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INTERNATIONAL STANDARD

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Energy performance of lamp controlgear – Part 2: Controlgear for high intensity discharge lamps (excluding fluorescent lamps) – Method of measurement to determine the efficiency of controlgear

IEC 62442-2:2018-05 RLV(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

Part 2: Controlgear for high intensity discharge lamps (excluding fluorescent lamps) – Method of measurement to determine the efficiency of controlgear

FOREWORD

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International Standard IEC 62442-2 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lamps and related equipment.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision and has been harmonized with IEC 62442-1 and IEC 62442-3.

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

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ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

Part 2: Controlgear for high intensity discharge lamps (excluding fluorescent lamps) – Method of measurement to determine the efficiency of controlgear

1 Scope

This part of IEC 62442 defines a measurement method of the power losses of electromagnetic controlgear, the total input power and the standby power of electronic controlgear for high intensity discharged lamps (excluding fluorescent lamps). A calculation method of the efficiency of controlgear for high intensity discharged lamp(s) is also defined.

It is assumed that the controlgear are 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.

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

NOTE 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 lamp controlgear efficiency for all controlgear sold for domestic and normal commercial purposes operating with high intensity discharge lamps.

This document 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 are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61347-1:~~2007~~ 2015, *Lamp controlgear – Part 1: General and safety requirements*
~~Amendment 1:2010~~
~~Amendment 2:2012~~

IEC 61347-2-9~~:2012~~, *Lamp controlgear – Part 2-9: Particular requirements for electromagnetic controlgear for discharge lamps (excluding fluorescent lamps)*

IEC 61347-2-12~~:2010~~, *Lamp controlgear – Part 2-12: Particular requirements for d.c. or a.c. supplied electronic ballasts for discharge lamps (excluding fluorescent lamps)*

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

3 Terms and definitions

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

[SOURCE: IEC 62442-1:~~2011~~ 2018, 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:~~2011~~ 2018, 3.3, modified — Note 2 has been ~~removed~~ deleted.]

3.3
controlgear
one or more components between the supply and one or more lamps which may serve to transform the supply voltage, limit the current of the 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~~ 2018, 3.4]

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 the lamp(s) to the required value and operates the lamp(s) at the same frequency as the supply frequency

~~Frequency of the lamp controlgear is the same as supply frequency~~

[SOURCE: IEC 62442-1:~~2011~~ 2018, 3.5]

3.5
electronic controlgear
<high intensity discharge lamps> AC and/or DC supplied electronic circuit including stabilizing elements for starting and operating one or more lamp(s)

3.6
discharge lamp
lamp in which the light is produced, directly or indirectly, by an electric discharge through a gas, a metal vapour or a mixture of several gases and vapours

3.7
controlgear-lamp circuit
electrical circuit, or part thereof, normally built in a luminaire, consisting of the controlgear and lamp(s)

[SOURCE: IEC 62442-1:~~2011~~ 2018, 3.8]

3.8
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)~~

~~Note 1 to entry: The ignition phase of lamp(s) is excluded from the 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

3.9
standby power
average power consumption of a controlgear ~~when subjected to~~ in the standby mode

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

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

3.10
total input power
total power ~~supplied to~~ consumed by the controlgear-lamp (light source) circuit measured at rated input voltage

[SOURCE: IEC 62442-1:~~2011~~ 2018, 3.13, modified — ~~The sentence "The rated power specified is related to a specific ballast lumen factor (BLF)." has been removed~~ "supplied to" has been replaced with "consumed ~~by~~", "(light source)" has been added and the note has been deleted.]

3.11
efficiency of lamp controlgear ~~efficiency~~
η_{MCG}
η_{ECG}
< high intensity discharge lamps> ~~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~~
ratio of the output power to lamp(s) and input power of the controlgear

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

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

3.12
multi-lamp type controlgear
controlgear designed for the operation of more than one type of lamp with different electrical characteristics, for example power

4 General

4.1 Applicability

The measurement and calculation methods in this document shall only be used for lamp controlgear which conforms to ~~IEC 61347-1 with~~ IEC 61347-2-9 or ~~IEC 61347-1 with~~ IEC 61347-2-12.

