

# INTERNATIONAL STANDARD

HORIZONTAL PUBLICATION

GROUP ENERGY EFFICIENCY PUBLICATION

**Measurement of standby power for appliances and equipment**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**Measurement of standby power for appliances and equipment**

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.

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IEC 62301 has been prepared by IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

This third edition cancels and replaces the second edition published in 2011. This edition constitutes a technical revision.

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

- a) expansion of the scope in line with the approved horizontal application of this standard;
- b) inclusion of battery powered and DC powered devices;
- c) complete revision and expansion of the definitions (this has been done in conjunction with TC 100/TA19 JWG2 and the definitions in this document and IEC 63474:2026 for **networked standby** are fully aligned);
- d) clarification that this document covers all **non-active** modes except for **networked standby mode(s)**, which is covered by IEC 63474:2026;
- e) reiteration that a wide range of product committees and their standards can reference this document and that they are free to define modes relevant for their products and to some extent measurement conditions that may be product specific, while using the broad methodology set out in this document;
- f) more precise specification of room illuminance requirements has been added, where required;
- g) mandatory requirements for data logging of test data;
- h) requirement that no data loss or out of range records occur within the data set being used to assess product performance;
- i) removal of the Average reading method and Direct meter reading method as valid measurement methods;
- j) greater detail in set-up procedures;
- k) revision of stability requirements, including the refinement of linear regression validity requirements and cyclic load validity requirements, and the introduction of a new alternative approach called the moving average method to ensure that results are as representative and accurate as possible;
- l) further refinement of measurement uncertainty requirements for power measuring instruments, especially for more difficult loads with high crest factor and/or low **power factor**, so that these are more in line with changes in the performance of measuring instruments typically used in laboratories;
- m) inclusion of explicit requirements in the assessment of large data sets against uncertainty requirements;
- n) updated guidance on product configuration, instrumentation settings and calculation of measurement uncertainty;
- o) inclusion of definitions for all relevant **non-active modes** and use of these new definitions and more rigorous terminology throughout the document.

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

|             |                  |
|-------------|------------------|
| Draft       | Report on voting |
| 59/867/FDIS | 59/870/RVD       |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

It has the status of a group energy efficiency publication in accordance with [IEC GUIDE 118 \[1\]](#) .

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

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## INTRODUCTION

The methods defined in this document are intended to cover **non-active modes**. They are not intended to be used to measure the power of products during **active modes** (also called "**on mode(s)**"), as these are generally covered by IEC or other product standards (see Bibliography for some examples), although the measuring techniques, measurement uncertainty determination and test equipment specifications could be adapted for such measurements with careful review.

# Sample Document

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## 1 Scope

This document specifies methods of measurement of electrical power in **standby mode(s)** and other **non-active modes** (such as **off mode**) and the reporting of the results.

The measurement of power and energy use in **networked standby mode**, is covered by IEC 63474:2026.

This document applies to electronic and electrical equipment powered by:

- low voltage AC power ( $LV \leq 1\,000$  V AC), or
- low voltage DC power ( $LV \leq 1\,500$  V DC) that is ripple-free, measured between conductors or between a conductor and earth, or
- extra low voltage AC power ( $ELV \leq 50$  V AC), or
- extra low voltage DC power ( $ELV \leq 120$  V DC) that is ripple-free, measured between conductors or between a conductor and earth, or
- an external power supply that provides low voltage or extra low voltage AC or DC power, or
- a separate source of extra low voltage DC power, or
- an internal **main battery**.

Conditions that are out of scope:

- **active modes** (**primary function**)
- **networked standby mode** (which is covered by IEC 63474:2026)
- conditions where **main batteries** are being charged other than in **maintenance mode**
- disconnected condition of the equipment.

This document applies to the following product groups where a **non-active mode** is present:

- household appliances, electrical and electronic equipment such as information technology equipment, audio, video and multimedia systems and equipment,
- gas burning equipment with electrical components.

NOTE 1 The measurement of power, energy use and performance of products during their intended use (when performing their **primary functions**) are generally specified in product standards and are not covered by this document.

Where this document is referenced by performance standards or procedures, these are to define and name the relevant **non-active mode** to which this test procedure is applied.

