INTERNATIONAL STANDARD

ISO 9241-400

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Ergonomics of human-system interaction —

Part 400: Principles and requirements for physical input devices

Ergonomie de l'interaction homme-système —

Partie 400: Principes et exigences pour les dispositifs d'entrée physiques

Reference number
ISO 9241-400:2007(E)

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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 9241-400 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

This first edition of ISO 9241-400, together with ISO 9241-410, ISO 9241-411[1)], ISO 9241-420[1)] and ISO 9241-421[1)], partially replaces ISO 9241-4:1998 and ISO 9241-9:2000, technically revised as follows:

— terms and definitions from ISO 9241-4 and ISO 9241-9 have been transferred to ISO 9241-400;

— all guiding principles have been incorporated into ISO 9241-400 and unified so that they correspond to the scope of the new ISO 9241 series;

— these principles are applied in ISO 9241-410 in order to generate provisions for product design.

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*

1) Planned or under preparation. (See Annex A)

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— *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*

— *Part 16: Direct manipulation dialogues*

— *Part 17: Form filling dialogues*

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 requirements and measurement techniques for electronic visual displays*

— *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 400: Principles and requirements for physical input devices*

— *Part 410: Design criteria for products for physical input devices*

The following parts, under the general title *Ergonomics of human-system interaction*, are under preparation:

— *Part 308: Surface-conduction electron-emitter displays (SED)* [Technical Report]

— *Part 411: Laboratory test and evaluation methods for the design of physical input devices*

— *Part 420: Selection procedures for physical input devices*

— *Part 421: Workplace test and evaluation methods for physical input devices*

— *Part 920: Guidance on haptic and tactile interactions*

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Introduction

Input devices are means whereby users can enter data into interactive systems. Generally speaking, an input device is a sensor that can detect changes in user behaviour (gestures, moving fingers, etc.) and transform them into signals to be interpreted by the interactive system.

Input devices are utilized for the sole purpose they have been designed for, e.g. a keyboard for entering character codes. Under certain circumstances they may be used also for other purposes. However, in this case, generally their efficiency and/or effectiveness is restricted to a certain degree (e.g. keyboard for pointing). An input device can also be used in combination with others if needed to enhance the capabilities of users. Utilizing a keyboard and a mouse for drawing straight lines is an example of the latter.

Whether or not an input device or a combination of input devices is acceptable from an ergonomic point of view is to be determined following the rationale of the usability concept. This concept postulates that an entity has no inherent usability, but one in a specified context of use, for specified goals and specified users. A product may be designed for an intended user population and for a restricted context of use, e.g. for children in moderately conditioned indoor spaces. Specifying goals for using a device needs additional considerations, however.

Goals that the users of input devices need to achieve may be defined as high-level tasks such as “word processing” or “multimedia”. A definition in this level, however, may be too abstract to design, test or select a device on the basis of usability. For this reason, this standard specifies “task primitives” such as “pointing”, “dragging” or “code input”.

Design and selection equipment requires a fit to be achieved between a range of task requirements and the needs of users. The concept of *fit* as defined in ISO 9241-5:1998 concerns the extent to which equipment (visual display units, input devices, etc.) can accommodate individual users’ needs. Good fit is needed for the intended user population, including users with special needs, e.g. people with disabilities, if the use of a certain device is not limited to a specified user population and task. Since a variety of input devices exists that may enable a user to achieve the same usability for the same task by creating input through different bodily abilities (e.g. hand, foot, speech or eye control) the required fit can be achieved by utilizing any device that offers the required level of usability. Depending on the character of the special needs, a combination of different devices may be necessary, e.g. a foot- and an eye-controlled input device instead of a mouse for a person who cannot use his or her hands for whatever reason.

This part of ISO 9241 specifies generic ergonomic principles valid for the design and use of input devices.

To be able to formulate recommendations for groups or types of input devices, a set of typologies is introduced, based on aspects according to which possible designs can be differentiated:

— physical variables carrying the information (relative/absolute position, force, velocity, acceleration, etc.);

— bodily part used for operation;

— dimensionality of control (degrees of freedom);

— multiplicity of control (number of parallel control variables);

— control modality (discrete/continuous);

— control monitoring (one-shot or continuous time, holds last value or returns to nominal value, sequential or skip-out the continuum output, etc.);

— control distance function (monotonic, non-monotonic, uni/bipolar, etc.);

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— mapping, straightforwardness;

— psychological nature of control (causality, exploratory or goal-oriented control).

It also specifies properties relevant for the usability of input devices and typologies in consideration of different aspects (e.g. degrees of freedom, property sensed etc.). Guidance on the application of these principles on product design is given in ISO 9241-410. The ergonomic guidance for the design of products is given without including aspects related to a particular context (e.g. using keyboards at CAD workstations). Selecting the intended context of use is part of the design process and not the subject of this part of ISO 9241.

ISO 9241-411[2)] is to specify methods for determining conformance through observation, performance and by measurement of the physical attributes of the various devices.

NOTE This part of ISO 9421 will be supported by the following methods (ISO 9241-411):

— usability test for text and data input using stationary keyboards (currently given in ISO 9241-4);

— generic usability test for keyboards for non-touch typing tasks;

— input device selection, usability testing and analysis (currently given in ISO 9241-9);

— testing of efficiency and effectiveness of physical input devices (based on the methods specified in ISO 9241-9);

— assessment of comfort (currently given in ISO 9241-4 and ISO 9241-9);

— additional evaluation methods.

