
Električna in elektronska gospodinjska in pisarniška oprema - Meritve majhne porabe energije

Electrical and electronic household and office equipment - Measurement of low power consumption

Elektrische und elektronische Haushalts- und Bürogeräte - Messung niedriger Leistungsaufnahmen

Appareils électriques et électroniques pour application domestique et équipement de bureau - Mesure de la consommation faible puissance

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Electrical and electronic household and office equipment - Measurement of low power consumption (IEC 62301:2011, modified)

Appareils électriques et électroniques
pour application domestique et
équipement de bureau -
Mesure de la consommation faible
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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

This European Standard was prepared by Technical Committee CENELEC TC 59X, Performance of household and similar electrical appliances.

A draft amendment covering common modifications towards IEC 62301:2011, prepared by the Technical Committees CENELEC TC 59X, Performance of household and similar electrical appliances and CENELEC TC 108X, Safety of electronic equipment within the fields of audio/video, information technology and communication technology, was submitted to the formal vote.

The combined texts were approved by CENELEC as EN 50564 on 2011-03-03.

This European Standard supersedes EN 62301:2005.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2012-03-03
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2014-03-03

Clauses, subclauses, notes, tables and figures which are additional to those in IEC 62301:2011 are prefixed "Z".

This European standard was prepared under standardisation mandate M/439. To fulfill the requirements of the mandate the scope of EN 50564 had to be broadened in comparison with IEC 62301:2011 to cover a range of electrical and electronic household and office equipment. This is reflected in the title of EN 50564 in comparison with the title of IEC 62301:2011.

In this European Standard, the common modifications to the International Standard are indicated by a vertical line in the left margin of the text.

Words in **bold** in the text are defined in Clause 3 Terms and definitions.

Introduction

The methods defined in this European Standard are intended to define requirements for the measurement of low power. This standard may be used in support of other, more specific, product standards where it is required to measure power consumption.

The aim of the common modification is to ensure this European Standard is compatible with the objectives of EU legislation for ecodesign and for energy labeling.

Since the **mode** definitions are given in the relevant EU regulation they are not contained in this standard. Additional product specific **mode** definitions might be given in more specific product standards.

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1 Scope

This European Standard specifies methods of measurement of electrical power consumption and the reporting of the results for a range of electrical and electronic household and office equipment, hereafter referred to as products.

This standard

- addresses issues associated with measuring electrical power, in particular low power (in the order of a few Watts or less), consumed by mains powered products,
- describes in detail the requirements for testing single phase products with a rated input voltage in the range of 100 V a.c. to 250 V a.c. but it may, with some adaptations, also be used with three phase products,
- may also be of assistance in determining the energy efficiency of products in conjunction with other, more specific, product standards.

The value of energy consumed will depend on the operating **mode** of the product under test, for instance whether the equipment is in an **off mode**, in a **standby mode** or in an **active mode**. This standard does not specify these **modes** and so it is not possible to use this standard on its own. Instead, it provides a method of measurement with a variety of **modes** which are defined elsewhere.

This standard does not

- specify safety requirements,
- specify minimum performance requirements,
- set maximum limits on power or energy consumption,
- contain limit values or procedures for verifying compliance with regulatory requirements.

NOTE Z1 This standard has been written in particular to support EC Commission Regulation n° 1275/2008 for the measurement of **off mode** and **standby mode** power consumption. This standard specifies methods of measurement of electrical power consumption in **standby mode(s)** and other **low power modes (off mode)**, as applicable.

NOTE Z2 This standard is applicable to electrical products with a rated input voltage of 230 V a.c. for single phase products and 400 V a.c. for three phase products.

NOTE Z3 The measurement of energy consumption and performance of products during intended use are generally specified in more specific product standards and are not covered by this standard.

NOTE Z4 The term “products” in this standard includes household appliances or information technology products, consumer electronics, audio, video and multimedia systems, however the measurement methodology could be applied to other products.

