

English version

**DC or AC supplied electronic control gear  
for LED modules -  
Performance requirements  
(IEC 62384:2006)**

Appareillages électroniques alimentés  
en courant continu ou alternatif  
pour modules de DEL -  
Exigences de performances  
(CEI 62384:2006)

Gleich- oder wechselstromversorgte  
elektronische Betriebsgeräte  
für LED-Module -  
Anforderungen an die Arbeitsweise  
(IEC 62384:2006)

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**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

### Foreword

The text of document 34C/752/FDIS, future edition 1 of IEC 62384, prepared by SC 34C, Auxiliaries for lamps, of IEC TC 34, Lamps and related equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62384 on 2006-09-01.

This standard is to be used in conjunction with EN 61347-2-13.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2007-06-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2009-09-01

Annex ZA has been added by CENELEC.

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### Endorsement notice

The text of the International Standard IEC 62384:2006 was approved by CENELEC as a European Standard without any modification.

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

### 1 Scope

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

NOTE 1 The tests in this standard are type tests. Requirements for testing individual control gear during production are not included.

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

NOTE 3 It may be expected that control gear complying with this standard 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 referenced documents are indispensable for the application 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 61347-2-13, *Lamp controlgear – Part 2-13: Particular requirements for d.c. or a.c. supplied electronic control gear for LED modules*

IEC 62031, *LED modules for general lighting – Safety requirements* <sup>1</sup>

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **total circuit power**

total power dissipated by control gear and LED module(s) in combination, at rated supply voltage of the control gear 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 (r.m.s.) and the supply current (r.m.s.).

#### 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.

#### 4 General notes on tests

4.1 The tests according to this standard are type tests.

NOTE The requirements and tolerances permitted by this standard 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.

It may be expected with the tolerances given in the standard that products manufactured in accordance with the type test sample will comply with the standard 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 of 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 of the LED module(s) when measured at its(their) rated voltage or rated current (d.c. and/or a.c.) shall not differ from the rated wattage 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 to all the tests.

4.5 In general all the tests are made on each type of control gear or, where a range of similar control gear is involved for each rated wattage 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 LED modules are not published in an IEC standard, they shall be made available by the LED module manufacturer.

4.7 All control gear covered by this standard 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 control gear

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

b) Multiple value load control gear

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

## 5.2 Classification according to the output voltage

- a) Control gear having a stabilised output voltage
- b) Control gear without a stabilised output voltage

## 5.3 Classification according to the output current

- a) Control gear having a stabilised output current
- b) Control gear without a stabilised output current

# 6 Marking

## 6.1 Mandatory marking

### 6.1.1 Control gear shall be clearly marked as follows:

Circuit power factor; e.g.  $\lambda = 0,9$

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

6.1.2 In addition to the above mandatory marking, the following information shall either be given on the control gear 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 control gear has a stabilised output voltage;
- c) if applicable: an indication that the control gear has a stabilised output current;
- d) if applicable: an indication that the control gear is suitable for operation with a mains supply dimmer;
- e) if applicable: an indication of the operation mode, e.g. phase control.

## 6.2 Optional marking

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

- a) total circuit power;
- b) if applicable: the symbol  $\Xi$  which indicates that the control gear is designed to comply with conditions for audio-frequency impedance;
- c) If applicable: a symbol which indicates that the control gear 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 a.c., 110 % is the percentage of the r.m.s. value, if d.c., 110 % is the percentage of the d.c. value.

## 7.2 Voltage and current during operation

For control gear having a non-stabilised 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 control gear having a stabilised 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 control gear having a non-stabilised 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 control gear having a stabilised 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 control gear 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 convertor contain capacitors for control and/or driving circuitry on the modules, current pulses may be generated when connecting the LED module to the control gear. This shall not disturb the control gear overcurrent detection nor the starting process of the control gear.

For test conditions, See clause A.2. Figure A.1a describes a test circuit during the starting process of the control gear and figure A.1b describes a test circuit for connecting the load during steady state operation.