Guidance on the application of these principles for selecting appropriate products for a given context of use is described in ISO 9241-420[2)] in the form of ergonomic selection and combination criteria for using single or multiple input devices at the same work-station.

This part of ISO 9241 does not include test and evaluation methods. These will be developed and published in separate documents for the two target groups “manufacturers, designers, and test houses” and “user organizations”, since such methods can be subject to frequent change.

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, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*. The revised multipart standard is structured as a 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.

2) Planned. (See Annex A)

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Ergonomics of human-system interaction —

Part 400:
Principles and requirements for physical input devices

1 Scope

This part of ISO 9241 gives guidelines for physical input devices for interactive systems. It provides guidance based on ergonomic factors for the following input devices: keyboards, mice, pucks, joysticks, trackballs, trackpads, tablets and overlays, touch sensitive screens, styli, light pens, voice controlled devices, and gesture controlled devices. This part of ISO 9241 defines and formulates ergonomic principles valid for the design and use of input devices. These principles are to be used to generate recommendations for the design of products and for their use. This part of ISO 9241 defines relevant terms for the entire 400 series of ISO 9241. For some applications, e.g. in areas where safety is the major concern, other additional principles may apply and take precedence over the guidance given here.

This part of ISO 9241 also determines properties of input devices relevant for usability including functional, electrical, mechanical, maintainability and safety related properties. Additionally included are aspects of interdependency with the use environment and software.

Any of these properties may be subject to other regulations or standards. These are considered following the example of electrical properties. In this case, this part of ISO 9241 considers the following properties.

— Properties influenced by overriding considerations.

  EXAMPLE Properties related to electrical safety cannot be influenced by the designer.

— Properties that could impair usability.

  EXAMPLE The thickness of the cabling for a mouse or the weight of batteries of a hand-held device need to be considered.

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 9241-5:1998, *Ergonomic requirements for office work visual display terminals (VDTs) — Part 5: Workstation layout and postural requirements*

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

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ISO/IEC 9995-1:2006, *Information technology — Keyboard layouts for text and office systems — Part 1: General principles governing keyboard layouts*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.[3)]

3.1 Actions

3.1.1
click
depression and release of a button or actuation point on an input device

3.1.2
free hand input
input where the input device controls the movement of the cursor without any constraints following the manual input of the user

3.1.3
tracking
moving a pointer or predefined symbol across the surface of a display screen in order to follow a target

3.2 Touch strategies

3.2.1
first contact touch
activation of a function upon touching the display surface

3.2.2
last contact touch
activation of a function upon withdrawing touch from the display surface

3.3 Press/release strategies

3.3.1
on-press activation
activation of a function by pressing a key or button

3.3.2
on-release activation
activation of a function by releasing a key or button

3.4 Feedback

3.4.1
feedback
indicators (such as tactile, auditory or visual) sensed by a user of an action (such as movement or actuation of an input device)

NOTE Display feedback refers to a change on the display resulting from an input device movement or activation.

3) The illustrations of the devices used in this clause do not necessarily represent the design requirements and recommendations of this part of ISO 9241.

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3.4.2
kinesthetic feedback
action perceived by the mechanoreceptors in joints, muscles and tendons resulting in awareness of position, movement, weight and resistance of the limbs or other body parts

3.4.3
tactile feedback
indication of the results of a user action transmitted through the sense of touch

3.5 Hardware

3.5.1
button
mechanical object integrated into an input device, which responds to force when depressed and provides input to computer

3.5.2
cursor
visual indication of where the user interaction via keyboard (or equivalent input device) will occur.

3.5.3
cursor keys
array of keys that control the movement of the cursor on the display screen and that are labelled with arrows indicating the direction of cursor movement caused by the individual keys

3.6 Input devices

3.6.1
home row
row of the keyboard to which the fingers typically return between keystrokes

See Figure 1.

NOTE On the typical keyboard, the home row is row C as defined by ISO/IEC 9995-1:1994 in the alphanumeric section as well as in the numeric section.

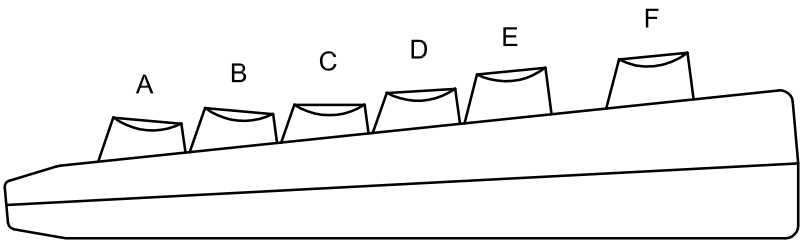

Figure 1 — Typical keyboard — Home row

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3.6.2
home row height
h
height from the centre of the strike surface of an unactuated key in the home row to the support surface

See Figure 2.

