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**Ergonomics of human-system  
interaction —**

**Part 171:  
Guidance on software accessibility**

*Ergonomie de l'interaction homme-système —*

*Partie 171: Lignes directrices relatives à l'accessibilité aux logiciels*  
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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member 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 shall not be held responsible for identifying any or all such patent rights.

ISO 9241-171 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

This first edition of ISO 9241-171 cancels and replaces ISO/TS 16071:2003, of which it constitutes a technical revision.

ISO 9241 consists of the following parts, under the general title *Ergonomic requirements for office work with visual display terminals (VDTs)*:

- Part 1: General introduction
- Part 2: Guidance on task requirements
- Part 3: Visual display requirements
- Part 4: Keyboard requirements
- Part 5: Workstation layout and postural requirements
- Part 6: Guidance on the work environment
- Part 7: Requirements for display with reflections
- Part 8: Requirements for displayed colours
- Part 9: Requirements for non-keyboard input devices
- Part 11: Guidance on usability
- Part 12: Presentation of information
- Part 13: User guidance
- Part 14: Menu dialogues
- Part 15: Command dialogues

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- Part 16: Direct manipulation dialogues
- Part 17: Form filling dialogues

Guidance on software individualization and human-centred design process for interactive systems are to form the subjects of future parts 129 and 210.

ISO 9241 also consists of the following parts, under the general title *Ergonomics of human-system interaction*:

- Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services
- Part 110: Dialogue principles
- Part 151: Guidance on World Wide Web user interfaces
- Part 171: Guidance on software accessibility
- Part 300: Introduction to electronic visual display requirements
- Part 302: Terminology for electronic visual displays
- Part 303: Requirements for electronic visual displays
- Part 304: User performance test methods
- Part 305: Optical laboratory test methods for electronic visual displays
- Part 306: Field assessment methods for electronic visual displays
- Part 307: Analysis and compliance test methods for electronic visual displays
- Part 308: Surface-conduction electron-emitter displays (SED) [Technical Report]
- Part 309: Organic light-emitting diode (OLED) displays [Technical Report]
- Part 400: Principles and requirements for physical input devices
- Part 410: Design criteria for physical input devices
- Part 920: Guidance on tactile and haptic interactions

Framework for tactile and haptic interaction is to form the subject of a future part 910.

## Introduction

The purpose of this part of ISO 9241 is to provide guidance on the design of the software of interactive systems so that those systems achieve as high a level of accessibility as possible. Designing human-system interactions to increase accessibility promotes increased effectiveness, efficiency and satisfaction for people having a wide variety of capabilities and preferences. Accessibility is therefore strongly related to the concept of usability (see ISO 9241-11).

The most important approaches to increasing the accessibility of a human-system interface are

- adopting a human-centred approach to design (see ISO 13407),
- following a context-based design process,
- providing the capacity for individualization (see ISO 9241-110), and
- offering individualized user instruction and training.

It is important to incorporate accessibility goals and features into the design as early as possible, when it is relatively inexpensive compared to the cost of modifying products to make them accessible once they have been designed. As well as providing guidance for achieving that, this part of ISO 9241 addresses the increasing need to consider social and legislative demands for ensuring accessibility by the removal of barriers that prevent people from participating in life activities such as the use of environments, services, products and information.

This part of ISO 9241 is applicable to software that forms part of interactive systems used in the home, in leisure activities, in public situations and at work. Requirements and/or recommendations are provided for system design, appearance and behaviour, as well as specific accessibility issues, thereby complementing International Standards ISO 9241-11, ISO 9241-12, ISO 9241-13, ISO 9241-14, ISO 9241-15, ISO 9241-16 and ISO 9241-17, ISO 9241-110 and ISO 14915, as well as reflecting the goals outlined in ISO Guide 71<sup>[60]</sup>. Conforming with the aforementioned International Standard is also important if the goal of accessibility is to be achieved.

NOTE 1 While the requirements and recommendations of this part of ISO 9241 are generally applicable to all software application domains, additional detailed guidance on the accessibility of Web content (including Web applications) is available from the Web Content Accessibility Guidelines (WCAG)<sup>[53]</sup>.