NOTE 2 **Non-active modes** for lighting equipment and the measurement of power is specified in IEC 63103 [2].

NOTE 3 **Edge equipment** can also include **auxiliary batteries**.

**Annex A** shows the conceptual framework of power modes and functions.

This document does not specify safety requirements. It does not specify minimum performance requirements nor does it set maximum limits on power or energy use.

This group energy efficiency publication is primarily intended to be used as an energy efficiency standard for the products mentioned in the scope, but is also intended to be used by TCs in the preparation of publications for products which are included in the boundary mentioned in the scope of this document.

## 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 63474:2026, *Electrical and electronic household and office equipment - Measurement of networked standby power consumption of edge equipment*

## 3 Terms, definitions, abbreviated terms and symbols

### 3.1 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 3.1.1 Function-related terms and definitions

##### 3.1.1.1

##### **function**

<of a product> predetermined operation undertaken by a product

Note 1 to entry: Functions can be controlled by an interaction of the user, of other technical systems, and of the system itself, from measurable inputs from the environment and/or time.

Note 2 to entry: A function can be classified as [primary function \(3.1.1.2\)](#), [secondary function \(3.1.1.3\)](#) or [tertiary function \(3.1.1.4\)](#), which are broad categories. The specific categorisation of a function can be determined for each type of equipment.

##### 3.1.1.2

##### **primary function**

<of a product> [function \(3.1.1.1\)](#) providing a main intended purpose

EXAMPLE Cleaning of clothes by a washing machine, displaying of video or providing sound by a television.

Note 1 to entry: Products can have more than one primary function.

Note 2 to entry: [Figure A.1](#) provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in [Figure A.1](#).

[SOURCE: IEC 60050-904:2014 [3], 904-03-02, modified - 'main' added to the definition, Example and new 'Note 1 to entry' added, and Table 1 replaced by [Figure A.1](#) in Note 2 to entry.]

##### 3.1.1.3

##### **secondary function**

<of a product> [function \(3.1.1.1\)](#) that enables, supplements or enhances a [primary function \(3.1.1.2\)](#)

EXAMPLE 1 Secondary functions can include [status information functions \(3.1.1.5\)](#), [network integrity functions \(3.1.1.6\)](#), [reactivation functions \(3.1.1.7\)](#), or [sensor-based functions \(3.1.1.10\)](#).

EXAMPLE 2 Timer informing the remaining time for completion of the washing program or the delay start [function \(3.1.1.1\)](#) of a washing machine.

Note 1 to entry: [Figure A.1](#) provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in [Figure A.1](#).

[SOURCE: [IEC 60050-904:2014 \[3\]](#), 904-03-03, modified - Examples added, in Note 1 to entry 'Table 1' replaced by [Figure A.1](#).]

#### 3.1.1.4 tertiary function

<of a product> [function \(3.1.1.1\)](#) other than a [primary function \(3.1.1.2\)](#) or a [secondary function \(3.1.1.3\)](#)

EXAMPLE 1 An EMC filter, if present, can provide its [function \(3.1.1.1\)](#) in [active modes \(3.1.2.2\)](#) and [non-active modes \(3.1.2.3\)](#).

EXAMPLE 2 Event and failure data recorder in a washing machine for service and design improvement purposes.

Note 1 to entry: Primary functions, secondary functions and tertiary functions are not distinguished by whether they are necessary or non-necessary.

Note 2 to entry: [Figure A.1](#) provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in [Figure A.1](#).

[SOURCE: [IEC 60050-904:2014 \[3\]](#), 904-03-04, modified - in Example 1 'off mode, partial on mode and on mode' replaced by 'non-active modes and active modes', Example 2 amended, new 'Note 1 to entry' and 'Note 2 to entry' added. In Note 3 to entry 'Table 1' replaced by [Figure A.1](#).]

#### 3.1.1.5 status information function

<of a product> [function \(3.1.1.1\)](#) by which the product provides usage-orientated information

EXAMPLE 1 Date, time, timer information, or past or future operation.

EXAMPLE 2 A [reactivation function \(3.1.1.7\)](#) indicated using a simple optical indicator (e.g. a light-emitting diode (LED)).

