
**Ergonomics — Accessible design
— Guidelines for designing tactile
symbols and characters**

*Ergonomie — Conception accessible — Lignes directrices pour la
conception des symboles et caractères tactiles*

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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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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

Providing tactile information such as raised symbols or characters is one method for making products or environments more accessible to users who need to access information using a modality that depends on neither vision nor hearing. The use of tactile information has become an increasingly important method for supporting accessible design of products services and environments.

The use of tactile information in a design requires proper consideration to best support human tactile senses so that the information is easily and correctly understandable. Guidelines for designing tactile symbols and characters based on ergonomic knowledge of human tactile abilities are therefore necessary for such design.

This document adopts the guidance of accessibility given in ISO/IEC Guide 71^[1] and also design guidelines given in ISO/TR 22411^[2].

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Ergonomics — Accessible design — Guidelines for designing tactile symbols and characters

1 Scope

This document provides design guidelines and requirements for tactile symbols and characters used for information and marking for people who need non-visual or non-auditory information. It is applicable to products, facilities and equipment in housing and transportation, services and packaging, where tactile symbols and characters may be used.

This document specifies the physical characteristics of tactile symbols and characters for ease of legibility by touch taking into account human abilities of tactile sense and their aging effect. It does not specify semantic characteristics of tactile symbols and characters.

This document is applicable to tactile symbols and characters of convex-type touched by fingers.

It is not applicable to specifically coded tactile symbols or characters such as those of Braille, nor to those with vibratory or temporal changes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 24503, *Ergonomics — Accessible design — Tactile dots and bars on consumer products*

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 tactile pattern

pattern composed of convex-type dots, lines or planes, or a combination of these which are perceived by touch

3.2 tactile symbol

tactile pattern (3.1) representing a symbol

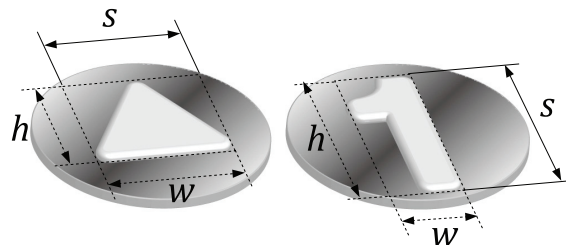
3.3 tactile character

tactile pattern (3.1) representing a character or number

3.4 size of tactile pattern

s
two-dimensional expanse of *tactile pattern* (3.1)

Note 1 to entry: In this document, the size of a symbol and a character is specified by one larger side of a circumscribed square rectangle of width and height, as shown by dashed lines in Figure 1. The size of a dot or line is specified in its diameter and length, respectively.



Key

s size
w width
h height

Figure 1 — Size of a tactile symbol and a tactile character

3.5 line width

<tactile pattern> width of a base of convex-type lines of which a *tactile pattern* (3.1) is composed

3.6 raised height

<tactile pattern> height from a base plane of convex-type dots, lines and planes of which a *tactile pattern* (3.1) is composed

3.7 tactile texture

plane filled by periodic convex or concave symbols

3.8 accessible design

design focused on diverse users to maximize the number of potential users who can readily use a system in diverse contexts

Note 1 to entry: This aim can be achieved by (1) designing systems that are readily usable by most users without any modification, (2) making systems adaptable to different users (by providing adaptable user interfaces) and (3) having standardized interfaces compatible with assistive products and assistive technology.

Note 2 to entry: Terms such as universal design, accessible design, design for all, barrier-free design, inclusive design and transgenerational design are often used interchangeably with the same meaning.

[SOURCE: ISO/IEC Guide 71:2014, 2.19]

3.9 convex

state of a *tactile pattern* (3.1) whose pictorial element(s) is raised from a surface on which the pattern is mounted

3.10**concave**

state of a *tactile pattern* (3.1) whose pictorial element(s) is lowered from a surface on which the pattern is mounted

3.11**tactile legibility**

ease with which tactile symbols or characters can be identified by touch

4 Design guidelines for tactile symbols and characters**4.1 Selection of tactile symbols**

The following guidelines apply to the selection of tactile symbols.

- a) Symbols used for tactile markings should have a simple geometrical pattern that can be identifiable by touch of fingers.

EXAMPLE In an automatic teller machine (ATM), dots, straight lines, triangles, circles and arrows are used.

- b) Tactile symbols consisting of either or both outlined and filled patterns with a raised surface should be used. See [Figure 2](#).

