

INTERNATIONAL STANDARD



Audio, video, and related equipment – Determination of power consumption – Part 1: General



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International Standard IEC 62087-1 has been prepared by technical area 12: AV energy efficiency and smart grid applications, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This first edition of IEC 62087-1 together with IEC 62087-2 to IEC 62087-6 cancels and replaces IEC 62087:2011 in its entirety. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to Clauses 1 to 5 of IEC 62087:2011.

- It includes new information about operation modes.
- Equipment that includes removable main batteries are now considered.
- Light measuring equipment is now specified.

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

FDIS	Report on voting
100/2466/FDIS	100/2496/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.

A list of all parts in the IEC 62087 series, published under the general title *Audio, video, and related equipment – Determination of power consumption*, can be found on the IEC website.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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- withdrawn,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
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INTRODUCTION

The IEC 62087 series specifies the general conditions and procedure for determining the power consumption of audio, video and related equipment. The specific conditions and procedures for specific types of equipment are specified in IEC 62087-3 to IEC 62087-6. IEC 62087-2 specifies signals and media that may be required to determine the power consumption of some types of equipment.

IEC 62087:2008¹ added methods for determining the On (average) mode power consumption of televisions, based on three video signal sets. These include static, dynamic broadcast-content, and Internet-content signals.

IEC 62087:2011² revised methods for determining the power consumption of set top boxes.

The IEC 62087 series separates IEC 62087 into parts, including this general part which specifies the common conditions and procedures and adds new information about operating modes.

IEC 62087 has been subdivided and currently consists of the following planned or published parts:

- Part 1: General
- Part 2: Signals and media
- Part 3: Television sets
- Part 4: Video recording equipment
- Part 5: Set top boxes
- Part 6: Audio equipment

¹ IEC 62087:2008, *Methods of measurement for the power consumption of audio, video and related equipment*

² IEC 62087:2011, *Methods of measurement for the power consumption of audio, video and related equipment*

AUDIO, VIDEO, AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

Part 1: General

1 Scope

This part of IEC 62087 specifies the general requirements for the determination of power consumption of audio, video, and related equipment. Requirements for specific types of equipment are specified in additional parts of this series of standards and may supersede the requirements specified in this standard.

Moreover, this part of IEC 62087 defines the different modes of operation which are relevant for determining power consumption.

This standard is only applicable for equipment which can be powered by an external power source. Equipment that includes a non-removable main battery is not covered by this standard. Equipment may include any number of auxiliary batteries.

In order to assess compliance of a specific model of equipment with the declared value, an example verification procedure is provided.

The measuring conditions in this standard represent the normal use of the equipment and may differ from specific conditions, for example as specified in safety standards.

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 62301:2011, *Household electrical appliances – Measurement of standby power*

IEC 62542:2013, *Environmental standardization for electrical and electronic products and systems – Glossary of terms*

3 Terms, definitions, and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62542:2013, Clause 5, as well as the following apply.

3.1.1

automatic brightness control

feature that senses ambient light conditions and changes display luminance accordingly, possibly reducing power consumption

3.1.2**auxiliary battery**

power storage device that is not capable of powering equipment such that the equipment can provide its primary functions

Note 1 to entry: Memory retention and remote control batteries are examples of auxiliary batteries.

3.1.3**illuminance**

photometric measure of the total luminous flux incident on a surface, per unit area

Note 1 to entry: Illuminance is expressed in lux (lx).

3.1.4**luminance**

photometric measure of the luminous intensity per unit area of light traveling in a given direction

Note 1 to entry: Luminance is expressed in units of candelas per square meter (cd/m^2).

3.1.5**main battery**

power storage device capable of powering equipment such that the equipment can provide its primary functions

3.1.6**model of equipment**

specific design of a product

3.1.7**type of equipment**

class of equipment providing the same main functions

EXAMPLES TV, STB, video recorder.

