

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Energy performance of lamp controlgear –  
Part 3: Controlgear for halogen lamps and LED modules – Method of  
measurement to determine the efficiency of the controlgear**

**Performance énergétique des appareillages de lampes –  
Partie 3: Appareillage de lampes à halogène et modules de DEL – Méthode de  
mesure pour la détermination du rendement de l'appareillage**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

**Part 3: Controlgear for halogen lamps and LED modules –  
Method of measurement to determine the efficiency of the controlgear**

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

FDIS	Report on voting
34C/1077/FDIS	34C/1088/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.

A list of all parts of the IEC 62442 series, published under the general title *Energy performance of lamp controlgear*, can be found on the IEC website.

The committee has decided that the contents of this 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

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## ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

### Part 3: Controlgear for halogen lamps and LED modules – Method of measurement to determine the efficiency of the controlgear

#### 1 Scope

This part of the IEC 62442 series defines a measurement method for the power losses of magnetic transformers and the power losses with the standby power of electronic convertor for halogen lamps and LED modules.

Also a calculation method of the efficiency for the mentioned controlgear for halogen lamps and LED modules is defined.

This part of IEC 62442 applies to electrical controlgear – lamp circuits comprised solely of the controlgear and of the lamp(s).

For multipurpose power supplies only the lighting part will be considered.

NOTE 1 Requirements for testing individual controlgear during production are not included.

It specifies the measurement method for the total input power, the standby power and the calculation method of the controlgear efficiency for all controlgear sold for domestic and normal commercial purposes operating with halogen lamps and LED modules.

This part of IEC 62442 does not apply to:

- controlgear which form an integral part of lamps;
- controlgear circuits with capacitors connected in series;
- controllable wire-wound electromagnetic controlgear.

#### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61047:2004, *DC or AC. supplied electronic step-down convertors for filament lamps – Performance requirements*

IEC 61347-1:2007, *Lamp controlgear – Part 1: General and safety requirements*  
Amendment 1:2010  
Amendment 2:2012

IEC 61347-2-2, *Lamp controlgear – Part 2-2: Particular requirements for d.c. or a.c. supplied electronic step-down convertors for filament lamps*

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

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



IEC 61558-2-6, *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 Guide 115:2007, *Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector*

### 3 Terms and definitions

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

#### 3.1

##### **nominal value**

suitable approximate quantity value used to designate or identify a component, device or equipment

[SOURCE: IEC 62442-1:2011, 3.1]

#### 3.2

##### **rated value**

quantity value for specified operating conditions of a component, device or equipment

The value and conditions are specified in the relevant standard or assigned by the manufacturer or responsible vendor

[SOURCE: IEC 62442-1:2011, 3.3, modified – The note has been removed.]

#### 3.3

##### **controlgear**

one or more component between supply and one or more lamps which may serve to transform the supply voltage, limit the current of lamp(s) to the required value, provide starting voltage and preheating current, prevent cold starting, correct power factor or reduce radio interference

[SOURCE: IEC 62442-1:2011, 3.4]

#### 3.4

##### **electromagnetic controlgear**

controlgear which by means of inductance, or a combination of inductance and capacitance, serves mainly to limit the current of lamp(s) to the required value

Frequency of the lamp controlgear is the same as supply frequency

[SOURCE: IEC 62442-1:2011, 3.5]

#### 3.5

##### **magnetic transformer**

transformer

magnetic controlgear which transform the supply voltage to operate lamp(s) with the same frequency as supply frequency at the lamps rated voltage

#### 3.6

**electronic controlgear**, <used for filament lamp(s) or LED module(s)>

A.C. and/or D.C. supplied electronic circuit including stabilizing elements for operating one or more filament lamp(s) or one or more LED module(s)



**3.7****electronic step-down convertor**

convertor

unit inserted between the supply and one or more tungsten-halogen or other filament lamps which serves to supply the lamp(s) with its (their) rated voltage, generally at high frequency

Note 1 to entry: The unit may consist of one or more separate components and may include means for dimming, correcting the power factor and suppressing radio interference.

[SOURCE: IEC 61347-2-2:2011, 3.1, modified – Additional information has been transferred to a note to entry.]

**3.8****electronic controlgear for LED modules**

convertor

unit inserted between the supply and one or more LED modules which serves to supply the LED module(s) with its (their) rated voltage or rated current. The unit may consist of one or more separate components and may include means for dimming, correcting the power factor and suppressing radio interference

**3.9****LED module**

unit supplied as a light source, which in addition to one or more LEDs may contain further components, e.g. optical, electrical, mechanical and/or electronic

**3.10****controlgear – lamp circuit**

electrical circuit, or part thereof, normally built in a luminaire, consisting of the controlgear and lamp(s)

[SOURCE: IEC 62242-1:2011, 3.8]

**3.11****standby power**

average power consumption of a controlgear when subjected to standby mode

Note 1 to entry: Unit: W.

**3.12****standby mode**

mode relevant for those controlgear which are permanently connected to the mains, where the lamp(s) are switched off via a control signal, not including failed lamp(s)

[SOURCE: IEC 62242-2:—, 3.8, modified – The note has been removed.]

**3.13****total input power**

total power supplied to the controlgear – lamp circuit measured at rated input voltage

[SOURCE: IEC 62242-1:2011, 3.14, modified – The sentence "The rated power specified is related to a specific ballast lumen factor (BLF)." has been removed.]