NOTE Z5 Where this standard is referenced by more specific standards or procedures, these should define and name the relevant conditions to which this test procedure is applied.

2 Normative references

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

IEC 60050-131, *International Electrotechnical Vocabulary (IEV) – Part 131: Circuit theory*

IEC 60050-300, *International Electrotechnical Vocabulary (IEV) – Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical measurements – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument*

3 Terms and definitions

For the purposes of this document, the terms and definitions contained in IEC 60050-131 and IEC 60050-300 as well as the following definitions apply.

3.1

function

a predetermined operation undertaken by the energy using product. **Functions** may be controlled by an interaction of the user, of other technical systems, of the system itself, from measurable inputs from the environment and/or time

In this standard, **functions** are grouped into 3 main types:

- user oriented secondary **functions** (see 3.6 - **standby mode**)
- primary **functions** (see 3.8 - **active mode**, which is not the focus of this standard)
- other **functions** (these **functions** do not affect the **mode** classification).

NOTE Accurate recording and documentation of **functions** in the relevant **product mode** is a key element of documentation in this standard (see 6.3). **Function** types are generally classified as primary or secondary (remote, network, sensing and protective).

3.2

mode

a state that has no **function**, one **function** or a combination of **functions** present

NOTE 1 The **low power mode** categories in this standard are intended to provide guidance for the development of specific **mode** definitions for TC59 products by the relevant subcommittees.

NOTE 2 Void.

NOTE 3 See Annex C for examples of how to calculate total energy consumption from power measurements where the duration of each relevant **mode** is known.

3.3

product mode

mode where the **functions** present, if any, and whether these are activated, depend on the particular product configuration

NOTE The issue of devising appropriate names for **product modes** is a matter for the relevant product committees. While a **product mode** name should generally reflect the **functions** that are activated, they need not contain the terms “standby” even where the **product mode** falls within that **mode** category.

3.4

low power mode

a **product mode** that falls into one of the following broad **mode** categories:

- **off mode(s)**
- **standby mode(s)**

NOTE Z1 Refer to relevant legislation or a more specific product standard. This term is not defined in EC Commission Regulation n° 1275/2008.

NOTE 1 **Low power modes** are classified into one of the **mode** categories above (where applicable) on the basis of the **functions** that are present and activated in each relevant **mode**. Where other **functions** are present in a **product mode** (in addition to the ones required for the **mode** categories specified above), these **functions** do not affect the **mode** classification.

NOTE 2 **Low power mode** categories are defined in order to provide guidance to users of this international standard and to provide a consistent framework for the development of **low power modes**.

NOTE 3 Any transition that occurs between **modes**, either through user intervention or automatically, is not considered to be a **mode**.

NOTE 4 Not all **low power mode** categories are present on all products. Some products may have more than one **product mode** in each of the **low power mode** categories with different combination of **functions** activated. The power consumption in each **low power mode** depends on the product design and the **functions** which are activated in the particular **product mode**.

3.5 off mode(s) void

NOTE Z1 Refer to relevant legislation or a more specific product standard.

NOTE Z2 EC Commission Regulation n° 1275/2008 states:

“ ‘**off mode**’ means a condition in which the equipment is connected to the mains power source and is not providing any **function**; the following shall also be considered as **off mode**:

- a) conditions providing only an indication of **off mode** condition;
- b) conditions providing only functionalities intended to ensure electromagnetic compatibility pursuant to Directive 2004/108/EC of the European Parliament and of the Council”

3.6 standby mode(s) void

NOTE Z1 Refer to relevant legislation or a more specific product standard

NOTE Z2 EC Commission Regulation n° 1275/2008 states:

“ ‘**standby mode(s)**’ means a condition where the equipment is connected to the mains power source, depends on energy input from the mains power source to work as intended and provides **only** the following **functions**, which may persist for an indefinite time:

- reactivation **function**, or reactivation **function** and only an indication of enabled reactivation **function**, and/or information or status display”