4.2 General notes on tests

The measurement conditions ~~are~~ specified in IEC 61347-1:~~2007~~ 2015, Clauses H.1, H.2, H.4, H.8, H.9 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:~~2007~~ 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.

4.3 Controllable controlgear

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

Requirements for other than 100 % light output operation of controllable controlgear and multi-tapped electromagnetic controlgear are under consideration.

4.4 Multi-lamp type controlgear

If a single-lamp controlgear is designed for different lamp powers then the test shall be carried out for each lamp.

The test for multi-lamp controlgear shall be carried out with all possible combinations.

4.5 Measurement uncertainty

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

4.6 Sampling of controlgear for testing

~~Tests in this International Standard are type tests.~~ 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.

4.7 ~~Number~~ Size of the test sample~~s~~

~~One specimen shall be tested.~~ Tests are carried out with one test specimen.

4.8 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 or region for which the measurement is being determined (refer to Table 1).

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

[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~~, respectively~~.

4.9 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 using the fundament 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.

4.10 Instrument accuracy

For measurement uncertainty and traceability see ISO/IEC Guide 98-3 and IEC Guide 115.

For ~~magnetic wire wound~~ electromagnetic controlgear, calibrated and traceable AC power meters, power analysers or digital power meters shall be used.

For electronic controlgear, 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 document, measurement instruments with the following minimum accuracies are to be used:

a) for frequencies ≤ 1 kHz
   - Voltage: 0,5 %
   - Current: 0,5 %
   - Power: 1,0 %
   - Frequency: 0,1 %

b) for frequencies > 1 kHz
   - Voltage: 1,5 %
   - Current: 1,0 %
   - Power: 2,0 %
   - Frequency: 0,1 %

Stability of the measurement values (V, A or W) is given if the data does not ~~differ by~~ 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.

4.11 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 standby power is valid.

4.12 Sensor and network connections

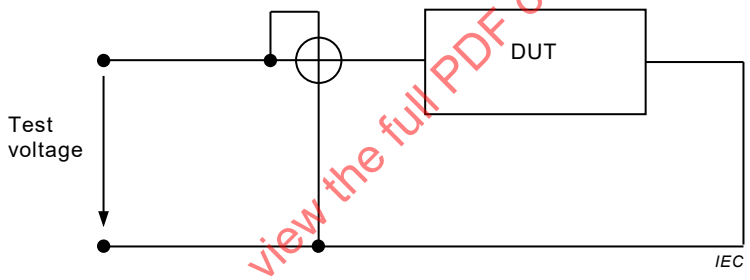
For the measurement of all kinds of controlgear power (also standby) the power consumed by all circuits (internal or external) which are not involved in power conversion for the controlgear operation (e.g. communication devices, external sensors, auxiliary load, battery charging circuits) shall be excluded 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).

5 Method of measurement of the input power and calculation of the efficiency of controlgear for high intensity discharge lamps

5.1 Measurement setup: electromagnetic ~~wire wound~~ controlgear

Figure 1 shows the measurement setup of the power losses of electromagnetic ~~wire wound~~ controlgear.



Key

DUT device under test

Figure 1 – Measurement setup for electromagnetic controlgear

The power losses (P_{losses}) of the electromagnetic controlgear will be measured based on the rated lamp current through the electromagnetic controlgear. Therefore the current through the electromagnetic controlgear will be adjusted by the test voltage to the current defined in the data sheet of the lamp(s). Tolerance for the current is ± ~~1~~ 0,5 %.

The measurements are carried out with a power meter connected to measure the power losses into the electromagnetic controlgear.

The value of the power losses (P_{losses}) is recorded when a steady state has been reached (temperature of the electromagnetic controlgear).

The measurement sequence is as follows:

1) Connect the DUT according to Figure 1.
2) Switch on the ~~supply~~ test voltage and adjust the ~~output~~ test voltage ~~of the transformer~~ until the rated lamp current is obtained.
3) Await the thermal equilibrium and if necessary adjust the test voltage ~~of the transformer~~ again to match the rated lamp current.
4) Measure the power losses.