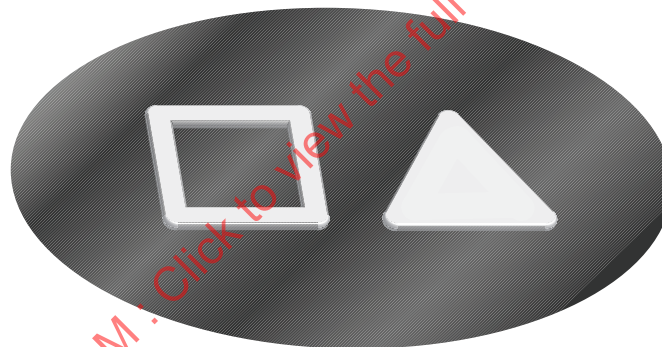


Figure 2 — Example of tactile symbols outlined (left) and filled (right)

- c) As well as solid lines, dotted lines or broken lines should be used, as appropriate.

NOTE Dotted lines and broken lines are not used as components of tactile symbols and characters.

- d) Tactile texture should be used to show a uniformly extended area.
- e) When more than one symbol is used in the same context of use, a sufficient spacing between the symbols should be provided so that the tactile legibility is not degraded by adjacent symbols. See [4.2 c](#)).

- f) A tactile symbol should have a fixed common meaning (see [Annex A](#)).

EXAMPLE A tactile triangle used for toxic packaging as a warning of danger (ISO 11683)^[3].

4.2 Selection of tactile characters

The following guidelines apply to the selection of tactile characters.

- a) Characters with simple composition should be used.

EXAMPLE An Arabic numeral or a simple Latin character as shown in [Figure 3](#).



Figure 3 — Examples of tactile characters

- b) Characters in a serif font or the script type font with decorations should not be used.
- c) When more than one character is used in the same context of use, sufficient spacing between the characters should be provided so that tactile legibility is not degraded by adjacent characters.

NOTE ANSI A117.1:2003 specifies a distance of 3,2 mm for lines with square cross-sectional figurations and 1,6 mm for lines with other cross-sectional figurations, and a maximum distance of four times of the line width[4]. DIN 32986 specifies a distance between words corresponding to 1,1 times of the greatest width of the character "M"[5].

4.3 Size of tactile patterns

The following requirements apply to the design of size of tactile symbols and characters considering the age-related differences in tactile sensitivity (see [Annex B](#)).

- a) The size of tactile symbols except for dots and lines shall not be less than 10 mm. See [Figure B.1 a](#)).
- b) The size of tactile characters shall not be less than 15 mm. See [Figure B.2 a](#)).
- c) The size of dots and the lengths of bars shall follow ISO 24503.
- d) When tactile dots and bars are used together in the same context of use, to avoid confusion the size of dots should be smaller than 1,5 mm and the length of the bars should be greater than 5 mm.
- e) For older people who are not accustomed to use tactile symbols and characters the size should be one and a half times larger than that specified in [4.3 a](#)) and [4.3 b](#)). See [Figures B.1 b](#)) and [B.2 b](#)).

NOTE People with visual disabilities who are accustomed to use tactile symbols and characters are able to identify them with the same size as young people are even they are older. See [Figures B.3 a](#)) and [b](#)).

4.4 Line width of tactile patterns

The following guidelines apply to the line widths of tactile symbols and characters.

- a) The line width of tactile symbols and characters should be about one tenth of the size of the tactile symbol and the character, and should be within a range of 0,5 mm to 3,0 mm.
- b) When an outlined symbol and a filled symbol of the same pattern are used in the same context of use, the width of the outlined pattern shall not be so wide that confusion between the outlined and filled symbols can occur.

4.5 Height of tactile patterns above the base plane

The following guidelines apply to designing height of tactile symbols and characters.

- a) The raised height of tactile symbols and characters shall be within the range of 0,3 mm to 1,5 mm.

- b) In very special purposes and contexts, the raised height may be lower than that specified in 4.5 a).

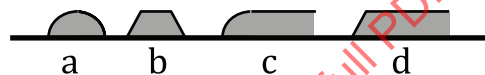
EXAMPLE The minimum raised height of a triangle symbol for warning of danger is 0,25 mm (ISO 11683).

- c) The raised height of tactile symbols and characters shall be designed so that the base plane that surrounds the tactile symbols and characters can be touched by fingertips.

4.6 Cross-sectional figurations of tactile lines and filled symbols

The following guidelines apply to cross-sectional figuration of lines.

- a) The cross-section of a line of tactile outlined symbols and characters should be in the shape of a semicircle or trapezoid. See Figure 4.
- b) The cross-section in the shape of a triangle can be used unless it has a sharp edge at the top.
- c) The cross-section of a line should not be in the shape of a rectangle.
- d) A cross section with a sharp angle should not be used so as to avoid pain or injury to fingers touching it.
- e) The edge of a plane of filled symbols should be rounded or slanted. See Figure 4.



Key

- a semicircle
b trapezoid
c rounded edge
d slanted edge

Figure 4 — Examples of cross-section of tactile lines and filled symbols

4.7 Others

Upright-positioned tactile symbols and characters should be used.

