

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

Part 1.2:  
**Laptop computer**

## KS 2416-1.2:2023

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## 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 1.2 of KS 2416 defines the minimum requirements for laptop computers to establish a solid technical platform for efficient delivery. This Second edition of the standard cancels and replaces KS 2416-1.2:2013 that has been technically revised

The following subparts have 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](http://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 1.2:

## Laptop computer

### 1 Scope

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

It defines the technical requirements for basic hardware devices (e.g., monitors, processors, RAM, hard disks etc.) that any computer-based, web-based or online learning program must implement to establish a solid technical platform for efficient delivery.

4.2 IT LET applies to:

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

4.3 This standard applies to both new 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 2416-2, *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 2382-1, *Information technology — Vocabulary Part 1: Fundamental terms*

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*

ISO IEC 11889, *Information technology -- Trusted Platform Module*

KS EAS 495-1:2008, *13 A plugs, socket-outlets, adaptors and connection units - Part 1: Specification for rewirable and non-rewirable 13 A fused plugs.*

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## 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 to the user. 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 all components have been tested; defective or substandard parts are replaced, and the system has gone through basically the same test cycle as a new computer.

**4.1.6** There shall be evidence that the equipment less than 4 years old.

**4.1.7** 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.

**4.1.8** 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 standard are recommended for reference:

- i) BAPCo\_SYSmarm25\_user\_guide\_v1.1
- ii) NOVABENCH January 2021
- iii) PRIME 95
- iv) PC MARK10

### 4.3 Functional requirements

Functional specifications for laptop computers shall be as defined in Table 1 and Table 2.

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

**Table 1 — Requirements for new laptop/notebook computers**

	Hardware property	Primary/ Elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
	<b>Display</b>					
<b>4.3.1</b>	<b>Display size in inches</b>	14" or less	14" or less	14"– 15.6"	14"– 15.6"	<ul style="list-style-type: none"> <li>▪ <b>Non-glare display</b></li> <li>▪ The higher the native (i.e., actual, physical) resolution, the smaller the display (font size, icons, etc.).</li> <li>▪ Also note that displays can only be run optimally at their native resolution. Changing the resolution entails loss of display quality. (This cannot be compensated for by changing the font size).</li> <li>▪ The combination of luminosity, contrast and dependency on the angle of view is more important than exact compliance of measured values.</li> </ul>
<b>4.3.2</b>	<b>Display resolution</b>	WXGA 1280 x 800 to HD (1366 x 768)	WXGA 1280 x 800 to HD (1366 x 768)	WXGA 1280 x 800 to HD (1366 x 768) at 15" optional higher resolution	WXGA 1280 x 800 to HD (1366 x 768) at 15" optional higher resolution	
<b>4.3.3</b>	<b>Contrast</b>	200:1	200:1	200:1	200:1	
<b>4.3.4</b>	<b>Luminosity (cd/m<sup>2</sup>)</b>	200	200	200	200	

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	<b>Hardware property</b>	<b>Primary/ Elementary</b>	<b>Secondary</b>	<b>Higher learning</b>	<b>Advanced higher learning</b>	<b>Recommendations</b>
<b>4.3.5</b>	<b>Weight in kg</b>	Max 2	Max 2	14": Max. 2,5 kg 15": Max. 3 kg	14": Max. 2,5 kg 15": Max. 3 kg	
<b>Graphic accelerator, Graphics Processing Unit (GPU)</b>						
<b>4.3.6</b>	<b>Graphics: PCIe</b>	<ul style="list-style-type: none"> <li>▪ 256 MB integrated or shared RAM</li> <li>▪ DirectX 10.1 support</li> </ul>	<ul style="list-style-type: none"> <li>▪ 256 MB integrated,,</li> <li>▪ DirectX 10.1 support</li> <li>▪ 256 MB (shared RAM).</li> </ul>	<ul style="list-style-type: none"> <li>▪ 256 MB integrated,,</li> <li>▪ 256 MB (shared RAM).</li> </ul>	<ul style="list-style-type: none"> <li>▪ 256 MB integrated</li> <li>▪ DirectX 10.1 support</li> <li style="text-align: center;">or</li> <li>▪ discrete 512 MB and graphics card with PCI Express (16-line bus width)</li> </ul>	Graphics resolution for external displays: must be compliant to the VESA specification.
<b>Main Memory</b>						
<b>4.3.7</b>	<b>Memory size (RAM)</b>	2 GB	4GB	4 GB	8 GB	<ul style="list-style-type: none"> <li>▪ 32-BIT OSs are only able to address up to 3 GB RAM. In order to use more than 3 GB RAM a 64-BIT OS must be used.</li> </ul>



	Hardware property	Primary/Elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
4.3.8	Technology	SODIMM	SODIMM	SODIMM	SODIMM	<ul style="list-style-type: none"> <li>Use of 1 x 2 GB to be able to upgrade by 1 GB to a maximum of 3 GB without de-installation of memory.</li> </ul>
<b>Storage, Hard Disk /Secondary memory</b>						
4.3.9	Size/ Capacity	500 GB	500 GB	1TB	1 TB	<ul style="list-style-type: none"> <li>Hard disks are currently offered with the following rotational speeds:                             <ul style="list-style-type: none"> <li>5400U/min (Standard)</li> <li>7200U/min</li> </ul> </li> <li>A higher speed (with the same capacity)</li> </ul>
4.3.10	Hard Drive Interface	SATA	SATA	SATA	SATA	
<b>Optical Drives</b>						
4.3.11	SATA Interface	Optional DVD Multi Norm Burning Device	Optional DVD Multi Norm Burning Device	DVD Multi Norm. Burning Device	DVD Multi Norm. Burning Device	<ul style="list-style-type: none"> <li>All internal drive types are currently connected via SATA.</li> <li>Optical drives are being offered as:</li> </ul>
<b>Network Interface</b>						