NOTE In the case of independent electromagnetic controlgear which incorporate an ignitor in the same enclosure, the test is only applicable to the electromagnetic controlgear.

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).

5.2 Efficiency calculation: ~~Magnetic wire wound~~ electromagnetic controlgear

For the calculation of the efficiency of electromagnetic controlgear (η_{MCG}), Equation (1) should be used:

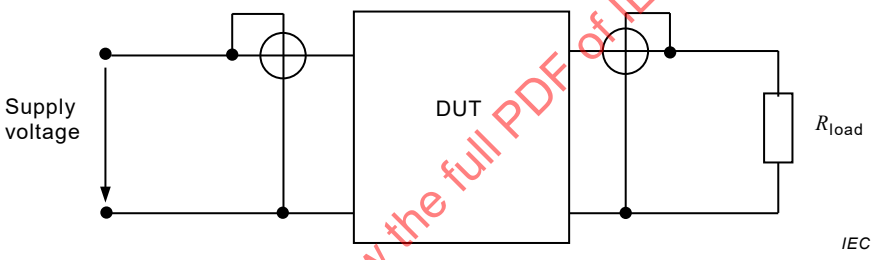
$$\eta_{MCG} = \frac{P_{lamp\ rated}}{P_{lamp\ rated} + P_{losses}} \quad (1)$$

where

$P_{lamp\ rated}$ is the lamp power given in the lamp datasheet (in W).

5.3 Measurement setup: electronic controlgear

Figure 2 illustrates the measurement setup of the input and the output power of electronic controlgear.



Key

DUT device under test

R_{load} lamp replacement resistor = load resistor

NOTE Due to the unstable lamp situation for high intensity discharge lamps and for a good reproducibility, as a replacement for the lamps, a resistor (R_{load}) is used.

Figure 2 – Measurement setup for electronic controlgear

If R_{load} is not given on the lamp data sheet, R_{load} is determined by dividing the rated/typical lamp voltage squared by the rated/typical lamp power. The value of the resistance shall be noted in the measurement report.

The measurements are carried out with power meters connected to measure the total input power into the electronic controlgear-lamp circuit and the output power of the controlgear (lamp power).

The value of the total input power ($P_{tot\ meas}$) is recorded when the temperature of the controlgear is stable. The temperature shall not ~~differ by~~ deviate from more than 1 K per hour.

The supply voltage for the measurement according to Figure 2 is defined in 4.8.

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 and the output power.

To obtain a more accurate value of the efficiency, R_{load} should be obtained taking into consideration the typical lamp voltage and current for square wave operation.

The measured total input power ($P_{tot\ meas}$) of a controlgear-lamp circuit is measured with one electronic lamp controlgear.

$P_{tot.meas.}$ is the measured total input power into the controlgear-lamp circuit under test (in W);

P_{Lamp} is the measured output power of the controlgear under test (lamp power = power at the substitution resistor) in the test circuit (in W).

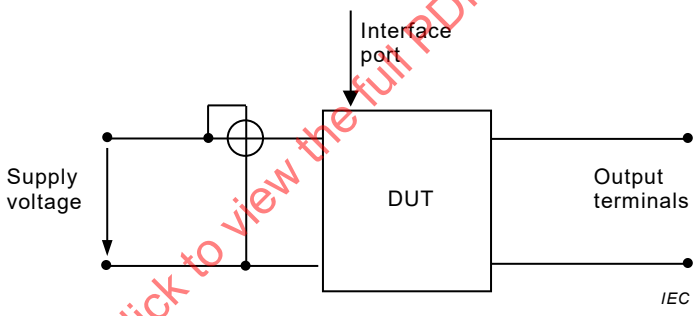
5.4 Efficiency calculation: electronic controlgear

For the calculation of the efficiency of controlgear (η_{ECG}), Equation (2) should be used:

$$\eta_{ECG} = \frac{P_{Lamp}}{P_{tot\ meas}} \quad (2)$$

5.5 Standby power measurement of electronic controlgear

Figure 3 illustrates the measurement setup of the standby power of electronic controlgear.



