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**Ergonomija medsebojnega vpliva človek-sistem - 920. del: Taktilne in haptične interakcije (ISO/DIS 9241-920:2023)**

Ergonomics of human-system interaction - Part 920: Tactile and haptic interactions (ISO/DIS 9241-920:2023)

Ergonomie der Mensch-System-Interaktion - Teil 920: Taktile und haptische Interaktionen (ISO/DIS 9241-920:2023)

Ergonomie de l'interaction homme-système - Partie 920: Interactions tactiles et haptiques (ISO/DIS 9241-920:2023)

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35.180	Terminalska in druga periferna oprema IT	IT Terminal and other peripheral equipment

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## Ergonomics of human-system interaction —

### Part 920: Tactile and haptic interactions

ICS: 35.180; 13.180

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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, which is 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 participate in the work. The 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 specific approval criteria required for varied 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](http://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 found in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://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", in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 122, Ergonomics, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 9241-20:2008), which has been technically revised.

A list of all parts of the ISO 9241 series can be found on the ISO website.

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](http://www.iso.org/members.html).



## Introduction

Tactile and haptic interactions have become increasingly important interaction modalities. Mobile interaction relies on gesture-based touch interaction, tactile/haptic control devices, and can utilise vibration-based displays as one of several ways to provide information/experiences to the user. Touch, vibration, and tactile/haptic interactions are also found in special purpose computing environments (e.g. simulation, remote control, or surgery) and in assistive technologies.

While considerable research exists, a lack of ergonomic standards in this area could result in systems being developed without sufficient concern for either ergonomics or interoperability, leading to serious ergonomic difficulties for users of multiple incompatible or conflicting tactile/haptic devices/applications. This part of ISO 9241 provides ergonomics recommendations for tactile and haptic hardware and software interactions, including guidance related to the design and evaluation of hardware, software, and combinations of hardware and software interactions. The guidelines are not technology-dependent and will also be applicable to future technologies.

ISO 9241-910 provides a common set of terms, definitions, and descriptions of the various concepts central to designing and using tactile/haptic interactions. It also provides an overview of the range of tactile/haptic applications, objects, attributes, and interactions.

This standard, ISO 9241-920 provides basic guidance in the design of tactile/haptic interactions.

ISO 9241-940 provides ways of evaluating tactile/haptic interactions for their usability, the validation of requirements, and the verification that systems meet the requirements.

ISO 9241-960 focuses on gestures as a specific type of tactile/haptic interaction and describes their features and usability requirements.

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# Ergonomics of human-system interaction —

## Part 920: Tactile and haptic interactions

### 1 Scope

This part of ISO 9241 gives recommendations for tactile/haptic hardware and software interactions. It provides guidance on the design and selection of hardware, software, and combinations of hardware and software interactions, including

- the design/use of tactile/haptic inputs, outputs, and/or combinations of inputs and outputs, with general guidance on their design/use as well as on designing/using combinations of tactile and haptic interactions for use in combination with other modalities or as the exclusive mode of interaction,
- the tactile/haptic encoding of information, including textual data, graphical data and controls,
- the design of tactile/haptic objects,
- the layout of tactile/haptic space, and
- interaction techniques.

For guidance and recommendations on the accessibility of tactile/haptic interactions, including information on the use of braille, see ISO 9241-971. It does not provide recommendations specific to braille but can apply to interactions that make use of braille.

The recommendations given in this part of ISO 9241 are applicable to a variety of tactile/haptic devices, representing the real world or virtual or mixed realities (e.g. exoskeletons, wearables, force feedback devices, touchables, tangibles) and stimulation types (e.g. acoustic radiation pressure, electrical muscle stimulation) and they can also be found in virtual and augmented environments.

This document does not include guidance on the role of walking in virtual or mixed realities for tactile/haptic interaction.

**NOTE** It is recognized that some interactive scenarios might be constrained by the limitation that a real workspace is to be modelled in a virtual environment. Objects can be in suboptimal positions or conditions for tactile/haptic interaction by virtue of the situation being modelled.

This document provides general information about how various forms of interaction can be applied to various user tasks. The use of gestures (e.g. multitouch) can be found in ISO 9241-960. Information on gesture-based interfaces can be found in the multipart standard ISO/IEC 30113. Information on contactless gestures can be found in ISO TS 9241-430.

## 2 Applying ISO 9241-920

### 2.1 Recommendations

Individual recommendations given in [Clauses 4 to 8](#) should be evaluated for their applicability. The applicable recommendations should be implemented unless there is evidence that to do so would cause deviation from the design objectives.

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### 2.2 Compliance

If a product is claimed to have met the applicable requirements and recommendations in this part of ISO 9241 then the procedures used to establish the compliance of the product shall be specified. The level of detail of the specification is a matter of negotiation between the involved parties.

NOTE Guidance on the evaluation of tactile/haptic products can be found in ISO 9241-940.

## 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 <https://www.electropedia.org/>

### 3.1 electrotactile feedback

delivering tactile/haptic sensations to the user by excitation of the cutaneous nerve fibres with electric current.

### 3.2 electrostatic feedback

delivering tactile/haptic sensations of friction to the user by electric force.

### 3.3 information haptification

presentation and exploration of data and their relations through tactile/haptic interaction.

### 3.4 sensory substitution

information usually analysed by one sense provided through another sense.

EXAMPLE 1 Tactile sensations can substitute for visual input, e.g. when visible text is transcribed into tactile sensations through braille for an individual who is blind.

EXAMPLE 2 A visual diagram is substituted by an audible representation of the information in the diagram.

Note 1 to entry: Sensory substitution allows the system to provide the same information in more than one modality. It is not a substitution on the part of human perception. For example, persons who experience synaesthesia, which is an involuntary association of one sense with another or one sensory attribute with another, might experience colour when hearing sound.

## 4 Tactile/haptic inputs, outputs, and/or combinations

### 4.1 General guidance on tactile/haptic inputs, outputs and/or combinations

#### 4.1.1 Optimizing performance

The system should be optimized to take account of the following.

- a) The accuracy of available devices, the accuracy of the user, and the required accuracy of the task.
- b) The ability of a user to control the velocity and the force (including direction) involved in operations.

NOTE 1 High speed of user actions is inconsistent with accurate control of force, and vice versa.

- c) Active exploration over passive exploration, when appropriate.