NOTE Upright position means symbols and characters stand perpendicular to the line of sentence or word. Italic font is not upright-positioned, for example.

5 Other factors to consider

5.1 General

The following guidelines and requirements for other factors related to tactile symbols and characters apply to the designing of tactile symbols and characters. For general use of tactile and haptic stimuli in products, particularly in ICT products, ISO 9241-910 (e.g. 5.2) and ISO 9241-920 (e.g. Clause 6) can be referred to [6][7].

5.2 Information associated with tactile symbols and characters

- a) Tactile symbols and characters should be associated with other signs, such as visual ones, of the same meaning.
- b) Tactile symbols and characters and other signs such as visual ones should use the same patterns and meanings when they are equivalent in meaning.

5.3 Easy to find and touch

- a) Tactile symbols and characters should be easy to see with high visual contrast and legible font size for persons with low vision or low visual acuity when the operational environment may impact the contrast sensitivity of the user.

NOTE ISO/TR 22411 presents the data of contrast sensitivity function of young, older and people with low vision^[2].

- b) The location, height and angle of a board on which tactile symbols and characters are mounted should be designed so that ease of touching by fingers is assured.
- c) Tactile symbols and characters should be placed so that people with visual disabilities are able to find them. Fixed location and/or auditory guidance to indicate the location of the board should be provided.
- d) The tactile symbols and characters should be close to the object that is to be identified and the position should be consistent in one environment.

5.4 Materials on which tactile symbols and characters are mounted

- a) The surface figuration and durability of materials on interfaces on which tactile symbols and characters are mounted shall not deteriorate through intended use throughout the operational life of the interface.
- b) The materials on which tactile symbols and characters are mounted shall not be glaring to enable visual reading.
- c) Tactile symbols and characters should not be placed on materials that can become too hot or too cold from changes in the thermal environment.
- d) The materials on which tactile symbols and characters are mounted should be prevented from clogging with dirt, and stains on the materials should be easily wiped off.

Annex A (informative)

Examples of tactile symbols and their meanings

A.1 General

Tactile symbols are used widely with particular meanings in everyday life. This annex provides examples of tactile symbols used in particular contexts of use.

A.2 Tactile symbols and their meanings

[Figure A.1](#) is a list of tactile symbols used for home appliances, automatic teller machines (ATMs), and packages, with their associated meanings. The popularity of those symbols depends on the regions and nations of the world.

•	a dot	start / stop power source	home appliances
—	a bar	cancel, stop draw	home appliances ATM
○	a circle	enter	ATM
×	a cross	cancel	ATM
...	three dots next to each other	power source	home appliances
◁◀	a triangle pointing to the left	Clear back	ATM home appliances
▷▶	a triangle pointing to the right	forward	home appliances
↕	a triangle pointing up and one pointing down	up, down	home appliances
→	an arrow pointing to the right	to the right side send	home appliances ATM
←	an arrow pointing to the left	to the left	home appliances
↑↓	an arrow, or a pair of arrows pointing up / down	up, down (or up / down)	elevators
△	a triangle with the tip pointing upwards	danger and warning	packages

NOTE A triangle for danger and warning is used for a sign for dangers cause.

Figure A.1 — List of tactile symbols and their meanings

Annex B (informative)

Legibility data of tactile symbols and characters for young people, older people and blind people

B.1 General

This annex provides experimental data used for estimating a legible size for tactile symbols and characters in this document^[8]. The data were collected in China, Germany, Japan, Rep. of Korea, Thailand, and USA in a research project directed by AIST (National Institute of Advanced Industrial Science and Technology), Japan. Legibility is expressed as percent correct identification to total trials for each of the symbols and numerals used in the experiment. In some cases, Japanese phonetic signs were used for Japanese participants.

Each country engaged 15 to 20 people aged in their twenties and in their sixties and seventies. 70 blind persons participated in the experiment only in Japan.

B.2 Tactile symbols and their meanings

[Figure B.1](#) presents legibility data for five tactile symbols as a function of their size measured for young and older people. They were asked to read the symbols with finger touch only. Legibility is expressed as the percentage of correct identification averaged over trials for each symbol with a different size. Data from different countries and, in Japan, different groups of participants were plotted together to show variability among those data sets. The dashed line indicates that the minimum acceptable size for tactile symbols to attain at least 80 % correct legibility is 10 mm for young people and 15 mm for older people.