This part of ISO 9241 is based on the current understanding of the characteristics of individuals who have particular physical, sensory and/or cognitive impairments. However, accessibility is an issue that affects many groups of people. The intended users of interactive systems are consumers or professionals — people at home, at school, engineers, clerks, salespersons, Web designers, etc. The individuals in such target groups vary significantly as regards physical, sensory and cognitive abilities and each target group will include people with different abilities. Thus, people with disabilities do not form a specific group that can be separated out and then disregarded. The differences in capabilities can arise from a variety of factors that serve to limit the capability to engage in the activities of daily living, and are a “universal human experience”<sup>[50]</sup>. Therefore, accessibility addresses a widely defined group of users including

- people with physical, sensory and cognitive impairments present at birth or acquired during life,
- elderly people who can benefit from new products and services but who experience reduced physical, sensory and cognitive capacities,
- people with temporary disabilities, such as a person with a broken arm or someone who has forgotten his/her glasses, and
- people who experience difficulties in particular situations, such as a person who works in a noisy environment or has both hands occupied by other activities.

When designing and evaluating interactive systems there are other terms that are often associated with accessibility. In Europe, the expression *design for all* or, in North America, *universal design* [9], address the goal of enabling maximum access to the maximum number and diversity of users, irrespective of their skill level, language, culture, environment or disability. This does not mean that every product will be usable by every consumer. There will always be a minority of people with severe or multiple disabilities who will need adaptations or specialized products. Accessibility as defined in this part of ISO 9241 emphasizes the goals of maximizing the number of users and striving to increase the level of usability that these users experience.

This part of ISO 9241 recognizes that some users of software will need assistive technologies in order to use a system. In the concept of designing software to be accessible, this includes the capability of a system to provide connections to, and enable successful integration with, assistive technologies, in order to increase the number of people who will be able to use the interactive system. Guidance is provided on designing software that integrates as effectively as possible with common assistive technologies. It is important to note that accessibility can be provided by a combination of both software and hardware controlled by software. Assistive technologies typically provide specialized input and output capabilities not provided by the system. Software examples include on-screen keyboards that replace physical keyboards, screen-magnification software that allows users to view their screens at various levels of magnification, and screen-reading software that allows blind users to navigate through applications, determine the state of controls, and read text via text-to-speech conversion. Hardware examples include head-mounted pointing devices instead of mice and Braille output devices instead of a video display. There are many others. When users employ add-on assistive software and/or hardware, usability is enhanced to the extent that systems and applications integrate with those technologies. For this reason, platforms (including operating systems) must provide programming services to allow software to operate effectively with add-on assistive software and hardware as specified in this part of ISO 9241. If systems do not provide support for assistive technologies, the probability increases that users will encounter problems with compatibility, performance and usability.

This part of ISO 9241 serves the following types of users:

- designers of user-interface development tools and style guides to be used by interface designers;
- user-interface designers, who will apply the guidance during the development process;
- developers, who will apply the guidance during the design and implementation of system functionality;
- those responsible for implementing solutions to meet end-user needs;
- buyers, who will reference this part of ISO 9241 during product procurement;
- evaluators, who are responsible for ensuring that products are in accordance with this part of ISO 9241.

NOTE 2 In this document the term “developers” is used as shorthand for *all those involved in the development of software design and creation*, which sometimes can span different collaborating or contracting organizations.

The ultimate beneficiary of this part of ISO 9241 will be the end-user of the software. Although it is unlikely that end-users will read this part of ISO 9241, its application by designers, developers, buyers and evaluators ought to provide user interfaces that are more accessible. This part of ISO 9241 concerns the development of software for user interfaces. However, those involved in designing the hardware aspects of user interfaces may also find it useful when considering the interactions between software and hardware aspects.

ISO 9241 was originally developed as a seventeen-part International Standard on the ergonomics requirements for office work with visual display terminals. As part of the standards review process, a major restructuring of ISO 9241 was agreed to broaden its scope, to incorporate other relevant standards and to make it more usable. The general title of the revised ISO 9241, “Ergonomics of human-system interaction”, reflects these changes and aligns the standard with the overall title and scope of Technical Committee ISO/TC 159, SC 4. The revised multipart standard is structured as series of standards numbered in the “hundreds”: the 100 series deals with software interfaces, the 200 series with human-centred design, the 300 series with visual displays, the 400 series with physical input devices, and so on.