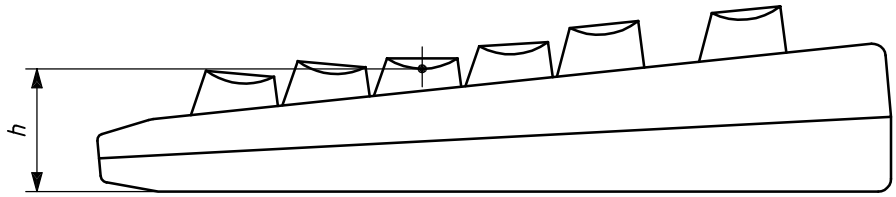

Figure 2 — Typical keyboard — Home row height

3.6.3
input device
user controlled device that transmits information to a system

3.6.4
joystick
lever mounted in a fixed base used to control the movement of objects displayed on a screen

See Figure 3.

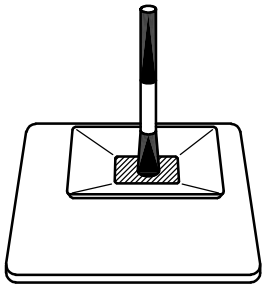

Figure 3 — Side view of example joystick

3.6.4.1
displacement joystick
joystick with a lever that tilts in the direction of applied force from a home position moving the display pointer in proportion to the displacement distance

3.6.4.2
isometric joystick
joystick where the input depends on the force exerted rather than the position of the control

3.6.5
keyboard profile
geometric (i.e. flat, stepped, sloped, dished or sculptured) configuration of the top of the keys

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3.6.5.1
dished profile keyboard
keyboard in which the side profile of the keys resembles a continuous concave curve

See Figure 4.

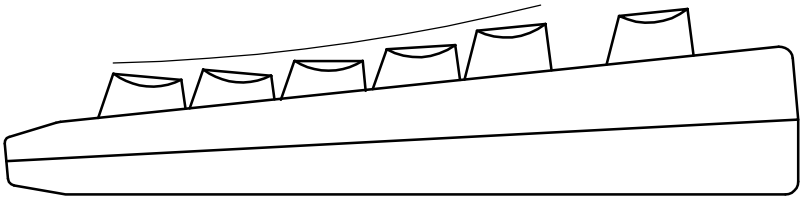

Figure 4 — Example of dished profile keyboard

3.6.5.2
flat profile keyboard
keyboard that has a zero slope with the front at the same height as the back when placed on a flat work surface

See Figure 5.

Figure 5 — Example of flat profile keyboard

3.6.5.3
keyboard slope
α
angle between the plane of the key top surfaces (P-P) and the horizontal surface (H-H) as measured across row A-E using the notation of ISO 9995-1:1994

See Figure 6.

NOTE For keyboards without an E row, rows B to D are used.

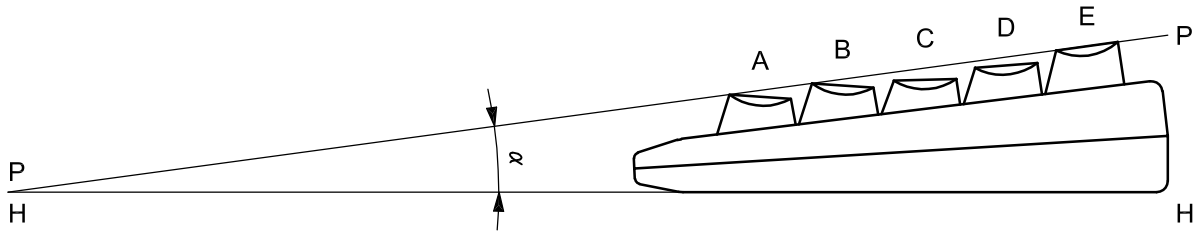

Figure 6 — Keyboard slope

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3.6.5.4
sculptured profile keyboard
keyboard in which the side view of the keytops is shaped in other than a straight line

See Figure 7.

Figure 7 — Example of sculptured profile keyboard

3.6.5.5
stepped profile keyboard
keyboard in which the top of each key is parallel to the work surface but at a different height from the work surface

See Figure 8.

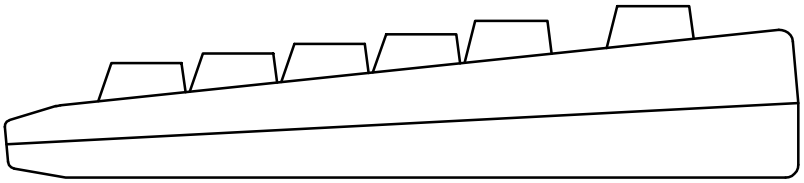

Figure 8 — Example of stepped profile keyboard

3.6.6
key displacement
key movement from its rest position to its fully depressed position

3.6.7
key force
force required to displace a key to a specified position

3.6.8
key roll over
ability of a keyboard to register the correct order of activation of a set of keys

3.6.9
keyboard layout
spatial allocation of keys on a keyboard

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3.6.10
light-pen
light sensitive input device that, when pointed onto a specific location on a display, identifies its position to the system

See Figure 9.

