

# INTERNATIONAL STANDARD



DC or AC supplied electronic controlgear for LED modules – Performance requirements

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INTERNATIONAL  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DC OR AC SUPPLIED ELECTRONIC CONTROLGEAR FOR  
LED MODULES – PERFORMANCE REQUIREMENTS**

## FOREWORD

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International Standard IEC 62384 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lamps and related equipment.

This second edition cancels and replaces the first edition published in 2006 and Amendment 1:2009. This edition constitutes a technical revision.

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

- a) scope extension (direct current from 250 V to 1 000 V);
- b) new specifications for measuring the power factor for controlgear with settable/non-constant output (for instance, to allow for constant light output);
- c) deletion of audio frequency requirements;
- d) selection of current test circuit by module capacitance (instead of selecting by having or not having logic circuitry) plus test circuit setup changes.

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

FDIS	Report on voting
34C/1488/FDIS	34C/1489/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This document is to be read in conjunction with IEC 61347-2-13.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

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# DC OR AC SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES – PERFORMANCE REQUIREMENTS

## 1 Scope

This document specifies performance requirements for electronic controlgear for use on ~~d.c. supplies up to 250 V and a.c.~~ DC or AC supplies up to 1 000 V (alternating current at 50 Hz or 60 Hz) and with an output frequency which can deviate from the supply frequency, associated with LED modules according to IEC 62031. Controlgear for LED modules specified in this document are designed to provide constant voltage or current. Deviations from the pure voltage and current types do not exclude the gear from this document.

NOTE 1 The tests in this document are type tests. Requirements for testing individual controlgear during production are not included.

NOTE 2 Requirements for controlgear which incorporate means for varying the output power are under consideration.

NOTE 3 It ~~may~~ can be expected that controlgear complying with this document will ensure satisfactory operation between 92 % and 106 % of the rated supply voltage, taking into account the specifications of the LED module manufacturer.

## 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 61347-1, *Lamp controlgear – Part 1: General and safety requirements*

<https://standards.iteh.ai/catalog/standards/iec/91d86548-9c85-4b9b-9a16-0e6f7b623d05/iec-62384-2020>

IEC 61347-2-13, *Lamp controlgear – Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules*

~~IEC 62031, LED modules for general lighting – Safety requirements<sup>4</sup>~~

## 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 terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1

#### total circuit power

total power dissipated by controlgear and LED module(s) in combination, at rated supply voltage of the controlgear and at the highest rated output load

### 3.2 circuit power factor

$\lambda$

ratio of the measured circuit power to the product of the supply voltage (RMS) and the supply current (RMS)

### ~~3.3 high audio-frequency impedance control gear~~

~~control gear the impedance of which in the frequency range 250 Hz to 2 000 Hz exceeds the values specified in Clause 11 of this standard.~~

### 3.3 controlgear for LED module circuitry with high input capacitance

controlgear suitable for LED modules which present high capacitance connected directly or indirectly to the input terminals

Note 1 to entry: Examples are LED modules with switch mode power supply conversion circuits, like buck or boost regulators.

Note 2 to entry: Typically, capacitances above 100 nF are considered high capacitance.

### 3.4 controlgear for LED module circuitry with low input capacitance

controlgear suitable for LED modules which present low capacitance or no capacitance connected directly or indirectly to the input terminals

Note 1 to entry: Examples are LED modules with only LEDs or with logic circuits intended for thermal protection, but not directly modifying the power supplied by the controlgear, or linear voltage regulators.

Note 2 to entry: Typically, capacitances of 100 nF and below are considered low capacitance.

## 4 General notes on tests

### 4.1 The tests given in this document are type tests.

**NOTE** The requirements and tolerances permitted by this document are based on testing of a type test sample submitted by the manufacturer for that purpose. In principle this type test sample should consist of units having characteristics typical of the manufacturer's production and be as close to the production centre point values as possible.

**NOTE** It ~~may~~ can be expected with the tolerances given in this document that products manufactured in accordance with the type test sample will comply with this document for the majority of the production. Due to the production spread however, it is inevitable that there will sometimes be products outside the specified tolerances. For guidance on sampling plans and procedures for inspection by attributes, see IEC 60410.

### 4.2 For tests which are carried out with a LED module or LED modules, this (these) LED module(s) shall fulfil the following requirements:

The ~~wattage~~ power of the LED module(s) when measured at its (their) rated voltage or rated current (direct current and/or alternating current) shall not differ from the rated ~~wattage~~ power by more than +6 % and –0 %.

### 4.3 The tests shall be carried out in the order of the clauses, unless otherwise specified.

### 4.4 One specimen shall be ~~submitted~~ subjected to all the tests.

### 4.5 In general all the tests are made on each type of controlgear or, where a range of similar controlgear is involved for each rated ~~wattage~~ power in the range or on a representative selection from the range as agreed with the manufacturer.