See Annex A for an overview of the entire ISO 9241 series.

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# Ergonomics of human-system interaction —

## Part 171: Guidance on software accessibility

### 1 Scope

This part of ISO 9241 provides ergonomics guidance and specifications for the design of accessible software for use at work, in the home, in education and in public places. It covers issues associated with designing accessible software for people with the widest range of physical, sensory and cognitive abilities, including those who are temporarily disabled, and the elderly. It addresses software considerations for accessibility that complement general design for usability as addressed by ISO 9241-110, ISO 9241-11 to ISO 9241-17, ISO 14915 and ISO 13407.

This part of ISO 9241 is applicable to the accessibility of interactive systems. It addresses a wide range of software (e.g. office, Web, learning support and library systems).

It promotes the increased usability of systems for a wider range of users. While it does not cover the behaviour of, or requirements for, assistive technologies (including assistive software), it does address the use of assistive technologies as an integrated component of interactive systems.

It is intended for use by those responsible for the specification, design, development, evaluation and procurement of software platforms and software applications.

### 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 9241-11:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 11: Guidance on usability*

ISO 9241-12:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 12: Presentation of information*

ISO 9241-13:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 13: User guidance*

ISO 9241-14:1997, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 14: Menu dialogues*

ISO 9241-15:1997, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 15: Command dialogues*

ISO 9241-16:1999, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 16: Direct manipulation dialogues*

ISO 9241-17:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 17: Form filling dialogues*

ISO 9241-110:2006, *Ergonomics of human-system interaction — Part 110: Dialogue principles*

ISO 13407:1999, *Human-centred design processes for interactive systems*

ISO 14915 (all parts), *Software ergonomics for multimedia user interfaces*

### 3 Terms and definitions

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

**3.1 accelerator keys**  
shortcut keys  
key combinations which invoke a menu option without displaying the menu on which the option appears or intermediate menus

[ISO 9241-14:1997]

**3.2 accessibility**  
<interactive system> usability of a product, service, environment or facility by people with the widest range of capabilities

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 a disability.

NOTE 2 The usability-orientated 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 particular attention to the full range of capabilities within the user population.

**3.3 accessibility feature**  
feature (etc.) that is specifically designed to increase the usability of products for those experiencing disabilities

**3.4 activation**  
internal state with differential degrees of mental and physical functional efficiency

[ISO 10075:1991]

**3.5 assistive technology**  
**AT**  
hardware or software added to, or incorporated within, a system that increases accessibility for an individual

EXAMPLE Braille display, screen reader, screen magnification software, eye tracking devices.

**3.6 chorded key-press**  
keyboard key or pointing-device button presses where more than one button is held down simultaneously to invoke an action

NOTE This includes both uses of modifier keys with other (non-modifier) keys as well as use of multiple non-modifier keys to enter data or invoke an action.

**3.7 closed system**  
system that does not allow user connection or installation of assistive technology that would have programmatic access to the full user interface

NOTE This can be because of policy, system architecture, physical constraints or for any number of other reasons.

### 3.8

#### colour scheme

set of colour assignments used for rendering user-interface elements

NOTE "Colour" refers to a combination of hue, saturation, and brightness.

### 3.9

#### contrast

⟨perceptual sense⟩ assessment of the difference in appearance of two or more parts of a field seen simultaneously or successively (hence: brightness contrast, lightness contrast, colour contrast, etc.)

[CIE 17.4:1987, definition 845-02-47]

### 3.10

#### cursor

visual indication of where the user interaction via keyboard (or keyboard emulator) will occur

cf. **keyboard focus cursor** (3.22), **text cursor** (3.35), **pointer** (3.30)

### 3.11

#### effectiveness

accuracy and completeness with which users achieve specified goals

[ISO 9241-11:1998, 3.2]

### 3.12

#### efficiency

resources expended in relation to the accuracy and completeness with which users achieve goals

[ISO 9241-11:1998, 3.3]

### 3.13

#### explicit designator

code or abbreviation for a menu option or control label, set apart from the name (usually to the left of it), and typed in for selection

cf. **implicit designator** ( 3.16)

EXAMPLE "O", "C", "S", "P", as shown in the menu in Figure 1.

