IEC 62442-3

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INTERNATIONAL STANDARD

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Energy performance of lamp controlgear – Part 3: Controlgear for tungsten-halogen lamps and LED light sources – Method of measurement to determine the efficiency of controlgear

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

Part 3: Controlgear for tungsten-halogen lamps and LED light sources – Method of measurement to determine the efficiency of controlgear

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 62442-3:2018. 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 62442-3 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 2018. This edition constitutes a technical revision.

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

a) this edition has been harmonized with IEC 62442-1 and IEC 62442-2;
b) the reference to and use of the measurement methods for non-active power consumption in accordance with IEC 63103 have been added.

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

Draft	Report on voting
34C/1547/FDIS	34C/1550/RVD

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/standardsdev/publications.

A list of all parts in 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 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,
- replaced by a revised edition, or
- amended.

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ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

Part 3: Controlgear for tungsten-halogen lamps and LED light sources – Method of measurement to determine the efficiency of controlgear

1 Scope

~~This part of IEC 62442 defines a measurement method for the power losses of electromagnetic transformers as well as the power losses and the standby power of electronic convertors for tungsten-halogen lamps and for LED light source(s).~~

This part of IEC 62442 defines measurement and calculation methods for specifying the efficiency and the standby power of controlgear for tungsten-halogen lamps and LED light sources.

NOTE 1 This includes electromagnetic transformers and electronic convertors for tungsten-halogen lamps, as well as electronic controlgear for LED light source(s).

NOTE 2 The term "LED light sources" includes LED modules and LED lamps.

This document is applicable for controlgear designed for use on DC supplies up to 1 000 V and/or AC supplies up to 1 000 V at 50 Hz or 60 Hz.

~~A calculation method of the efficiency of the mentioned controlgear for tungsten-halogen lamps and LED light source(s) is also defined.~~

~~This document applies to electrical controlgear-lamp circuits comprised solely of the controlgear and of the lamp(s) (LED light sources).~~

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

NOTE 3 Requirements for testing individual controlgear during production are not included.

~~This document 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 tungsten-halogen lamps and LED light source(s). The term "LED light sources" includes LED modules and LED lamps.~~

This document does not apply to:

– controlgear which form an integral part of lamps (LED light sources);
– controlgear circuits with capacitors connected in series;
– controllable electromagnetic controlgear.

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 60050-845, *International Electrotechnical Vocabulary (IEV) – Part 845: Lighting* (available at http://www.electropedia.org)

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

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

~~IEC 61347-2-2, *Lamp controlgear – Part 2-2: Particular requirements for DC or AC supplied electronic step-down convertors for filament lamps*~~

~~IEC 61347-2-13, *Lamp controlgear – Part 2-13: Particular requirements for DC or AC supplied electronic controlgear for LED modules*~~

~~IEC 61558-1, *Safety of transformers, reactors, power supply units and combinations thereof – 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 62301:2011, *Household electrical appliances – Measurement of standby power*~~

IEC 63103:2020, *Lighting equipment – Non-active mode power measurement*

IEC TS 63105:2021, *Lighting systems and related equipment – Vocabulary*

IEC Guide 115:~~2007~~2021, *Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector*

3 Terms and definitions

For the purposes of this document the terms and definitions given in IEC 60050-845 and IEC TS 63105 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
nominal value
suitable approximate quantity value used to designate or identify a component, device or equipment

Note 1 to entry: To express the "nominal value" of a particular quantity, the term "value" is replaced by the quantity name; for example, nominal power, nominal voltage, and nominal current.

[SOURCE: IEC 62442-1:~~2018~~2022, 3.1]

3.2
rated value
~~quantity value for specified operating conditions of a component, device or equipment~~

~~Note 1 to entry: The value and conditions are specified in the relevant standard or assigned by the manufacturer or responsible vendor.~~

~~[SOURCE: IEC 62442-1:2018, 3.3, modified – Note 2 has been deleted.]~~

value of a quantity, used for specification purposes, declared by the manufacturer or responsible vendor and established under standard test conditions

Note 1 to entry: To express the "rated value" of a particular quantity, the term "value" is replaced by the quantity name; for example, rated power, rated voltage, rated current, and rated temperature.

[SOURCE: IEC 60050-845:2020, 845-27-100, modified – Note 2 to entry has been deleted.]

3.3
controlgear
~~one or more components between supply and one or more lamps (LED light source(s)) which may serve to transform the supply voltage, limit the current of the lamp(s) (LED light source(s)) to the required value, the correct power factor or reduce radio interference~~

~~[SOURCE: IEC 62442-1:2018, 3.4 modified – "provide starting voltage and preheating current, prevent cold starting" has been deleted and "(LED light source(s))" has been added.]~~

<for an electric light source> unit inserted between the power supply and at least one light source, which serves to supply the light source(s) with its (their) rated voltage or rated current, and which can consist of one or more separate components

Note 1 to entry: A controlgear can include means for igniting, dimming, correcting the power factor and suppressing radio interference, and further control functions.

Note 2 to entry: A controlgear can consist of a power supply and a control unit.

Note 3 to entry: A controlgear can be partly or totally integrated in the light source.

[SOURCE: IEC 60050-845:2020, 845-28-048, modified – Note 4 to entry has been deleted.]

