

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

Lamp controlgear –
Part 1: General and safety requirements

Appareillages de lampes –
Partie 1: Exigences générales et exigences de sécurité

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FOREWORD

This amendment has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lamps and related equipment.

The text of this amendment is based on the following documents:

FDIS	Report on voting
34C/1023/FDIS	34C/1029/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Add, after the Foreword, the following new text:

Introduction

Work is currently underway to modify creepage distances and clearances requirements regarding:

- working voltages with operating frequencies up to 30 kHz and with higher operating frequencies then 30 kHz;
- impulse and resonance ignition;
- basic, supplementary and reinforced insulation;
- insulation between circuits;
- coated or potted controlgear.

This information is expected to be incorporated into the future Edition 3 of IEC 61347-1.

1 Scope

Replace the fifth, sixth and seventh paragraphs by the following new paragraph:

Particular requirements for controlgears providing safety extra low voltage (from now on SELV) are given in Annex L.

2 Normative references

Add the following new references:

IEC 60065:2001, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60085:1987, *Electrical insulation – Thermal classification and designation*

IEC 60216 (all parts), *Electrical insulating materials – Properties of thermal endurance*

IEC 60598-2 (all Parts 2), *Luminaires – Part 2: Particular requirements.*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60884-2-4, *Plugs and socket-outlets for household and similar purposes – Part 2-4: Particular requirements for plugs and socket outlets for SELV*

IEC 60906-3, *IEC System of plugs and socket-outlets for household and similar purposes – Part 3: SELV plugs and socket-outlets, 16 A 6 V, 12 V, 24 V, 48 V, a.c. and d.c.*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61558-1:2005, *Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests*

IEC 61558-2-6:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers*

IEC 61558-2-16:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units*

Replace the references to IEC 60317-0-1:1997 and IEC 60598-1:2003 by the following:

IEC 60317-0-1:2008, *Specifications for particular types of windings wires – Part 0-1: General requirements – Enamelled round copper wire*

IEC 60598-1:2008, *Luminaires – Part 1: General requirements and tests*

3 Terms and definitions

3.23

functional earthing (ground)

Replace the existing Notes 1 and 2 of the existing definition by the following Note to entry:

Note 1 to entry: In some cases, functional earthing may be necessary to facilitate starting and/or to avoid radio interference.

Add, after Definition 3.26, the following new definitions:

3.27 extra-low voltage ELV

voltage which does not exceed 50 V a.c. or 120 V ripple free d.c. between conductors, or between any conductor and earth (voltage band 1 of IEC 60449:1973)

Note 1 to entry: "Ripple free" is conventionally defined for sinusoidal ripple voltage as a ripple content of not more than 10 % r.m.s. The maximum peak value does not exceed 140 V for a nominal 120 V ripple-free d.c. system.

3.28 safety extra low voltage SELV

ELV in a circuit which is isolated from the mains supply by insulation not less than that between the primary and secondary circuits of a safety isolating transformer according to IEC 61558-2-6

Note 1 to entry: Maximum voltage lower than 50 V a.c. r.m.s. or 120 V ripple free d.c. may be specified in particular requirements, especially when direct contact with current-carrying parts is allowed.

Note 2 to entry: The voltage limit should not be exceeded at any load between full loads and no-load when the source is a safety isolation transformer.

Note 3 to entry: "Ripple free" is conventionally an r.m.s. ripple voltage not more than 10 % of the d.c. component: the maximum peak value does not exceed 140 V for a nominal 120 V ripple free d.c. system and 70 V for a nominal 60 V ripple free system.

3.29 body

term used in this standard as a general term which includes all accessible metal parts, shafts, handles, knobs, grips and the like, accessible metal fixing screws and metal foil applied on accessible surfaces of insulating material and does not include non-accessible metal parts

3.30 impulse withstand category

DEPRECATED: overvoltage category numeral defining a transient overvoltage condition

Note 1 to entry: Impulse withstand categories I, II, III and IV are used. For detailed information, see IEC 60664-1 and IEC 60598-1.

3.31 class I lamp controlgear

independent controlgear in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in such a way that means are provided for the connection of accessible conductive parts to the protective (earthing) conductor in the fixed wiring of the installation in such a way that accessible conductive parts cannot become live in the event of a failure of the basic insulation

Note 1 to entry: Class I lamp independent controlgear may have parts with double or reinforced insulation.