**4.6** The tests shall be made under the conditions specified in Clause A.1. Since up to now data ~~of~~ with regard to LED modules ~~are~~ have not been published in an IEC standard, they shall be made available by the LED module manufacturer.

**4.7** All controlgear covered by this document shall comply with the requirements of IEC 61347-2-13.

**4.8** The tests shall be carried out with the length of the output cable of both 20 cm and 200 cm unless otherwise declared by the manufacturer.

## 5 Classification

### 5.1 Classification according to the load

a) Single value load controlgear

This type of controlgear is designed for use with one specific output ~~wattage~~ power only, which may be dissipated by one or more LED modules.

b) Multiple value load controlgear

This type of controlgear is designed for use with one or more LED modules with a total load within the declared ~~wattage~~ power range.

### 5.2 Classification according to the output voltage

a) Controlgear having a stabilized output voltage.

b) Controlgear without a stabilized output voltage.

### 5.3 Classification according to the output current

a) Controlgear having a stabilized output current.

b) Controlgear without a stabilized output current.

## 6 Marking

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### 6.1 Mandatory marking

**6.1.1** Controlgear shall be clearly marked as follows:

Circuit power factor, for example  $\lambda = 0,9$ .

For controlgear where the power factor is not constant all over the rated output range and/or controlgear with a supply voltage range, the power factor may be different for different combinations of supply voltage and output power. In this case the controlgear shall be marked with a range of power factor values, for example  $\lambda = 0,8 - 0,9$ .

If the power factor is less than 0,95 leading, it shall be followed by the letter "C", for example  $\lambda = 0,9 C$ .

**6.1.2** In addition to the above mandatory marking, the following information shall either be given on the controlgear or made available in the manufacturer's catalogue or the like:

- a) if applicable: limits of the permissible temperature range;
- b) if applicable: an indication that the controlgear has a stabilized output voltage;
- c) if applicable: an indication that the controlgear has a stabilized output current;
- d) if applicable: an indication that the controlgear is suitable for operation with a mains supply dimmer;
- e) if applicable: an indication of the operation mode, for example phase control;

- f) if applicable:  $P_{\text{rated\_min}}$ , the rated minimum output power for the proper operation of the controlgear.

NOTE  $P_{\text{rated\_min}}$  can be combined with  $P_{\text{rated}}$  in only one marking. e.g.  $P_{\text{rated}} = 20 \text{ W} \dots 60 \text{ W}$ .

## 6.2 Optional marking

The following information may either be given on the controlgear or made available in the manufacturer's catalogue or the like:

- a) total circuit power;
- ~~b) if applicable: the symbol which indicates that the control gear is designed to comply with conditions for audio-frequency impedance;~~
- b) If applicable: a symbol which indicates that the controlgear is a short-circuit proof type (the symbol is under consideration).

## 7 Output voltage and current

### 7.1 Starting and connecting requirements

After starting or connecting a LED module, the output should be within 110 % of its rated value within 2 s. Maximum current or maximum voltage shall not exceed the values given by the manufacturer. This performance is tested with the minimum rated power.

NOTE If the output voltage is AC, 110 % is the percentage of the RMS value, if DC, 110 % is the percentage of the DC value.

### 7.2 Voltage and current during operation

For controlgear having a non-stabilized output voltage, when supplied with the rated supply voltage, the output voltage shall not differ by more than  $\pm 10\%$  from the rated voltage of the LED modules. For controlgear having a stabilized output voltage, when supplied at any supply voltage between 92 % and 106 % of the rated supply voltage, the output voltage shall not differ by more than  $\pm 10\%$  from the rated voltage of the LED modules.

For controlgear having a non-stabilized output current, when supplied with the rated supply voltage, the output current shall not differ by more than  $\pm 10\%$  from the rated current of the LED modules. For controlgear having a stabilized output current, when supplied at any supply voltage between 92 % and 106 % of the rated supply voltage, the output current shall not differ by more than  $\pm 10\%$  from the rated current of the LED modules.

Multiple load controlgear shall be tested with both the minimum and maximum load.

### 7.3 Capacitive load requirement

~~If~~ The LED module or any additional control unit connected to the ~~converter~~ controlgear may contain capacitors for control and/or driving circuitry on the modules, and current pulses may be generated when connecting the LED module to the controlgear. ~~This shall not disturb the control gear.~~ Controlgear overcurrent detection ~~nor~~ shall not be disturbed during the starting process of the controlgear.

For test conditions, see Clause A.2. Figure A.1a) describes a test circuit during the starting process of the controlgear and Figure A.1b) describes a test circuit for connecting the load during steady state operation.

The test according to Figure A.1b) may be waived under the condition that it is specified by the manufacturer in the product information of the controlgear that the LED module must be connected prior to starting the controlgear in order to ensure proper starting of the LED module.

