

**Information technology equipment — Computer
monitor — Minimum Energy Performance
Standards (MEPS)**

Part 2

Test methods

DKS 2879-2:2019

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Information technology equipment — computer monitors — Minimum Energy Performance Standards (MEPS)

Part 2

Test methods

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Foreword

This Standard was prepared by the Technical Committee 98 WG on Sustainability for and by ICT, under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards.

This standard provides designers, manufacturers, exporters, test laboratories, regulators and users of computers with a test method to assess the energy efficiency of computer monitors.

This series consists of two parts under the general title, **Information Technology — Minimum Energy Performance Standards (MEPS) — Computer Monitors**

Part 1 — Performance and Energy Label Requirements

Part 2 — Test Methods

During the preparation of this standard, reference was made to the following documents:

- i) ENERGY STAR® Program Requirements Product Specification for Computers-Eligibility Criteria Version 7.0 ENERGY STAR Computer Specification
- ii) ENERGY STAR Program Requirements for Displays (Sep 2015)
- iii) EU 75 Ecodesign (2010) Ecodesign requirements for computers and computer servers

Acknowledgement is hereby made for the assistance derived from these sources.

Information technology — Minimum Energy Performance Standards (MEPS) — Computer monitor

Part 1 — Test methods

1. Scope and application

1.1 Scope

This Standard specifies methods to measure computer monitor power consumption to determine compliance with the Minimum Energy Performance Standards (MEPS) requirements for computer monitors specified in Part 3 of this series of Standards. This standard has been developed as an energy performance measuring standard for computer monitors and can be used for purposes other than determining MEPS compliance.

1.2 Exclusions

Exclusion of equipment is covered in Part 3 of this Standards.

2. Normative references

The following documents are referred to in this Standard:

- i) **Part 3** of this Kenya standards
- ii) **KS IEC 62087-1**, Audio, video, and related equipment – Determination of power consumption – Part 1: General
- iii) **KS IEC 62087-2**, Audio, video, and related equipment – Determination of power consumption – Part 2: Signals and media
- iv) **KS IEC 62301**, Household electrical appliances – Measurement of standby power

3. Terms and definitions

For the purposes of this standard, the following definitions shall apply:

Additionally, 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

Automatic brightness control (ABC)

A feature that adjusts the brightness of the computer monitor according to the illuminance level where it is being used.

3.2

Computer monitor

a commercially-available product with a display screen and associated electronics, often encased in a single housing, that as its primary function displays visual information from a computer, workstation or server via one or more inputs, such as VGA, DVI, HDMI, or IEEE 1394, or through a wireless connection

EXAMPLES liquid crystal display (LCD), light emitting diode (LED), cathode-ray tube (CRT) and plasma display panel (PDP).

3.3

EUT

Equipment Under Test

refers to the monitor being tested

3.4

off mode

The operational mode of a computer monitor that is

- a) connected to a power source;
- b) engaged by a physical power switch; and
- c) not providing any function

3.5

on mode

The operational mode of a computer monitor that is-

- a) Connected to a power source;
- b) Has all mechanical (hard) power switches turned on; and
- c) Is performing its primary function of producing an image.

3.6

standby active (sleep) mode

The operational modes of a computer monitor that

- a) Is connected to a power source;
- b) Has all mechanical (hard) power switches turned on; and
- c) Has been placed into a low-power mode by receiving a signal from an externally connected device (e.g. computer, game console, or set-top box) or by cause of an internal function such as a sleep timer or occupancy sensor.

4. Measuring conditions

4.1 General measuring conditions

4.1.1 Power measurements

- i) Power measurements shall be performed according to Annex A of this standard. On mode power measurements shall be rounded to one decimal place.
- ii) Off mode and standby active mode power measurements shall be rounded to two decimal places. The input on the computer monitor to which the video test signal is applied shall be specified in the test report.
- iii) The test voltage and frequency shall be 230V and 50Hz respectively.
- iv) For a computer monitor that is powered by an external power supply (EPS), the computer monitor shall be tested with the supplied EPS.
- v) The power measurements and other related measurements required by this Standard are those of the combination of the computer and the external power supply (EPS). In addition, the EPS shall comply with (refer to reference std on EPS)