~~**3.4**~~
~~**electromagnetic controlgear**~~
~~**magnetic controlgear**~~
~~controlgear which, by means of inductance, or a combination of inductance and capacitance, serves mainly to limit the current of lamp(s) (LED light source(s)) to the required value and operates the lamp(s) at the same frequency as the supply frequency~~

~~[SOURCE: IEC 62442-1:2018, 3.5, modified – "(LED light source(s))" has been added.]~~

3.4
electromagnetic transformer
magnetic transformer
transformer
electromagnetic controlgear which transforms the supply voltage to operate lamp(s) (LED light source(s)) with the same frequency as the supply frequency at the lamps (light sources) rated voltage

3.5
electronic controlgear
~~<filament lamp(s) or LED light sources> AC and/or DC supplied electronic circuit including stabilizing elements for operating one or more filament lamp(s) or one or more LED light sources~~

controlgear comprised of semiconductors and other electronic components

~~**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**~~
~~**controlgear for LED light sources**~~

~~**3.8.1**~~
~~**electronic controlgear for LED light sources**~~
~~**convertor**~~
~~unit inserted between the supply and one or more LED light sources which serves to supply the LED light source(s) with its (their) rated voltage or rated current~~

~~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, and further control functions~~

~~Note 2 to entry: The controlgear consists of a power supply and a control unit.~~

~~Note 3 to entry: The controlgear may be partly or totally integrated in the LED module.~~

~~Note 4 to entry: When there is no risk of confusion, as in a LED standard for example, "controlgear" may also be used. Both terms "controlgear" or "control gear" are acceptable.~~

~~[SOURCE: IEC 61347-2-13:2014, 3.1, modified – "LED modules" has been replaced with "LED light sources" and Note 4 has been added.]~~

~~**3.8.2**~~
~~**power supply of the controlgear**~~
~~electronic device, being part of the controlgear, capable of controlling current, voltage or power within design limits and containing no additional LED control capabilities~~

~~Note 1 to entry: For LEDsi modules, the power supply of the controlgear is separate from the LED module on a distant location.~~

~~Note 2 to entry: The energy source of a power supply can be either a battery or the electrical supply system.~~

~~**3.8.3**~~
~~**control unit of the controlgear**~~
~~electronic device, being part of the controlgear, responsible for controlling the electrical energy to the LED light sources as well as colour mixing, response to depreciating luminous flux and further performance features~~

~~Note 1 to entry: In LEDsi modules, the control unit of the controlgear is on board the LED module and separate from the power supply of the controlgear.~~

3.6
controlgear-light source circuit
electrical circuit, or part thereof, normally built in a luminaire, consisting of the controlgear and light source(s)

[SOURCE: IEC 62442-1:~~2018~~2022,~~ 3.8~~ 3.7, modified – "lamp" has been replaced with "light source".]

3.7
standby mode
~~mode of the controlgear, in which the light source is switched off by a control signal, while the controlgear remains connected to the mains supply not including failed lamp(s) or light source(s)~~

~~Note 1 to entry: Failed light source(s) could lead to incorrect measurements.~~

<of controlgear> mode when the equipment is connected to a supply voltage with the illumination function off, while capable of being activated by an external trigger not being a trigger from a network

Note 1 to entry: Examples of external triggers are sensing or timing.

[SOURCE: IEC 63103:2020, 3.10, modified – The domain "<of lighting equipment>" has been replaced with "<of controlgear>".]

3.8
networked standby mode
<of controlgear> mode when the equipment is connected to a supply voltage with the illumination function off, while capable of being activated by an external trigger being a trigger from a network

[SOURCE: IEC 63103:2020, 3.11, modified – The domain "<of lighting equipment>" has been replaced with "<of controlgear>".]

3.9
standby power
<of controlgear> average power consumption in the standby mode

~~Note 1 to entry: Power supplied by controlgear to sensors, network connections and other auxiliaries is not included in the standby power.~~

~~Note 2 to entry: Standby power is expressed in W.~~

3.10
networked standby power
<of controlgear> average power consumption in the networked standby mode

3.11
no-load mode
~~mode relevant for those controlgear which are permanently connected to the mains, where the lamp(s) or light source(s) are switched off via a switch on the output circuit of the controlgear~~

<of controlgear> mode when the equipment is connected to a supply voltage where all loads are disconnected from the controlgear

3.12
total input power
total power consumed by the ~~controlgear-lamp (light source)~~ controlgear-light source circuit measured at rated input voltage

~~[SOURCE: IEC 62442-1:2018, 3.13, modified "supplied to" has been replaced with "consumed by", "(light source)" has been added and the note has been deleted.]~~

3.13
controlgear efficiency
η_{CG}
<filament lamp(s) or LED light source(s)> ratio of the output power to lamp(s) (light source) and the input power of the controlgear

~~Note 1 to entry: Detailed measurement method and conditions are given in Clause 5.~~

Note ~~2~~ 1 to entry: Loads from sensors, network connections or other auxiliaries are disconnected or, if not possible, otherwise, eliminated from the result.

3.14
controllable controlgear
controlgear whose light sources operating characteristics can be changed by means of a signal via mains or extra control input(s)

Note 1 to entry: Signal control is either wired or wireless.