Note 1 to entry: Displayed content that relates to the [primary function \(3.1.1.2\)](#) of a display, e.g. displaying moving images, is not status information. The primary display of a product can provide status information in [active mode \(3.1.2.2\)](#).

Note 2 to entry: [Figure A.1](#) provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in [Figure A.1](#).

[SOURCE: [IEC 60050-904:2014 \[3\]](#), 904-03-07, modified - 'equipment provides simple use-oriented' replaced by 'product provides usage-oriented', original 'Note 1 to entry' changed to 'EXAMPLE', new 'Note 1 to entry' added, in Note 2 to entry 'Table 1' replaced by [Figure A.1](#).]

#### 3.1.1.6 network integrity function

<of a product> [function \(3.1.1.1\)](#) to maintain a [network \(3.1.3.1\)](#) communication path that is external to the product

Note 1 to entry: The communication can be via wired or wireless interfaces.

Note 2 to entry: In order to communicate, it is necessary for the product to have at least one [network port \(3.1.3.5\)](#) activated.

Note 3 to entry: [Figure A.1](#) provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in [Figure A.1](#).

[SOURCE: [IEC 60050-904:2014 \[3\]](#), 904-03-08, modified - 'equipment' replaced by 'product', original 'Note 3 to entry' deleted, in Note 3 to entry 'Table 1' replaced by [Figure A.1](#).]

**3.1.1.7****reactivation function**

<of a product> **function (3.1.1.1)** allowing a product to be switched into a different **mode (3.1.2.1)** with additional **functions (3.1.1.1)** via an internal signal, manually using a control on the product, with a remote control unit, or via an externally initiated signal

EXAMPLE 1 A timer could provide the internal signal leading to reactivation.

EXAMPLE 2 The reactivation function can be indicated using a simple optical device (e.g. a light-emitting diode (LED)).

Note 1 to entry: The **mode (3.1.2.1)** after reactivation can be an **active mode (3.1.2.2)** .

Note 2 to entry: **Figure A.1** provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in **Figure A.1**. **Figure A.2** provides a concept diagram.

[SOURCE: IEC 60050-904:2014 [3], 904-03-06, modified - definition extended to cover both internal reactivation function and network reactivation function, original 'Note 2 to entry' deleted, in Note 2 to entry 'Table 1' replaced by **Figure A.1** and '**Figure A.2** provides a concept diagram.' added.]

**3.1.1.8****internal reactivation function**

<of a product> **reactivation function (3.1.1.7)** where the product is switched into a different **mode (3.1.2.1)** via an internal signal, with its remote control unit, or manually using a control on the product

Note 1 to entry: **Figure A.1** provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in **Figure A.1**. **Figure A.2** provides a concept diagram.

**3.1.1.9****network reactivation function**

<of a product> **reactivation function (3.1.1.7)** where the product is switched into a different **mode (3.1.2.1)** via an external signal through a **network (3.1.3.1)**

Note 1 to entry: **Figure A.1** provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in **Figure A.1**. **Figure A.2** provides a concept diagram.

**3.1.1.10****sensor-based function**

<of a product> **function (3.1.1.1)** using a sensor to monitor a certain condition, internally or externally to the product

**3.1.1.11****protective function**

<of a product> **function (3.1.1.1)** that operates to prevent harm to persons or damage to property

EXAMPLE Protective functions can operate in different **modes (3.1.2.1)**, for instance:

- a back-siphonage device fitted to a dishwasher can operate in any **non-active modes (3.1.2.3)**,
- a flood protection device fitted to a washing machine can operate in any **non-active modes (3.1.2.3)**,
- a no-movement deactivation switch fitted to an iron can operate in **active mode (3.1.2.2)**, and
- a touch control for a cooking hob requires a minimum of two activation steps (switch on & set level) to commence heating for the **primary function (3.1.1.2)** to prevent accidental operation.

[SOURCE: IEC 60050-904:2014 [3], 904-03-05, modified - removed text "after the occurrence of a failure in the equipment so as" to ensure that protective function covers user safety. Examples modified to align with mode definitions in this document, added cook top example.]