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	Hardware property	Primary/ Elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
4.3.12	Network connection	10/100 WLAN/Bluetooth/ Ethernet	10/100 WLAN/Bluetooth/Ether net	10/100/1000 WLAN/Bluetooth/ether net	10/100/1000 WLAN/Bluetooth/Ether net	<ul style="list-style-type: none"> <li>▪ Optional given to safety requirements:                             <ul style="list-style-type: none"> <li>– WLAN IEEE 801.11 a/b/g/n</li> <li>– UMTS integrated or as plug-in module. Watch out for provider dependencies!</li> <li>– Bluetooth 2.1</li> </ul> </li> <li>▪ It should be possible to disable wireless communications interfaces by means of mechanical keys or switches.</li> <li>▪ The notebook should support “Wake on LAN” (WOL) and Pre-boot Execution Environment (PXE) (network boot capability).</li> </ul>
4.3.13	connectors	RJ 45/ PCIe integrated/	RJ 45/ PCIe integrated	RJ 45/ PCIe integrated	RJ 45/ PCIe integrated	
<b>Interfaces (External I/O Ports)</b>						
4.3.14	USB	3 x USB 2.0	3 x USB 2.0	3 x USB 2.0 1 x USB 3.0	3 x USB 2.0 1 x USB 3.0	<ul style="list-style-type: none"> <li>▪ Possible interfaces:                             <ul style="list-style-type: none"> <li>– USB – 2.0 (up to 4)</li> <li>– Graphics: There is DVI-I und DVI-D.</li> </ul> </li> </ul>

	Hardware property	Primary/Elementary	Secondary	Higher learning	Advanced higher learning	Recommendations
4.3.15	Graphics	VGA or digital interface	VGA analogue At least 1 digital interface (DVI, HDMI or Display port)	VGA analogue At least 1 digital interface (DVI, HDMI or Display port)	VGA analogue At least 1 digital interface (DVI, HDMI or Display port)	The DVI-I interface is a combination of a (digital) DVI-D interface and an (analogous) VGA interface.
4.3.16	Firewire	optional	optional	optional	FireWire 800 or thunder bolt or USB 3.0	<ul style="list-style-type: none"> <li>The above-mentioned individual requirements can be implemented by means of adapters, port replicators or docking stations.</li> </ul>
4.3.17	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	
<b>Power</b>						
4.3.18	Power supply	Mains side 220-240 V; 50-60 Hz	Mains side 220-240 V; 50-60 Hz	Mains side 220-240 V 50-60 Hz	Mains side 220-240 V; 50-60 Hz	<ul style="list-style-type: none"> <li>Battery charging times depend on the power supply's maximum performance.</li> </ul>
4.3.19	Power plug	KS EAS 495-1:2008				<ul style="list-style-type: none"> <li>During operations, a battery that is almost empty should be charged to ~ 90% of its maximum capacity within 3 hours.</li> </ul>
4.3.20	Energy Efficiency	<p><b>KS 2880</b> — Information technology equipment — Computers — Minimum Energy Performance Standards (MEPS) Part 1: Specification.</p> <p><b>KS 2879</b> — Information technology equipment — Minimum Energy Performance Standards — Computer monitors Part 1: Performance and energy rating requirements</p>				<ul style="list-style-type: none"> <li>Identical power supplies for docking station and direct connection are recommended.</li> </ul>

4.4 Additional requirements for lower primary education

Table 2 — Additional requirements for Primary education

SI no.	Property	Specification	Test method and recommendations
4.4.1	Durability	i) easy-to-clean and dust dustproof ii) Durable chassis	<b>Drop test</b> when dropped from a minimum height of 70 cm no part of the laptop shall break or come dismantled
4.4.2	Keyboard damage	i) Liquid-resistant keyboard, ii) the keyboard shall be easily replaceable when damaged	i) <b>Spill proof-test</b> When a minimum of 50 mL of water is poured onto the keyboard, functionality of the laptop shall not be reduced i.e., computer should respond to keystrokes normally and there should be no electrical short circuiting i.e., sparks and burning smell ii) <b>Key board durability</b> Keys should be designed in such a way that they cannot be easily removed e.g., by scratching the keyboard
4.4.3	Mobility	It shall have a carrying case and built-in handle	The handle shall be made of durable material
4.4.4	Ergonomics	Keyboard shall be ergonomically designed for young learners	Keys spread a bit farther apart allowing for easy movement and touch between keys
4.4.5	Device security	TPM Hardware-based theft deterrent	The device should provide for a trusted platform module (TPM) security function as defined in KS ISO IEC 11889
4.4.6	OS & Software	It shall have suitable genuine software intended for learning, Education and training	As specified in Part 2 of this Kenya Standard, KS 2416- 2

5 Recycling and disposal of obsolete equipment

When ICT equipment reaches its end-of-life it 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

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