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Information technology — User interfaces — Accessibility of personal computer hardware

Technologies de l'information — Interfaces utilisateur — Accessibilité matérielle des ordinateurs personnels

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 29136 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 35, *User interfaces*.

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Introduction

With the progress of the information society, personal computers have become a necessary tool for many people in their daily life. A wide range of people, regardless of their ages, physique, physical ability or disability, use personal computers throughout their life, i.e. at home, in school, in the workplace, and in public places. This International Standard provides guidance to improve information accessibility for older persons and persons with disabilities (including temporary disabilities) when they use personal computers.

The guidelines in this International Standard use the following approach.

- When planning, developing, designing, and distributing personal computers, this International Standard can be referenced to improve accessibility for older persons and persons with disabilities.

- If the required degree of accessibility cannot be provided by a default configuration of a personal computer, such accessibility might be attained by using the product in combination with additional software, optional equipment and/or assistive technology.

This International Standard elaborates on hardware-related guidance provided in ISO/IEC Guide 71:2001, *Guidelines for standards developers to address the needs of older persons and persons with disabilities*, ISO 9241-20:2008, *Ergonomics of human-system interaction — Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services*, and ISO/IEC TR 29138-1, *Information technology — Accessibility considerations for people with disabilities — Part 1: User needs summary*. The hardware guidance in this International Standard can be used in combination with ISO 9241-171:2008, *Ergonomics of human-system interaction — Part 171: Guidance on software accessibility*.

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Information technology — User interfaces — Accessibility of personal computer hardware

1 Scope

This International Standard provides requirements and recommendations for the accessibility of personal computer hardware, to be used when planning, developing, designing and distributing these computers.

Some requirements or recommendations in this International Standard require software support.

While this International Standard does not cover the behaviour of, or requirements for, assistive technologies, it does address connectivity of assistive technologies as an integrated component of interactive systems.

Requirements and recommendations that solely focus on software are not included in this International Standard.

NOTE 1 Requirements and recommendations for software accessibility are specified in ISO 9241-171.

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NOTE 2 High level requirements and recommendations for information and communication technology (ICT) accessibility are specified in ISO 9241-20.

NOTE 3 Requirements and recommendations for office equipment accessibility, including printers, scanners and copiers, are specified in ISO/IEC 10779[2].

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2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 9241-20:2008, *Ergonomics of human-system interaction — Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services*

ISO 9241-171:2008, *Ergonomics of human-system interaction — Part 171: Guidance on software accessibility*

ISO 9241-410:2008, *Ergonomics of human-system interaction — Part 410: Design criteria for physical input devices*

ISO/IEC 9995-1, *Information technology — Keyboard layouts for text and office systems — Part 1: General principles governing keyboard layouts*

ISO/IEC 13066-1, *Information technology — Interoperability with assistive technology (AT) — Part 1: Requirements and recommendations for interoperability*

ISO/IEC 24786:2009, *Information technology — User interfaces — Accessible user interface for accessibility settings*

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3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
accessibility
〈interactive system〉 usability of a product, service, environment or facility by people within the widest range of capabilities

[ISO 9241-20:2008, definition 3.1]

NOTE 1 The concept of accessibility addresses the full range of user capabilities and is not limited to users who are formally recognized as having disability.

NOTE 2 The usability-oriented concept of accessibility aims to achieve levels of effectiveness, efficiency and satisfaction that are as high as possible considering the specified context of use, while paying attention to the full range of capabilities within the user population.

3.2
assistive technology
AT
hardware or software, added to or incorporated within a system, which increases accessibility for an individual

[ISO 9241-20:2008, definition 3.2]

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3.3
control
〈hardware〉 physical actuator which controls the operations of the personal computer or any function thereof

NOTE 1 There are various types of hardware controls, including multi-position controls, power on/off switches and toggle controls.

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NOTE 2 A key is a specialized type of control which often involves software to achieve its purpose.

3.4
keyguard
rigid cover with holes for guiding a finger to the intended keys

NOTE Keyguards prevent the unwanted striking of keys.

3.5
personal computer
microcomputer primarily intended for stand-alone use by an individual

[ISO/IEC 2382-1:1993]

3.6
reset
initialize a main processor and restart a personal computer to a known state

3.7
usability
extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

[ISO 9241-11:1998, definition 3.1]

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4 Conformance

4.1 Applying the requirements

This International Standard contains requirements and recommendations for a variety of personal computer hardware.

