

**Information technology — Learning,
education and training — Computer
hardware intended for eLearning —
Specification**

Part 1.1:

Desktop computer

KS 2416-1.1: 2023

TECHNICAL COMMITTEE REPRESENTATION

The following organizations were represented on the Technical Committee:

Jomo Kenyatta University of Agriculture and Technology — JKUAT
Elimu Holdings Ltd.
Kenya Private Sector Alliance — KEPSA
Commission of University Education
Daystar University
Development Bank Kenya Limited
Esri Easter Africa
Global Open Data for Agriculture and Nutrition — GODAN
ICT Authority
Inable Kenya
Intelligent Technologies
Kenya Industrial Research Institute — KIRDI
Kenya Engineering Technology Registration Board — KETRIB
Kenya National Library services
Maseno University
MTECH Communications
Multimedia University
Nakuru Training Institute
National Industrial Training Institute
Spring Training and Consulting
Sunshine Secondary School
University of Embu
Vision Fund Kenya
Kenya Bureau of Standards — Secretariat

REVISION OF KENYA STANDARDS

In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

© Kenya Bureau of Standards, 2023

Copyright. Users are reminded that by virtue of Section 25 of the Copyright Act, Cap. 12 of 2001 of the Laws of Kenya, copyright subsists in all Kenya Standards and except as provided under Section 26 of this Act, no Kenya Standard produced by Kenya Bureau of Standards may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing from the Managing Director.

Information technology — learning, education and training — Computer hardware intended for eLearning — Specification

Part 1.1: Desktop computer

KENYA BUREAU OF STANDARDS (KEBS)

Head Office: P.O. Box 54974, Nairobi-00200, Tel.: (+254 020) 605490, 602350, Fax: (+254 020) 604031
E-Mail: info@kebs.org, Web: <http://www.kebs.org>

Coast Region

P.O. Box 99376, Mombasa-80100
Tel.: (+254 041) 229563, 230939/40
Fax: (+254 041) 229448

Lake Region

P.O. Box 2949, Kisumu-40100
Tel.: (+254 057) 23549, 22396
Fax: (+254 057) 21814

Rift Valley Region

P.O. Box 2138, Nakuru-20100
Tel.: (+254 051) 210553, 210555

KS 2416-1.1: 2023

Foreword

This Kenya Standard was prepared by the Technical Committee on Information Technology for Learning, Education and Training under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards.

Since early 2020 when the pandemic disrupted learning globally, education systems have rolled out emergency remote learning strategies at an unprecedented scale. Studies have shown that remote learning requires three complementary elements: effective teachers, suitable technology, and engaged learners.

Kenya stands to gain tremendously by fully digitizing its educational system, now and even post Covid-19 crisis. Decision-making at the policy-making level will significantly improve thanks to data analytics capabilities that global tech partners bring to the table

The Digital Literacy Programme (DLP) that has currently earned a brand name “DigiSchool” was borne out of the Government’s vision to equip pupils with relevant skills needed in today’s digital world. It is pertinent that all the target schools be connected to power grid before and quality devices that can last for a long time should be procured and distributed to the schools

Many schools continue to face challenges as they take steps to transform their delivery models to extend and deepen student learning, while integrating use of the technology. Planning for online learning should be closely aligned with its technology infrastructure investments and its school improvement planning process.

As such, KS 2416 is a multi-part standard intended to set minimum requirements for ICT infrastructure intended for learning education and training (eLearning) under the general title, Information Technology — Learning, Education and training —

This part 1.1 of KS 2416 defines the minimum requirements for desktop computers to establish a solid technical platform for efficient delivery. This Second edition of the standard cancels and replaces KS 2416-1.1:2013 that has been technically revised

The following subparts have also been developed to define minimum requirements for computer hardware intended for eLearning:

Part 1.0 — *Terms* and definition

Part 1.1 — Desktop Computers — Specification

Part 1.2 — Laptop Computers — Specification

Part 1.3 — Tablet Computers — Specification

Part 1.4 — Servers — Specification

Part 2 of KS 2416 specifies the minimum requirements for application software intended for on-line learning. Applications software for learning, education and training includes tools and systems that can be used alone or in combination to implement a computer-based learning program

Part 3 of the standard specifies the minimum network requirements to support e-Learning.

KS 2416 Part 4 specifies the minimum requirement for computer peripherals necessary to support the effective use of IT in Learning, Education and Training

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

- i) Non-proprietary performance description of Desktop PCs, Guideline, version 3.4, BITKOM.
- ii) Non-proprietary procurement specifications notebooks, Guideline, version 2.1, BITKOM.
- iii) www.bapco.com

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

Information technology — Learning, education and training — Computer hardware intended for eLearning — Specification

Part 1.1: Desktop computer

1 Scope

1.1 This Kenya Standard specifies the minimum requirement for desktop computer hardware necessary to support the effective use of IT in Learning, Education and Training (IT LET).