Note 2 to entry: Class I lamp independent controlgear may have parts in which protection against shock relies on operation at safety extra-low voltage (SELV)

3.32 class II lamp controlgear

independent controlgear in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions such as double insulation or reinforced insulation are provided, there being no provision for protective earthing or reliance upon installation conditions

3.33 class III lamp controlgear

independent controlgear in which protection against electric shock relies on supply at safety extra-low voltage (SELV) and in which voltages higher than those of SELV are not generated

3.34**protective impedance device**

component or assembly of components the impedance and construction of which are such as to ensure that steady state touch current and charge are limited to a non-hazardous level

3.35**maximum working voltage** U_{out}

maximum occurring working voltage (r.m.s.) between the output terminals or between the output terminals and earth, during normal or abnormal operating condition

Note 1 to entry: Transients and ignition voltages have to be neglected.

3.36**basic insulation**

insulation of parts which provide protection against electrical shock under fault-free conditions

3.37**double insulation**

insulation of parts with two layers of insulation which provide protection against electrical shock under single fault condition

3.38**reinforced insulation**

Insulation of parts which provide a degree of protection as double insulation

4 General requirements

Add, after the second paragraph, the following new paragraph:

Requirements for insulation materials used for double or reinforced insulation of controlgear are specified in Annex N of this standard

Add, after the third paragraph, the following new paragraph:

Built-in electronic controlgear with double or reinforced insulation shall comply additionally with the requirements of Annex O.

Add, at the end of Clause 4, the following new paragraph:

Controlgears providing SELV shall comply with the additional requirements given in Annex L. This includes especially insulation resistance, electric strength, creepage distances and clearances between the primary and secondary circuit.

5 General notes on tests

Add, at the end of Subclause 5.3, the following new paragraph:



If the tests of 14.3 or 15.5 of IEC 61558-1:2005 have to be made, three additional samples are needed. These samples are used only for the test of 14.3 or 15.5 of IEC 61558-1:2005, respectively.

7.1 Items to be marked

Add, after the first paragraph of Subclause 7.1, but before the alphabetical list, the following new paragraph:

For controlgear without an enclosure, and classified as built-in (e.g. open printed circuit board assembly), only items a) and b) are to be considered mandatory for marking on the controlgear. Other mandatory markings required by the IEC 61347-2 part shall be provided as information to be given either on the controlgear or made available in the manufacturer's catalogue or similar.

Replace the existing point f) by the following new point f):

- f) The earthing terminals (if any) shall be identified by the symbol  or .

These symbols shall not be placed on screws or other easily removable parts.

If the lamp control gear is market with an earthing symbol, the manufacturer's instruction shall contain the information whether it is permitted to use the control gear also without connection to earth.

NOTE For the use of symbols, see IEC 60417.

Add, at the end of Subclause 7.1, the following new items, table and text:

- s) Symbol indicating the kind of controlgear providing SELV.
 t) The earthing terminals of an independent controlgear used for the connection of lamp compartments (if any) shall be marked with the symbol:



This symbol shall not be placed on screws or other easily removable parts. The symbol size of the earthing terminals of an independent controlgear used for the connection of lamp compartments shall be at least 5 mm (over all, including letters).

- u) Declaration of the maximum working voltage U_{out} (r.m.s.) between
- output terminals, or
 - any output terminal and earth (if applicable)
- in steps as described in Table 5.

Table 5 – Working voltage and U_{out} steps

Working voltage	< 50 V	< 500 V	> 500 V
U_{out} in steps of	1 V	10 V	50 V

The highest of the specified voltage values shall be marked on the controlgear as “Output working voltage = ...V” or “U-OUT = ...V” or “ U_{out} = ...V”.

NOTE 5 Item u) is not applicable to terminals with SELV-circuits as defined in IEC 61558-1.

9 Provisions for protective earthing

Replace the existing title and content of Clause 9 by the following:

9 Earthing

9.1 Provisions for protective earthing (Symbol: IEC 60417-5019 (2006-08))

Earthing terminals shall comply with the requirements of Clause 8. The electrical connection/clamping means shall be adequately locked against loosening, and it shall not be possible to loosen the electrical connection/clamping means by hand without the use of a tool. For screwless terminals, it shall not be possible to loosen the clamping means/electrical connection unintentionally.

All parts of an earthing terminal shall be such as to minimize the danger of electrolytic corrosion resulting from contact with the earth conductor or any other metal in contact with them.

The screw and the other parts of the earthing terminal shall be made of brass or other metal no less resistant to corrosion, or material with a non-rusting surface and at least one of the contact surfaces shall be bare metal.

Compliance is checked according to 7.2.3 of IEC 60598-1:2008.