Key

DUT device under test

Figure 3 – Measurement setup of the standby power of electronic controlgear

The output circuit (terminals) of the controlgear is open (not connected to a substitution resistor).

The measurements are carried out with a power meter connected to measure the total input power into the electronic controlgear.

If a controlgear is also designed for functions other than lamp operation, all these additional functions shall be switched-off during the test.

NOTE Controlgear with additional power supply for the digital addressable lighting interface could be possible.

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

The supply voltage for the measurement according to Figure 3 is defined in 4.8.

If the stand-by power varies within the time, the power is determined as the arithmetic mean value over a sufficient period.

The measurement sequence is as follows:

1) Connect the DUT according to Figure 3.
2) Switch on the mains voltage.
3) Control the output power of the electronic 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).

Bibliography

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IEC 60662, *High-pressure sodium vapour lamps – Performance specifications*

IEC 60923, *Auxiliaries for lamps – Ballasts for discharge lamps (excluding tubular fluorescent lamps) – Performance requirements*

IEC 61167, *Metal halide lamps – Performance specification*

IEC 62035, *Discharge lamps (excluding fluorescent lamps) – Safety specifications*

IEC 62442-1:~~2011~~ 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 the controlgear*

IEC 62442-3~~[1]~~, *Energy performance of lamp controlgear – Part 3: Controlgear for tungsten-halogen lamps and LED ~~modules~~ light sources – Method of measurement to determine the efficiency of the controlgear*

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

~~[1] To be published.~~

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Energy performance of lamp controlgear –
Part 2: Controlgear for high intensity discharge lamps (excluding fluorescent lamps) – Method of measurement to determine the efficiency of controlgear

Performance énergétique des appareillages de lampes –
Partie 2: Appareillages des lampes à décharge à haute intensité (à l'exclusion des lampes à fluorescence) – Méthode de mesure pour la détermination du rendement des appareillages

IEC 62442-2:2018-05(en-fr)

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Part 2: Controlgear for high intensity discharge lamps (excluding fluorescent lamps) – Method of measurement to determine the efficiency of controlgear

1 Scope

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

IEC 61347-2-9, *Lamp controlgear – Part 2-9: Particular requirements for electromagnetic controlgear for discharge lamps (excluding fluorescent lamps)*

IEC 61347-2-12, *Lamp controlgear – Part 2-12: Particular requirements for d.c. or a.c. supplied electronic ballasts for discharge lamps (excluding fluorescent lamps)*

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

3 Terms and definitions

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

[SOURCE: IEC 62442-1:2018, 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.]

3.3
controlgear
one or more components between the supply and one or more lamps which may serve to transform the supply voltage, limit the current of the lamp(s) to the required value, provide starting voltage and preheating current, prevent cold starting, correct power factor or reduce radio interference

[SOURCE: IEC 62442-1:2018, 3.4]

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 the lamp(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]

3.5
electronic controlgear
<high intensity discharge lamps> AC and/or DC supplied electronic circuit including stabilizing elements for starting and operating one or more lamp(s)

3.6
discharge lamp
lamp in which the light is produced, directly or indirectly, by an electric discharge through a gas, a metal vapour or a mixture of several gases and vapours

3.7
controlgear-lamp circuit
electrical circuit, or part thereof, normally built in a luminaire, consisting of the controlgear and lamp(s)

[SOURCE: IEC 62442-1:2018, 3.8]

3.8
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

3.9
standby power
average power consumption of a controlgear in the standby mode

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

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

3.10
total input power
total power consumed by the controlgear-lamp (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.]

3.11
efficiency of lamp controlgear
η_{MCG}
η_{ECG}
<high intensity discharge lamps> ratio of the output power to lamp(s) and input power of the controlgear

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

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

3.12
multi-lamp type controlgear
controlgear designed for the operation of more than one type of lamp with different electrical characteristics, for example power

4 General

4.1 Applicability

The measurement and calculation methods in this document shall only be used for lamp controlgear which conforms to IEC 61347-2-9 or IEC 61347-2-12.