4 General

~~**4.1 Applicability**~~

~~The measurement and calculation methods in this document shall only be used for magnetic transformers which conform to IEC 61558-1 and IEC 61558-2-6 or for electronic convertors which conform to IEC 61347-2-2 or for electronic controlgear for LED modules which conforms to IEC 61347-2-13.~~

4.1 General notes on tests

The measurement conditions specified in IEC 61347-1:2015, Clauses H.1, H.2, H.4, H.8 and H.11 shall be applied unless otherwise specified in this document. The device under test (DUT) shall be placed according to IEC 61347-1:2015, Figure H.1.

An AC or DC voltage 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 ±0,5 % during the warm-up period. However, during the actual measurement, the voltage shall be adjusted to within ±0,2 % of the specified testing value.

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

Unless otherwise specified in IEC 63103, stability of the measurement values (V, A or W) is given if the data does not deviate by more than 1 % in a time frame of 15 min. However, if any of these values vary with time, the power is determined as the arithmetic mean value over a sufficient period.

4.2 Controllable controlgear

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

In case a controlgear has multiple channels, each channel shall be set at the same power level. The sum of the power per channel shall be equal to the maximum allowed output power of the controlgear.

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

4.3 Measurement uncertainty

Measurement uncertainty shall be managed in accordance with the accuracy method in IEC Guide 115:~~2007~~2021, 4.4.3.

4.4 Sampling of controlgear for testing

The requirements and tolerances specified in this document 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.

4.5 Size of the test sample

Tests are carried out with one test specimen.

4.6 Power supply

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

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.

Table 1 – Typical nominal electricity supply details for some regions

Country or region	Nominal voltage and frequency [a]
Europe	230 V; 50 Hz
North America	120 V, 277 V; 60 Hz
Japan [b]	100 V, 200 V; 50/60 Hz
China	220 V; 50 Hz
Australia and New Zealand	230 V; 50 Hz
South Africa	230 V; 50 Hz

[a] 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).

[b] 50 Hz is applicable for the Eastern part and 60 Hz for the Western part.

The above table can require test voltages additional to those required in IEC 63103.

4.7 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 (RMS) summation of the individual components up to the 40th harmonic using the fundamental as 100 %.

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

4.8 Substitution load

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

~~During the test, R_{load} shall be within 1% of the calculated resistance.~~

~~For electronic controlgear for LED light sources, a pure resistive load may cause malfunction of the DUT. In these cases a combination of diodes and variable resistor equivalent to the LED light source shall be used, to 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.~~

For the specification of substitution loads, IEC 63103:2020, 5.3.2 applies.

NOTE Although the scope of IEC 63103 is limited to non-active mode power, the principle is also suitable for other power measurements.

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

~~The measurement setup circuit for constant power controlgear shall also be used in a suitable way with the current defined in the data sheets of the lamp(s) (LED light source(s)).~~

4.9 Thermocouple and temperature indicator

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

4.10 Instrument accuracy

For electromagnetic transformers, calibrated and traceable AC power meters, power analysers or digital power meters shall be used. For measurement uncertainty and traceability see ISO/IEC Guide 98-3~~:2008~~ and IEC Guide 115.

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

The power measuring instrument shall be capable of measuring DC and AC ~~10 Hz to 2 000 Hz components~~ from 10 Hz to a frequency that is at least equal to the 40th harmonic of the test supply frequency.

For measurements made under the scope of this document, measurement instruments with the following minimum accuracies shall 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 %

~~The power consumption shall be measured by applying the procedure of IEC 62301:2011, 5.3 excluding 5.3.4.~~

~~Stability of the measurement values (V, A or W) is given if the data does not deviate from more than 1 % in a time frame of 15 min. If any of these values vary with time, the power is determined as the arithmetic mean value over a sufficient period.~~

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

4.11 Measuring circuits

When the controlgear has supplementary connections to the output circuit or sensors (e.g. to detect fault or temperatures for example to ensure a safe function of the controlgear), all these sensors and circuits shall be connected as in normal use~~; sensors or networks which are not involved in power conversion shall be disconnected (see 4.15)~~.

4.12 Multi-rated voltage controlgear

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

4.13 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.

4.14 Sensor and network connections

~~For the measurement of all kinds of controlgear power (also standby) the power consumed by all circuits (internal or external) which are not involved in power conversion for the controlgear operation (e.g. communication devices, external sensors, auxiliary load, battery charging circuits) shall be excluded from the measurements. If the auxiliary cannot be disconnected, its effect shall be otherwise eliminated from the result.~~

~~NOTE Power consumed by circuits necessary for the proper operation of power conversion is considered in the measurement (e.g. cooling fan, signalling lighting).~~

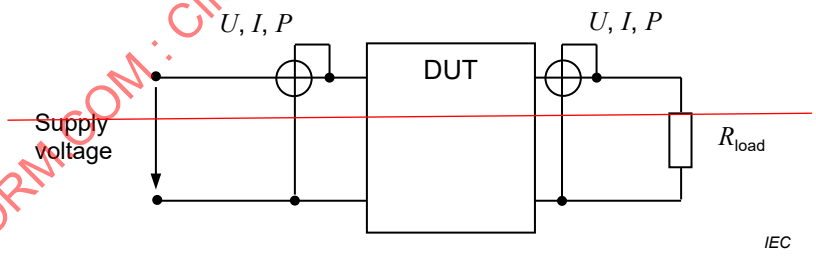
For the measurement of all kinds of controlgear power (also standby) the power consumed by all circuits (internal or external) shall be considered as indicated in IEC 63103.

