BS EN 62442-2:2014

BSI Standards Publication

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

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National foreword

This British Standard is the UK implementation of EN 62442-2:2014. It is identical to IEC 62442-2:2014.

The UK participation in its preparation was entrusted by Technical Committee CPL/34, Lamps and Related Equipment, to Subcommittee CPL/34/3, Auxiliaries for lamps.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2014

ISBN 978 0 580 80427 4
ICS 29.140.99

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2014.

Amendments/corrigenda issued since publication

Amd. No.	Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62442-2

May 2014

ICS 29.140.99

English Version

Energy performance of lamp controlgear - Part 2: Controlgear for high intensity discharge lamps (excluding fluorescent lamps) - Method of measurement to determine the efficiency of the controlgear (IEC 62442-2:2014)

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 (CEI 62442-2:2014)

Energieeffizienz von Lampenbetriebsgeräten - Teil 2: Betriebsgeräte für Hochdruck-Entladungslampen (ausgenommen Leuchtstofflampen) - Messverfahren zur Bestimmung des Wirkungsgrades von Betriebsgeräten (IEC 62442-2:2014)

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Foreword

The text of document 34C/1078/FDIS, future edition 1 of IEC 62442-2, prepared by SC 34C "Auxiliaries for lamps" of IEC/TC 34 "Lamps and related equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62442-2:2014.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-02-22
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-05-22

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60188	NOTE	Harmonised in EN 60188 (not modified).
IEC 60662	NOTE	Harmonised in EN 60662 (not modified).
IEC 60923	NOTE	Harmonised in EN 60923 (not modified).
IEC 61167	NOTE	Harmonised in EN 61167 (not modified).
IEC 62035	NOTE	Harmonised in EN 62035 (not modified).
IEC 62442-1:2011	NOTE	Harmonised in EN 62442-1:2011 (not modified).
IEC 62442-3	NOTE	Harmonised in EN 62442-3 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 61347-1 (mod)	2007	Lamp controlgear -- Part 1: General and safety requirements	EN 61347-1	2008
+A1	2010		+A1	2011
+A2	2012		+A2	2013
IEC 61347-2-9	2012	Lamp controlgear -- Part 2-9: Particular requirements for electromagnetic controlgear for discharge lamps (excluding fluorescent lamps)	EN 61347-2-9	2013
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		Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector	-	-

CONTENTS

ENERGY PERFORMANCE OF LAMP CONTROLGEAR –

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

1 Scope

This part of the IEC 62442 series 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). Also a calculation method of the efficiency for controlgear for high intensity discharged lamp(s) is defined.

This International Standard 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.

It 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 International Standard does not apply to:

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

2 Normative references

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

IEC 61347-1:2007, *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 purpose of this document, the following terms and definitions apply.

3.1
nominal value
suitable approximate quantity value used to designate or identify a component, device or equipment

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

3.2
rated value
quantity value for specified operating conditions of a component, device or equipment. The value and conditions are specified in the relevant standard or assigned by the manufacturer or responsible vendor

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

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

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

3.4
electromagnetic controlgear
controlgear which by means of inductance, or a combination of inductance and capacitance, serves mainly to limit the current of lamp(s) to the required value

Frequency of the lamp controlgear is the same as supply frequency

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

3.5
electronic controlgear, <used for high intensity discharge lamps>
A.C. and/or D.C. 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 62442-1:2011,3.8]

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.

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

Note 1 to entry: Unit: W.

3.10
total input power
total power supplied to the controlgear – lamp circuit measured at rated input voltage

[SOURCE: CEI 62442-1:2011, 3.14, modified – The sentence "The rated power specified is related to a specific ballast lumen factor (BLF)." has been removed.]

3.11
lamp controlgear efficiency, <for controlgear used for high intensity discharge lamps>
η_{MCG}
η_{ECG}
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

3.12
multi-lamp type controlgear
controlgear designed for the operation of more than one type of lamp with different electrical characteristics e.g. power

4 General

4.1 Applicability

The measurement and calculation methods of this International Standard 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 test

The measurement conditions are specified in IEC 61347-1:2007, Clauses H.1, H.2, H.4, H.8, H.9 and H.11; unless otherwise specified in this standard. The device under test (DUT) shall be placed according to IEC 61347-1:2007, Figure H.1.

An A.C. 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

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 4.4.3 of the IEC Guide 115:2007.

4.6 Sampling of controlgear for testing

Tests in this International Standard are type tests. The requirements and tolerances specified in this International Standard 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 of samples

One specimen shall be tested.

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 (r.m.s.) summation of the individual components using the fundament as 100 %.

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

4.10 Instrument accuracy

For magnetic wire wound controlgear, calibrated and traceable a.c. 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 standard, measurement instruments with the following minimum accuracies are to be used:

- Voltage: 0,5 %
- Current: 0,5 %
- Power: 1,0 %
- Frequency: 0,1 %

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

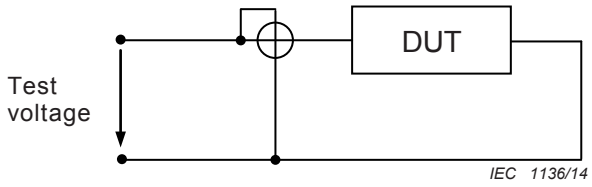
4.11 Multi-rated voltage controlgear

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 is valid.

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 %.

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).

Measurement sequence:

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

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

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

5.2 Efficiency calculation: Magnetic wire wound controlgear

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

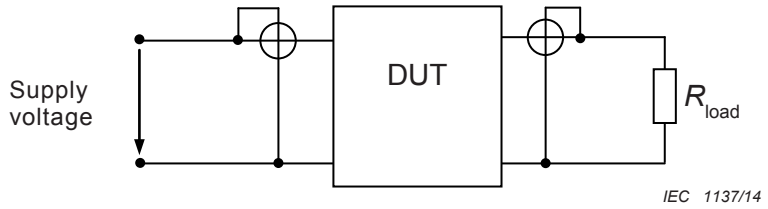
$$\eta_{MCG} = \frac{P_{lamp.rated}}{P_{lamp.rated} + P_{losses}} \quad (1)$$

where

$P_{lamp,rated}$ is the lamp power given in the lamp datasheet (in watt).

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 more than 1 K per hour.

The supply voltage for the measurement according Figure 2 is defined in 4.8 of this standard.

Measurement sequence:

1) Connect the DUT according 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, the 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 watts)

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

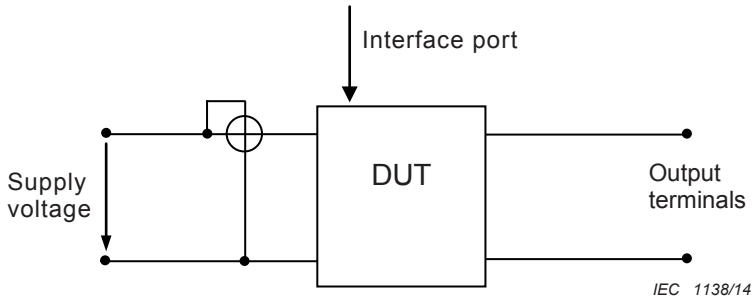
5.4 Efficiency calculation: Electronic controlgear

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 Figure 3 is defined in 4.8 of this standard.

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

Measurement sequence:

1) Connect the DUT according 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 lamp) – Performance requirements*

IEC 61167, *Metal halide lamps – Performance specification*

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

IEC 62442-1:2011, *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 halogen lamps and LED modules – Method of measurement to determine the efficiency of the controlgear*

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