9.2 Provisions for functional earthing (Symbol: IEC 60417-5018 (2011-07))

Functional earthing terminals shall comply with the requirements of Clause 8 and 9.1.

The functional earthing contact (potential) of a lamp controlgear shall be insulated from the live parts by double or reinforced insulation.

9.3 Lamp controlgear with conductors for protective earthing by tracks on printed circuit boards

If a printed circuit board track is used for earthing internally, in the independent, built-in or integral lamp controlgear, it shall withstand the following test.

A current from an a.c. source of 25 A is passed for 1 min between the earthing terminal or earthing contact via the track on the printed circuit board and each of the accessible metal parts in turn.

After the test and after cooling the controlgear to ambient temperature, the requirements of 7.2.3 of IEC 60598-1:2008 shall apply.

9.4 Earthing of built-in lamp controlgear

It is allowed to earth built-in lamp controlgear by means of fixing the controlgear to earthed metal of the luminaire.

For compliance, see 7.2 of IEC 60598-1:2008.

If a lamp controlgear has an earthing terminal, this terminal shall only be used for earthing the built-in lamp controlgear.

Earthing of the luminaire or other equipment via the built-in lamp controlgear is not allowed.

9.5 Earthing via independent controlgear

9.5.1 Earth connection to other equipment

Independent lamp controlgear may have earthing terminals that allow the onward earth connection to other equipment in the installation. For looping or through connection, the conductor shall have a minimum cross-section of 1,5 mm² and be of copper, or an equivalent conductive material shall be used.

Protective earthing wires within the luminaire shall be in line with 5.3.1.1 and Clause 7 of IEC 60598-1:2008. For looping-through, a minimum cross section of 1,5 mm² is required.

Compliance is checked by inspection and measurement.

9.5.2 Earthing of the lamp compartments powered via the independent lamp controlgear

Independent lamp controlgear may have earthing terminals that allow the earthing of the lamp compartment, which are powered by this controlgear. In this case, the earth path between the input and output earth terminals of the controlgear shall withstand the following test.

A current from an a.c. source of 25 A is passed for 1 min between the earthing terminal or earthing contact (via the track on the printed circuit board, if used for protective earth) and each of the accessible metal parts in turn.

After the test and after cooling the control gear at ambient temperature, a current of at least 10 A, derived from the source with a no-load voltage not exceeding 12 V, shall be passed between the earthing terminal or earthing contact and each of the accessible metal parts in turn. The voltage drop between the earthing terminal or earthing contact and the accessible metal part shall be measured and the resistance shall be calculated from the current and the voltage drop. In no case shall the calculated resistance value exceed 0,5 Ω.

The output earthing terminals to the lamp compartment shall be marked as described in 7.1 t).

10 Protection against accidental contact with live parts

Add, after Subclause 10.2, the following new subclauses:

10.3 For controlgears providing SELV, the accessible conductive parts shall be electrically separated from live parts by at least double or reinforced insulation. There shall be no connection between the output circuit and the body or the protective earthing circuit, if any. Moreover, the construction shall be such that there is no possibility of any connection between these circuits, either directly or indirectly, through other conductive parts, except by deliberate action (see 10.4).

SELV output circuits shall be electrically separated from earth by at least basic insulation.

The expression “circuits” also covers windings of internal transformers (HF and others) of the controlgear.

In controlgears providing ELV conductive parts are regarded as live parts and shall be insulated accordingly.

Compliance is checked by inspection, relevant insulation tests and measurements. See also Annex L.

10.4 Controlgears providing SELV may have accessible conductive parts in the SELV circuit; if: the rated output voltage under load does not exceed 25 V r.m.s. or 60 V d.c. ripple free d.c. where the voltage exceeds 25 V r.m.s. or 60 V ripple free d.c., the touch current does not exceed:

- for a.c.: 0,7 mA (peak);
- for d.c.: 2,0 mA;
- the no-load output does not exceed 35 V peak or 60 V ripple free d.c.

NOTE The limits given are based on IEC 60364-4-41.

Compliance is checked by measuring the output voltage when steady conditions are established, the controlgear being connected to rated supply voltage and rated frequency. For the test under load the controlgear is loaded with a resistance which would give rated output (current or wattage respectively) at rated output voltage. For controlgears with more than one supply voltage, the requirements are applicable for each of the rated supply voltages.

The touch current is checked by measurement in accordance with Annex G from IEC 60598-1.

For controlgears providing SELV with rated output voltages or currents exceeding the values given above at least one of the conductive parts in the SELV circuit shall be insulated by insulation capable of withstanding a test voltage of 500 V r.m.s. for 1 min.

