à être utilisé conjointement avec l'IEC 61347-1:2015 et l'IEC 61347-1:2015/AMD1:2017. Lorsque les exigences de l'un des articles de l'IEC 61347-1:2015 et de l'IEC 61347-1:2015/AMD1:2017 sont citées en référence dans le présent document par la phrase "L'IEC 61347-1:2015, Article n et l'IEC 61347-1:2015/AMD1:2017, Article n s'appliquent", cette phrase signifie que l'ensemble des exigences de cet article de l'IEC 61347-1:2015 et de l'IEC 61347-1:2015/AMD1:2017 s'appliquent, excepté les exigences qui ne s'appliquent explicitement pas au type particulier d'appareillage couvert par le présent document.

NOTE Dans le présent document, les caractères d'imprimerie suivants sont utilisés:

– *déclarations de conformité: caractères italiques.*

Une liste de toutes les parties de la série IEC 61347, publiées sous le titre général *Appareillages de commande pour les sources de lumière électriques – Sécurité*, se trouve sur le site web de l'IEC.

Les futurs documents de cette série porteront le nouveau titre général cité ci-dessus. Le titre des documents qui existent déjà dans cette série sera mis à jour lors de leur prochaine édition.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

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INTRODUCTION

Les exigences techniques spécifiées dans le présent document par rapport à l'IEC 61347-2-3:2011 et à l'IEC 61347-2-3:2011/AMD1:2016 n'ont pratiquement pas évolué. Néanmoins, l'élaboration d'une nouvelle édition du présent document était inévitable, car sans l'ajout de références datées à l'IEC 61347-1:2015 et l'IEC 61347-1:2015/AMD1:2017, l'applicabilité de la quatrième édition de l'IEC 61347-1:—[1] aurait été implicite en raison des références à l'IEC 61347-1 non datées dans l'IEC 61347-2-3:2011 et l'IEC 61347-2-3:2011/AMD1:2016.

Lorsque le présent document fait référence à l'un des articles de l'IEC 61347-1:2015 et l'IEC 61347-1:2015/AMD1:2017, celui-ci spécifie le degré d'applicabilité de cet article. Des exigences supplémentaires sont également fournies, lorsque cela est nécessaire.

1 Quatrième édition en cours d'élaboration. Stade à la date de publication IEC FDIS 61347-1:2024.

APPAREILLAGES DE COMMANDE POUR LES SOURCES DE LUMIÈRE ÉLECTRIQUES – SÉCURITÉ –

Partie 2-3: Exigences particulières – Appareillages électroniques alimentés en courant alternatif ou en courant continu pour lampes fluorescentes

1 Domaine d'application

La présente partie de l'EC 61347 spécifie les exigences de sécurité des appareillages électroniques destinés à être utilisés avec des alimentations jusqu'à 1 000 V en courant alternatif à 50 Hz ou 60 Hz ou avec des alimentations jusqu'à 1 000 V en courant continu avec des fréquences de fonctionnement des lampes différentes de la fréquence du réseau d'alimentation, associés aux lampes fluorescentes spécifiées dans l'IEC 60081 et l'IEC 60901, à des lampes à infrarouge à basse pression et à d'autres lampes fluorescentes fonctionnant à haute fréquence.

NOTE 1 Les exigences relatives aux appareillages à alimentation centralisée pour l'éclairage de secours sont fournies à l'Annexe B. Elles comprennent également les exigences de performance dans la mesure où celles-ci sont considérées comme liées à la sécurité pour la fiabilité du fonctionnement en mode secours.

NOTE 2 Les exigences relatives aux appareillages pour l'éclairage de secours fonctionnant à partir d'une alimentation non centralisée sont fournies dans l'IEC 61347-2-7.

NOTE 3 Les exigences de performance sont traitées dans l'IEC 60929.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60081:1997, *Lampes à fluorescence à deux culots – Prescriptions de performance*
IEC 60081:1997/AMD1:2000
IEC 60081:1997/AMD2:2003
IEC 60081:1997/AMD3:2005
IEC 60081:1997/AMD4:2010
IEC 60081:1997/AMD5:2013
IEC 60081:1997/AMD6:2017

IEC 60901:1997, *Lampes à fluorescence à culot unique – Prescriptions de performances*
IEC 60901:1997/AMD1:1997
IEC 60901:1997/AMD2:2000
IEC 60901:1997/AMD3:2004
IEC 60901:1997/AMD4:2007
IEC 60901:1997/AMD5:2011
IEC 60901:1997/AMD6:2014