<b>O</b>	Open
<b>C</b>	Close
<b>S</b>	Save
<b>P</b>	Print

Figure 1 — Examples of explicit designators

**3.14**  
**focus cursor**

location cursor  
indicator showing which user-interface element has keyboard focus

cf. **input focus** ( 3.18) and **cursor** (3.10).

EXAMPLE Box or highlighted area around a text field, button, list or menu option.

NOTE The appearance of this indicator usually depends on the kind of user-interface element that has focus. The user-interface element with focus can be activated if it is a control (e.g. button, menu item) or selected if it is a selectable user-interface element (e.g. icon, list item).

**3.15**  
**icon**  
graphic displayed on the screen of a visual display that represents a function of the computer system

[ISO/IEC 11581-1:2000, 4.7]

**3.16**  
**implicit designator**  
portion of an option name or control label used for keyboard selection

EXAMPLE “P” on a screen used for initiating a print job where the control label is displayed as “Print”.

**3.17**  
**individualization**  
modification of interaction and presentation of information to suit individual capabilities and needs of users

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**3.18**  
**input focus**  
in relation to a given input device, the indication of the object upon which the user directs input

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EXAMPLE Pointer focus and keyboard focus are input foci.

**3.19**  
**keyboard emulator**  
software or hardware that generates input identical to that from a keyboard

NOTE A keyboard emulator can provide a representation of keys (e.g. on-screen keyboard) or not (e.g. voice recognition).

EXAMPLE Platform-based on-screen keyboards, speech input, handwriting, wherever their output appears to applications as keystroke input.

**3.20**  
**keyboard equivalent**  
key or key combination that provides access to a function usually activated by a pointing device, voice input or other input or control mechanism

**3.21**  
**keyboard focus**  
current assignment of the input from the keyboard or equivalent to a user-interface element

NOTE For an individual user-interface element, focus is indicated by a focus cursor.

**3.22**  
**keyboard focus cursor**  
visual indication of where the user interaction via keyboard (or keyboard emulator) will occur

cf. **keyboard focus** (3.21), **pointer** (3.30), **text cursor** (3.35).

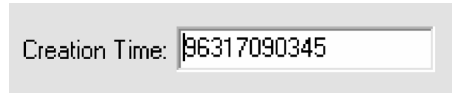
**3.23****label**

short descriptive title for an entry or read-only field, table, control or object

cf. **name** (3.27)

EXAMPLE 1 Heading, prompt for entry field, text or graphic that accompanies and identifies a control (such as those displayed on the face of buttons), audible prompt used by an interactive voice response system.

EXAMPLE 2 “Creation Time”, as shown in Figure 2.



**Figure 2 — Example of text field with label**

EXAMPLE 3 “Pagination”, “Widow/Orphan control”, “Keep with text”, “Keep lines together”, “Page break before”, as shown in Figure 3.



**Figure 3 — Example of check box group with labels for group and each check box**

EXAMPLE 4 Image of a printer in a window that the user can click to print the current document.

NOTE 1 In some applications, labels are classified as protected fields.

NOTE 2 Adapted from ISO 9241-17:1998, definition 3.4.

NOTE 3 For the purposes of this part of ISO 9241, *label* refers to the presented title for a user-interface element — in contrast with the *name* attribute, which might or might not be presented to users but is available to assistive technologies. Textual labels are often a visual display of the name.

**3.24****latch**

mode in which any modifier key remains logically pressed (active) in combination with a single subsequent non-modifier key-press or pointing-device button action

cf. **lock** (3.25)

**3.25****lock**

persistent mode in which one or more modifier keys or pointing-device buttons remain logically pressed (active) until lock mode for the key or button is turned off

cf. **latch** (3.24)

NOTE 1 Unlike *latch*, which affects only keyboard and pointing device actions, *lock* will affect any software that uses the modifier key(s) to alter its behaviour.