Accessible conductive parts separated by double or reinforced insulation, e.g. live parts and the body or primary and secondary circuits, may be bridged (conductive bridged) by resistors or Y2 capacitors provided they consists of at least two separate components of the same rated value (resistance or capacitance) and are rated for the total working voltage and whose impedance is unlikely to change significantly during the individual lifetime of the controlgear. In addition, accessible conductive parts separated by double or reinforced insulation from live parts, as above, may be bridged by a single Y1 capacitor.

Y1 or Y2 capacitors shall comply with relevant requirements of IEC 60384-14 and if resistors are used they shall comply with the requirements of test (a) in 14.1 of IEC 60065:2001.

11 Moisture resistance and insulation

Replace, after the third paragraph after the note, the rest of the text of Clause 11 by the following:

Insulation resistance shall be not less than 2 M Ω for basic insulation and 4 M Ω for double or reinforced insulation between live parts and the body. For insulation between primary and secondary circuits, in controlgear providing SELV, other values apply (see Annex L).

Insulation shall be adequate

- a) between live parts and outer metal parts, including fixing screws and metal foil in contact with outer insulating parts;
- b) between live parts and control terminals, where relevant.

In the case of lamp controlgear having an internal connection or component between one or more output terminals and the earth terminal, such a connection shall be removed during this test.

For the test the input and output terminals shall be bonded together. Controlgear, having insulation cover or envelope is wrapped with metal foil.

12 Electric strength

Replace the existing Table 1 by the following new Table 1:

Table 1 – Electric strength test voltage

Working voltage U		Test voltage V
Basic insulation for voltages of SELV		500
Up to and including 50 V		500
Above 50 V up to and including 1 000 V	Basic insulation	$2 U + 1\,000$
	Supplementary insulation	$2 U + 1\,000$
	Double or reinforced insulation	$4 U + 2\,000$
Where both reinforced insulation and double insulation are used, care shall be taken that the voltage applied to the reinforced insulation does not overstress the basic insulation or the supplementary insulation.		
When testing the controlgear the input should be tested with a test voltage which corresponds with the supply voltage and the output related part should be tested with a test voltage which corresponds with U_{out} .		

Add the following sentence after Table 1:

For solid or thin sheet insulation used for double or reinforced insulation Annex N applies.

13 Termal endurance test for windings of ballasts

Add, after the second paragraph "Compliance is checked by the following test.", the following new note:

NOTE 5 For windings included in controlgears providing SELV, see modifications specified in IEC 61558-1, Annex U.

14 Fault conditions

Add, after the second paragraph, the following new text:

If a lamp controlgear marked with a protective earthing symbol and the manufacturer declared in the instructions that the use of the controlgear without earthing contact is permitted then the operation under fault conditions shall be made with and without earthing connection.

If a lamp controlgear marked with a functional earthing symbol and the manufacturer declared in the instructions that the use of the controlgear without functional earthing contact is permitted then the operation under fault conditions shall be made with and without earthing connection.

Add, after the first paragraph of Subclause 14.1, the following new paragraphs:

Creepage and clearance distances below the values of Clause 16 are not allowed between live parts and accessible metal parts.

The test shall be carried out on one item for each fault condition. If one of the items fails, the test shall be repeated with three new items, none of which shall fail.

Delete the existing NOTE.

Subclause 14.5 of Amendment 1

Add, after the second NOTE introduced in Amendment 1, the following new text:

Insulation shall be adequate between input and output terminals bonded together, and all exposed metal parts and the control terminals, where relevant. Controlgear, having insulation cover or envelope is wrapped with metal foil.

Delete, in Subclause 14.6 of Amendment 1, in the first sentence and under item a), the words "at least".

Add, in Subclause 14.6, in the first sentence and under item a), after 160 A $\begin{matrix} -0 \\ +10 \end{matrix}$ % the word "r.m.s.".

15 Construction

Add, after Subclause 15.2, the following new subclause:

15.3 Plugs and socket-outlets used in SELV or ELV circuits

For controlgear providing SELV or ELV socket-outlets, the output circuit shall be such that there is no dangerous compatibility between such a socket-outlet and a plug intended for direct connection to a socket-outlet which could be used for the input circuit in relation to installation rules, voltages and frequencies.

Plugs and socket-outlets for SELV system shall comply with the requirements of IEC 60906-3 and IEC 60884-2-4. However, plugs and socket-outlets for SELV systems with both a rated current ~ 3 A and a maximum voltage of 25 V a.c. or 60 V d.c. with a power not exceeding 72 W are allowed to comply only with the following requirements:

- plugs shall not be able to enter socket-outlets of other standardised systems;
- socket-outlets shall not admit plugs of other standardised voltage systems;
- socket-outlets shall not have a protective earth contact.