3.1.8**unit of equipment**

single instance of a model of equipment

3.1.9**unit under test****UUT**

specific unit of equipment subjected to a test

3.2 Abbreviations

ABC Automatic Brightness Control

LMD Luminance Measuring Device

UUT Unit Under Test

4 Specification of operating modes and functions

Table 1 specifies the general operating modes and functions for equipment covered by this standard. More specific information about modes and functions may exist in the equipment-specific parts of this series of standards.

For all modes, main batteries shall be removed for the duration of the measurement procedure as directed in 5.1.1.1.

Table 1 – General operating modes and functions

Power	Mode	Sub-mode	Function(s)	Functional description
0 W	Disconnected	Disconnected	– Disconnected from external power sources and main batteries	The equipment is disconnected or galvanically isolated from all external power sources and main batteries.
≥0 W	Off	Off	– Off	The equipment is connected to an external power source and provides no functions that depend on an external power source. The equipment cannot be switched into any other mode with the remote control unit, or an external or internal signal. Note that some power may be consumed if an EMC filter or other components exist on the source side of the power switch.
>0 W	Partial On	Standby-passive	– Wake on • remote control • internal signal	The equipment is connected to an external power source and does not provide its primary functions. The equipment can be switched into another mode with the remote control unit or an internal signal, but not with an external signal.
		Standby-active, low	– Wake on • remote control • internal signal • external signal	The equipment is connected to an external power source and does not provide its primary functions. The equipment can be switched into another mode with the remote control unit, an internal signal, or an external signal.
		Standby-active, high	– Wake on • remote control • internal signal • external signal – Data communications	The equipment is connected to an external power source and does not provide its primary functions. The equipment can be switched into another mode with the remote control unit, an internal signal, or an external signal. Additionally, the equipment is exchanging/receiving data with/from an external source but not as part of a primary function.
	On	Operation	– Operation	The equipment is connected to an external power source and provides its primary functions.

NOTE The operating modes introduced in Table 1 describe the general framework of operating modes applied in this standard. They may be further differentiated for specific types of equipment in the other parts of IEC 62087. The equipment-specific parts of this series of standards do not necessarily describe determination of power consumption for all modes, sub-modes, and functions shown in Table 1.

5 General method

5.1 General conditions

5.1.1 Power source

5.1.1.1 Main battery connection

If the UUT includes a removable main battery, it shall be disconnected and galvanically isolated for the duration of the measurement procedure, unless directed otherwise by another part of this series of standards.

5.1.1.2 External power supplies

Equipment supplied by the manufacturer with an external power supply shall be connected to that external power supply during the measuring procedures.

5.1.1.3 Mains power

For equipment powered by the mains, the equipment shall be powered using the declared voltage and frequency of the region.

The voltage and frequency of the power source shall be reported.

NOTE Annex B provides additional information regarding electricity supplies.

5.1.1.4 Power from other than the mains

For equipment powered by a means other than the mains, the equipment shall be powered at the voltage and frequency as specified by the manufacturer.

The voltage and frequency of the power source shall be reported.

5.1.1.5 Power source, On mode

In On mode, the following requirements apply:

The fluctuation of the voltage supplied shall not exceed ± 2 %. The frequency fluctuation and the harmonic components of the supplied power shall not exceed ± 2 % and 5 % respectively.

5.1.1.6 Power source, Partial On and Off modes

In the Partial On and Off modes, the following requirements apply:

The test voltage shall be the declared voltage ± 1 % and the test frequency shall be the rated frequency ± 1 %. Where a number of models of equipment are being tested and compared for use in the same country, the declared voltage ± 1 % and declared frequency ± 1 % may be used for all tests. Where the test voltage and frequency are not defined by an external standard, the test voltage and the test frequency shall be the declared voltage and the declared frequency of the country for which the power consumption is being determined ± 1 %.

The total harmonic content of the source voltage when supplying the UUT 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 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.

NOTE 1 Annex B provides additional information regarding electricity supplies.

NOTE 2 A stabilized power supply may be required to meet these requirements.

5.1.2 Environmental conditions

The ambient temperature of the test room shall be $23\text{ °C} \pm 5\text{ °C}$, unless otherwise specified in this series of standards. The ambient temperature shall be reported.