IEC 60929:2011, *Appareillages électroniques alimentés en courant alternatif et/ou continu pour lampes tubulaires à fluorescence – Exigences de performances*
IEC 60929:2011/AMD1:2015

IEC 61347-1:2015, *Appareillages de lampes – Partie 1: Exigences générales et exigences de sécurité*
IEC 61347-1:2015/AMD1:2017

IEC 61347-2-7:2011, *Appareillages de lampes – Partie 2-7: Exigences particulières relatives aux appareillages électroniques alimentés par source électrique de sécurité (ESSS) pour l'éclairage de secours (autonome)*
IEC 61347-2-7:2011 /AMD1:2017
IEC 61347-2-7:2011 /AMD2:2021

IEC 61547, *Équipements pour l'éclairage à usage général – Exigences concernant l'immunité CEM*

3 Termes et définitions

Pour les besoins du présent document, les termes et les définitions de l'IEC 61347-1 ainsi que les suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse https://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse https://www.iso.org/obp

3.1
appareillage électronique alimenté en courant alternatif
onduleur alternatif/alternatif alimenté par le réseau, qui comporte des éléments de stabilisation pour l'amorçage et l'alimentation d'une ou de plusieurs lampes fluorescentes, généralement à haute fréquence

3.2
tension de crête maximale admise
tension de crête la plus élevée admise aux bornes de tout isolant de la sortie en condition de circuit ouvert et dans toutes les conditions de fonctionnement normales ou anormales

Note 1 à l'article: La tension de crête maximale admise est liée à la tension de service efficace déclarée; voir le Tableau 1.

3.3
résistance de cathode de substitution
résistance de substitution de cathode, spécifiée dans la feuille de caractéristiques de la lampe appropriée de l'IEC 60081 ou de l'IEC 60901, ou déclarée par le fabricant de la lampe ou le vendeur responsable

3.4
appareillage électronique alimenté en courant continu
onduleur alimenté en courant continu qui comporte des éléments de stabilisation pour l'amorçage et l'alimentation d'une ou de plusieurs lampes fluorescentes tubulaires, généralement à haute fréquence

3.5
échantillon
une ou plusieurs entités d'échantillonnage destinées à fournir des informations sur la population ou la matière, fournies par le fabricant ou le fournisseur responsable

[SOURCE: IEC 60050-151:2001, 151-16-19, modifié – "fournies par le fabricant ou le fournisseur responsable" a été ajouté.]

3.6
entité d'échantillonnage
l'une des entités individuelles dans une population d'entités semblables, ou une portion de matière formant une entité cohérente et prélevée en un lieu et en un moment

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

3.7
éclairage de secours
éclairage prévu pour être utilisé en cas de défaillance de l'alimentation de l'éclairage normal

Note 1 à l'article: L'éclairage de secours inclut l'éclairage de sécurité et l'éclairage de remplacement.

3.8
tension assignée de l'alimentation de secours
tension assignée du système d'alimentation de secours, déclarée par le fabricant pour l'information de l'installateur ou de l'utilisateur

3.9
dispositif d'amorçage
dispositif qui facilite l'amorçage de la lampe

EXEMPLE Une bande conductrice appliquée sur la surface extérieure de la lampe et une plaque conductrice située à une distance donnée de la lampe.

3.10
facteur de flux lumineux d'un ballast en mode de fonctionnement de secours
EBLF
rapport entre le flux lumineux de fonctionnement de secours de la lampe alimentée par l'appareillage de secours et le flux lumineux de la même lampe fonctionnant avec le ballast de référence approprié, à sa tension et à sa fréquence assignées

Note 1 à l'article: Le facteur de flux lumineux du ballast en mode de fonctionnement de secours est la valeur minimale des valeurs mesurées au moment approprié après la défaillance de l'alimentation normale, et sans interruption.

Note 2 à l'article: L'abréviation "EBLF" est dérivée du terme anglais développé correspondant "emergency ballast lumen factor".

3.11
amorçage par préchauffage
circuit dans lequel les électrodes de la lampe sont portées à une température d'émission avant l'amorçage effectif de la lampe

3.12
amorçage sans préchauffage
circuit qui utilise une tension en circuit ouvert élevée, ce qui entraîne une émission par effet de champ de l'électrode

4 Exigences générales

L'IEC 61347-1:2015, Article 4 s'applique, ainsi que ce qui suit:

– Pour les lampes à culot G5 d'un diamètre de 16 mm, la tension de service entre toute borne de sortie et la terre ne doit pas dépasser 430 V (valeur efficace).