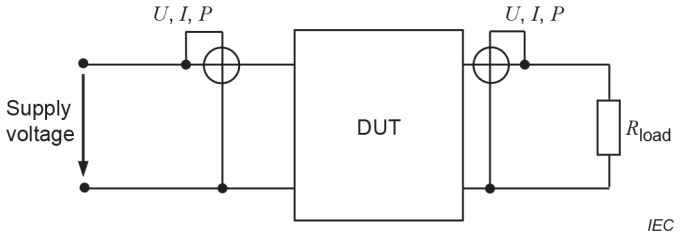
NOTE although the scope of IEC 63103:2020 is limited to non-active mode power, the principle is also suitable for other power measurements.

5 Method of measurement and calculation of the efficiency ~~of controlgear (transformer, convertor) for tungsten halogen lamps and for LED light sources~~

5.1 Measurement set-up: input and output power

Figure 1 shows the set-up for the measurement of the power losses of electromagnetic controlgear and the input and output power of convertor-electronic controlgear.





Key

DUT	device under test
U	voltage
I	current
P	power
R_{load}	substitution load (see 4.9)

Figure 1 – Power losses measurement set-up for electromagnetic controlgear (transformer) and input and output power measurement set-up for convertor (electronic controlgear)

The information regarding the substitution load is given under 4.8. The measurements are carried out with power meters connected to measure the total input power into and the output power ~~(lamp (light source) power)~~ (light source power) of the DUT.

The value of the total input power $P_{\text{tot meas}}$ is recorded when a steady state has been reached (temperature of the DUT).

The supply voltage for the measurement according to Figure 1 is defined in 4.6 and 4.12.

The measurement sequence is as follows:

1) Connect the DUT according to Figure 1.
2) Switch on the mains voltage.
3) Await the thermal equilibrium.
4) Measure the input and the output power.

~~The total input power $P_{\text{tot meas}}$ of a DUT is measured on one DUT.~~

~~$P_{\text{tot meas}}$ is the measured total input power into the DUT (in W);~~

~~P_{Lamp} is the measured output power of the DUT (lamp (light source) power power on the substitution resistor) in the test circuit (in W).~~

In the case of multi output controlgear, ~~P_{Lamp}~~ $P_{\text{light source}}$ is the sum of all the power measured in each channel.

5.2 Efficiency calculation ~~for electromagnetic (transformer) and electronic (convertor) controlgear~~

~~For the calculation of the efficiency of a DUT (η_{CG}), Equation (1) should be used:~~

$$\eta_{\text{CG}} = \frac{P_{\text{light source}}}{P_{\text{tot meas}}} \quad \text{~~(1)~~}$$

For the calculation of the efficiency of a DUT (η_{CG}), Equation (1) should be used:

$$\eta_{CG} = \frac{P_{\text{light source}}}{P_{\text{tot meas}}} \quad (1)$$

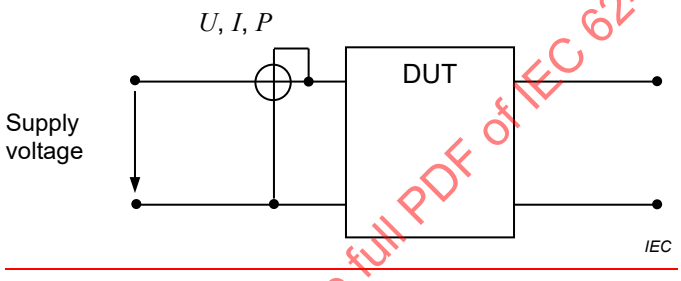
where

$P_{\text{tot meas}}$ is the measured total input power into the DUT (in W);

$P_{\text{light source}}$ is the measured output power of the DUT (light source power or substitution resistor power) in the test circuit (in W).

5.3 Measurement set-up: input power in no-load mode

~~Figure 2 shows the setup for the measurement of the input power losses in no-load mode for electromagnetic controlgear and for a convertor (electronic controlgear).~~



~~**Key**~~

~~DUT device under test~~

~~*U* voltage~~

~~*I* current~~

~~*P* power~~

~~**Figure 2 – Input power in no-load mode measurement setup for electromagnetic controlgear (transformer) and for convertor (electronic controlgear)**~~

~~The substitution load is disconnected from the DUT-open output circuit (see Figure 2). The measurements are carried out with a power meter connected to measure the total input power into the DUT. Measurement of power shall be current correct (i.e. measurement in the DUT path).~~

~~The value of the total input power in no-load mode $P_{\text{tot meas no-load}}$ is recorded when a steady state has been reached (temperature of the DUT).~~

~~The supply voltage for the measurement according to Figure 2 is defined in 4.7 and 4.13.~~

~~The measurement sequence is as follows:~~

~~1) Connect the DUT according to Figure 2.~~

~~2) Switch on the mains voltage.~~

~~3) Await the thermal equilibrium.~~

~~4) Measure the input power.~~

~~The measured total input power in no-load mode $P_{\text{tot meas no-load}}$ of a DUT is measured on one DUT.~~