4.2 General notes on tests

The measurement conditions specified in IEC 61347-1:2015, Clauses H.1, H.2, H.4, H.8, H.9 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.

4.3 Controllable controlgear

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

Requirements for other than 100 % light output operation of controllable controlgear and multi-tapped electromagnetic controlgear are under consideration.

4.4 Multi-lamp type controlgear

If a single-lamp controlgear is designed for different lamp powers then the test shall be carried out for each lamp.

The test for multi-lamp controlgear shall be carried out with all possible combinations.

4.5 Measurement uncertainty

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

4.6 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.

4.7 Size of the test sample

Tests are carried out with one test specimen.

4.8 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 or region for which the measurement is being determined (refer to Table 1).

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

[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.

4.9 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 using the fundament 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.

4.10 Instrument accuracy

For measurement uncertainty and traceability see ISO/IEC Guide 98-3 and IEC Guide 115.

For electromagnetic controlgear, calibrated and traceable AC power meters, power analysers or digital power meters shall be used.

For electronic controlgear, 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 document, measurement instruments with the following minimum accuracies are to be used:

a) for frequencies ≤ 1 kHz
   - Voltage: 0,5 %
   - Current: 0,5 %
   - Power: 1,0 %
   - Frequency: 0,1 %

b) for frequencies > 1 kHz
   - Voltage: 1,5 %
   - Current: 1,0 %
   - Power: 2,0 %
   - Frequency: 0,1 %

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.

4.11 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 standby power is valid.

4.12 Sensor and network connections

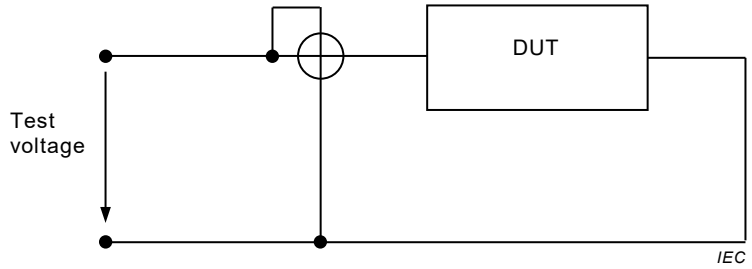
For the measurement of all kinds of controlgear power (also standby) the power consumed by all circuits (internal or external) which are not involved in power conversion for the controlgear operation (e.g. communication devices, external sensors, auxiliary load, battery charging circuits) shall be excluded 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).

5 Method of measurement of the input power and calculation of the efficiency of controlgear for high intensity discharge lamps

5.1 Measurement setup: electromagnetic controlgear

Figure 1 shows the measurement setup of the power losses of electromagnetic controlgear.



Key

DUT device under test

Figure 1 – Measurement setup for electromagnetic controlgear

The power losses (P_{losses}) of the electromagnetic controlgear will be measured based on the rated lamp current through the electromagnetic controlgear. Therefore the current through the electromagnetic controlgear will be adjusted by the test voltage to the current defined in the data sheet of the lamp(s). Tolerance for the current is ±0,5 %.

The measurements are carried out with a power meter connected to measure the power losses into the electromagnetic controlgear.

The value of the power losses (P_{losses}) is recorded when a steady state has been reached (temperature of the electromagnetic controlgear).

The measurement sequence is as follows:

1) Connect the DUT according to Figure 1.
2) Switch on the test voltage and adjust the test voltage until the rated lamp current is obtained.
3) Await the thermal equilibrium and if necessary adjust the test voltage again to match the rated lamp current.
4) Measure the power losses.

NOTE In the case of independent electromagnetic controlgear which incorporate an ignitor in the same enclosure, the test is only applicable to the electromagnetic controlgear.

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).