4.1.2 Power supply

- i) Measurements shall be carried using a power supply providing 230V r.m.s at 50Hz, which is the nominal voltage and frequency used in Kenya.
- ii) The voltage and frequency used during the power measurement shall be described in the report (Annex B).
- iii) An a.c. reference source shall be used to provide input voltage to the EUT. The input test voltage to the EUT shall be 230V a.c. $\pm 2\%$ at $50\text{Hz} \pm 1\%$

4.1.3 Environmental conditions

The ambient temperature shall be $23 \pm 5^\circ\text{C}$. the ambient temperature shall be described in the report (appendix A).

4.1.4 Adjustment controls

The controls not specifically mentioned in this Standard 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.

4.1.5 Input signals

For equipment for which the input signals are not explicitly described in this Standard, the nominal signals specified by the manufacturer shall be applied during the test. The input signals used shall be described in the report (appendix A)

4.1.6 Power measurements instrument

4.1.6.1 The average power measurement shall be carried out by measuring the energy consumption in a specified mode for a specific duration using an electric energy watt hour (Whr) meter and calculating the mode respective average power consumption using formulae in section Annex A.

4.1.6.2 The sampling rate of the watthour meter should be high enough to achieve an accurate measurement.

4.1.6.3 The energy measurement instrument used shall measure the actual energy consumed regardless of the power factor of the EUT.

4.1.6.4 Measurements of power of 0.5 W or greater shall be made with an uncertainty of less of less than or equal to 2% at the 95% confidence level. Measurements of power of less than 1 W shall be made with an uncertainty of less than or equal to 0.01 W at the 95% confidence level.

4.1.6.5 The energy measurement instrument shall have a resolution of:

- a) 0.02 Whr or better for energy measurements of 10 Whr or less;
- b) 0.2 Whr or better for energy measurements of greater than 10 Whr up to 100 Whr ; or
- c) 1 W or better for power measurements of greater than 100 Whr

Note1 to entry: In case of standby mode power measurement, it should be ascertained that 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 standby modes.

Note 2 to entry: For digital power meters a sampling rate of at least 10 kHz is recommended. ('Sampling rate' in many specifications refers to how often the computer monitor is updated, and not the actual sampling frequency of the input waveform.) Most digital power meters are believed to meet this specification. If it not listed in the manufacturer's specifications, contact the manufacturer.

Note 3 to entry: For more information about the determination of uncertainty of measurement, refer to KS IEC 62301:2005, Annex D.

4.2 General measurements procedures

4.2.1 Rounding

Unless otherwise stated, numbers shall be rounded and recorded to four significant figures in accordance with KS EAS 124:1999, Rounding off numerical values.

4.2.2 Stabilization

- i) The measurements shall be performed after the computer monitor has achieved a stable condition with respect to power consumption.
- ii) To achieve stabilization, the measurements shall be made after the computer monitor has been in the off or disconnected mode for a minimum of one hour immediately followed by a minimum of one hour in the on mode and shall be completed before a maximum of three hours in the on mode.
- iii) The relevant video signal shall be displayed on the computer monitored during the entire on mode duration.
- iv) For computer monitors that are known to stabilize within one hour, these durations may be reduced if the resulting measurement can be shown to be within 2% of the results that would otherwise be achieved using the durations described herein.
- v) For standby active low mode, power on all test equipment and properly adjust operation range then allow the computer monitor to remain in standby active low mode until stable power readings are measured.
- vi) Measurements are considered stable once the wattage reading does not vary more than 1% over a three-minute period.

4.2.3 Procedure

Unless otherwise specified in this Standard, the procedure shall be as follows:

- i) Measure the power consumption of the applicable at a time not less than 15 minutes after it has been switched into the relevant operating mode.
- ii) If the power consumption in a certain operating mode has more than one stable level, ensure the measuring time is of an appropriate duration to measure the correct average value.
- iii) For appliances that switch, after a time delay, from a standby mode to a mode with a lower (or zero) power consumption, determine the power consumption before and after the switching.
- iv) The results shall be given in watts (W), with a number of relevant digits in accordance with the accuracy of the measurement.

