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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Audio, video, and related equipment – Methods of measurement for power consumption
Part 7: Computer monitors

Appareils audio, vidéo et matériel connexe – Méthodes de mesure de la consommation de puissance
Partie 7: Moniteurs d'ordinateurs

IEC 62087-7:2018-12(en-fr)

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FOREWORD

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International Standard IEC 62087-7 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.

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

CDV	Report on voting
100/2916/CDV	100/2988/RVC

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

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

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

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

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- withdrawn,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

INTRODUCTION

This part of IEC 62087 specifies methods of measurement for the power consumption of computer monitors for use with computers. The test method includes power measurement using static patterns and both the broadcast and web-based dynamic test loops.

The test method also includes testing with the automatic brightness control (ABC) function where it is incorporated into a computer monitor.

The test method has also been made consistent with the test method for televisions in IEC 62087-3.

AUDIO, VIDEO, AND RELATED EQUIPMENT – METHODS OF MEASUREMENT FOR POWER CONSUMPTION

Part 7: Computer monitors

1 Scope

This part of IEC 62087 specifies the determination of the power consumption of computer monitors including, but is not limited to, those with CRT, LCD, PDP or OLED technologies. Computer monitors that include touch screen functionality are included in the scope of this document. This document is limited to computer monitors that are powered from a main power source other than a battery. Computer monitors that are powered from a battery source are not covered by this document. However mains-powered computer monitors may include any number of auxiliary batteries.

Computer monitors connected by digital inputs such as DisplayPort, HDMI, DVI, or by analogue VGA input, are considered in this document. This document does not apply to network- and wirelessly connected computer monitors.

A computer monitor is a display device that does not include a TV tuner and is intended to be used to display the video signals from a computer. These video signals are produced from software programs that are operating within the computer and can consist of static and moving images. As such, test procedures using static patterns, dynamic video and web-based video are specified.

The test methods specified in this document can be applied to computer monitors of any size, however, this document is not applicable to specialized monitors associated with medical equipment, publishing and other professional, commercial or industrial uses.

The various modes of operation that are relevant for measuring power consumption are also defined.

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

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 62087-1, *Audio, video, and related equipment – Determination of power consumption – Part 1: General*

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

IEC 62301, *Household electrical appliances – Measurement of standby power*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62087-1 and the following apply.

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

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

3.1.1
ND filter
neutral density filter
optical device that reduces the light intensity in the visible wavelength region

3.1.2
computer monitor
product for the display of data, visual and video signals from a computer

3.1.3
default picture setting
picture setting as set by the manufacturer for computer monitors

3.1.4
special functions
functions that are related to, but not required for, the basic operation of the device

Note 1 to entry: Examples of special functions include, but are not limited to, special sound processing, power saving functions (e.g. automatic brightness control), cameras, motion sensors and microphones.

3.2 Abbreviated terms

AV	audio-visual
ABC	automatic brightness control
CRT	cathode ray tube
DVI	Digital Visual Interface
LCD	liquid crystal display
LMD	luminance measuring device
ND	neutral density
OLED	organic light-emitting diode
PDP	plasma display panel
SCR	silicon controlled rectifier
UUT	unit under test
VGA	Video Graphics Array

4 Specification of operating modes and functions

4.1 General

Table 1 contains the operating modes and functions for computer monitors.

4.2 Auto power down function

An auto power down feature may be implemented on a computer monitor to power down into a standby mode after a predetermined time and possibly predetermined conditions. Such a feature should be referred to as "auto power down".

Table 1 – Operating modes and functions

Power	Mode	Sub-mode	Function(s)	Description
0 W	Disconnected	Disconnected	Disconnect from power source	The equipment is disconnected from all external power sources.
≥0 W	Off	Off	Off	The equipment is connected to an external power source and provides no functions that depend on a 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.
	On	Operation	Operation	The computer monitor is connected to an external power source and provides pictures and, if possible, sound.

5 Measurement conditions

5.1 General

Clause 5 specifies requirements that are independent of the equipment to be evaluated. When setting up a test laboratory, these requirements shall be taken into account.