3.7 void

3.8 active mode(s) void

NOTE Z1 Refer to relevant legislation or a more specific product standard

NOTE Z2 EC Commission Regulation n° 1275/2008 states:

“ ‘**active mode(s)**’ means a condition in which the equipment is connected to the mains power source and at least one of the main **function(s)** providing the intended service of the equipment has been activated”

3.9 void

3.10 rated voltage supply voltage (range) designated by the manufacturer

3.11 rated frequency supply frequency (range) designated by the manufacturer

3.12 instructions for use information that is provided for users of the product

NOTE **Instructions for use** would include a user manual and may be in paper or electronic form. **Instructions for use** do not include any special directions provided by the product supplier to the test laboratory especially for testing purposes.

4 General conditions for measurements

4.1 General

Unless otherwise specified, measurements shall be made under the test conditions and with measuring instruments specified in 4.2 to 4.4.

NOTE The measuring accuracy and consequently total measurement uncertainty depend not only on the specification of the individual equipment but also their combination. Some combinations of power source and power measurement equipment, which individually meet their respective specifications, are known to give anomalous readings with capacitive loads. This could be caused by, for example, the power supply having high frequency components above the 13th harmonic.

4.2 Test room

The tests shall be carried out in a room that has an air speed close to the product under test of $\leq 0,5$ m/s. The ambient temperature shall be maintained at (23 ± 5) °C throughout the test.

Where the product has an ambient light sensor that affects the power consumption, the test shall be carried out with controlled ambient light conditions. Where the illuminance levels are externally defined (in a test procedure or in the **instructions for use**), these values shall be used. Where no illuminance levels are stated or defined, reference illuminance levels of >300 lx and <10 lx shall be used.

Information on the method used to achieve the above illuminance levels, where relevant, shall be recorded in the test report (see 6.3). Where values of illuminance are given, they shall be measured as close to the product's light sensor as practical.

NOTE The measured power for some products and modes could be affected by the ambient conditions (e.g. illuminance, temperature).

4.3 Power supply

4.3.1 Supply voltage and frequency

Where this standard is referenced by a regulation or more specific product standard that specifies a voltage and frequency to be used during measurement, the test voltage and frequency so defined shall be used for all tests.

For single phase products, unless otherwise specified by a regulation or a more specific product standard, the voltage and frequency of the supply shall be:

- 230 V $\pm$ 1%,
- 50 Hz $\pm$ 1%.

NOTE Z1 A stabilised power supply may be required to meet these requirements.

For three-phase products, unless otherwise specified by a regulation or more specific product standard, the voltage and frequency of the supply shall be:

- 400 V $\pm$ 1%,
- 50 Hz $\pm$ 1%.

NOTE Z2 A stabilised power supply may be required to meet these requirements. Some stabilised power supplies have high frequency components and in such cases it is strongly recommended to use an artificial mains network between the power supply and the power measuring instrument, as described in B.4.2. Where an artificial mains network is used it should have a nominal impedance of 50 Ω /50 μ H or 50 Ω /50 μ H + 5 Ω as defined in EN 55016-1-2.

4.3.2 Supply voltage waveform

The total harmonic content of the supply voltage when supplying the product under test in the specified **mode** shall not exceed 2 % (up to and including the 13th harmonic); harmonic content is defined as the root-mean-square (r.m.s.) summation of the individual components using the fundamental as 100 %. The value of the harmonic content of the voltage supply shall be recorded during the test and reported (see 6.3).

In addition to the above, the ratio of peak value to r.m.s. value of the test voltage (i.e. crest factor) when supplying the product under test shall be between 1,34 and 1,49.

NOTE Power supplies meeting EN 61000-3-2 are likely to meet the above requirements.

4.4 Power measuring instruments

NOTE Many power meters can also record harmonic content, as required by 4.3.2.

