

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**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**

**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**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### Recherche de publications IEC - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 14 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

Plus de 55 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**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**

**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**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

**M**

ICS 29.140.99

ISBN 978-2-8322-1529-6

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references.....	5
3 Terms and definitions.....	6
4 General.....	7
4.1 Applicability.....	7
4.2 General notes on test.....	7
4.3 Controllable controlgear.....	7
4.4 Multi-lamp type controlgear.....	7
4.5 Measurement uncertainty.....	8
4.6 Sampling of controlgear for testing.....	8
4.7 Number of samples.....	8
4.8 Power supply.....	8
4.9 Supply voltage waveform.....	8
4.10 Instrument accuracy.....	8
4.11 Multi-rated voltage controlgear.....	9
5 Method of measurement of the input power and calculation of the efficiency of controlgear for high intensity discharge lamps.....	9
5.1 Measurement setup: Electromagnetic wire wound controlgear.....	9
5.2 Efficiency calculation: Magnetic wire wound controlgear.....	10
5.3 Measurement setup: Electronic controlgear.....	10
5.4 Efficiency calculation: Electronic controlgear.....	11
5.5 Standby power measurement of electronic controlgear.....	11
Bibliography.....	13
Figure 1 – Measurement setup for electromagnetic controlgear.....	9
Figure 2 – Measurement setup for electronic controlgear.....	10
Figure 3 – Measurement setup of the standby power of electronic controlgear.....	11
Table 1 – Typical nominal electricity supply details for some regions.....	8

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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

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

FDIS	Report on voting
34C/1078/FDIS	34C/1089/RVD

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

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

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Withhold

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/527b9d6-6aa6-4870-b013-929e44b02ff9/iec-62442-2-2014>

## 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>

$\eta_{MCG}$

$\eta_{ECG}$

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  $\pm 0,5$  % during the warm-up period. However, during the actual measurement, the voltage shall be adjusted to within  $\pm 0,2$  % of the specified testing value.

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

#### 4.9 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 fundamental as 100 %.

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

#### 4.10 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.

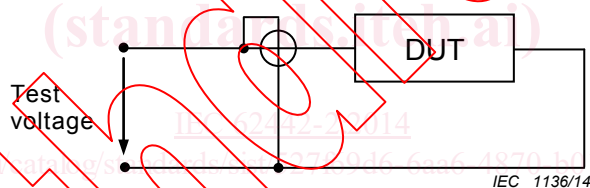
#### 4.11 Multi-rated voltage controlgear

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 ( $P_{\text{losses}}$ ) 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  $\pm 1$  %.

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 ( $P_{\text{losses}}$ ) 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 ( $\eta_{MCG}$ ), Equation (1) should be used:

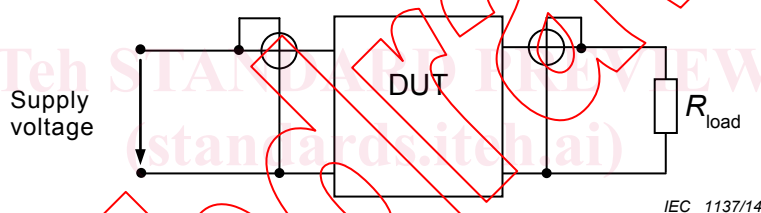
$$\eta_{MCG} = \frac{P_{lamp.rated}}{P_{lamp.rated} + P_{losses}} \quad (1)$$

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.