The requirements in Clause 5 apply to the procedures specified in Clause 6.

5.2 Power supply

Defined in IEC 62087-1:2015, 5.1.1.

5.3 Environmental conditions

Defined in IEC 62087-1:2015, 5.1.2.

5.4 Ambient light conditions

For determining on-mode power consumption for computer monitors with ABC enabled, ≤ 1 lux shall be confirmed at the surface of the ABC sensor assembly with the light sources (5.7, 5.8) off and the UUT in the off or disconnected mode.

For determining the peak luminance ratio with a non-contact LMD, ≤ 5 lux shall be confirmed at the nominal centre of the display area of the UUT in the off or disconnected mode. This requirement applies whether or not a light source (5.8) is applied to disable the ABC feature.

A dark room and/or shroud may be necessary in order to achieve the required ambient light conditions.

5.5 Measuring equipment

5.5.1 Power measuring instrument

Defined in IEC 62087-1:2015, 5.1.5.

5.5.2 Luminance measuring device

Defined in IEC 62087-1:2015, 5.1.6.

5.5.3 Illuminance measuring instrument

Defined in IEC 62087-1:2015, 5.1.7.

5.6 Signal generation

5.6.1 Equipment

Defined in IEC 62087-2:2015, 6.1.

5.6.2 Interfaces

Defined in IEC 62087-2:2015, 6.2.

5.6.3 Accuracy

Defined in IEC 62087-2:2015, 6.3.

5.7 Light source for specific illuminance levels

The light source used for illuminating the ABC sensor to specific illuminance levels shall use a dimmable halogen lamp in a sealed reflector and shall have a diameter of 120 mm or less. The rated correlated colour temperature shall be 2 800 K ± 300 K at its rated voltage. The front surface of the lamp shall be clear (i.e. not coloured or coated with a spectrum modifying material) and may be smooth or granular. The lamp assembly shall not modify the spectrum of the halogen source, including the IR and UV bands.

For luminance levels below 10 lux, a 2-stop ND filter (3.1.1) shall be used. No ND filter shall be used for luminance levels at or above 10 lux. The ND filter shall be of the absorptive type and shall be large enough to cover the entire light acceptance area of the ABC sensor assembly with a margin of at least 5 mm on all sides. The ND filter shall have an average transmission of 25 % ± 2,5 % within the visible range, which is 400 nm to 700 nm, without selectively absorbing light at specific wavelengths.

Specific illuminance levels shall be obtained by controlling the voltage and/or duty cycle to the above light source.

The model of the lamp used for illuminating the ABC sensor to specific illuminance levels shall be recorded.

Some lighting controllers, such as those with SCR-based circuits, can introduce current spikes into the power source. Such controllers should be avoided or otherwise isolated from the power source for the UUT.

5.8 Light source for disabling the ABC feature

The light source used for disabling the ABC feature shall use a dimmable halogen lamp in a sealed reflector and shall have a diameter of 120 mm or less. The rated correlated colour temperature shall be 2 800 K ± 300 K at its rated voltage. The front surface of the lamp shall be clear (i.e. not coloured or coated with a spectrum modifying material) and may have a smooth or granular front surface. The lamp assembly shall not modify the spectrum of the halogen source, including the IR and UV bands. The light source shall be capable of providing 300 lux or greater when applied directly to the ABC sensor assembly.

The model of the lamp used for disabling the ABC feature shall be recorded.

5.9 Picture controls

5.9.1 Manufacturer's settings

Where manufacturer’s settings are specified in the measurement procedure, the controls 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.

5.9.2 Static test pattern settings

Without changing any of the manufacturer’s settings, the computer monitor shall display a test pattern that contains a 100 % white window covering 80 % of the screen. The luminance of the window shall be measured and recorded. The brightness shall then be adjusted until the window of the screen is set at the luminance specified in Table 2 for the appropriate resolution.

Table 2 – Luminance levels for specified MP resolutions

Product	cd/m^2
Less than or equal to 1,1 × 10^6 pixel resolution	175
Greater than 1,1 × 10^6 pixel resolution	200

If the display's maximum luminance is less than the prescribed luminance in the table above, the maximum luminance shall be used. Similarly, if the display's minimum luminance is greater than the prescribed luminance, the minimum luminance shall be used. The luminance used for power measurement shall be reported in the test report.