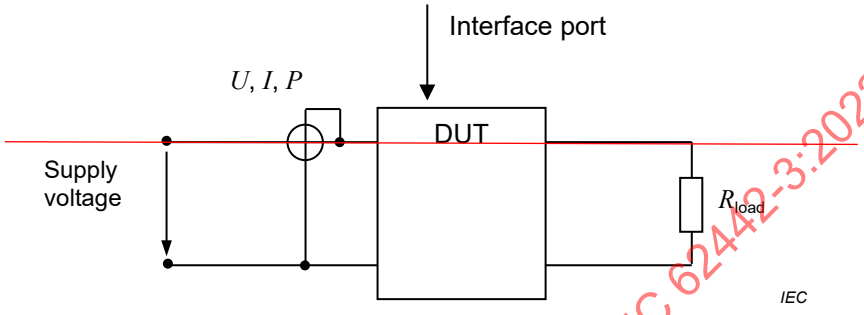
~~$P_{tot\ meas\ no\text{-}load}$ is the measured total input power into the DUT (in W) in no-load mode.~~

The measurement of no-load power of electronic controlgear is performed according to IEC 63103.

NOTE By the definition of "no-load" it is given that loads of any sort are disconnected from the controlgear.

5.4 Standby power measurement ~~of convertor-electronic controlgear~~

~~Figure 3 shows the measurement setup of the standby power of convertor-electronic controlgear.~~



~~Key~~

~~DUT device under test~~

~~U voltage~~

~~I current~~

~~P power~~

~~R_{load} substitution load~~

~~Figure 3 – Measurement setup of the standby power of convertor-electronic controlgear~~

~~Information regarding the substitution load is given under 4.9.~~

~~The measurements are carried out with a power meter connected to measure the total input power into the convertor-electronic controlgear. Measurement of power shall be current correct (i.e. measurement in the DUT path).~~

~~The value of the standby power $P_{CGstandby}$ (total input power) is recorded when a steady state has been reached (temperature of the convertor-electronic controlgear).~~

~~The supply voltage for the measurement according to Figure 3 is defined in 4.7 and 4.13.~~

~~The measurement sequence is as follows:~~

~~1) Connect the DUT according to Figure 3.~~

~~2) Switch on the mains voltage.~~

~~3) Set the controlgear via the interface port (for example "digital addressable lighting interface") to the standby mode.~~

~~4) Await the thermal equilibrium.~~

~~5) Measure the standby power (total input power).~~

~~The standby power $P_{CGstandby}$ (total input power) of a convertor-controlgear is measured with one electronic lamp controlgear.~~

The measurement of standby power of electronic controlgear shall be performed according to IEC 63103.

5.5 Networked standby power measurement

The measurement of networked standby power of electronic controlgear shall be performed according to IEC 63103.

5.6 Reporting of power measurements

Power measurements shall be reported in W with the minimum following resolution:

- ≥ 10 W: whole number;
- > 1 W and < 10 W: first decimal digit;
- ≤ 1 W: two decimal digits.

Bibliography

IEC 60357, *Tungsten halogen lamps (non-vehicle) – Performance specifications*

IEC 62384, *DC or AC supplied electronic controlgear for LED modules – Performance requirements*

IEC 62442-1~~:2018~~, *Energy performance of lamp controlgear – Part 1: Controlgear for fluorescent lamps – Method of measurement to determine the total input power of controlgear circuits and the efficiency of controlgear*

IEC 62442-2, *Energy performance of lamp controlgear – Part 2: Controlgear for ~~high intensity~~ discharge lamps (excluding low-pressure mercury fluorescent lamps) – Method of measurement to determine the efficiency of controlgear*

ISO/IEC Guide 98-3~~:2008~~, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

IEC 62442-3

Edition 3.0 2022-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Energy performance of lamp controlgear –
Part 3: Controlgear for tungsten-halogen lamps and LED light sources – Method of measurement to determine the efficiency of controlgear

Performance énergétique des appareillages de lampes –
Partie 3: Appareillages des lampes tungstène-halogène et des sources lumineuses à LED – Méthode de mesurage pour la détermination du rendement des appareillages

IEC 62442-3:2022-02(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

Part 3: Controlgear for tungsten-halogen lamps and LED light sources – Method of measurement to determine the efficiency of controlgear

FOREWORD

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IEC 62442-3 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 2018. This edition constitutes a technical revision.

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

a) this edition has been harmonized with IEC 62442-1 and IEC 62442-2;
b) the reference to and use of the measurement methods for non-active power consumption in accordance with IEC 63103 have been added.

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

Draft	Report on voting
34C/1547/FDIS	34C/1550/RVD

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/standardsdev/publications.

A list of all parts in 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 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,
- replaced by a revised edition, or
- amended.

ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

Part 3: Controlgear for tungsten-halogen lamps and LED light sources – Method of measurement to determine the efficiency of controlgear

1 Scope

This part of IEC 62442 defines measurement and calculation methods for specifying the efficiency and the standby power of controlgear for tungsten-halogen lamps and LED light sources.

NOTE 1 This includes electromagnetic transformers and electronic convertors for tungsten-halogen lamps, as well as electronic controlgear for LED light source(s).

NOTE 2 The term "LED light sources" includes LED modules and LED lamps.

This document is applicable for controlgear designed for use on DC supplies up to 1 000 V and/or AC supplies up to 1 000 V at 50 Hz or 60 Hz.

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

NOTE 3 Requirements for testing individual controlgear during production are not included.

This document does not apply to:

– controlgear which form an integral part of lamps (LED light sources);
– controlgear circuits with capacitors connected in series;
– controllable electromagnetic controlgear.