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

## 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 control gear 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 control gear is operated on its rated wattage with LED module(s) and the whole combination is supplied with rated voltage and frequency.

## 10 Supply current

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

## 11 Impedance at audio-frequencies

Control gear marked with the audio-frequency symbol  $\overline{Z}$  (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  $\mu\text{F}$  (total value) which may be incorporated in the control gear may be disconnected for this test.

## 12 Operational tests for abnormal conditions

The control gear shall not be damaged under following conditions.

a) Test without LED module(s) inserted

The control gear 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 control gear

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

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

## 13 Endurance

13.1 The control gear shall be subjected to a temperature cycling shock test and a supply voltage switching test as follows:

a) Temperature cycling shock test

The non-energised control gear shall be stored firstly at  $-10^{\circ}\text{C}$  or if the control gear is marked with a lower value, at that value for 1 h. The control gear 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 control gear shall be switched on and off for 30 s. The cycling shall be repeated 200 times with no load and 800 times with maximum load conditions.



LED modules failing during this test shall be replaced immediately.

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

13.2 The control gear shall then be operated with an appropriate LED module/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 control gear shall operate an appropriate LED module/appropriate LED modules correctly for 15 min. During this test the LED module(s) is (are) placed outside the test enclosure in an ambient temperature of  $(25 \pm 5)^\circ\text{C}$ .

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**Annex A**  
(normative)**Tests****A.1 General requirements****A.1.1 General**

The tests are type tests. One sample shall be submitted to all the tests.

**A.1.2 Ambient temperature**

The tests shall be made in a draught-free room and at an ambient temperature within the range 20°C to 27°C.

**A.1.3 Supply voltage and frequency****a) Test voltage and frequency**

Unless otherwise specified, the control gear to be tested shall be operated at its rated supply voltage and frequency.

When a control gear is marked for use on a range of supply voltages, or has different separate rated supply voltages, any voltage for which it is intended may be chosen as the rated voltage.

**b) Stability of supply voltage and frequency**

During the tests, the supply voltage and the frequency shall be maintained constant within  $\pm 0,5$  %. However, during the actual measurement, the voltage shall be adjusted to within  $\pm 0,2$  % of the specified testing value.

**c) Supply voltage waveform**

The total harmonic content of the supply voltage shall not exceed 3 %. Harmonic content being defined as the root-mean-square (r.m.s.) summation of the individual components using the fundamental as 100 %.

**A.1.4 Magnetic effects**

Unless otherwise specified, no magnetic object shall be allowed within 25 mm of any outer surface of the control gear under test.

**A.1.5 Instrument characteristics****a) Potential circuits**

Potential circuits of instruments connected across the LED module shall not pass more than 3 % of the nominal running current of the LED module.

**b) Current circuits**

Instruments connected in series with the LED module shall have a sufficiently low impedance such that the voltage drop shall not exceed 2 % of the objective LED module voltage.

**c) RMS measurements**

Instruments shall be essentially free from errors due to waveform distortion and shall be suitable for the operating frequencies.

Care shall be taken to ensure that the earth capacitance of the instruments does not disturb the operation of the unit under test. It may be necessary to ensure that the measuring point of the circuit under test is at earth potential.

**A.2 Measurement of capacitive load current (Figures A.1a and A.1b)**

Figure A.1 illustrates the test circuit for the current when connecting a load.

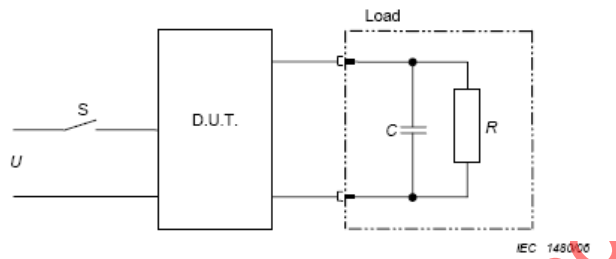


Figure A.1a – Test circuit for current during the starting process

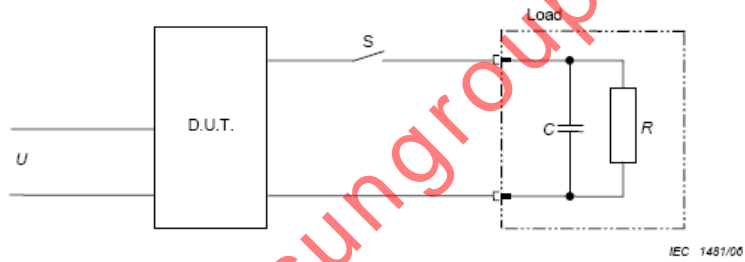


Figure A.1b – Test circuit for current when connecting the load during the steady state operation