NOTE 1 Cette exigence est conforme à l'Annexe E de l'IEC 61195:1999.

– L'Annexe B s'applique aux appareillages à alimentation centralisée pour l'éclairage de secours.

NOTE 2 Cela inclut les types alimentés en courant alternatif, courant alternatif/continu et courant continu.

EXEMPLE Systèmes de batteries centrales et systèmes reposant sur des générateurs.

– Pour les appareillages équipés de moyens de protection contre la surchauffe, l'IEC 61347-1:2015, Annexe C s'applique.

5 Généralités sur les essais

L'IEC 61347-1:2015, Article 5 s'applique, ainsi que ce qui suit:

– L'IEC 61347-1:2015, Annexe H s'applique.

– Une entité d'échantillonnage doit être utilisée pour l'ensemble des essais, sauf spécification contraire dans l'article correspondant.

  Pour permettre la réalisation des essais en parallèle et réduire la durée des essais, des entités d'échantillonnage supplémentaires peuvent être utilisées, sauf lorsque le résultat de l'essai peut être influencé par les essais précédents, par exemple les essais de l'Article 11 et de l'Article 12.

  Des entités d'échantillonnage spécialement confectionnées peuvent être utilisées, si cela est exigé.

– Les essais visant à satisfaire aux exigences de sécurité des appareillages électroniques pour l'éclairage de secours doivent être effectués dans les conditions spécifiées à l'Annexe B.

Pour plus d'informations sur la requalification des produits conformes à l'édition précédente du présent document, c'est-à-dire l'IEC 61347-2-3:2011 et l'IEC 61347-2-3:2011/AMD1:2016, voir l'Annexe D.

6 Classification

L'IEC 61347-1:2015, Article 6 s'applique.

7 Marquage

7.1 Marquages et informations

7.1.1 Marquages obligatoires

Les appareillages, autres que les appareillages intégrés, doivent porter les marquages suivants:

– les marquages a), b), c), d), e), f), k), l), m), t) et u) indiqués dans l'IEC 61347-1:2015, 7.1 et l'IEC 61347-1:2015/AMD1:2017, 7.1;

– le marquage s) indiqué dans l'IEC 61347-1:2015, 7.1 et l'IEC 61347-1:2015/AMD1:2017, 7.1;

  Ce marquage prévaut sur les exigences relatives aux appareillages TBTS indiquées dans le Tableau L.1 de l'IEC 61347-1:2015 et dans le Tableau L.1 de l'IEC 61347-1:2015/AMD1:2017.

Conformément au 15.4, la déclaration de U_{out} peut être fondée sur un nombre réduit de mesurages.

7.1.2 Informations à fournir

Les informations suivantes, si elles s'appliquent, doivent figurer sur l'appareillage ou dans le catalogue du fabricant ou un document équivalent:

– les marquages h), i), j) et n) indiqués dans l'IEC 61347-1:2015, 7.1;

– pour les appareillages alimentés en courant continu, informations concernant la protection contre l'inversion de la polarité de la tension.

7.2 Durabilité et lisibilité des marquages

L'IEC 61347-1:2015, 7.2 s'applique.

7.3 Appareillage à incorporer

Pour les appareillages sans enveloppe et classés comme des appareillages à incorporer (assemblages ouverts de cartes de circuits imprimés, par exemple), seuls les marquages a) et b) de l'IEC 61347-1:2015, 7.1 doivent être apposés sur l'appareillage.

D'autres marquages obligatoires doivent être fournis sous la forme d'informations à apposer sur l'appareillage ou à fournir dans le catalogue du fabricant ou un document équivalent.

8 Bornes

L'IEC 61347-1:2015, Article 8 et l'IEC 61347-1:2015/AMD1:2017, Article 8 s'appliquent.

9 Mise à la terre

L'IEC 61347-1:2015, Article 9 s'applique.

10 Protection contre le contact accidentel avec des parties actives

L'IEC 61347-1:2015, Article 10 et l'IEC 61347-1:2015/AMD1:2017, Article 10 s'appliquent.