6 Procedure

6.1 Order of activities

The following order of activities is recommended (also represented in Figure 1):

- preparation (Subclause 6.2);
- initial activities (Subclause 6.3);
- determination of power consumption, on mode (Subclause 6.4);
- determination of power factor (Subclause 6.5);
- determination of power consumption, partial on mode (Subclause 6.6);
- determination of power consumption, off mode (Subclause 6.7).

The above order is chosen to ensure proper stabilization prior to the taking of each measurement. The order may be varied as needed; however, the stabilization process prior to the taking of each measurement shall effectively be the same as if the recommended order had been followed.

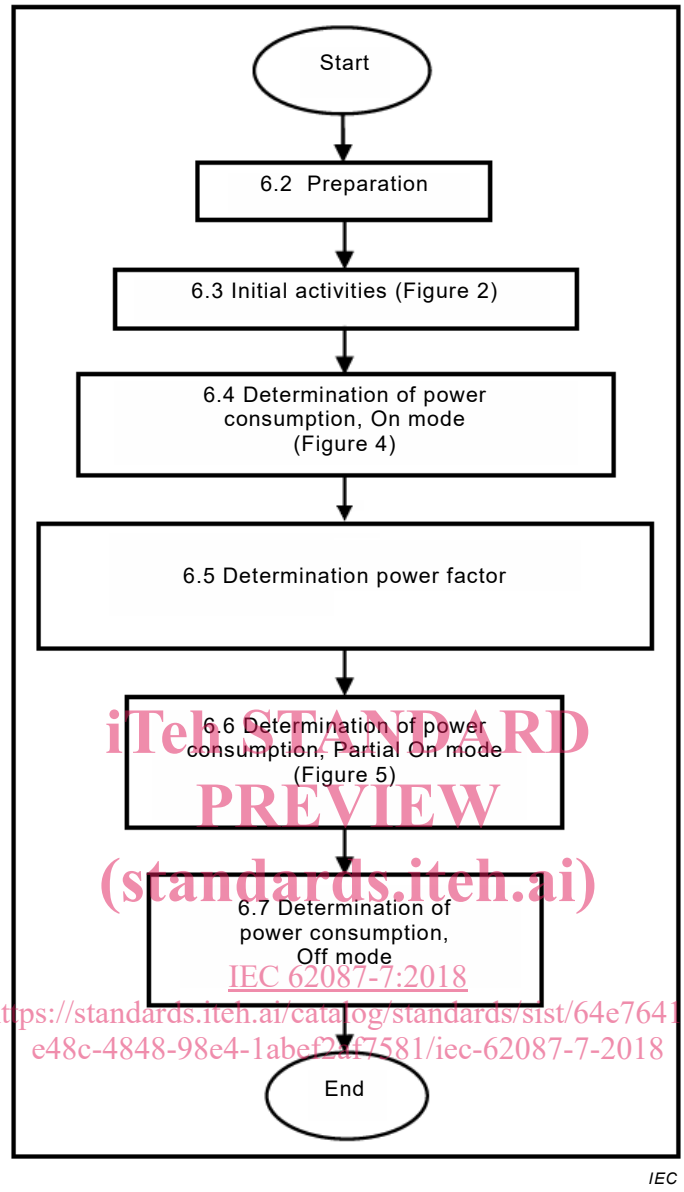

Figure 1 – Recommended order of activities

6.2 Preparation

6.2.1 Measuring plan

Before the UUT has been installed, a measuring plan should be developed based on the specifications of the UUT and the region in which the results are to be recorded. The measuring plan is based on the decision points in 6.2.2 to 6.2.9. These decision points include:

– power supply voltage and frequency (6.2.2);
– input terminals (6.2.3);
– video signal, On mode power consumption procedure (6.2.4);
– video format (6.2.6);
– automatic brightness control capabilities (6.2.7).

After these decisions have been made, the following activities can be expected to be deterministic.