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 60050-845, *International Electrotechnical Vocabulary (IEV) – Part 845: Lighting* (available at http://www.electropedia.org)

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

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

IEC 63103:2020, *Lighting equipment – Non-active mode power measurement*

IEC TS 63105:2021, *Lighting systems and related equipment – Vocabulary*

IEC Guide 115:2021, *Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector*

3 Terms and definitions

For the purposes of this document the terms and definitions given in IEC 60050-845 and IEC TS 63105 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
nominal value
suitable approximate quantity value used to designate or identify a component, device or equipment

Note 1 to entry: To express the "nominal value" of a particular quantity, the term "value" is replaced by the quantity name; for example, nominal power, nominal voltage, and nominal current.

[SOURCE: IEC 62442-1:2022, 3.1]

3.2
rated value
value of a quantity, used for specification purposes, declared by the manufacturer or responsible vendor and established under standard test conditions

Note 1 to entry: To express the "rated value" of a particular quantity, the term "value" is replaced by the quantity name; for example, rated power, rated voltage, rated current, and rated temperature.

[SOURCE: IEC 60050-845:2020, 845-27-100, modified – Note 2 to entry has been deleted.]

3.3
controlgear
<for an electric light source> unit inserted between the power supply and at least one light source, which serves to supply the light source(s) with its (their) rated voltage or rated current, and which can consist of one or more separate components

Note 1 to entry: A controlgear can include means for igniting, dimming, correcting the power factor and suppressing radio interference, and further control functions.

Note 2 to entry: A controlgear can consist of a power supply and a control unit.

Note 3 to entry: A controlgear can be partly or totally integrated in the light source.

[SOURCE: IEC 60050-845:2020, 845-28-048, modified – Note 4 to entry has been deleted.]

3.4
electromagnetic transformer
magnetic transformer
transformer
electromagnetic controlgear which transforms the supply voltage to operate lamp(s) (LED light source(s)) with the same frequency as the supply frequency at the lamps (light sources) rated voltage

3.5
electronic controlgear
controlgear comprised of semiconductors and other electronic components

3.6
controlgear-light source circuit
electrical circuit, or part thereof, normally built in a luminaire, consisting of the controlgear and light source(s)

[SOURCE: IEC 62442-1:2022, 3.7, modified – "lamp" has been replaced with "light source".]

3.7
standby mode
<of controlgear> mode when the equipment is connected to a supply voltage with the illumination function off, while capable of being activated by an external trigger not being a trigger from a network

Note 1 to entry: Examples of external triggers are sensing or timing.

[SOURCE: IEC 63103:2020, 3.10, modified – The domain "<of lighting equipment>" has been replaced with "<of controlgear>".]

3.8
networked standby mode
<of controlgear> mode when the equipment is connected to a supply voltage with the illumination function off, while capable of being activated by an external trigger being a trigger from a network

[SOURCE: IEC 63103:2020, 3.11, modified – The domain "<of lighting equipment>" has been replaced with "<of controlgear>".]

3.9
standby power
<of controlgear> average power consumption in the standby mode

3.10
networked standby power
<of controlgear> average power consumption in the networked standby mode

3.11
no-load mode
<of controlgear> mode when the equipment is connected to a supply voltage where all loads are disconnected from the controlgear

3.12
total input power
total power consumed by the controlgear-light source circuit measured at rated input voltage

3.13
controlgear efficiency
η_{CG}
<filament lamp(s) or LED light source(s)> ratio of the output power to lamp(s) (light source) and the input power of the controlgear

Note 1 to entry: Loads from sensors, network connections or other auxiliaries are disconnected or, if not possible, otherwise, eliminated from the result.

3.14
controllable controlgear
controlgear whose light sources operating characteristics can be changed by means of a signal via mains or extra control input(s)

Note 1 to entry: Signal control is either wired or wireless.

4 General

4.1 General notes on tests

The measurement conditions specified in IEC 61347-1:2015, Clauses H.1, H.2, H.4, H.8 and H.11 shall be applied unless otherwise specified in this document. The device under test (DUT) shall be placed according to IEC 61347-1:2015, Figure H.1.

An AC or DC voltage 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 ±0,5 % during the warm-up period. However, during the actual measurement, the voltage shall be adjusted to within ±0,2 % of the specified testing value.

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

Unless otherwise specified in IEC 63103, stability of the measurement values (V, A or W) is given if the data does not deviate by more than 1 % in a time frame of 15 min. However, if any of these values vary with time, the power is determined as the arithmetic mean value over a sufficient period.

4.2 Controllable controlgear

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

In case a controlgear has multiple channels, each channel shall be set at the same power level. The sum of the power per channel shall be equal to the maximum allowed output power of the controlgear.

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

4.3 Measurement uncertainty

Measurement uncertainty shall be managed in accordance with the accuracy method in IEC Guide 115:2021, 4.4.3.

4.4 Sampling of controlgear for testing

The requirements and tolerances specified in this document 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.

4.5 Size of the test sample

Tests are carried out with one test specimen.

4.6 Power supply

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

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.

Table 1 – Typical nominal electricity supply details for some regions

Country or region	Nominal voltage and frequency [a]
Europe	230 V; 50 Hz
North America	120 V, 277 V; 60 Hz
Japan [b]	100 V, 200 V; 50/60 Hz
China	220 V; 50 Hz
Australia and New Zealand	230 V; 50 Hz
South Africa	230 V; 50 Hz

[a] 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).