It defines the technical requirements for basic hardware devices that any computer-based, web-based or online learning program must implement to establish a solid technical platform for efficient delivery.

1.2 IT LET applies to:

- online and digital teaching and training resources
- social, collaborative and content creation applications
- virtual classrooms and communication tools
- audio and/or video player

1.3 This standard applies to new, used and refurbished computer hardware.

2 Normative references

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

KS 2416-1.0, *Information Technology — Learning education and Training — hardware intended for eLearning — Terms and Definitions*

KS 2416-2, *Information Technology — Learning education and Training — Part 2: Software intended for eLearning*

KS 2416-3, *Information Technology — Learning education and Training — Part 3: Network components to support eLearning*

KS ISO 2382-36, *Information technology — Vocabulary Part 36: Learning, education and training*

KS IEC 60950-1, *Information technology equipment — Safety — Part 1: General requirements*

KS 2880 — *Information technology equipment — Computers — Minimum Energy Performance Standards (MEPS) Part 1: Specification.*

KS 2879 — *Information technology equipment — Minimum Energy Performance Standards — Computer monitors Part 1: Performance and energy rating requirements*

KS ISO IEC IEEE 8802-3 — *Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements Part 3: Standard for Ethernet*

KS 2416-1.1:2013

3 Definitions

For the purposes of this standard, the definitions in part 1.0 of this standard 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>

4 Requirements

4.1 General requirements

All computers shall have the following general requirements:

- 4.1.1** All computers shall have protective hard cover casing free from sharp edges that are likely to cause injury to the user as defined in **Clause 5** of the standard and in **KS IEC 60950 Part 1**.
- 4.1.2** Information on the product's energy consumption and, where applicable, its related energy modes shall be made available in the product user documentation in either printed or electronic form.
- 4.1.3** All used/ refurbished computers shall have warranty of not less than six months and 1 year warranty for new computers.
- 4.1.4** The system shall run genuine operating system software as detailed in Part 2 of this standard.
- 4.1.5** All **refurbished computers** shall have a test certificate as evidence that the system has gone through the same test cycle as a new computer.
- 4.1.6** While the functional specifications aim to act as a guide, it is worth remembering that the inclusion of products and company names does not imply approval by Kenya Bureau of Standards nor does the exclusion imply the reverse.
- 4.1.7** Under normal or overload conditions, no output shall continuously provide more than 240 VA under any conditions of load including output short circuit, per the requirement of **KS ISO IEC 60950**.

4.2 Performance requirements

The following performance benchmarks and industry standards are recommended for reference:

- i) BAPCo_SYSmarmk25_user_guide_v1.1
- ii) NOVABENCH January 2021
- iii) PRIME 95
- iv) PC MARK10

4.3 Functional requirements for desktop computers shall be as defined in Table 1.

Table 1 — Functional specifications for desktop computers

Hardware property	Primary/ elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
Monitor					
Display size	17-inch, LCD Screen,	17-Inch, LCD screen,	17-Inch, LCD screen	17-Inch, LCD screen	These are minimum requirements, however depending on the use case, higher requirements may be preferred
Screen resolution	1024 x 768 pixels	1024 x 768 pixels	1024 x 768 pixels	1024 x 768 pixels	
Graphics Processing Unit (GPU)					
Graphics: PCIe	256 MB onboard	256 MB onboard	256 MB onboard or external	256 MB external	These are minimum requirements, however depending on the use case higher requirements may be preferred
Processor/Central Processing Unit (CPU)					
Standard	x86-architecture	x86-architecture	x86-architecture	x86-architecture	
Main Memory (RAM)					
Memory Size	2 x 1 GB RAM	4 GB RAM	4GB	8 GB	<ul style="list-style-type: none"> ▪ To avoid performance hits, make sure that both memory banks are populated symmetrically.

KS 2416-1.1: 2023

Hardware property	Primary/ elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
Technology	SDRAM	SDRAM	SDRAM	SDRAM	<ul style="list-style-type: none"> At present a clock speed of 677/800 MHz is standard for DDR 2 and 1066/1333 MHz for DDR 3. As the use of 4 GB or more only makes sense with 64-Bit operating systems, an extension to 3 GB is sufficient for performance reasons on 32-bit
Storage, hard disk /secondary memory					
Size/ Capacity	250 GB	500 GB	500 GB	1 TB	<ul style="list-style-type: none"> The higher the cache size (4, 8, 16, or 32MB) per disk the higher the data transfer rate.
Motherboard					
Form factor	ATX/BTX (To match case)	ATX/BTX (To match case)	ATX/BTX (To match case)	ATX/BTX (To match case)	<ul style="list-style-type: none"> Choice of a form factor not only determines the size of the PC, but also the number of internal slots available for extension cards. PCIe x16 slot should be available for graphics cards as a minimum.