5.2 Efficiency calculation: electromagnetic controlgear

For the calculation of the efficiency of electromagnetic controlgear (η_{MCG}), Equation (1) should be used:

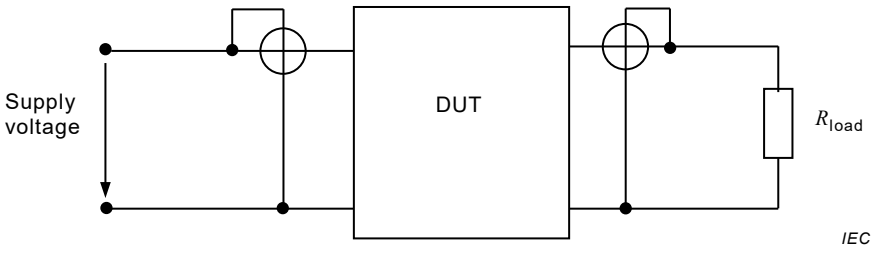
$$\eta_{\text{MCG}} = \frac{P_{\text{lamp rated}}}{P_{\text{lamp rated}} + P_{\text{losses}}} \quad (1)$$

where

$P_{\text{lamp rated}}$ is the lamp power given in the lamp datasheet (in W).

5.3 Measurement setup: electronic controlgear

Figure 2 illustrates the measurement setup of the input and the output power of electronic controlgear.



Key

DUT device under test

R_{load} lamp replacement resistor = load resistor

NOTE Due to the unstable lamp situation for high intensity discharge lamps and for a good reproducibility, as a replacement for the lamps, a resistor (R_{load}) is used.

Figure 2 – Measurement setup for electronic controlgear

If R_{load} is not given on the lamp data sheet, R_{load} is determined by dividing the rated/typical lamp voltage squared by the rated/typical lamp power. The value of the resistance shall be noted in the measurement report.

The measurements are carried out with power meters connected to measure the total input power into the electronic controlgear-lamp circuit and the output power of the controlgear (lamp power).

The value of the total input power ($P_{tot\ meas}$) is recorded when the temperature of the controlgear is stable. The temperature shall not deviate from more than 1 K per hour.

The supply voltage for the measurement according to Figure 2 is defined in 4.8.

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 and the output power.

To obtain a more accurate value of the efficiency, R_{load} should be obtained taking into consideration the typical lamp voltage and current for square wave operation.

The measured total input power ($P_{tot\ meas}$) of a controlgear-lamp circuit is measured with one electronic lamp controlgear.

$P_{tot.meas.}$ is the measured total input power into the controlgear-lamp circuit under test (in W);

P_{Lamp} is the measured output power of the controlgear under test (lamp power = power at the substitution resistor) in the test circuit (in W).

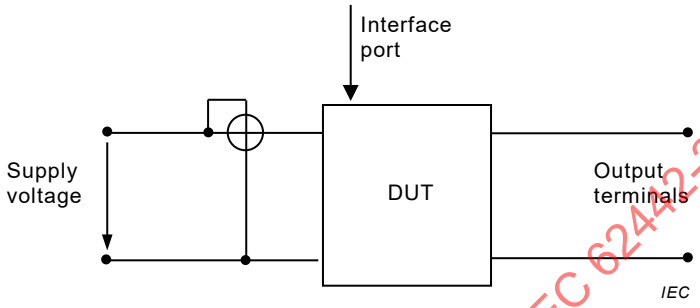
5.4 Efficiency calculation: electronic controlgear

For the calculation of the efficiency of controlgear (η_{ECG}), Equation (2) should be used:

$$\eta_{ECG} = \frac{P_{Lamp}}{P_{tot\ meas}} \tag{2}$$

5.5 Standby power measurement of electronic controlgear

Figure 3 illustrates the measurement setup of the standby power of electronic controlgear.



Key

DUT device under test

Figure 3 – Measurement setup of the standby power of electronic controlgear

The output circuit (terminals) of the controlgear is open (not connected to a substitution resistor).

The measurements are carried out with a power meter connected to measure the total input power into the electronic controlgear.