[b] 50 Hz is applicable for the Eastern part and 60 Hz for the Western part.

The above table can require test voltages additional to those required in IEC 63103.

4.7 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 (RMS) summation of the individual components up to the 40th harmonic using the fundamental as 100 %.

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

4.8 Substitution load

For the specification of substitution loads, IEC 63103:2020, 5.3.2 applies.

NOTE Although the scope of IEC 63103 is limited to non-active mode power, the principle is also suitable for other power measurements.

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

4.9 Thermocouple and temperature indicator

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

4.10 Instrument accuracy

For electromagnetic transformers, calibrated and traceable AC power meters, power analysers or digital power meters shall be used. For measurement uncertainty and traceability see ISO/IEC Guide 98-3 and IEC Guide 115.

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

The power measuring instrument shall be capable of measuring DC and AC from 10 Hz to a frequency that is at least equal to the 40th harmonic of the test supply frequency.

For measurements made under the scope of this document, measurement instruments with the following minimum accuracies shall 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 %

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

4.11 Measuring circuits

When the controlgear has supplementary connections to the output circuit or sensors (e.g. to detect fault or temperatures for example to ensure a safe function of the controlgear), all these sensors and circuits shall be connected as in normal use.

4.12 Multi-rated voltage controlgear

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

4.13 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.

4.14 Sensor and network connections

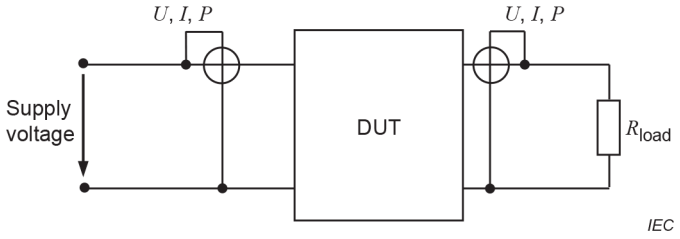
For the measurement of all kinds of controlgear power (also standby) the power consumed by all circuits (internal or external) shall be considered as indicated in IEC 63103.

NOTE although the scope of IEC 63103:2020 is limited to non-active mode power, the principle is also suitable for other power measurements.

5 Method of measurement and calculation of the efficiency

5.1 Measurement set-up: input and output power

Figure 1 shows the set-up for the measurement of the power losses of electromagnetic controlgear and the input and output power of convertor-electronic controlgear.



Key

DUT	device under test
U	voltage
I	current
P	power
R_{load}	substitution load (see 4.9)

Figure 1 – Power losses measurement set-up for electromagnetic controlgear (transformer) and input and output power measurement set-up for convertor (electronic controlgear)

The information regarding the substitution load is given under 4.8. The measurements are carried out with power meters connected to measure the total input power into and the output power (light source power) of the DUT.

The value of the total input power $P_{\text{tot meas}}$ is recorded when a steady state has been reached (temperature of the DUT).

The supply voltage for the measurement according to Figure 1 is defined in 4.6 and 4.12.

The measurement sequence is as follows:

1) Connect the DUT according to Figure 1.
2) Switch on the mains voltage.
3) Await the thermal equilibrium.
4) Measure the input and the output power.

In the case of multi output controlgear, $P_{\text{light source}}$ is the sum of all the power measured in each channel.

5.2 Efficiency calculation

For the calculation of the efficiency of a DUT (η_{CG}), Equation (1) should be used:

$$\eta_{\text{CG}} = \frac{P_{\text{light source}}}{P_{\text{tot meas}}} \quad (1)$$

where

$P_{\text{tot meas}}$ is the measured total input power into the DUT (in W);

$P_{\text{light source}}$ is the measured output power of the DUT (light source power or substitution resistor power) in the test circuit (in W).

5.3 Measurement set-up: input power in no-load mode

The measurement of no-load power of electronic controlgear is performed according to IEC 63103.

NOTE By the definition of "no-load" it is given that loads of any sort are disconnected from the controlgear.

5.4 Standby power measurement

The measurement of standby power of electronic controlgear shall be performed according to IEC 63103.

5.5 Networked standby power measurement

The measurement of networked standby power of electronic controlgear shall be performed according to IEC 63103.

5.6 Reporting of power measurements

Power measurements shall be reported in W with the minimum following resolution:

- ≥ 10 W: whole number;
- > 1 W and < 10 W: first decimal digit;
- ≤ 1 W: two decimal digits.

Bibliography

IEC 60357, *Tungsten halogen lamps (non-vehicle) – Performance specifications*

IEC 62384, *DC or AC supplied electronic controlgear for LED modules – Performance requirements*

IEC 62442-1, *Energy performance of lamp controlgear – Part 1: Controlgear for fluorescent lamps – Method of measurement to determine the total input power of controlgear circuits and the efficiency of controlgear*

IEC 62442-2, *Energy performance of lamp controlgear – Part 2: Controlgear for discharge lamps (excluding low-pressure mercury fluorescent lamps) – Method of measurement to determine the efficiency of controlgear*

ISO/IEC Guide 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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PERFORMANCE ÉNERGÉTIQUE DES APPAREILLAGES DE LAMPES –

Partie 3: Appareillages des lampes tungstène-halogène et des sources lumineuses à LED – Méthode de mesurage pour la détermination du rendement des appareillages

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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L'IEC 62442-3 a été établie par le sous-comité 34C: Appareils auxiliaires pour lampes, du comité d'études 34 de l'IEC: Eclairage. Il s'agit d'une Norme internationale.