Hardware property	Primary/ elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
Input/output devices					
Key board	Qwerty, 6-feet cable USB 2.0 connector	Qwerty, 6-feet cable USB 2.0 connector	Qwerty, 6-feet cable, USB 2.0 connector,	Qwerty, 6-feet cable USB 2.0 connector	
Mouse	Optical sensor; controller inbuilt USB 2.0 connector 3-button (including scroll)	Optical sensor; controller inbuilt USB 2.0 connector 3-button (including scroll)	Optical sensor; controller inbuilt USB 2.0 connector 3-button (including scroll)	Optical sensor; controller inbuilt USB 2.0 connector 3-button (including scroll)	
Network connection					
Gigabit Ethernet	10/100	10/100/1000	10/100/1000	10/100/1000	<ul style="list-style-type: none"> ▪ KS ISO IEC IEEE 8802-3 Standard for Ethernet
Interface	RJ 45/ PCIe onboard	RJ 45/ PCIe onboard	RJ 45/ PCIe onboard	RJ 45/ PCIe onboard	
Power supply					
Form factor	ATX or higher (To match case)	ATX or higher (To match case)	ATX or higher (To match case)	ATX or higher (To match case)	<ul style="list-style-type: none"> ▪ Sufficiently dimensioned for full extensibility
Voltage mains side	220/230 v; 50 Hz	220/230 v; 50 Hz	220/230 v; 50 Hz	220/230 v; 50 Hz	<ul style="list-style-type: none"> ▪ Active PFC (Power Form Correction Factor)

KS 2416-1.1: 2023

Hardware property	Primary/ elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
Energy Efficiency	<ul style="list-style-type: none"> KS 2880 — Information technology equipment — Computers — Minimum Energy Performance Standards (MEPS) Part 1: Specification. KS 2879 — Information technology equipment — Minimum Energy Performance Standards — Computer monitors Part 1: Performance and energy rating 				<ul style="list-style-type: none"> This requirement conforms to Energy Star 5.0.
Power plug	KS EAS 495-1:2008	KS EAS 495-1:2008	KS EAS 495-1:2008	KS EAS 495-1:2008	KS EAS 495-1:2008 is the East African standard for power plugs
Interfaces (External I/O Ports)					
USB	6 x USB 2.0	6 x USB 2.0	4 x USB 2.0 1 x USB 3.0	4 x USB 2.0 1 x USB 3.0	<ul style="list-style-type: none"> USB 2.0 interfaces (should be available at the front and rear of the machine), of which at least 6 recommended
Graphics interface	VGA/DVI	VGA/DVI	DVI/HDMI	DVI/HDMI	<ul style="list-style-type: none"> At least one digital graphics interface (DVI, HDMI or Display-Port). There are DVI-I and DVI-D. DVI-I combines a DVI_D plus a VGA interface. VGA or alternative adapter, if you want be continuing to use older displays

Hardware property	Primary/ elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
Sound	1 Audio Out port, 1 MIC-In port	1 Audio Out port, 1 MIC-In port	1 Audio Out port, 1 MIC-In port	1 Audio Out port, 1 MIC-In port	Optional interfaces depending on individual requirements and security requirements: <ul style="list-style-type: none"> ▪ Parallel (old plotters/printers) ▪ PS/2 ▪ Serial port (e.g., plotter) ▪ Bluetooth ▪ Firewire
Case/chassis					
Form factor	ATX/BTX	ATX/BTX	ATX/BTX	ATX/BTX	<ul style="list-style-type: none"> ▪ Industry standards include Mini, Midi, Maxi Tower; Desktop ATX; BTX; ITX ▪ The form factor depends on the workplace where the computer is to be deployed. Tower cases are more suitable for deployment under the desk, and desktops for deployment on the desk. ▪ Make sure not to choose too small cases if you intend to use add-on cards or drives

5 Recycling and disposal of obsolete equipment

When ICT equipment reaches its end-of-life it may be reused, refurbished, recycled or disposed of. Obsolete equipment shall be recycled or disposed of in the following ways:

5.1 In accordance with standards, laws and regulations specified by the Kenya Government. This may include guidelines provided by the National Environmental Management Authority (NEMA) and any other applicable regulations.

5.2 Through asset management and recovery programs within the institution.

5.3 By contacting your computer supplier or retailer and request information on their recycling schemes, leasing and take back option

PUBLIC REVIEW DRAFT 2023

PUBLIC REVIEW DRAFT 2023