If a controlgear is also designed for functions other than lamp operation, all these additional functions shall be switched-off during the test.

NOTE Controlgear with additional power supply for the digital addressable lighting interface could be possible.

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

The supply voltage for the measurement according to Figure 3 is defined in 4.8.

If the stand-by power varies within the time, the power is determined as the arithmetic mean value over a sufficient period.

The measurement sequence is as follows:

1) Connect the DUT according to Figure 3.
2) Switch on the mains voltage.
3) Control the output power of the electronic 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).

Bibliography

IEC 60188, *High-pressure mercury vapour lamps – Performance specifications*

IEC 60662, *High-pressure sodium vapour lamps – Performance specifications*

IEC 60923, *Auxiliaries for lamps – Ballasts for discharge lamps (excluding tubular fluorescent lamps) – Performance requirements*

IEC 61167, *Metal halide lamps – Performance specification*

IEC 62035, *Discharge lamps (excluding fluorescent lamps) – Safety specifications*

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 the controlgear*

IEC 62442-3, *Energy performance of lamp controlgear – Part 3: Controlgear for tungsten-halogen lamps and LED light sources – Method of measurement to determine the efficiency of the controlgear*

ISO/IEC Guide 98-3:2008, *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 2: Appareillages des lampes à décharge à haute intensité (à l'exclusion des lampes à fluorescence) – Méthode de mesure pour la détermination du rendement des appareillages

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La Norme internationale IEC 62242-2 a été établie par le sous-comité 34C: Appareils auxiliaires pour lampes, du comité d'études 34 de l'IEC: Lampes et équipements associés.

Cette deuxième édition annule et remplace la première édition parue en 2014. Cette édition constitue une révision technique. Cette édition constitue une révision technique et elle a été harmonisée avec l'IEC 62442-1 et l'IEC 62442-3.

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

CDV	Rapport de vote
34C/1336A/CDV	34C/1377/RVC

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

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 62442, publiées sous le titre général *Performance énergétique des appareillages de lampes*, peut être consultée 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 "http://webstore.iec.ch" dans les données relatives au document recherché. A cette date, le document sera

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

PERFORMANCE ÉNERGÉTIQUE DES APPAREILLAGES DE LAMPES –

Partie 2: Appareillages des lampes à décharge à haute intensité (à l'exclusion des lampes à fluorescence) – Méthode de mesure pour la détermination du rendement des appareillages

1 Domaine d'application

La présente partie de l'IEC 62442 définit une méthode de mesure des pertes de puissance de l'appareillage électromagnétique, de la puissance d'entrée totale et de la puissance de veille de l'appareillage électronique pour les lampes à décharge à haute intensité (à l'exclusion des lampes à fluorescence). Une méthode de calcul du rendement des appareillages de lampe(s) à décharge à haute intensité est également définie.

On considère que les appareillages sont conçus pour des alimentations en courant continu jusqu'à 1 000 V et/ou des alimentations en courant alternatif de 1 000 V au maximum, à 50 Hz ou 60 Hz.

Le présent document s'applique aux circuits d'appareillage électrique-lampe constitués exclusivement de l'appareillage et de la ou des lampes.

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

Le présent document spécifie la méthode de mesure de la puissance d'entrée totale, de la puissance de veille et la méthode de calcul du rendement pour tous les appareillages de lampes à usage domestique et commercial normal, fonctionnant avec les lampes à décharge à haute intensité.

Le présent document ne s'applique pas:

– aux appareillages qui font partie intégrante des lampes;
– aux circuits d'appareillages à condensateurs reliés en série;
– aux appareillages électromagnétiques commandables.