11 Résistance à l'humidité et isolement

L'IEC 61347-1:2015, Article 11 et l'IEC 61347-1:2015/AMD1:2017, Article 11 s'appliquent, ainsi que ce qui suit:

Le courant de fuite qui peut se produire à partir d'un contact avec des lampes fluorescentes fonctionnant en haute fréquence à partir d'un appareillage électronique alimenté en courant alternatif ne doit pas dépasser les valeurs de la Figure 5 lorsque le courant est mesuré conformément à l'Annexe A. Les valeurs sont des valeurs efficaces.

La conformité à ces exigences est vérifiée conformément à l'Annexe A.

12 Rigidité diélectrique

L'IEC 61347-1:2015, Article 12 s'applique.

13 Essai d'endurance thermique des enroulements des ballasts

Il n'y a pas d'exigences.

NOTE Les exigences spécifiées à l'Article 13 de l'IEC 61347-1:2015 ne s'appliquent pas.

14 Conditions de défaut

L'IEC 61347-1:2015, Article 14 et l'IEC 61347-1:2015/AMD1:2017, Article 14 s'appliquent.

Pour les appareillages alimentés en courant continu, l'inversion de la polarité de la tension d'alimentation doit être soumise à l'essai en tant que condition de défaut supplémentaire.

15 Protection des composants associés

15.1 Tension de crête maximale admise dans des conditions normales de fonctionnement

Dans des conditions normales de fonctionnement, vérifiées par insertion de résistances de cathode de substitution, et dans des conditions anormales de fonctionnement, comme cela est spécifié à l'Article 16, la tension aux bornes de sortie ne doit jamais dépasser la tension de crête maximale admise spécifiée dans le Tableau 1.

Tableau 1 – Relation entre la tension de service efficace et la tension de crête maximale admise

Tension aux bornes de sortie	
Tension de service efficace V	**Tension de crête maximale admise** V
250	2 200
500	2 900
750	3 100
1 000	3 200
Une interpolation linéaire entre les échelons de tension donnés est admise.	

15.2 Tension de service maximale dans des conditions normales et anormales de fonctionnement

Dans des conditions normales de fonctionnement et dans des conditions anormales de fonctionnement, comme cela est spécifié à l'Article 16, à l'exception de l'effet redresseur, et à partir de 5 s à compter de la mise sous tension ou du début du processus d'amorçage, la tension aux bornes de sortie ne doit pas dépasser la tension de service maximale pour laquelle l'appareillage est déclaré.

15.3 Tension de service maximale et effet redresseur

Dans le cas d'un effet redresseur, c'est-à-dire dans des conditions anormales de fonctionnement selon le 16.1 d), la tension efficace au niveau de la borne de sortie ne doit pas dépasser la valeur maximale admise pour laquelle l'appareillage est conçu pendant une durée supérieure à 30 s après la mise sous tension, ou après le début du processus d'amorçage.

Pour les appareillages qui effectuent plus d'une tentative pour amorcer une lampe défaillante, le cumul des durées pendant lesquelles la tension est supérieure à la tension de service maximale déclarée pour l'appareillage ne doit pas dépasser 30 s.

Le circuit d'essai de l'effet redresseur et les informations concernant le temps de récupération t_{rr} de la diode sont représentés sur la Figure 4 a), la Figure 4 b) et la Figure 4 c).

15.4 Tension de sortie et conditions anormales

Pour les essais du 15.1 et du 15.2, les tensions de sortie mesurées doivent être celles qui existent entre toute borne de sortie et la terre. De plus, les tensions qui apparaissent entre les bornes de sortie doivent être mesurées lorsque la tension est présente au travers des barrières isolantes à l'intérieur des composants associés.

Pour les appareillages alimentant plusieurs lampes ou comportant plusieurs puissances, seule la combinaison donnant la tension la plus élevée doit être mesurée.

Si un examen ou une déclaration similaire concernant tous les appareillages fait clairement apparaître que la tension est inférieure à 50 V, seule la combinaison borne-borne ou borne-terre est alors mesurée.

15.5 Isolation des bornes d'entrée des appareillages électroniques à gradation

Pour les appareillages électroniques à gradation, l'entrée de commande doit être isolée du réseau par une isolation au moins égale à l'isolation principale.

NOTE Cette exigence ne s'applique pas aux appareillages où les signaux de commande sont injectés au travers des bornes d'alimentation ou lorsque les signaux de commande sont complètement isolés de l'appareillage par une transmission à distance par des émetteurs à infrarouges ou des émetteurs radioélectriques.

Si une TBTS doit être utilisée, une isolation double ou renforcée est alors exigée.