**Key to figures A.1a and A.1b**

- $U$  : Supply 50 Hz (60 Hz)
- $S$  : Switch
- D.U.T. : Control gear Under test
- $R$  : Resistor which gives the nominal output current of the D.U.T.  
 For voltage sources:  $R = U^2/P_{max}$   
 For current sources:  $R = P_{max}/I^2$
- $C$  : Suitable capacitor  
 For control gear intended to drive the LED module which includes a logic circuitry  
 a) for voltage sources:  $C = 20 \mu F/A$   
 b) for current sources:  $C = 400 \mu F$   
 For control gear intended to drive the LED module which does not include a logic circuitry  
 c) for voltage sources:  $C = 1 \mu F/A$   
 d) for current sources:  $C = 1 \mu F$
- LOAD : Equivalent load for the LED module

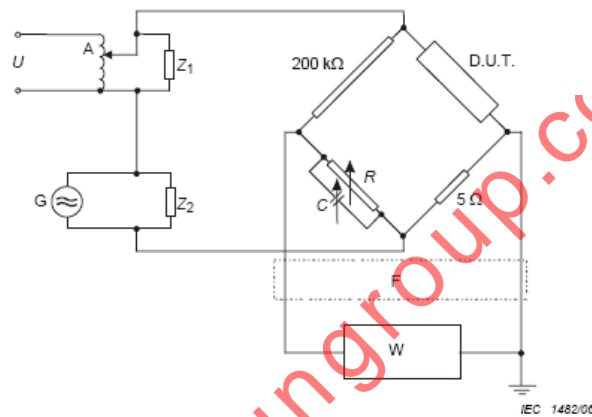
Figure A.1 – Test circuit for the current when connecting a load

### A.3 Measurement of impedance at audio-frequencies (Figure A.2)

The circuit of Figure A.2 illustrates a complete bridge which permits a full determination of the audio-frequency impedance  $\bar{Z}$  of the LED module-control gear assembly that is not only its absolute value (modulus) but its variation as well.

Let  $R'$  and  $R''$  represent the values of the resistors shown in Figure A.2 by the values of  $5\ \Omega$  and  $200\ \text{k}\Omega$  respectively (the latter at least not being critical). When by adjustments of  $R$  and  $C$  a balance is obtained for a given audio-frequency selected on the wave analyser (or any other suitable selective detector), we have in general:

$$\bar{Z} = R'R''(1/R + j\omega C)$$



- $U$  : supply 50 Hz (60 Hz)
- $G$  : Generator 250 Hz...2 000 Hz
- $A$  : supply transformer 50 Hz (60 Hz)
- D.U.T. : Control gear – LED-module-combination under test
- $Z_1$  : impedance of value sufficiently high for 50 Hz (60 Hz), sufficiently low for 250 Hz to 2 000 Hz (e.g. resistance  $15\ \Omega$  and capacitance  $16\ \mu\text{F}$ )
- $Z_2$  : impedance of value sufficiently low for 50 Hz (60 Hz), sufficiently high for 250 Hz to 2 000 Hz (e.g. inductance 20 mH)
- $F$  : Filter 50 Hz (60 Hz)
- $W$  : Selective voltmeter or wave analyser

NOTE 1 The value of  $200\ \text{k}\Omega$  for one branch of the bridge is not critical.

NOTE 2 The impedance  $Z_1$  and/or  $Z_2$  are/is not necessary if the corresponding source has a low impedance for the currents of the other.