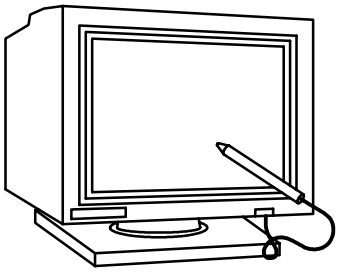


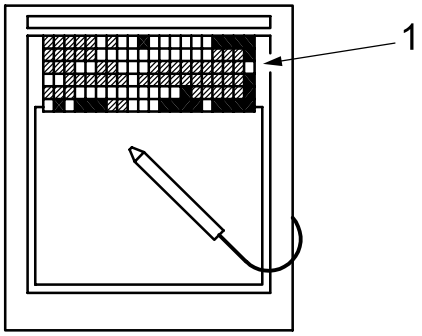
Figure 9 — Example of light-pen against display

3.6.11
mouse
computer input device having one or more buttons and capable of two-dimensional rolling motion which can drive a cursor on the display and which performs a variety of selection options or commands

3.6.12
numeric keypad
array of keys in the numeric section to which are allocated the ten digits 0 to 9 and the decimal separator

3.6.13
overlay
thin template on the surface of a tablet used to indicate the graphic functions available to the user

See Figure 10.



Key

1 graphic overlay

Figure 10 — Top view of example tablet with graphic overlay

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3.6.14
palm rest
surface supporting the palm of the hand (when using an input device) for a keyboard platform placed in front of the keyboard or embedded in the keyboard on which the operator may place the palms of the hands

3.6.15
pointer
symbol on a display which indicates input or selection position whose movement is controlled by an input device

3.6.16
puck
hand-held device similar to a mouse but with a reticle view port and that is typically used with a digitizing tablet

See Figure 11.

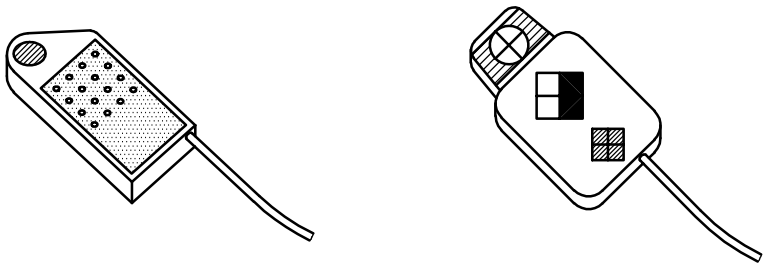
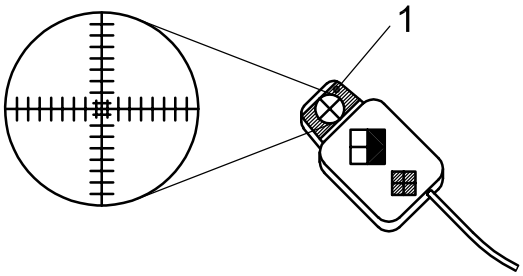


Figure 11 — Top view examples of two types of pucks

3.6.17
ramp action
kinaesthetic sensation during key actuation in which the force required to actuate the key increases as the key is displaced

3.6.18
reticle
orthogonal lines in the lens of a puck used to visually align the puck to an image

See Figure 12.



Key

1 reticle

Figure 12 — Top view of example puck with reticle

3.6.19
section
⟨keyboard⟩ part of a keyboard

EXAMPLE Alphanumeric section, editing section, function section or numeric section.

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3.6.20
selector button
actuator located on an input device

3.6.21
snap action
sudden drop in force required to further displace a key

3.6.22
strike surface
area on the top surface of the key which the finger contacts during key actuation

3.6.23
stylus
pen-shaped pointing device which, when touched to a display or graphics tablet, can be used to draw images on a display or select displayed objects, typically by depressing the stylus tip or actuating a button located along the side of the stylus

See Figure 13.

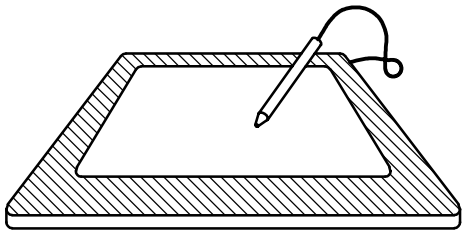

Figure 13 — Side view example of stylus over graphics tablet

3.6.24
tablet
graphics tablet
special flat surface with an input device (such as a stylus or puck) for selection, drawing, or indicating the position, of images to be displayed

3.6.25
tactile indicator keys
keys in the home row which contain a tactile aid for recentring the hands

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3.6.26
trackball
ball in a fixed housing that can be rolled in any direction by the fingers to control pointer movement

See Figure 14.

NOTE The trackball often has adjacent buttons.

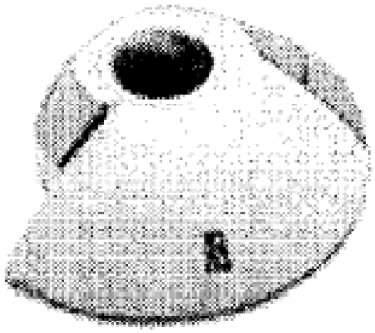

Figure 14 — Example of top view of trackball device with buttons

3.6.27
touch sensitive screen
TSS
input device that produces a position and selection input signal from a finger touching, lifting off or moving across a display

3.6.28
workstation
assembly comprising display equipment with or without a central processing unit, which may be provided with a keyboard and/or input device and/or software determining the operator/machine-interface, optional accessories, peripherals and the immediate work environment

[ISO 9241-5:1998. 3.26]

3.7 Measures

3.7.1
biomechanical load
effect of work posture and effort on the musculoskeletal system

3.7.2
colour difference
difference between two colour stimuli, defined as the Euclidean distance between the points representing them in CIE 1976 L*u*v*

NOTE Adapted from ISO 9241-8:1997, 3.12.

