
**Ergonomics — Accessible design —
Accessibility of information presented
on visual displays of small consumer
products**

*Ergonomie — Conception accessible — Accessibilité des informations
présentées sur les écrans de visualisation des produits de
consommation de petite taille*

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Published in Switzerland

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Visual displays are in-built in many consumer products to be used to present information about the status, function or operation of the product to the users. If a product is big enough to adopt large displays, it would be easy to make the various users including older or visually disabled people feel comfortable in recognizing and understanding the presented information on the displays. Some small consumer products, such as digital cameras and remote controllers of air conditioners, are equipped with a small display because of the limited space on the product itself. The adoption of small display can mean that many users experience difficulties in using those products because they cannot easily recognize or understand the information visually presented on it. Among the many things that can be done to make the product more accessible to the widest range of users, one thing is to carefully design the visual information presented on the small display. This document provides design guidance on the accessibility of visually presented information on small displays.

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1 Scope

This document specifies the methods to improve accessibility of the visual display on small consumer products in order to minimize inconveniences that a variety of users including people with disabilities and the elderly can experience while using those products.

In particular, this document focusses on how to present information on small visual displays to make the product more accessible for older people and people with low vision or colour deficiency. The provision of different modalities or alternative ways of displaying information to make the product more accessible is not covered in this document. This document only covers accessibility with regard to visual presentation of information, not audio or tactile-based display methods.

NOTE 1 Accessibility of a product can be enhanced by adopting alternative means to the visual presentation of the information, which is not covered in this document. For information about alternative forms of presentation, ISO/IEC Guide 71, ISO 9241-112 and ISO 9241-171 can be useful.

NOTE 2 A comprehensive catalogue of accessibility needs and strategies for accommodation for all users (not only those with visual impairments) is out of scope for this document. Readers interested in this regard can refer to ISO/IEC 29138-1.

This document applies to various consumer products equipped with digital displays, in which the information about operation of the product is visually presented. The products are usually equipped with built-in display panels. The consumer products include those hand-held products that can be easily carried by the user or those that are not portable but equipped with small displays, though the size of the product or the display is not specified in this document.

NOTE 3 This document focusses on the accessibility of small displays, regardless of the size of the consumer product.

NOTE 4 Examples include, but are not limited to, electronic thermometers, digital cameras, air-conditioning systems, remote controllers.

This document is not applicable to those products with high flexibility or adjustability in presenting information on the display. Some examples are web- or application-based displays of ICT devices such as smart phones, smart TVs, and tablet PCs. It is not applicable to touch-based displays that have both the functions of display and control. Some examples are touch interfaces of smart watches or digital cameras. Finally, accessibility issues relating to indicating lamps/lights used for simple alerts or alarm are covered in ISO 24550 and are not considered in this document.

NOTE 5 There are many accessibility issues in the touch interface related to information presentation as well as control function and they need to be dealt with together.

It is possible that some guidance of this document is not applicable to some products, such as oral or ear thermometers, which have extremely small in-built displays.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 accessibility

extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of user needs, characteristics and capabilities to achieve identified goals in identified contexts of use

Note 1 to entry: Context of use includes direct use or use supported by assistive technologies.

[SOURCE: ISO 9241-112:2017, 3.15]

3.2 visual display panel

means of providing visible information to the user about the status of specific product functions and operational characteristics

EXAMPLE An LCD display of a remote controller or an LCD display of a digital camera is a visual display panel of the products.

3.3 visual coding coding

method of displaying information composed of multiple levels or items separately by their physical characteristics such as size, location, colour or luminance to enhance the degree of recognition, identification or memorizing of the displayed information

EXAMPLE WLAN quality or battery status are displayed in a series of visual bars, where different colours can indicate the overall status, e.g. red, yellow, green for low, medium or high network quality or battery capacity, respectively.

4 Basic design principles

The following basic design principles should be considered in order to increase accessibility of the information displayed on the visual display. The principles are applicable to displays of various sizes, but if the product is large enough, the adoption of larger display should be considered first.

The design principles are mainly related to the accessibility of visual presentation of information, which is within the scope of this document. However, it should be noted that the accessibility of the product can be increased by adopting several modalities in presenting information either redundantly or alternatively.

- a) Information should be displayed in a simple and intuitive manner in order for users to easily understand regardless of their experience, knowledge, language, or cognitive ability.
- b) Critical information, which is essential to use the product, should be displayed either redundantly by using more than one visual means such as text, symbol, and colour, or largely and clearly enough to be easily recognized by the widest range of users.
- c) The user should be informed of the current status of the product by the visual display or other methods such as indicating lights.
- d) When operating the product, the user should be provided with a proper and timely feedback by the visual display.

- e) To facilitate the understanding of the displayed information, the arrangement, space, and order of the displayed contents should be considered.
- f) Visual warnings for the dangers or errors that might occur while using the product should be clearly displayed so that the users can recognize them with ease.

5 Display elements

5.1 Alphanumeric characters

- a) The font size should be large enough to be easily legible, with the consideration of characteristics of the language used.

NOTE 1 Different minimum character heights are provided for different languages as a guidance of usability for visual display (e.g. Latin and Hindi/Devnagari characters 16' of arc, Japanese characters 20' of arc) (see ISO 9241-125:2017, 4.4.2).

NOTE 2 ISO 24509 and ISO/TR 22411 provide information on the proper font size for people with visual disabilities or older people.

NOTE 3 The accessibility of the product can be enhanced by adopting the function to make the font size adjustable.

NOTE 4 The recommended font size can vary depending on conditions such as luminance, resolution, contrast or density of information.

- b) Proper colour combination (e.g. yellow letters against a black background) and high luminance contrast are also critical to enhancing visibility of alphanumeric characters.