2 Références normatives

Les documents suivants cités dans le texte 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 61347-1:2015, *Appareillages de lampes – Partie 1: Exigences générales et exigences de sécurité*

IEC 61347-2-9, *Appareillages de lampes – Partie 2-9: Exigences particulières pour les appareillages électromagnétiques pour lampes à décharge (à l'exclusion des lampes fluorescentes)*

IEC 61347-2-12, *Appareillages de lampes – Partie 2-12: Exigences particulières pour les ballasts électroniques alimentés en courant continu ou alternatif pour lampes à décharge (à l'exclusion des lampes fluorescentes)*

IEC Guide 115:2007, *Application de l'incertitude de mesure aux activités d'évaluation de la conformité dans le secteur électrotechnique*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions 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

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

3.2
valeur assignée
valeur d'une grandeur correspondant à des conditions de fonctionnement spécifiées d'un composant, d'un dispositif ou d'un matériel

Note 1 à l'article: La valeur et les conditions sont spécifiées dans la norme applicable, ou attribuées par le fabricant ou le fournisseur compétent.

[SOURCE: IEC 62442-1:2018, 3.3, modifiée — La note 2 a été supprimée.]

3.3
appareillage
composant unique ou ensemble de composants insérés entre l'alimentation et une ou plusieurs lampes, pouvant servir à transformer la tension d'alimentation, limiter le courant de la ou des lampes à la valeur requise, fournir la tension d'amorçage et le courant de préchauffage, empêcher le démarrage à froid, corriger le facteur de puissance ou réduire les perturbations radioélectriques

[SOURCE: IEC 62442-1:2018, 3.4]

3.4
appareillage électromagnétique
appareillage magnétique
appareillage qui, via l'inductance, ou une combinaison de l'inductance et de la capacité, sert principalement à limiter le courant de la ou des lampes à la valeur requise et fait fonctionner la ou les lampes à la même fréquence que la fréquence d'alimentation

[SOURCE: IEC 62442-1:2018, 3.5]

3.5
appareillage électronique
<lampes à décharge à haute intensité> circuit électronique alimenté en courant alternatif et/ou continu comprenant des éléments de stabilisation pour l'amorçage et le fonctionnement d'une ou plusieurs lampes

3.6
lampe à décharge
lampe dans laquelle la lumière est produite, directement ou indirectement, par une décharge électrique dans un gaz, une vapeur métallique ou un mélange de plusieurs gaz et vapeurs

3.7
circuit d'appareillage-lampe
circuit électrique, ou partie de ce circuit, habituellement intégré à un luminaire, comprenant l'appareillage et la ou les lampes

[SOURCE: IEC 62442-1:2018, 3.8]

3.8
mode veille
mode de l'appareillage dans lequel la source lumineuse est éteinte par un signal de commande, tandis que l'appareillage reste branché au réseau

3.9
puissance de veille
consommation de puissance moyenne d'un appareillage en mode veille

Note 1 à l'article: La puissance fournie par les appareillages aux capteurs, connexions réseau et autres auxiliaires n'est pas incluse dans la puissance de veille.

Note 2 à l'article: La puissance de veille est exprimée en W.

3.10
puissance d'entrée totale
puissance totale consommée par le circuit d'appareillage-lampe (source lumineuse), mesurée à la tension d'entrée assignée

[SOURCE: IEC 62442-1:2018, 3.13, modifiée — "fournie au" a été remplacé par "consommée par", "(source lumineuse)" a été ajouté et la note a été supprimée.]

3.11
rendement de l'appareillage de lampe
η_{MCG}
η_{ECG}
<lampes à décharge à haute intensité> rapport de la puissance de sortie de la ou des lampes et de la puissance d'entrée de l'appareillage

Note 1 à l'article: La méthode et les conditions de mesure détaillées sont indiquées dans l'Article 5.

Note 2 à l'article: Les charges des capteurs, des connexions réseau ou d'autres auxiliaires sont déconnectées ou, si cela n'est pas possible, elles sont éliminées d'une autre manière du résultat.

3.12
appareillage de type multilampe
appareillage conçu pour faire fonctionner plus d'un type de lampe, avec différentes caractéristiques électriques, par exemple la puissance

4 Généralités

4.1 Applicabilité

Les méthodes de mesure et de calcul spécifiées dans le présent document doivent uniquement être utilisées pour les appareillages de lampes conformes à l'IEC 61347-2-9 ou à l'IEC 61347-2-12.