NOTE 2 Lock mode is usually turned off explicitly by the user, but can also be turned off at other times such as at system shutdown or restart.

### 3.26

#### modifier key

keyboard key that changes the action or effect of another key or a pointing device

EXAMPLE 1 Moving the keyboard focus with the shift key held down, thereby extending the current selection in the direction of cursor movement rather than merely moving the position of the cursor.

EXAMPLE 2 Pressing “C”, to obtain the input of that character, pressing “Ctrl+C” to obtain the “Copy” function.

### 3.27

#### name

word or phrase associated with a user-interface element and that is used to identify the element to the user

cf. **label** (3.23).

NOTE 1 Names are most useful when they are the primary word or phrase by which the on-screen instructions, software documentation and the user refer to the element, and when they do not contain the type or status of the user-interface element.

NOTE 2 The name attribute might or might not be presented to users but is available to assistive technologies — in contrast with *label*. For the purposes of this part of ISO 9241, *label* refers to the presented title for a user-interface element. Textual labels are often a visual display of the name.

NOTE 3 When a textual label is provided it would generally present the name or a shortened version of the name. Not all user-interface elements have labels, however. In those cases, the names would be available to assistive technologies (or sometimes by pop-up tool tips, etc.).

NOTE 4 Names are not to be confused with internal identifiers (ID), which can be used by software and might not be designed to be understood by a human.

### 3.28

#### natural language

language that is, or that was, in active use in a community of people, the rules of which are mainly deduced from the usage

### 3.29

#### platform software

software that interacts with hardware or provides services for other software

EXAMPLE Operating system, device driver, windowing system, software toolkit.

NOTE 1 A browser can function both as an application and as platform software.

NOTE 2 For the purposes of this part of ISO 9241, *software* refers to both platform software and application software.

### 3.30

#### pointer

graphical symbol that is moved on the screen according to operations with a pointing device

NOTE Users can interact with elements displayed on the screen by moving the pointer to that location and starting a direct manipulation.

[ISO 9241-16:1999, 3.15]

### 3.31

#### pointer focus

current assignment of the input from the pointing device to a window

NOTE The window with pointer focus usually has some distinguishing characteristic, such as a highlighted border and/or title bar.

**3.32****pointing device**

device that translates a human controlling operation to a controlling operation on the display

NOTE 1 Depending on the applied technology, not only machine devices but also parts of the human body (e.g. fingers, arms) can currently be used as pointing devices.

[ISO 9241-16:1999]

NOTE 2 Pointing devices typically have buttons that are used to activate or manipulate user-interface elements.

NOTE 3 Almost any hardware can be used to control a **pointer** (3.30) with the appropriate software.

**3.33****satisfaction**

freedom from discomfort, and positive attitudes towards the use of the product

[ISO 9241-11:1998, 3.4]

**3.34****screen reader**

assistive technology that allows users to operate software without the need to view the visual display

NOTE 1 Output of screen readers is typically text-to-speech or dynamic Braille output on a refreshable Braille display.

NOTE 2 Screen readers rely on the availability of information from the operating system and applications, such as the name or label of the user-interface element.

**3.35****text cursor**

visual indication of the current insertion point for text entry

cf. **pointer** (3.30), **focus cursor** (3.14).

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**3.36****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, 3.1]

**3.37****user interface****UI**

all components of an interactive system (software or hardware) that provide information and controls for the user to accomplish specific tasks with the interactive system

[ISO 9241-110:2006, 3.9]

**3.38****user-interface element**

user-interface object

entity of the user interface that is presented to the user by the software

EXAMPLE Text, graphic, control.

NOTE 1 User-interface elements can be interactive or not.

NOTE 2 Both entities relevant to the task and entities of the user interface are regarded as user-interface elements. A user-interface element can be a visual representation or an interaction mechanism for a task object (such as a letter, sales order, electronic part or wiring diagram) or a system object (such as a printer, hard disk or network connection). It can be possible for the user to directly manipulate some of these user-interface elements.

NOTE 3 User-interface elements in a graphical user interface include such things as basic objects (such as window title bars, menu items, push buttons, image maps, and editable text fields) or containers (such as windows, grouping