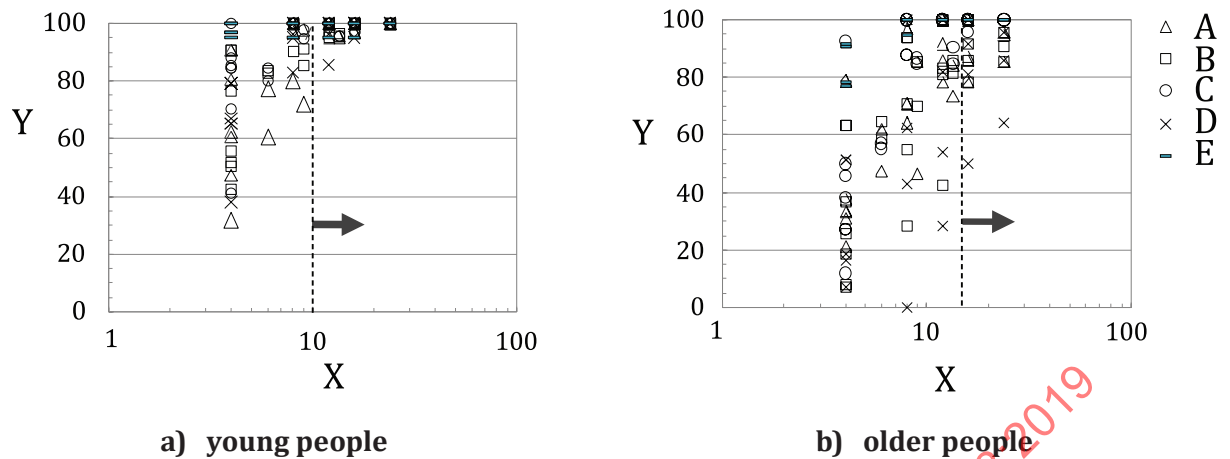
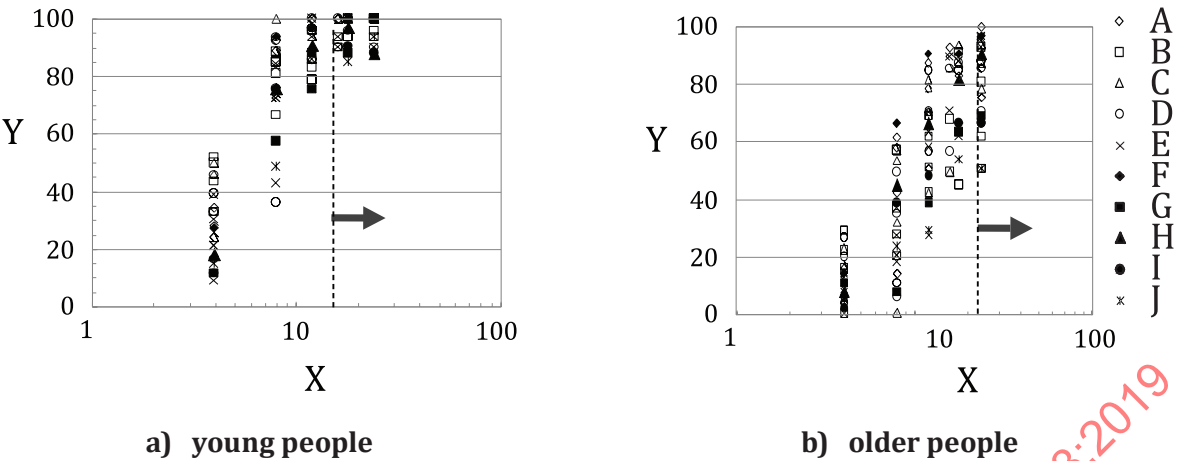


Figure B.1 — Legibility of tactile symbols for young and older people sighted

[Figure B.2](#) presents legibility for ten tactile characters which include five Arabic numerals and five Japanese phonetic signs (Katakana). The five Japanese phonetic signs were only tested by Japanese young and older people. Similar to the data expressed in [Figure B.1](#), legibility is expressed as percent correct identification averaged over trials for each character with a different size. Data from different countries and different groups in Japan are all plotted all together. The dashed line indicates that the minimum acceptable size for tactile characters to attain at least 80 % of correct legibility is 15 mm for young people and 22,5 mm for older people. For older people, a size 1,5 times larger than that required by the young people is needed to attain the same rate of legibility.



Key

X size of a tactile character

Y percent correct

A number "2"

B number "4"

C number "5"

D number "6"

E number "8"

F Japanese character "レ"

G Japanese character "ナ"

H Japanese character "チ"

I Japanese character "ネ"

J Japanese character "ヤ"

Figure B.2 — Legibility of tactile characters for young and older people sighted

Figure B.3 presents legibility for the same tactile symbols and characters for 73 blind people ranging in age from 23 to 76 years (average 49,8 years) who use Braille in their everyday lives. Because they were accustomed to reading Braille, the minimum acceptable size for tactile symbols and characters can be smaller than that for the sighted people. Figure B.3 indicates that it is 10 mm for symbols and 15 mm for characters, which is the same value for young people. There seems to be no aging effects for blind people.