3.7.3
design reference posture
posture specified for the purpose of workstation design to define relative positions and dimensions

[ISO 9241–5:1998, 3.6]

NOTE For detailed information about working postures, see ISO 9241-5:1998 and ISO 11226:2000.

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3.7.4
design viewing distance
distance, or range of distances (specified by the supplier) between the screen and the operator's eyes for which the images on the display meet the requirements of this part of ISO 9241, such as character size, raster modulation, fill factor, spatial instability (jitter) and temporal instability (flicker)

NOTE Adapted from ISO 9241-3:1992, 2.12.

3.7.5
gain
relationship of the movement or change of an indicator on a display to the movement of a control

3.7.6
goniometer
instrument which measures angle of the joints

3.7.7
intended user population
group of human beings for which a product or machinery or a workstation is designed

EXAMPLE Male and female workers of Southeast Asian origin aged between 45 years and 65 years.

3.7.8
movement time
time taken to move a pointing device from a starting position to a target position, excluding stimulus presentation time and button actuation time

3.7.9
parallax
difference in the apparent relative positions of objects when viewed from different points

3.7.10
reflectance
ratio of the reflected luminous flux to the incident flux under given conditions

[CIE 17.4:1987]

3.7.11
resolution
resolving power
smallest detectable movement, or actuation force, of an input device that results in a pointer displacement on a display

3.7.12
specular reflection
reflection in accordance with the laws of geometrical optics, without diffusion

[CIE 17.4:1987]

3.7.13
throughput
⟨input devices⟩ rate of information transfer when a user is operating an input device to control a pointer on a display

NOTE The throughput is expressed in bits per second.

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3.8 Postures and movements

3.8.1
dorsal
pertaining to the back of the hand or foot

See Figure 15.

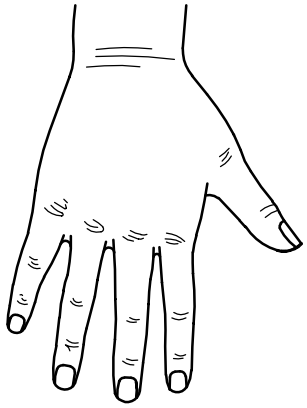

Figure 15 — Dorsal view of hand

3.8.2
ventral
nearest to or facing toward the axis of an organ

3.8.3
palm
ventral area of the hand between wrist and base of fingers

See Figure 16.

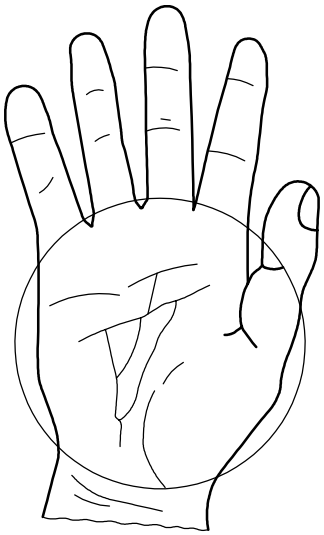

Figure 16 — Palmar area of hand

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3.8.4
Frankfurt plane
standard horizontal plane at the level of the upper edge of the opening of the external auditory meatus (external ear opening) and the lower border of the orbital margin (lower edge of the eye socket) while the median plane of the head is held vertically

NOTE 1 The Frankfurt plane is associated with the normal line of sight (relaxed extraocular muscles).

NOTE 2 Adapted from ISO 11226:2000, 2.2.

3.8.5
neutral body posture
upright standing posture with the arms hanging freely by the side of the body

[ISO 11228-1:2003, 3.10]

NOTE The neutral body posture includes the Frankfurt plane horizontal.

3.8.6
neutral posture for the trunk, upper arms, and head
upright trunk, upper arms hanging freely, and head posture according to the Frankfurt plane

[ISO 11226:2000, 2.8]

3.8.7
neutral posture
position that the body (and parts of the body) assumes when relaxed, i.e. without any intentional bending at the joints

3.8.8
reach envelope
optimum or maximum space accessible to the intended user population with respect to a specified user position

3.8.9
wrist deviation
moving or turning of the hand in its own plane away from the axis of the forearm, and the position after this movement

3.8.10
neutral range
within acceptable limits for joint motion

NOTE 1 This range of motion minimizes the bio-mechanical load and enhances users' well-being.

NOTE 2 Relevant body parts for the work with input devices include the neck, shoulder, elbow, wrist and hand.

3.8.11
displacement
change of position in the location of a point with respect to some reference coordinate

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3.8.12
flexion
moving a limb segment in the ventral direction (for example, moving the hand and fingers toward the palm), and the position of the segment and joint after this movement

See Figure 17.