5.1.3 Adjustment of controls

The controls not specifically mentioned in this part or other parts of IEC 62087 shall be in the position adjusted by the manufacturer for shipment to the end user. These controls shall remain in this state for the duration of the test unless otherwise directed.

5.1.4 Input signals

For equipment for which the input signals are not explicitly described in this standard, the signals as specified by the manufacturer shall be applied during the test. The input signals used shall be reported.

5.1.5 Power measuring instrument

The measurement shall be carried out directly by means of a wattmeter, a wattmeter with averaging function, or a watthour meter by dividing the reading by the measuring time. If the power consumption is expected to vary over time, such as in the case of a television set displaying a dynamic signal, a watthour meter or a wattmeter with an averaging function shall be used to carry out the measurement.

The sampling rate of the watthour meter or wattmeter with averaging function shall be high enough to achieve an accurate measurement. The manufacturer's specification shall be used to determine the appropriateness of the meter and suitable sampling rates to perform a measurement with the required accuracy.

The power measuring instrument used shall measure the real power consumed regardless of the power factor of the UUT.

In the case of Partial On mode power measurement, it should be ascertained that the wattmeter or the watthour meter is suitable to measure the power consumption of power supplies working in a burst mode with a low duty cycle and the low power consumption levels in the Partial On mode.

For digital power meters a sampling rate of at least 10 kHz is recommended. ("Sampling rate" in many specifications refers to how often the display is updated, and not the actual sampling frequency of the input waveform.) Most digital power meters are believed to meet this requirement. If it is not listed in the manufacturer's specifications, contact the manufacturer.

5.1.6 Measurement uncertainty

Measurements of power of 0,5 W or greater shall be made with an uncertainty of less than or equal to 2 % at the 95 % confidence level. Measurements of power of less than 0,5 W shall be made with an uncertainty of less than or equal to 0,01 W at the 95 % confidence level. The power measuring instrument shall have a resolution of:

- 0,01 W or better for power measurements of 10 W or less;
- 0,1 W or better for power measurements of greater than 10 W up to 100 W;
- 1 W or better for power measurements of greater than 100 W.

For equipment connected to more than one phase, the power measuring instrument shall be equipped to measure the total power of all phases connected.

NOTE For more information about the determination of uncertainty of measurement, refer to IEC 62301:2011, Annex D.

5.1.7 Luminance measuring device

When directed to measure display luminance a luminance measuring device (LMD), which may be of either the contact or non-contact type, shall be used. The LMD shall have an

acceptance (or measuring) angle in the range of 1° to 3°, inclusive. For contact LMDs, the measuring area shall have a diameter of 25 mm or more.

The LMD shall have an accuracy of $\pm 2\% \pm 2$ digits of the digitally displayed value or better.

5.1.8 Illuminance measuring instrument

When directed to illuminate one or more ABC sensors, an illuminance measuring instrument shall be used to adjust the light level to the specified value.

The illuminance measuring instrument shall have an accuracy of $\pm 2\% \pm 2$ digits or better.

5.2 General measuring procedure

The following measuring procedure shall be used, unless otherwise specified in other parts of this series of standards.

Measure the power consumption of the UUT at a time not less than 15 min after it has been switched into the relevant operating mode.

If the power consumption in a certain operating mode has more than one stable level, the measuring time shall be of an appropriate duration to measure the correct average value.

Some models of equipment switch, after a time delay, from a Partial On mode to a mode with a lower (or zero) power consumption. The power consumption before and after the switching occurs shall be determined.

For types of equipment with less functionality than described in the respective parts of IEC 62087, for example playback tape equipment, only the relevant parts of the measuring conditions have to be considered.

The results that are related to power consumption shall be given in watts (W), with a number of relevant digits in accordance with the accuracy of the measurement.

6 Determination of power consumption, Off mode

Power consumption in the Off mode shall be determined as specified in IEC 62301:2011.

NOTE IEC 62301:2011 cites "Off mode" in clauses 1, 3.5, and 5.2, Clause A.2, Table A.1, and Annex C. Additional clauses of IEC 62301:2011 also apply to determining the power consumption in Off mode.