As IEC 60906-3 covers only 6 V, 12 V, 24 V and 48 V output voltage, controlgear with intermediate output voltages shall be able to withstand the nearest upper voltage.

16 Creepage distances and clearances

Replace the first paragraph by the following:

Creepage distances and clearances shall be not less than the values given in Tables 3 and 4, as appropriate, unless otherwise specified in Clause 14 and for controlgear providing SELV, where Subclause L.1 1 applies.

Replace the paragraph before Table 3 by the following:

Distances which provide basic insulation on printed circuit boards are exempt from the requirements of this clause because they are tested according to Clause 14. This exemption is not applicable where double or reinforced insulation barriers are provided on printed circuit boards.

Replace Table 3 by the following new Table 3:

Table 3 – Minimum distances for a.c. (50/60 Hz) sinusoidal voltages

RMS working voltage not exceeding V	50	150	250	500	750	1 000
	Distances in mm					
<i>Creepage distances</i>						
– <i>Basic insulation PTI</i>						
≥ 600	0,6	0,8	1,5	3	4	5,5
< 600	1,2	1,6	2,5	5	8	10
– <i>Supplementary insulation PTI*</i>						
≥ 600	–	0,8	1,5	3	4	5,5
< 600	–	1,6	2,5	5	8	10
– <i>Reinforced insulation</i>	–	3,2	5	6	8	11
<i>Clearances</i>						
– <i>Basic insulation</i>	0,2	0,8	1,5	3	4	5,5
– <i>Supplementary insulation</i>	–	0,8	1,5	3	4	5,5
– <i>Reinforced insulation</i>	–	1,6	3	6	8	11
NOTE 1 PTI (proof tracking index) in accordance with IEC 60112.						
NOTE 2 In the case of creepage distances to parts not energized or not intended to be earthed where tracking cannot occur, the values specified for material with PTI ≥ 600 apply for all materials (in spite of the real PTI). For creepage distances subjected to working voltages of less than 60 s duration, the values specified for materials with PTI ≥ 600 apply for all materials.						
NOTE 3 For creepage distances not liable to contamination by dust or moisture, the values specified for materials with PTI ≥ 600 apply (regardless of the real PTI).						
NOTE 4 For lamp controlgear specified in IEC 61347-2-1, accessible metal parts are rigidly placed in relation to live parts.						
NOTE 5 The creepage distances and clearances specified in this clause do not apply to those devices specified in IEC 61347-2-1 which comply with the dimensions specified in IEC 60155. In such instances, the requirements of that standard apply.						

Table 4 – replacement

This correction only applies to the French version.

20 No-load output voltage

Replace the existing text of Clause 20 by the following:

The requirements of this clause are only applicable for magnetic lamp controlgear with integrated transformer, operating with supply frequencies.

If a magnetic lamp controlgear is connected at rated supply voltage and rated frequency with no-load on the output, the output voltage shall not differ from the rated value of the no-load output voltage declared by the manufacturer by more than 10 %.

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

Replace the existing text of Annex A by the following:

A.1 In order to determine whether a conductive part is a live part which may cause an electric shock, the lamp controlgear is operated at rated voltage and nominal supply frequency. A conductive part is not a live part if the requirements of Clause A.2 or A.3 are met.

For the test according to Clause A.2 and A.3,

- one pole of the supply of the DUT shall be at earth potential,
- the measurements shall be carried out between the part concerned and any accessible conductive part and/or earth.

NOTE The purpose of this annex is to establish if a conductive part may cause electric shock if touched. It does not give response about the kind and level of insulation used.

A.2 The voltage shall be measured by using a measuring circuit consisting of a non-inductive resistance of 50 k Ω .

- the voltage shall not exceed 35 V a.c. peak or 60 V ripple free d.c.

A.3 Where the voltage exceeds 35 V a.c. peak or 60 V ripple free d.c. or a protective impedance device is used the touch-current shall not exceed:

- for a.c.: 0,7 mA (peak);
- for d.c.: 2,0 mA.

Compliance is checked according Annex G of IEC 60598-1:2008.

Annex B – Particular requirements for thermally protected lamp controlgear, Amendment 1

B.9.5.2 Test sequence

Add, at the end of Subclause B.9.5.2, the following note:

NOTE In Japan, $(t_w + 5)$ °C is required instead of $(t_w + 20)$ °C for this test.