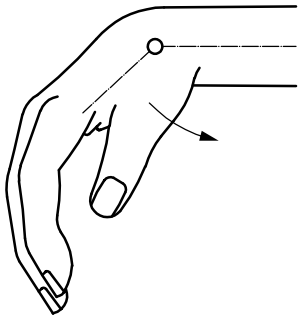
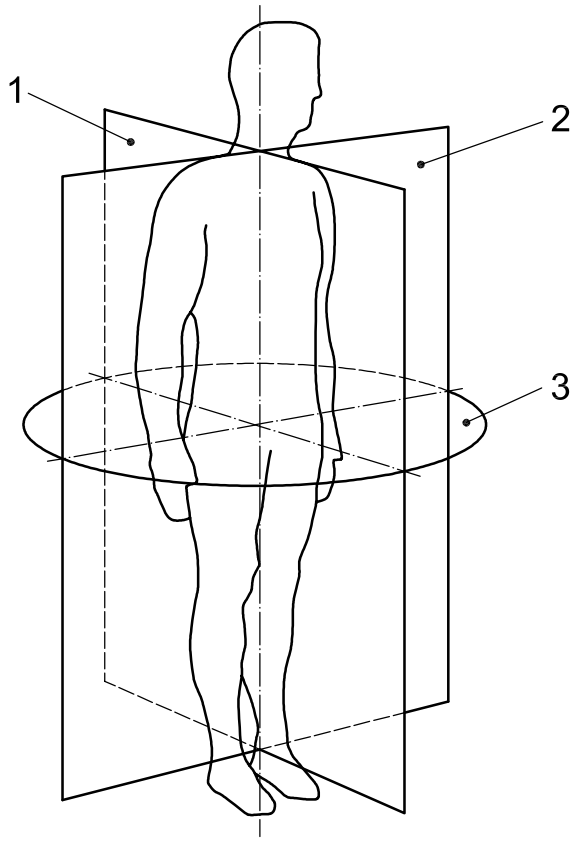


Figure 17 — Example of wrist flexion

3.8.13
shoulder forward flexion
forward movement of the arm in the sagittal plane

NOTE For an illustration of the sagittal plane, see Figure 18.



Key

1 median or sagittal plane
2 coronal or frontal plane
3 transverse or horizontal plane

Figure 18 — Planes

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3.8.14
extension
moving a limb segment in the dorsal direction and position of the segment and joint after this movement

See Figure 19.

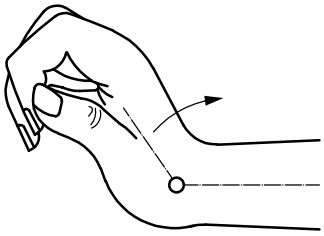

Figure 19 — Example of wrist extension

3.8.15
abduction
movement of a limb away from the median plane

[EN 1005-1:2001]

See Figure 20.

NOTE For an illustration of the median plane, see Figure 18.

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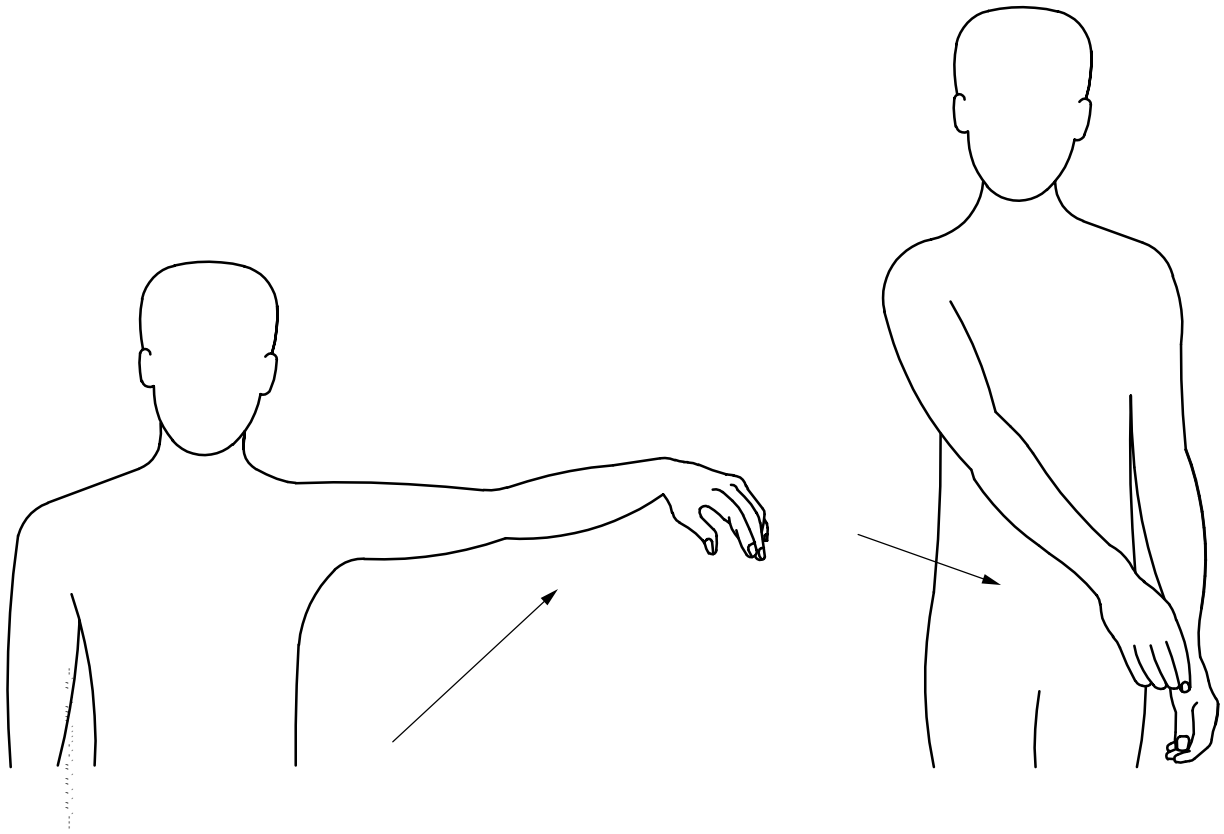
3.8.16
adduction
movement of a limb towards the median plane

[EN 1005-1:2001]

See Figure 20.