### 3.1.1.12 emergency warning & alert function

EWf

<of a radio receiver> automatic receiver switching and emergency reactivation by alarm announcement broadcast signal

Note 1 to entry: Measurement of power in a [non-active mode \(3.1.2.3\)](#) when this [function \(3.1.1.1\)](#) is active is covered by IEC 63474:2026.

### 3.1.1.13 power management

power management function

automatic control mechanism that achieves within a preset timeframe, or other conditions, a certain power demand consistent with a pre-determined level of functionality

[SOURCE: IEC 60050-904:2014 [3], 904-03-01, modified - 'the smallest input power' replaced by 'within a preset timeframe, or other conditions, a certain power demand' by ', Note 1 to entry omitted.]

### 3.1.1.14 power supply function

<of a battery powered product> ability of the charging circuitry or power supply to directly power some or all of the [functions \(3.1.1.1\)](#) of the battery powered product without drawing power from the battery

Note 1 to entry: This can include [main batteries \(3.1.4.4\)](#) charging or [main batteries \(3.1.4.4\)](#) removed.

Note 2 to entry: Chargers with a power supply function do not show the typical recharging pattern of chargers without a power supply function as the batteries are not permanently discharged by internal processes, display information and [networked standby \(3.1.2.5\)](#) energy use. This energy use can be supplied exclusively from the power supply unit or also proportionally from the battery and the power supply unit.

## 3.1.2 Mode-related terms and definitions

### 3.1.2.1 mode

condition that has any combination of [functions \(3.1.1.1\)](#)

Note 1 to entry: A mode with one or no [functions \(3.1.1.1\)](#) could be a valid combination.

Note 2 to entry: Any transition of a product to a different mode, either through user intervention or automatically initiated, is not part of either mode.

Note 3 to entry: A mode can have [functions \(3.1.1.1\)](#) with variable power draw.

Note 4 to entry: [Figure A.1](#) provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in [Figure A.1](#).

### 3.1.2.2 active mode

on mode

[mode \(3.1.2.1\)](#) in which the product is connected to a power source and provides at least one [primary function \(3.1.1.2\)](#)

Note 1 to entry: The terms "on", "in-use", and "operation" also describe this [mode \(3.1.2.1\)](#).

Note 2 to entry: This includes conditions during which the equipment can promptly provide a [primary function \(3.1.1.2\)](#) but is not doing so, such as:

- when content on a media playing device is paused,
- when noise cancelling is active but no audio is playing.

Note 3 to entry: [Figure A.1](#) provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in [Figure A.1](#).

**3.1.2.3****non-active mode**

non-active

**mode (3.1.2.1)** in which the product is connected to a power source and provides no **primary functions (3.1.1.2)**

Note 1 to entry: This can include **modes (3.1.2.1)** such as **off mode (3.1.2.6)**, **standby mode (3.1.2.4)** and **networked standby mode (3.1.2.5)**, as applicable. Product groups can have product specific non-active modes which can be identified and named as appropriate.

Note 2 to entry: **Figure A.1** provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in **Figure A.1**.

**3.1.2.4****standby mode**

standby

**non-active mode (3.1.2.3)** providing at least one **secondary function (3.1.1.3)**

Note 1 to entry: **Figure A.1** provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in **Figure A.1**.

**3.1.2.5****networked standby mode**

networked standby

**standby mode (3.1.2.4)** in which the **edge equipment (3.1.3.3)** is able to switch into a different **mode (3.1.2.1)** via a **network reactivation function (3.1.1.9)**

Note 1 to entry: **Figure A.1** provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in **Figure A.1**.

Note 2 to entry: Measurement of power in networked standby mode is covered by IEC 63474:2026.

**3.1.2.6****off mode**

off

**non-active mode (3.1.2.3)** in which the product is providing no **secondary function (3.1.1.3)**

Note 1 to entry: **Figure A.1** provides a structured overview as an aid to understanding functional relationships and energy use applicable in electrotechnical products. Additional terms and definitions to fulfil the particular needs of product sectors should be defined within the structure of the concepts shown in **Figure A.1**.