Cette troisième édition annule et remplace la deuxième édition parue en 2018. Cette édition constitue une révision technique.

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

a) cette édition a été harmonisée avec l'IEC 62442-1 et l'IEC 62442-2;
b) des références à l'IEC 63103 ont été ajoutées afin d'appliquer les méthodes de mesurage de la consommation de puissance en mode non actif.

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

Projet	Rapport de vote
34C/1547/FDIS	34C/1550/RVD

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

La version française de cette norme n'a pas été soumise au vote.

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/standardsdev/publications.

Une liste de toutes les parties de la série IEC 62442, publiées sous le titre général *Performance énergétique des appareillages de lampes*, se trouve sur le site web de l'IEC.

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. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

PERFORMANCE ÉNERGÉTIQUE DES APPAREILLAGES DE LAMPES –

Partie 3: Appareillages des lampes tungstène-halogène et des sources lumineuses à LED – Méthode de mesurage pour la détermination du rendement des appareillages

1 Domaine d'application

La présente partie de l'IEC 62442 définit les méthodes de mesurage et de calcul afin de spécifier le rendement et la puissance de veille des appareillages des lampes tungstène-halogène et des sources lumineuses à LED.

NOTE 1 Cela comprend les transformateurs électromagnétiques et les convertisseurs électroniques pour lampes à tungstène-halogène, ainsi que les appareillages électroniques pour sources lumineuses à LED.

NOTE 2 Le terme "sources lumineuses à LED" couvre les modules de LED et les lampes à LED.

Le présent document s'applique aux appareillages conçus pour des alimentations en courant continu jusqu'à 1 000 V et/ou des alimentations en courant alternatif jusqu'à 1 000 V à 50 Hz ou 60 Hz.

Pour les alimentations électriques à usages multiples, seule la partie éclairage est prise en compte.

NOTE 3 Les exigences pour les essais des appareillages individuels pendant la production ne sont pas incluses.

Le présent document ne s'applique pas aux:

– appareillages qui font partie intégrante des lampes (sources lumineuses à LED);
– circuits d'appareillages à condensateurs reliés en série;
– appareillages de commande électromagnétiques gradables.

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 60050-845, *Vocabulaire électrotechnique international (IEV) – Partie 845: Eclairage* (disponible à l'adresse http://www.electropedia.org)

IEC 61047:2004, *Convertisseurs abaisseurs électroniques alimentés en courant continu ou alternatif pour lampes à incandescence – Exigences de performances*

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

IEC 63103:2020, *Appareils d'éclairage – Mesure de puissance en mode non actif*

IEC TS 63105:2021, *Lighting systems and related equipment – Vocabulary* (disponible en anglais seulement)

Guide IEC 115:2021, *Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector* (disponible en anglais seulement)

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions de l'IEC 60050-845 et de l'IEC TS 63105 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 http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

3.1
valeur nominale
valeur approchée appropriée d'une grandeur, utilisée pour dénommer ou identifier un composant, un dispositif ou un matériel

Note 1 à l'article: Pour exprimer la "valeur nominale" d'une grandeur particulière, le terme "valeur" est remplacé par le nom de la grandeur; par exemple, puissance nominale, tension nominale et courant nominal.

[SOURCE: IEC 62442-1:2022, 3.1]

3.2
valeur assignée
valeur d'une grandeur, utilisée à des fins de spécification, établie dans des conditions normales d'essai et telle que déclarée par le fabricant ou le fournisseur responsable

Note 1 à l'article: Pour exprimer la "valeur assignée" d'une grandeur particulière, le terme "valeur' est remplacé par nom de la grandeur; par exemple, puissance assignée, tension assignée, courant assigné et température assignée.

[SOURCE: IEC 60050-845:2020, 845-27-100, modifié – La Note 2 à l'article a été supprimée.]

3.3
appareillage de commande
<d'une source lumineuse électrique> ensemble inséré entre l'alimentation électrique et au moins une source de lumière, qui permet d'alimenter la ou les sources de lumière avec sa ou ses tensions ou courants assignés, et qui peut comprendre un ou plusieurs composants distincts

Note 1 à l'article: Un appareillage de commande peut comporter des moyens d'allumage et de gradation, de correction du facteur de puissance et de suppression des perturbations radioélectriques, ainsi que d'autres fonctions de commande.

Note 2 à l'article: Un appareillage de commande peut se composer d'une alimentation électrique et d'un ensemble de commande.

Note 3 à l'article: Un appareillage de commande peut être intégré partiellement ou totalement dans la source de lumière.

[SOURCE: IEC 60050-845:2020, 845-28-048, modifié – La Note 4 à l'article a été supprimée.]

3.4
transformateur électromagnétique
transformateur magnétique
transformateur
appareillage de commande électromagnétique qui transforme la tension d'alimentation pour faire fonctionner la ou les lampes (ou la ou les sources lumineuses à LED) avec la même fréquence que la fréquence d'alimentation à la tension assignée des lampes (ou des sources lumineuses)