7 Verification procedure

The verification procedure in Annex A may be used to assess compliance of a specific model of equipment with the declared value.

Annex A (informative)

Verification procedure

A.1 General

Assesses compliance of a specific model of equipment with the declared value.

A.2 Verification procedure

To assess compliance of a specific model of equipment with the declared value, the verification procedure of Figure A.1 may be used.

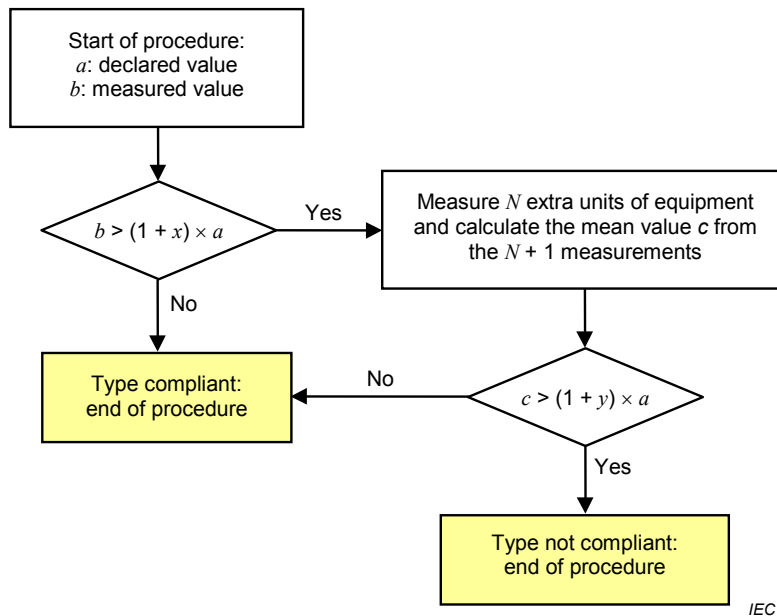


Figure A.1 – Flowchart, verification procedure

The verification procedure is a two-step approach: the measured value of one unit of equipment should not exceed the declared value by x %. If it does, N extra units of equipment are measured and the average value of the $N + 1$ measurements is calculated. This average value should not exceed the declared value by y %.

The average value should be calculated as follows:

$$P_M = 1/(N + 1) \sum_{i=1}^{(N+1)} P_{mi}$$

where

P_{mi} is the power consumption of measurement i ;

P_M is the average power consumption of $N + 1$ measurements.

EXAMPLE Reasonable values for x might be 15 % (0,15), for y might be 10 % (0,10) and for N might be 3.

NOTE Specific or diverging requirements for the verification procedure may be set by local regulations.

Annex B (informative)

Electricity supplies

The electricity supplies for some regions are listed in Table B.1.

Table B.1 – Typical declared electricity supplies for some regions

Country/Region	Declared voltage ^a and frequency
Europe	230 V, 50 Hz
North America	115 V, 60 Hz
Japan ^b	100 V, 50/60 Hz
China	220 V, 50 Hz
Republic of Korea	220 V, 60 Hz
Australia and New Zealand	230 V, 50 Hz
^a Values are for single phase only.	
^b 50 Hz is applicable for the Eastern part; 60 Hz is applicable for the Western part.	

Bibliography

IEC 62087 (all parts), *Audio, video, and related equipment – Determination of power consumption*

IEC 62087-2, *Audio, video, and related equipment – Determination of power consumption – Part 2: Signals and media*

IEC 62087-3, *Audio, video, and related equipment – Determination of power consumption – Part 3: Television sets*

IEC 62087-4, *Audio, video, and related equipment – Determination of power consumption – Part 4: Video recording equipment*

IEC 62087-5, *Audio, video, and related equipment – Determination of power consumption – Part 5: Set top boxes*

IEC 62087-6, *Audio, video, and related equipment – Determination of power consumption – Part 6: Audio equipment*

EN 50564:2011, *Electrical and electronic household and office equipment – Measurement of low power consumption*

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