NOTE For an illustration of the median plane, see Figure 18.



a) Abduction **b) Adduction**

Figure 20 — Abduction and adduction

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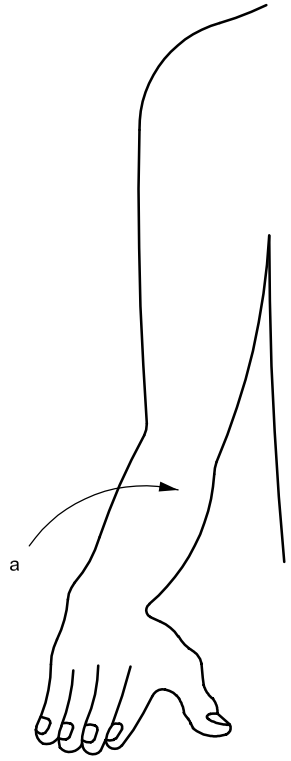
3.8.17
pronation
medial rotation of the forearm around its longitudinal axis

See Figure 21.

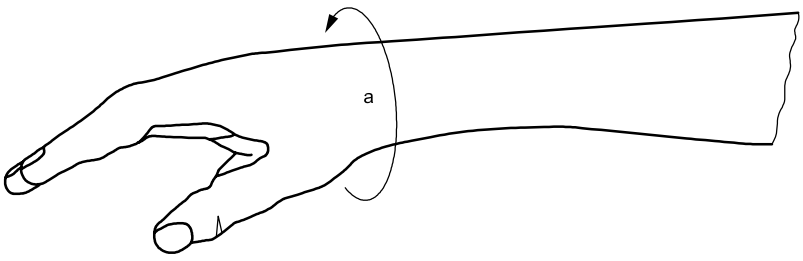


a Rotation.

Figure 21 — Pronation

3.8.18
supination
lateral rotation of the forearm around its longitudinal axis

See Figure 22.



a Rotation.

Figure 22 — Supination

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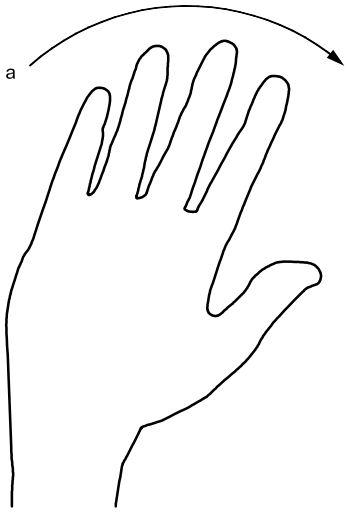
3.8.19
radial hand deviation
bending the hand at the wrist in the direction of the thumb

See Figure 23.

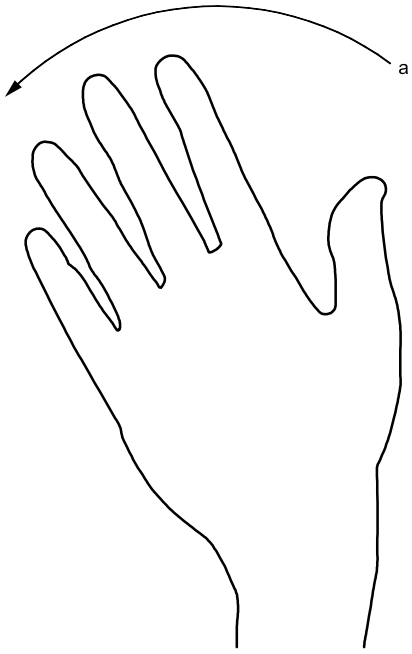


a Direction of deviation.

Figure 23 — Radial hand deviation

3.8.20
ulnar deviation
bending the hand at the wrist in the direction of the little finger

See Figure 24.



a Direction of deviation.

Figure 24 — Ulnar hand deviation

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3.9 Types of task primitives

3.9.1
dragging
dragging and dropping
moving one (or more) objects on a display by translating it along a path determined by a pointer

3.9.2
pointing
operation with a graphic user interface in which an input device is used to move a small display image (such as a pointer) to a specific location on the display

3.9.2.1
direct pointing
hitting a target unaided by system feedback

EXAMPLE Direct pointing with a finger or stylus.

3.9.2.2
indirect pointing
using system visual feedback to hit a target

EXAMPLE Indirect pointing when the system is controlling a screen pointer in response to a mouse movement.

3.9.3
selecting
choosing one or more items on a display

3.9.4
task primitive
fundamental action (such as pointing, selecting and dragging) associated with using a non-keyboard input device

NOTE User tasks contain a mix of task primitives.

3.9.5
tracing
following the outline of an image by moving the cursor or input device over the lines or shape of an image

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3.10 Usability related definitions

3.10.1
diffuse reflection
diffusion by reflection in which, on the macroscopic scale, there is no regular reflection

[CIE 17.4: 1987]

See Figure 25.