**3.14****off mode**

mode relevant for those controlgear which are permanently connected to the mains, where the lamp(s) are switched off via a switch on the output circuit of the controlgear, not including failed lamp(s)

### 3.15

**controlgear efficiency**, <for controlgear used for filament lamp(s) or LED module(s)>

$\eta_{(CG)}$

ratio between the lamp power (controlgear output power) and the input power of the controlgear – lamp circuit with possible sensors, network connections and other auxiliary loads disconnected

## 4 General

### 4.1 Applicability

The measurement and calculation methods of this standard shall only be used for magnetic transformer which conforms to IEC 61558-1 and IEC 61558-2-6 or for electronic convertor which conforms to IEC 61347-1 and IEC 61347-2-2 or for electronic controlgear for LED modules which conforms to IEC 61347-1 and IEC 61347-2-13.

### 4.2 General notes on test

The measurement conditions are specified in IEC 61347-1:2010; Annex H: H.1, H.2, H.4, H.8 and H.11; unless otherwise specified in this standard. The device under test (DUT) shall be placed according to IEC 61347-1:2010; Figure H.1.

An A.C. reference source shall be used to provide input voltage to the DUT. During the tests, the supply voltage and the frequency shall be maintained constant within  $\pm 0,5\%$  during the warm-up period. However, during the actual measurement, the voltage shall be adjusted to within  $\pm 0,2\%$  of the specified testing value.

The input voltage source shall be capable of delivering at least three times the input power of the DUT.

### 4.3 Controllable controlgear

In case of controllable controlgear the test shall be carried out with the maximum output power.

Requirements of the efficiency during the dimming condition of controllable controlgear are under consideration.

### 4.4 Measurement uncertainty

Measurement uncertainty shall be managed in accordance with the accuracy method in 4.4.3 of the IEC Guide 115:2007.

### 4.5 Sampling of controlgear for testing

Tests in this part of IEC 62442 are type tests. The requirements and tolerances specified in this part of IEC 62442 are based on the testing of a type test sample submitted by the manufacturer for that purpose. This 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.

### 4.6 Number of samples

One specimen shall be tested.

#### 4.7 Power supply

Where the test voltage and frequency are not defined by national or regional requirements, the controlgear manufacturer shall declare the nominal voltage(s) at which the given efficiency is valid.

Test voltage(s) and test frequency(ies) shall be the nominal voltage and the nominal frequency of the country for which the measurement is being determined (refer to Table 1).

**Table 1 – Typical nominal electricity supply details for some regions**

Country	Nominal voltage and frequency <sup>a</sup>
Europe	230 V; 50 Hz
North America	120 V, 277 V; 60 Hz
Japan <sup>b</sup>	100 V, 200 V; 50/60 Hz
China	220 V; 50 Hz
Australia and New Zealand	230 V; 50 Hz
<sup>a</sup> Values are for single phase only. Some single phase supply voltages can be double the nominal voltage above (centre transformer tap). The voltage between two phases of a three-phase system is 1,73 times single phase values. (e.g. 400 V for Europe).	
<sup>b</sup> 50 Hz is applicable for the Eastern part and 60 Hz for the Western part, respectively.	

#### 4.8 Supply voltage waveform

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

The ratio of peak value to r.m.s. value of the test voltage (i.e. crest factor) shall be between 1,34 and 1,49.

#### 4.9 Substitution load

To give reproducible measurement results, a resistor ( $R_{load}$ ) shall be used as a replacement for the lamp(s).  $R_{load}$  is determined from the rated output power and the rated output voltage or rated output current of the controlgear.

The resistor  $R_{load}$  shall be selected so that the value of the resistance shall not deviate by more than 1 % during the test.

For electronic controlgear for LED lamps/modules a pure resistive load may cause malfunction of the DUT. In these cases a combination of diodes and variable resistor equivalent to the LED lamp/module shall be used, which should ensure the maximum rated output current at the rated output voltage.

NOTE When a special starting procedure is used to allow the constant current controlgear to function properly, the method with the equivalent resistor can be used.

In case of controlgear with an output frequency higher than 70 Hz for halogen lamps, the load shall always be a lamp as indicated in 4.2 of IEC 61047:2004.

#### 4.10 Thermocouple and temperature indicator

The resolution of the temperature indicator shall be at least 0,1 °C, when used with the appropriate thermocouple.

#### 4.11 Instrument accuracy

For magnetic transformers, calibrated and traceable a.c. power meters, power analysers or digital power meters shall be used.

For electronic step-down convertors, all output power measurements shall be made with a calibrated and traceable wideband power analyser or digital power meter.

For measurements made under the scope of this standard, measurement instruments with the following minimum accuracies are to be used.

a) For frequencies up to and including 1 kHz:

- voltage: 0,5 %
- current: 0,5 %
- power: 1,0 %
- frequency: 0,1 %

b) For frequencies above 1 kHz:

- voltage: 1,0 %
- current: 1,0 %
- power: 2,0 %

Stability of the measurement values (V, A or W) is given if the data does not differ by more than 1 % in a time frame of 15 min.

Measurement shall be done in such a way that the line losses are limited (for example with a four wire measurement system).

Additional tests will be required using an oscilloscope with at least 20 MHz bandwidth or a spectrum analyser/receiver. This will be required for determination of convertor output fundamental frequency and harmonics. The power analyser or digital power meter shall have specified accuracies to within 200 kHz.

#### 4.12 Measuring circuits

In case of controlgear with supplementary connection to the output circuit or sensors (e.g. to detect fault or temperatures), all sensors and circuits have to be connected as in normal use.

#### 4.13 Multi-rated voltage controlgear

If a controlgear is designed for more than one rated voltages, the controlgear manufacturer shall declare the rated voltage(s) at which the given efficiency and the standby power are valid.

#### 4.14 Multi-power controlgear

If a controlgear is designed for more than one output power the test shall be carried out with the maximum output power.