4.4.1 Power measurement uncertainty

This section covers the requirements for uncertainty introduced by the instrument that measures the input power to the product under test, including any external shunts.

The maximum permitted uncertainty of measurement depends on the size of the load and the characteristics of the load. The key characteristic of the load used to determine the maximum permitted uncertainty is the Maximum Current Ratio (MCR), which is calculated as follows:

$$\text{Maximum Current Ratio (MCR)} = \frac{\text{Crest Factor (CF)}}{\text{Power Factor (PF)}}$$

where

- the Crest Factor (CF) is the measured peak current drawn by the product divided by the measured r.m.s. current drawn by the product;
- the Power Factor (PF) is a characteristic of the power consumed by the product. It is the ratio of the measured real power to the measured apparent power.

a) Permitted uncertainty for values of MCR ≤ 10

For measured power values of greater than or equal to 1,0 W, the maximum permitted relative uncertainty introduced by the power measurement equipment, U_{mr} , shall be equal to or less than 2 % of the measured power value at the 95 % confidence level.

For measured power values of less than 1,0 W, the maximum permitted absolute uncertainty introduced by the power measurement equipment, U_{ma} , shall be equal to or less than 0,02 W at the 95 % confidence level.

b) Permitted uncertainty for values of MCR > 10

The value of U_{pc} shall be determined using the following equation:

$$U_{pc} = 0,02 \times [1 + (0,08 \times \{MCR - 10\})]$$

where U_{pc} is the maximum permitted relative uncertainty for cases where the MCR is > 10.

For measured power values of greater than or equal to 1,0 W, the maximum permitted relative uncertainty introduced by the power measurement equipment shall be equal to or less than U_{pc} at the 95 % confidence level.

For measured power values of less than 1,0 W, the permitted absolute uncertainty shall be the greater of U_{ma} (0,02 W) or U_{pc} when expressed as an absolute uncertainty in W ($U_{pc} \times \text{measured value}$) at the 95 % confidence level.

NOTE 1 It is preferred that the power measuring instrument detects, indicates, signals and records any "out of range" conditions.

NOTE 2 See Annex D and the *Guide to the Expression of Uncertainty in Measurement (GUM)* for further details.

NOTE 3 Although a specification for the power meter in terms of allowable crest factor is not included here, it is important that the peak current of the measured waveform does not exceed the permitted measurable peak current for the range selected, otherwise the uncertainty requirements above will not be achieved. See B.1.2 for an example calculation for U_{pc} and for more information.

NOTE Z1 Clause B.1 explains why certain load types can result in increased uncertainty.

For products connected to more than one phase, the power measuring instrument shall be capable of measuring the total power of all phases connected.

Where the power is measured using the accumulated energy method (see 5.3.3) the calculated power measurement uncertainty shall meet the above requirements.

4.4.2 Power measurement frequency response

The power measuring instrument shall be capable of meeting the requirements of 4.4.1 when measuring the following:

- DC
- AC with a frequency from 10 Hz to 2 000 Hz.

NOTE If the power meter contains a bandwidth limiting filter, it should be capable of being taken out of the measurement circuit.

4.4.3 Power measurement long term averaging requirement

Where it is necessary to perform measurements in accordance with 5.3.3, the power measuring instrument shall either be capable of

- measuring the average power over any operated selected time interval, or;
- integrating energy over any operator selected time interval.

NOTE A data recording capability (sampling) or output to a computer or data recorder is the most desirable capability as required by 5.3.2 – see B.2.5 for further information.

5 Measurements

5.1 General

The purpose of this test method is to determine the power consumption in the relevant **product mode**, which is either persistent or of a limited duration. A **mode** is considered to be persistent where the power level is constant or where there are several power levels that occur in a regular sequence for an indefinite period of time.

NOTE 1 During transition from one **mode** to another (either automatic or user initiated) some products could wait in a higher power state while transition tasks are performed or circuits are energized or de-energized, so they can take some time to enter a stable state.