All requirements in Clauses 5 – 9 shall be implemented.

4.2 Applying the recommendations

Individual recommendations in Clauses 5 - 9 shall be evaluated for their applicability to the particular product.

4.3 Evaluation of products

If a product is claimed to conform to this International Standard then the procedures used to establish the product's requirements (as identified in Clauses 4.1 and 4.2), and to evaluate the product based on these requirements, shall be specified. The level of detail of the specification is a matter of negotiation between the involved parties.

5 General requirements

5.1 Requirements related to ICT

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ISO 9241-20 shall be complied with for hardware issues relating to personal computers.

5.2 Requirements related to software

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ISO 9241-171 and ISO/IEC 24786 shall be complied with for issues relating to the use of software to configure and control hardware features of personal computers.

5.3 Requirements related to interoperability with assistive technologies

ISO/IEC 13066-1 shall be complied with for issues relating to personal computer hardware interoperability with assistive technologies.

5.4 Avoidance of erroneous operations and support of easy operations

5.4.1 Stability of computer cases

The pressing of buttons should not cause the computer case to topple or to slip on typical surfaces where they are intended to be used.

NOTE Clause 6.1.2 b) specifies forces for pressing buttons.

5.4.2 Positions of on/off controls

a) A control to turn on/off should be located away from other controls in order to reduce the possibility of accidental activation.

b) A control to turn the device on/off should be placed in a position where it is easy to locate and activate but not to activate accidentially.

EXAMPLE In a desktop computer the on/off control is positioned in the front of the computer case.

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5.4.3 Operation of a latch

If a personal computer has a latch, the associated task (e.g. performing an operation while the latch is open) should be operable with one hand.

EXAMPLE A notebook has a latch that is used to remove the battery. This latch and the battery are designed to enable the user to remove the battery using only one hand.

5.4.4 Operation on covers and flaps

a) If personal computer hardware has a cover or a flap, it should be operable with one hand to open and close.

b) If personal computer hardware has a cover or a flap for a control, it should be designed to allow users to access the control easily.

NOTE A user may access the control with the stick holding in a mouth.

EXAMPLE The flap has many ridges to prevent slipping.

5.5 Functionality provided as hardware support

5.5.1 Turning on/off

a) A control to turn on/off shall be independent from other operations except a reset operation.

b) A control to turn on/off should be easily recognizable both visually and tactilely.

NOTE 1 ISO 24503 provides the information about tactile discernable controls, either by their shape or by tactile symbols or Braille dots. [3]

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c) A control to turn on/off should be a push-button.

NOTE 2 Push-button controls assist those with reduced motor control and those using head or mouth sticks or other alternative pointing devices.

d) The response to pushing a control to turn off should be configurable by the user.

EXAMPLE The user is given the option of choosing between two possibilities for turning off the computer. It can be a short press of the turn off button or a hold and press action on the same button. The second option is useful to make sure that the user really intends to turn off the computer.

e) The on/off status should be discernible by visual, aural and tactile means.

f) The user should be able to configure the personal computer to emit a visual, tactile or aural signal when the personal computer has started and the keyboard is ready to accept input.

g) If on/off control is provided from the keyboard, it should be located in a position where it is unlikely to be accidentally activated.

5.5.2 Resetting a PC

a) A reset control shall be provided to return the computer to a known state.

NOTE 1 In many cases, a reset control and an on/off control is the same control.

b) The reset button should be a push-button control.

c) The activation time following of the reset control should be configurable.

NOTE 2 This can help to avoid accidental resets, by changing the duration to a value that is long enough to ensure that the reset was pushed intentionally.

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d) A reset control should be separate from the on/off control.

EXAMPLE The on/off switch is only used for turning the computer on and off, and is not used for initiating a system reset.

NOTE 3 Although the reset control can be the same as the on/off control, it is preferable that these controls are separate in order to minimize accidental activation.

5.5.3 Consideration for consumable items

a) User replaceable consumable items (e.g. batteries) should be able to be replaced with one hand.