Figure A.2 – Measurement of impedance at audio-frequencies

**Annex B**  
(informative)

**A guide to quoting product life and failure rate**

To allow the lifetime and failure rate of different electronic products to be meaningfully compared by a user it is recommended that the following data be provided by the manufacturer in a product catalogue:

- a) the maximum surface temperature, symbol  $t_f$  (t-lifetime) of the electronic product or the maximum part temperature which affects product life, measured under normal operating conditions and at the nominal voltage or at the maximum of the rated voltage range, that allows a life of 50 000 h to be achieved.

NOTE In some countries, such as Japan, a life of 40 000 h should be applied.

- b) the failure rate, if the electronic product is operated continuously at the maximum temperature  $t_f$  (defined in a)). Failure rate should be quoted in units of failure in time (fit).

For the method used to obtain the information given in a) and b) above (mathematical analysis, reliability test etc.), the manufacturer should, on request, provide a comprehensive data file containing the details of the method.

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Première édition  
First edition  
2006-08

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For price, see current catalogue*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**APPAREILLAGES ÉLECTRONIQUES ALIMENTÉS EN COURANT  
CONTINU OU ALTERNATIF POUR MODULES DE DEL –  
EXIGENCES DE PERFORMANCES**

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La Norme internationale CEI 62384 a été établie par le sous-comité 34C: Appareils auxiliaires pour lampes, du comité d'études 34 de la CEI: Lampes et équipements associés

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
34C/752/FDIS	34C/760/RVD

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

Cette publication a été rédigée selon les Directives ISO/CEI, Partie 2.

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

DC OR AC SUPPLIED ELECTRONIC CONTROL GEAR  
FOR LED MODULES –  
PERFORMANCE REQUIREMENTS

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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

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

FDIS	Report on voting
34/752/FDIS	34/760/RVD

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

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

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# APPAREILLAGES ÉLECTRONIQUES ALIMENTÉS EN COURANT CONTINU OU ALTERNATIF POUR MODULES DE DEL – EXIGENCES DE PERFORMANCES

## 1 Domaine d'application

La présente Norme internationale spécifie les exigences de performances relatives aux appareillages électroniques pour utilisation sur des alimentations en courant continu jusqu'à 250 V et sur des alimentations en courant alternatif jusqu'à 1 000 V à 50 Hz ou 60 Hz avec une fréquence de sortie qui peut différer de la fréquence d'alimentation, associés à des modules de DEL conformes à la CEI 62031. Les appareillages pour modules de DEL spécifiés dans cette norme sont conçus pour délivrer une tension ou un courant constants. Cette norme couvre aussi les appareillages qui ne sont pas des générateurs purs de courant ou de tension.

NOTE 1 Les essais dans cette norme sont des essais de type. Les exigences applicables aux essais individuels des appareillages en cours de production ne sont pas incluses.

NOTE 2 Les exigences pour les appareillages qui incluent des dispositifs pour la variation de la puissance de sortie sont à l'étude.

NOTE 3 Il y a tout lieu de penser que les appareillages conformes à cette norme assureront un fonctionnement satisfaisant entre 92 % et 106 % de la tension d'alimentation nominale, en prenant en compte les spécifications du fabricant du module de DEL.

## 2 Références normatives

Les documents de référence suivants sont indispensables pour l'utilisation 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).

CEI 61347-2-13, *Appareillage de lampe – Partie 2-13 Exigences particulières pour les appareillages électroniques alimentés en courant continu ou alternatif pour modules de DEL*

CEI 62031, *Modules de DEL pour l'éclairage général – Exigences de sécurité*<sup>1</sup>

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

### 1 Scope

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

NOTE 1 The tests in this standard are type tests. Requirements for testing individual control gear during production are not included.

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

NOTE 3 It may be expected that control gear complying with this standard 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 referenced documents are indispensable for the application 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 61347-2-13, *Lamp controlgear – Part 2-13: Particular requirements for d.c. or a.c. supplied electronic control gear for LED modules*

IEC 62031, *LED modules for general lighting – Safety requirements*<sup>1</sup>