If the load detection circuit of the controlgear does not allow operation with pure resistive load, the resistor R is to be substituted with equivalent LED load.

~~Compliance: when connecting the measurement circuit to the control gear, the detection device shall not trip.~~

*Compliance: The controlgear overvoltage detection shall not act during the starting phase or when connecting the load in the steady state phase.*

#### ~~7.4 Voltage surges during switching and operation~~

~~Voltage surges superimposed on the output voltage shall not exceed the values specified below (values under consideration).~~

### 8 Total circuit power

At rated voltage, the total circuit power shall not be more than 110 % of the value declared by the manufacturer, when the controlgear is operated with LED module(s).

### 9 Circuit power factor

The measured circuit power factor shall not be less than the marked value by more than 0,05 when the controlgear is operated ~~on its rated wattage~~ at the rated output power range with LED module(s) and the whole combination is supplied with rated voltage and frequency.

For controllable controlgear, the power factor is measured with the controlgear adjusted to provide the maximum output power.

Controlgear designed to provide, in combination with a LED module, constant luminous flux, are measured with a load not using the rated output power at 0 h, but with the controlgear providing the maximum output power.

The DUT may be specially prepared in a way that the output power is set to the maximum value compensating the luminous flux depreciation of the load at the end of life.

For controlgear with a supply voltage range, the test shall be performed with the combination of supply voltage range and output power range which gives the lowest and highest power factor (e.g. minimum supply voltage, maximum rated output power and maximum supply voltage, minimum rated output power). The measured power factors shall not be less than the lowest and highest marked values by more than 0,05 respectively.

### 10 Supply current

At rated voltage, the supply current shall not differ by more than +10 % from the value marked on the controlgear or declared in the manufacturer's literature, when that controlgear is operated on its rated ~~wattage~~ power with LED module(s).

#### ~~11 Impedance at audio frequencies~~

~~Control gear marked with the audio-frequency symbol (see subclause 6.2b)) shall be tested in accordance with Clause A.3, using the circuit in Figure A.2.~~

~~For every signal frequency between 400 Hz and 2 000 Hz, the impedance of the control gear when operated with the rated LED module load at rated voltage and frequency shall be inductive in characteristic. Its impedance in ohms shall be at least equal to the resistance of~~

~~the resistor which would dissipate the same power as the LED module control gear combination when operating at its rated voltage and frequency. The control gear impedance is measured with a signal voltage equal to 3,5 % of the rated supply voltage of the control gear.~~

~~Between 250 Hz and 400 Hz, the impedance shall be at least equal to half the minimum value required for frequencies between 400 Hz and 2 000 Hz.~~

~~NOTE Radio interference suppressors consisting of capacitors of less than 0,2 µF (total value) which may be incorporated in the control gear may be disconnected for this test.~~

## 11 Operational tests for abnormal conditions

The controlgear shall not be damaged under the following conditions.

### a) Test without LED module(s) inserted

The controlgear shall be supplied with rated voltage for 1 h without LED module(s) inserted. At the end of this test, the LED module(s) shall be connected and shall operate normally.

### b) Test for reduced LED module resistance

Under consideration.

### c) Tests for short-circuit proof controlgear

The controlgear is short-circuited for 1 h ~~or until a protecting device opens the circuit.~~

The 1 h test shall be completed also in the case of a thermal protection acting.

After these tests and after restoration of a possible protecting device, the controlgear shall function normally.

## 12 Endurance

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~~12.1~~ **12.1** The controlgear shall be subjected to a temperature cycling shock test and a supply voltage switching test as follows:

### a) Temperature cycling shock test

The non-energized controlgear shall be stored firstly at  $-10^{\circ}\text{C}$  or if the controlgear is marked with a lower value, at that value for 1 h. The controlgear is then moved into a cabinet having a temperature of  $t_c$  and stored for 1 h. Five such temperature cycles shall be carried out.

### b) Supply voltage switching test

At rated supply voltage the controlgear shall be switched on and off for 30 s. The cycling shall be repeated 200 times with no load and 800 times under maximum load conditions.

LED modules failing during this test shall be replaced immediately.

At the end of these tests the controlgear shall operate an appropriate LED module or LED modules correctly for 15 min.

**12.2** The controlgear shall then be operated with an appropriate LED module(s) ~~with appropriate LED modules~~ at rated supply voltage and at the ambient temperature which produces  $t_c$ , until a test period of 200 h has passed. At the end of this time, and after cooling down to room temperature, the controlgear shall operate an appropriate LED module(s) ~~with appropriate LED modules~~ correctly for 15 min. During this test the LED module(s) is (are) placed outside the test enclosure at an ambient temperature of  $(25 \pm 5)^{\circ}\text{C}$ .