NOTE 5 ISO 9241-303 provides general guidance regarding the interaction between character height, user characteristics, tasks and display imaging properties and the implications of this for legibility (see ISO 9241-303:2011, 5.5.4).

- c) When text labels are displayed with symbols or icons, the labels should be large enough to be easily legible.

NOTE 6 ISO 24509 provides information for specifying the proper font size for older people.

- d) Larger font size in negative contrast is needed for people with low vision to increase legibility.
- e) The ratio of the stroke width to the character height should be kept in a proper range so that users can read the letters without difficulties.

NOTE 7 The recommended ratio can be varied according to the characters being used. For Latin-origin characters, the recommended range of the ratio of the stroke width to the character height is 10 % to 17 %, which is a general guidance (see ISO 9241-303:2011, 5.5.6).

- f) A simple font type without serif should be used and the same font type should be applied for the overall display in the same product.

- g) When letters or figures are displayed with a specific order, the ordering rule should be consistently maintained in the product.

EXAMPLE If the items in a menu are presented in an alphabetical order, the same rule is maintained in another menu in the product.

- h) Arabic numbers should be used for presenting numeric information and numbering of menu elements.
- i) Alignment of numbers presenting the same kind of numeric information should be consistent in the product.

NOTE 8 The guidance on visual presentation of information states that numeric information without decimals is right-justified and numeric information containing decimals is aligned with respect to the decimal sign (comma or point) (ISO 9241-125:2017, 6.1.4).

- j) Abbreviations should only be used if they are necessary. The meaning of abbreviations that may not be easily understood shall be shown in a printed or electronic user manual or by a help function.
- k) The letters should be presented with enough spaces of the between-character, between-word, and between-line to ensure the legibility.

NOTE 9 For guidelines on spacing to enhance the usability of visual displays, see ISO 9241-303:2011, 5.5.9, 5.5.10, and 5.5.11.

5.2 Symbols and icons

- a) When a standard national or international graphic or symbol exists for the represented object or action, then it should be used (see ISO 9241-125:2017, 7.2.7).
- b) Similar symbols and icons that can cause confusion to the users should not be used in a product.
- c) Symbols and icons should only have a single meaning in a product.
- d) Symbols or icons should be labelled unless their meaning is obvious and can be understood clearly by the users (see ISO 9241-125:2017, 5.1.11).
- e) When symbols and icons are very complicate, they should be displayed with high contrast to enhance visibility.

6 Presentation of information

6.1 Arrangement of displayed elements

- a) When arranging several elements in a single display panel, the characteristics of information of the elements, such as type, similarity, function, etc., should be presented in a way that the user can easily understand the arrangement.
- b) Elements of similar characteristics should be presented as a group and the distinction between the groups should be clearly presented.

NOTE 1 A line is generally drawn between the groups for distinction.

- c) If there is a sequence of operation among functions, they should be visually presented in an order to comply with the sequence (see ISO 9241-125:2017, 5.1.6).

NOTE 2 Lines are often used in indicating the sequence of operation by connecting visual information in the display panel.

6.2 Displaying status and function

- a) In the case that the operational status of a product is changed, it should be presented on the display for users to recognize the change.

NOTE It is possible to show the operational status change using size, colour or location.

- b) In case the operational status needs to be maintained, it should be displayed all the time for users to recognize it.
- c) When a function is disabled the user should be informed, so that the user can recognize which function is being enabled or not in the display.

- d) The enabled functions at the current state should be displayed all together to help users recognize them.
- e) Indication of sub-menu or expandable functions, if any, should be displayed so that users can recognize its existence.

6.3 Coding of visual information

- a) If coding is used in a small visual display, the number of codes should be as few as possible.

NOTE People with cognitive disabilities can have difficulties matching a code with its meaning, unless common population stereotypes (e.g., red for “warning” or “stop”, yellow for “caution”, and green for “OK” or “ready.”)

- b) In developing codes employing common cultural stereotypes, designers should ensure that the stereotypes apply to all of the potential user populations, and should avoid the use of icons, symbols or other codes that can be misunderstood by, or which can be offensive to, users from particular cultures.
- c) Luminance coding should be used only to indicate one of two states, for example, “on/off” or “active/inactive”.
- d) For effective delivery of information, different coding or other means of presenting information should be used redundantly, e.g. using the coding of shape and size, the coding of shape and colour, or the colour coding and text labels. For example, when the colours used to indicate the current statuses of the product, the user should be informed redundantly using other means such as text labels or symbols.

7 Physical characteristics of digital displays

7.1 Luminance contrast

- a) High luminance contrast should be used.

NOTE 1 In guidance for enhancing accessibility of displays, a recommendation for the luminance contrast is given as the range between 6:1 and 15:1 (EIF/EIA), and in a guidance for enhancing accessibility of web contents as the range between 3:1 and 7:1 (WCAG 2.1).

NOTE 2 For the same luminance contrast ratio, it is better to present items in light colours against dark background.

- b) Low luminance contrast should be avoided when displaying information in red (EIF/EIA).

7.2 Colour

- a) When displaying information on a low-luminance visual display panel, discrimination in the presented information by colour combination or colour contrast should be avoided.
- b) Highly saturated blue, white, and red colours should not be used when informing the user of important information related to the use of the product.

NOTE 1 Pure red or white can cause distortion or oscillation phenomenon of letters when it is excessively bright.

- c) When using colours for the purpose of discriminating the elements presented together in a display, they should be discriminative as much as possible to the people with low vision.
- d) Some colours are difficult to discriminate for people with defective colour vision when they have nearly the same luminance. Considerable luminance differences should be associated with those colour combinations to increase discriminability.