4.3 On (average) mode measuring conditions for computer monitors

4.3.1 Video signals

The average power consumption of the computer monitor shall be tested with the dynamic broadcast-content as supplied and specified in KS IEC 62087, Ed 2.0 or Ed 3.0. the type of signals used during the measurement shall be described in the report (Annex B).

4.3.2 Input terminals

Input terminals shall conform to the requirements below:

- a) **Input terminal selection:** On (average) mode computer monitor power consumption shall be measured with the video test signals applied to one set of input terminals, and that set of input terminals shall be selected as the source for picture generation by the computer monitor. The selected input terminal(s) used during the measurement shall be described in the report (appendix A).
- b) **Accuracy of input signal levels:** Analogue input signals provided by the signal generating device shall be accurate within 2% of the full range of the video signal when terminated with a 75 Ω load.
- c) Digital input signal levels should be accurate within the resolution of the signal source equipment used.

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Annex A (Normative)

Test Methods

A.1 Test method for fixed pixel computer monitors using a static test pattern and without abc enabled by default

A.1.1. On mode power measurement

The procedure shall be as follows:

- i) Connect the EUT to the power source and test equipment. Power on all test equipment and properly adjust power source voltage and frequency.
- ii) Check for normal operation of the EUT and leave all customer adjustments set to factory default settings.
- iii) Turn the EUT on and allow it to reach operating temperature (approximately 20 minutes).
- iv) Set the proper computer monitor mode.

A.1.2. Setting and measuring the luminance levels

- i) A contact luminance meter or a non-contact meter (provided with dark room conditions) shall be used.
- ii) Without changing any 'out of box' condition, a test pattern that contains a 100% window covering 80 % of the screen shall be displayed.
- iii) The luminance of the window shall be measured and reported.
- iv) The brightness shall then be adjusted until the window of the screen is set at the luminance specified in Table A.1 for the appropriate resolution.

Table A.1 — Luminance levels for specified MP resolutions

Product	Cd/m ²
Less than or equal to 1.1 MP resolution	175
Greater than 1.1 MP resolution	200

- v) If the computer monitor's maximum luminance is less than the prescribed luminance in Table 1, the maximum luminance shall be used.
- vi) Similarly, if the computer monitor's minimum luminance is greater than the prescribed luminance, the minimum luminance shall be used.
- vii) The luminance used for power measurement shall be reported in the test report (Annex B).

A.1.3. Measuring the power consumption

Allow the unit to stabilize in accordance with Clause 4.3.2. Measure the average energy used in Whr over a 10 min period. Record this as E_{Meas}

The average power measured P_{Meas} is calculated using the formula:

$$P_{Meas}(W) = E_{Meas} (Whr) \times 6$$

A.2 Test method for fixed pixel computer monitors using a static test pattern and with abc enabled by default

The following test procedure shall be used to calculate maximum on mode power consumption for computer monitors shipped with ABC enabled by default.

- i) For this test procedure, high ambient lighting shall be set at 300 lx, while low ambient lighting shall be at 0 lx, as follows:
- ii) Turn the EUT on and set the ambient light level to 300 lx as measured at the face of the ambient light sensor. Allow the EUT to stabilize as per Clause 4.3.2.
- iii) Make the power measurement as per Clause A.1.3 and designate the results as P_h .
- iv) Set the ambient light level to 0 lx as measured at the face of an ambient light sensor.
- v) Allow the EU to stabilize as per Clause 4.3.2.
- vi) Make the power measurement P_l as per Clause A.1.3 and designate the result as P_l .

A.3 Test method for computer monitors using the dynamic broadcast – content video signal

A.3.1. Picture level adjustments

The contrast and brightness of the computer monitor and the backlight level, if it exists, shall be set as originally adjusted by the manufacturer for the end user.

In the case that a setting mode must be chosen on initial activation, the 'standard mode' or equivalent shall be chosen. In the case that no 'standard mode' or equivalent exists, the first mode listed in the on-screen menu shall be selected. The mode used during the test shall be described in the report.

A.3.2. Video aspect ratio

The computer monitor shall be set in a mode such that the active area of the video input signal fills the entire screen.