EXAMPLE The battery of a laptop is fixed by two latches at the right and left sides of the computer. These latches remain in the “open” or “close” state when the user slides them so the user can replace the battery using only one hand.

b) The replacement should not require movements that need tight grasping, twisting the wrist or precision gripping.

5.6 Using readable labels

a) Large (e.g. 14 point), and high-contrast (e.g. greater than 3:1) should be used.

NOTE 1 This allows users with low vision or reduced vision to more easily read the lettering.

NOTE 2 As described in ISO TR 22411:2008, Annex C, clause C.3, a font size of 14 points is the estimated minimum legible font size for text of a luminosity of 100 cd/m^2, when read by a person aged 68, and at a viewing distance of 0,5 m. [4]

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NOTE 3 For calculating colour contrast, see the definitions of “contrast ratio” and “relative luminance” provided in the Web Content Accessibility Guidelines 2.0, from the World Wide Web Consortium. [5]

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b) Sans-serif lettering should be used.

NOTE 4 As described in ISO TR 22411:2008, 8.6.3, a sans-serif font can increase accessibility because there will not be enough dots or pixels to render the serifs clearly. [4]

c) Text should not be overlaid upon images.

d) The labels which are essential for operating a personal computer (e.g. power switch label) should include text or symbols.

e) Tactilely distinct symbols for controls, connectors, and legends should be used.

NOTE 5 Raised symbols allow users who are blind to easily discern an item's label by touch. They also enable users to identify a component located out of view (e.g. on the back of a personal computer).

NOTE 6 Optional Braille and tactile labels enable users who are blind to customize labels.

5.7 Connection

5.7.1 Interface specification for input/output devices

A personal computer should use industry standard interfaces for supporting various types of input/output devices and AT devices.

NOTE 1 There are various types of connections, including USB, IEEE1394, Bluetooth, etc.

NOTE 2 Using standard interface specifications enables the connection of alternative input/output devices, and consequently the range of available devices to the user will be increased.

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NOTE 3 Some users with sensory or cognitive disabilities, problems with language, reading, or writing, use sign language or Braille or some other means of expression. To help such users, connection to various types of software or devices used for converting and expressing language can be provided. For instance, although voice output is often used for visually-impaired users, it is also possible to convert the same content into Braille and to output it to a Braille display. Finger-Braille devices are useful for users who are deaf-blind.

5.7.2 Connectors

a) Connectors that are frequently plugged in and/or pulled out should be able to be handled with one hand.

b) Locations, colour scheme contrast and shapes of connectors that are frequently plugged in and/or pulled out should be designed for clear distinction, easy handling and prevention of inadvertent operation.

EXAMPLE A wheelchair user easily plugs in and/or pulls out the cable used to connect a printer to a personal computer, because that connector is located on the front surface.

NOTE 1 The correct orientation of a connector is easily distinguished by visual and tactile means.

NOTE 2 It is difficult to physically distinguish between sides of connectors with regular (e.g. rectangular, circular) sides (e.g. USB connectors are rectangular but have a specific orientation which might not be determined by touching their outside).

c) Misinsertion blocking should be provided.

NOTE 3 Blocking assists all users as a memory aid, but it especially helps those with low vision or cognitive impairments who might forget or misinterpret how to insert connectors.

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d) The force to connect and disconnect cables and other devices should not exceed 22,2 Newtons.

NOTE 4 Users with reduced muscular strength, paralysis, tremor and involuntary movement of hands might find it difficult to connect peripheral devices.

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e) Cables and their corresponding connections should be tactilely and visually distinguishable.

5.7.3 Audio port

a) An external output port for connecting an earphone or a headphone shall be provided.

b) The output from a loudspeaker of main body of a personal computer should be disabled when the external output port connects to an earphone or a headphone.

c) Audio input ports and audio output ports should be clearly distinguishable.

d) Audio input ports and audio output ports should be 3,5 mm (1/8 inch) in diameter.

e) Audio input ports and audio output ports should have a funnel-shaped surround (which makes it easier for a blind person to guide the headphone jack into the receptacle).

f) Audio input and output ports should be tactilely distinguishable.

NOTE 1 The graphical symbol for headphone is defined by IEC 60417 clause 5077. [6]

NOTE 2 The graphical symbol for microphone is defined by IEC 60417 clause 5913.

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