16 Conditions anormales

16.1 Conditions anormales pour les appareillages à courant alternatif et à courant continu

L'appareillage ne doit pas compromettre la sécurité lorsqu'il fonctionne dans des conditions anormales à une tension comprise entre 90 % et 110 % de la tension d'alimentation assignée.

La conformité est vérifiée par l'essai suivant.

Chacune des conditions suivantes doit être appliquée, l'appareillage étant mis en fonctionnement conformément aux instructions du fabricant pendant 1 h (avec un dissipateur thermique, si cela est spécifié):

a) la lampe ou l'une des lampes n'est pas insérée;

b) la lampe ne s'amorce pas, car l'une de ses cathodes est coupée;

c) la lampe ne s'amorce pas, alors que les circuits des cathodes sont intacts (lampe désactivée);

d) la lampe fonctionne, mais l'une des cathodes est désactivée ou coupée (effet redresseur);

e) le starter, s'il existe, est en court-circuit.

Pour l'essai simulant le fonctionnement avec une lampe désactivée, une résistance est connectée en lieu et place de chaque cathode de la lampe. La valeur de la résistance, exprimée en Ω, est issue de la valeur du courant de fonctionnement (maximal) de la lampe I_n, spécifiée dans la feuille de caractéristiques de la lampe appropriée de l'IEC 60081 et de l'IEC 60901, et utilisée dans l'équation suivante:

$$R = \frac{5{,}23}{I_{\mathrm{n}}}$$

Pour les lampes non couvertes par l'IEC 60081 et l'IEC 60901, les valeurs déclarées par le fabricant de la lampe doivent être utilisées.

Lors de l'essai de l'effet redresseur sur les appareillages électroniques, le circuit représenté sur la Figure 1 est utilisé. L'anode du redresseur est raccordée aux points médians de la résistance équivalente appropriée; la cathode du redresseur est raccordée à l'électrode de la lampe mise en court-circuit. La direction de l'effet redresseur est choisie de manière à donner les conditions les plus défavorables. Si cela est nécessaire, la lampe est amorcée à l'aide d'un dispositif approprié.

Pendant et après les essais spécifiés aux points a) à e), l'appareillage ne doit présenter aucun défaut compromettant la sécurité et ne doit pas dégager de fumée.

16.2 Conditions anormales supplémentaires pour les appareillages électroniques alimentés en courant continu

Si l'appareillage électronique alimenté en courant continu est déclaré par le fabricant comme un appareillage protégé contre l'inversion de la polarité de la tension d'alimentation, l'essai suivant est alors appliqué:

L'appareillage électronique alimenté en courant continu doit être connecté pendant 1 h à la tension d'alimentation à polarité inversée à la valeur maximale de la tension assignée, avec la puissance de lampe maximale déclarée par le fabricant.

Pendant et après l'essai, l'appareillage électronique doit faire fonctionner la ou les lampes normalement, sans aucun défaut.

17 Comportement de l'appareillage en fin de vie de la lampe

17.1 Effets de fin de vie de la lampe

À la fin de vie de la lampe, l'appareillage doit se comporter de telle sorte qu'aucune surchauffe du ou des culots de la lampe ne se produise à n'importe quelle tension comprise entre 90 % et 110 % de la tension d'alimentation assignée.

Pour les essais simulant les effets de fin de vie des lampes, trois essais sont décrits:

a) essai aux impulsions, mode asymétrique (décrit au 17.2);

b) essai de puissance dissipée, mode asymétrique (décrit au 17.3);

c) essai du filament coupé (décrit au 17.4).

N'importe lequel de ces trois essais peut être utilisé pour qualifier des appareillages électroniques. Le fabricant de l'appareillage doit déterminer lequel de ces trois essais sera utilisé pour soumettre à l'essai un appareillage donné en fonction de la conception de circuit de cet appareillage particulier. La méthode d'essai choisie doit être indiquée dans la documentation du fabricant de l'appareillage.

NOTE 1 Le contrôle des appareillages visant à vérifier leur aptitude à gérer un effet redresseur partiel est recommandé par l'IEC 61195:1999, Annexe E, l'IEC 61199:2011, Annexe H et l'IEC 61199/AMD2:2014, Annexe H.

NOTE 2 Au Japon, seules les exigences du 17.1 b) s'appliquent pour les appareillages électroniques.

Les lampes utilisées dans les circuits d'essais d'appareillages doivent être des lampes neuves vieillies pendant 100 h.