A.3.3. On (average) mode testing using dynamic broadcast-content video signal for computer monitors without ABC enabled by default

A.3.3.1 Measurements using dynamic broadcast-content video signal

- i) The duration of the dynamic broadcast – content video signal is used for measuring TV power consumption when the computer monitor is used for viewing typical broadcast TV content.
- ii) The measurement shall be the average power consumed over 10 consecutive minutes.
- iii) The dynamic broadcast-content video signal shall be used for stabilization and measurement and shall be generated from one of the video content sources available from the KS IEC in a format compatible with the input under test. (See KS IEC 62087, Ed.2.0 (2008) video content_DVD_50 through KS IEC 62087, Ed. 2.0. (2008) video content _BD.)
- iv) The duration of the video signal is 10 minutes.

A.3.3.2 $P_{0_broadcast}$: On (average) mode power consumption using dynamic broadcast – content video signal

The average energy consumption shall be measured over a 10-minute period using the dynamic broadcast content test signal. Record this as $P_{0_broadcast}$.

A.3.4. On (average) mode testing using dynamic broadcast - content video signal for computer monitors with ABC enabled by default

- i) Set the ambient light level to at least 300 lx measured at the face of an ambient light sensor.
- ii) Measure the high ambient lighting on mode power consumption, P_h , as described in Clause A.3.3.2.
- iii) Set the ambient light level to 0 lx as measured at the face of an ambient light sensor.

- iv) Measure the low ambient lighting on mode power consumption, P_1 , as described in Clause **A.3.3.2**.

A.4 Standby and off mode

A.4.1. Standby active mode (power switch on, no video signal)

- i) The EUT shall be placed in standby mode by removing the video signal.
- ii) The method of adjustment be documented along with the sequence of events required to reach the standby mode.
- iii) When the EUT is stable as per Clause **4.3.2** record the energy used in watthours for a 10-minute period and record this measurement as $E_{\text{Standby_Wh}}$.
- iv) Using Equation **A.3**, calculate the average power consumed, in Watts, and record this as $P_{\text{Standby_Avg}}$.

$$P_{\text{Standby_Avg}} = E_{\text{Standby_Wh}} \times 6$$

- v) If the device has different standby modes that can be manually selected, the measurement shall be taken with the device in the most energy consumptive of those modes.
- vi) If the modes are cycled through automatically, the measurement time should be long enough to obtain a true average that includes all modes.

A.4.2. Off mode (power switch off) standby mode

Turn the monitor off using the on/off switch on the monitor. The method of adjustment shall be documented along with the sequence of events required to reach the off mode.

When the EUT is stable as per Clause **4.3.2**, record the energy in watthours used for a 10-minute period and record this measurement as $E_{\text{Off_Meas}}$.

Using Equation **A.3.4**, calculate the average power consumed, in watts, and record this as $P_{\text{Off_Avg}}$.

$$P_{\text{Off_Avg}} = E_{\text{Off_Meas}} \times 6$$

Annex B

Sample test report

(normative)

Test report number/code _____

LABORATORY INFORMATION	
Test laboratory name:	
Test laboratory address:	
Test technician:	
Test laboratory type, e.g. in house, independent:	
Test laboratory accreditation:	
Test Standard used:	
Date of test:	

TEST SETUP AND EQUIPMENT		
A.C. test voltage:		
Ambient temperature		
Test equipment:	Measurement	Calibration date
COMPUTER MONITOR DETAILS		Source
Manufacturer/brand name:		
Computer monitor type:		
Model number:		
Country of Manufacture:		
Date of manufacture (if known):		
Power supply		
Nameplate voltage / voltage range:		
Nameplate frequency / frequency range:		
Laboratory only data		
Serial number:		
P ₀ broadcast : On (average) ABC off		
P _h :On (average) ABC on 300 Lux		
P ₁ : On (average) ABC On 0 Lux		
P _{Meas} (Static Test Patterns) ABC Off		
P _h :On (Static Test Patterns) ABC On 300 Lux		
P ₁ : On (Static Patterns) ABC On 0 Lux		
Active mode power (W):		
Off mode power (W):		