**3.1.2.7****maintenance mode**

<battery> **mode (3.1.2.1)** of a charging circuitry that maintains a battery at a pre-set charge limit while the battery remains connected to the charging circuitry

Note 1 to entry: Some products can periodically charge the battery while connected to mains power and run some **functions (3.1.1.1)** from the battery between these charging cycles. This is still considered to be maintenance mode. Not all battery powered products have a maintenance mode.

Note 2 to entry: Maintenance mode can include the display of information or status and **networked standby mode (3.1.2.5)** when connected to a **network (3.1.3.1)**. This **mode (3.1.2.1)** is focusing on the state of the **main battery (3.1.4.4)** and is independent from other **functions (3.1.1.1)** present.

**3.1.3 Network-related terms and definitions****3.1.3.1****network**

communication infrastructure with a topology of links, an architecture, including the physical components, organisational principles, communication procedures and formats (protocols)

Note 1 to entry: A network can include connections that use layers in the Open Systems Interconnection (OSI) model such as WiFi (IEEE 802.11 [4]) and wired networks (IEEE 802.3 [5]) as well as other types of two way digital data links that possibly do not use all OSI layers or IP addresses such as HDMI® (CEC), Bluetooth®, USB and DVI. A network does not normally include any form of one way communication (for example from an infrared remote control) or broadcast signal (the exception being the [emergency warning & alert function \(3.1.1.12\)](#)).

### 3.1.3.2

#### **networked equipment**

equipment that can connect to a [network \(3.1.3.1\)](#) and has one or more [network ports \(3.1.3.5\)](#)

### 3.1.3.3

#### **edge equipment**

[networked equipment \(3.1.3.2\)](#) that can interact with a [network \(3.1.3.1\)](#) or other products and that does not have, as its [primary function \(3.1.1.2\)](#), the passing of [network \(3.1.3.1\)](#) traffic to provide a [network \(3.1.3.1\)](#)

Note 1 to entry: Examples of edge equipment are given in IEC 63474:2026, Annex C.

Note 2 to entry: Some edge equipment can provide some [network \(3.1.3.1\)](#) functions found in [interconnecting equipment \(3.1.3.4\)](#) in addition to their [primary function \(3.1.1.2\)](#).

### 3.1.3.4

#### **interconnecting equipment**

high network availability equipment

[networked equipment \(3.1.3.2\)](#) that has, as its [primary function \(3.1.1.2\)](#), the passing of network traffic to provide a [network \(3.1.3.1\)](#)

Note 1 to entry: Examples of [interconnecting equipment \(3.1.3.4\)](#) are given in IEC 63474:2026, Annex C.

### 3.1.3.5

#### **network port**

wired or wireless physical interface of the [network \(3.1.3.1\)](#) connection located on the product

Note 1 to entry: International Electrotechnical Vocabulary (IEC 60050-701:1988/AMD2 [6], 701-02-10) defines "port (of a network)" as: "a termination through which signals can enter or leave a network".

Note 2 to entry: The broadcast receiver interface of DAB+ radio receivers with EWF is regarded as a network port for the purposes of this document.

### 3.1.3.6

#### **physical network port**

physical (hardware) medium of a [network port \(3.1.3.5\)](#)

Note 1 to entry: A physical network port can consist of multiple [logical network ports \(3.1.3.7\)](#).

Note 2 to entry: A physical network port can host two or more [network \(3.1.3.1\)](#) technologies.

### 3.1.3.7

#### **logical network port**

[network \(3.1.3.1\)](#) technology running over a [physical network port \(3.1.3.6\)](#)

### 3.1.3.8

#### **reactivation network port**

[network port \(3.1.3.5\)](#) through which the product can receive a [remote reactivation trigger \(3.1.3.9\)](#)

Note 1 to entry: Reactivation is remotely initiated by a signal that comes from outside the equipment via a [network \(3.1.3.1\)](#).

### 3.1.3.9

#### **remote reactivation trigger**

externally initiated signal received via a [network \(3.1.3.1\)](#) connection that brings the [networked equipment \(3.1.3.2\)](#) into a different [mode \(3.1.2.1\)](#) providing additional [functions \(3.1.1.1\)](#)