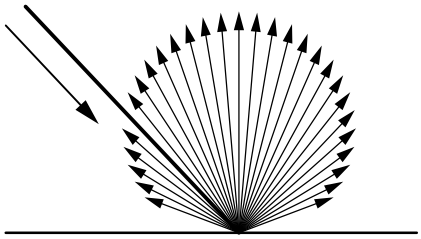

Figure 25 — Diffuse reflection

3.10.2
effectiveness
accuracy and completeness with which users achieve specified goals

[ISO 9241-11:1998, 3.2]

3.10.3
efficiency
resources expended in relation to the accuracy and completeness with which users achieve goals

[ISO 9241-11:1998, 3.3]

3.10.4
satisfaction
freedom from discomfort, and positive attitudes towards the use of the product

[ISO 9241-11:1998, 3.4]

3.10.5
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]

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4 Guiding principles

4.1 General considerations

Guiding principles given in this clause are generic design rules for input devices or combinations thereof if designed to be used together within the same workspace and during the same time period. For a specific physical input device, design requirements can be derived from the principles in consideration of the relative importance for each principle for the object, the task and the intended user population.

The concept of *fit* (as defined in ISO 9241-5:1998) concerns the extent to which equipment (e.g. visual display units, input devices) can accommodate individual users' needs. The ergonomic design and selection of equipment ensures a good fit between equipment and a range of users and a range of tasks. The designer should consider a range of users including e.g. left-handed-people, people with reduced ability and people with hand tremor. Some specialized devices are intended for use only for specified user populations and tasks, e.g. assistive devices. The required fit can be achieved by using any device that offers the required level of usability. For example, there are a variety of input devices which enable users to achieve the same results for the same task by using different parts of their body (e.g. hand, foot, speech or eye control). Depending on the special needs, some users can even use a combination of different devices, e.g. a foot and an eye controlled input device instead of a mouse, to achieve the same result.

The guiding principles of this part of ISO 9241 are based on the concept of *usability* as defined in ISO 9241-11:1998. Following the rationale of this concept, an entity has no intrinsic usability, but only a capability to be used in a particular context. Usability cannot be completely assessed by studying a product in isolation, although form factors such as activation force or grip size may be accurately described *a priori*.

In general, input devices for interactive systems as physical units function with the help of software either resident in the device, or supplied by the operating system or by a specific program (mostly a driver). Thus, the "product", as defined in ISO 9241-11:1998, 3.10, is represented by the relevant characteristics achieved by the interaction of hardware and software.

In practice, using an application may require more functionality than a single input device offers. The problem associated with this situation is similar to that which occurs when a certain type of control (e.g. a button) is required to accomplish a certain function (e.g. input of a single bit), but where an additional requirement exists for certain applications (e.g. inhibiting unintended input). Thus, a device usable for its intended use may become unusable for certain uses if not supported by an additional device (or software).

In such cases, designers of application software either take advantage of other input devices, the existence of which can be anticipated (e.g. the existence of a keyboard when a mouse is being considered), or require the use of an additional device (e.g. a tablet for certain applications that rely on the precision of pointing). Under such conditions, the usability of the device is not or only partly relevant. The reason is that its usability has been determined without the context enforced by the application, i.e. the additional device including its software, and possible restrictions imposed by the workplace. A usable keyboard may become unusable if being used together with a large tablet, and usability of this device itself might suffer if the keyboard occupies the optimum reach of the user. The opposite effect is also very common — enhancement of the usability of a certain device through the use of another device (and software). In the given combination of a keyboard and tablet, the keyboard may enhance the function drawing straight lines, whereas the tablet may enable the user to enter symbols the specific keyboard cannot generate.

To address these aspects, the term *appropriateness* was already introduced in ISO 9241-9:2000. Appropriateness is the application of the concept of usability on entities that are combined for a specific purpose, e.g. achieving a certain level of usability for users with special needs, or for uses where no single device can achieve the level of usability required for a certain task. If an input device is to be used for its designated purpose (used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use) it is appropriate *per se*.

The design of input devices shall take into consideration the design requirements according to 4.2.

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4.2 Design requirements

4.2.1 Appropriateness

The design shall be appropriate for the intended user, intended tasks being performed and the intended use environment. An appropriate input device or combination of devices enables the user to achieve the required level of effectiveness and is efficient and satisfactory for the intended user population and the intended use.

Input device appropriateness may be enhanced by software or by additional use of another device. If a device can be evaluated without considering another input device, the usability and the appropriateness of it are identical. If the use of another device is required for a task or for an intended use environment, the appropriateness of the device under consideration is its usability in the context required.

4.2.2 Operability

4.2.2.1 General considerations

An input device shall be operable, i.e. its intended use obvious, predictable and consistent.

NOTE The concepts of obviousness and predictability may be termed *affordance*.

4.2.2.2 Obviousness

The intended use of an appropriately designed input device for a task primitive shall be either obvious or easily discovered.

4.2.2.3 Predictability

The use of an input device shall be predictable, i.e. it shall be designed to operate and respond according to the expectations of the intended user population.

4.2.2.4 Consistency

The use of an input device shall be consistent, i.e. it operates and responds in the same manner when used in similar situations.

4.2.3 User compatibility

An input device shall be user compatible, i.e. its design accommodates the characteristics of the intended users, e.g. anthropometric and biomechanical capabilities.

NOTE Consideration of principles for accessible design can require some specific design parameters, e.g. for children, people with reduced visual ability and people with hand tremor.

4.2.4 Feedback

An input device shall provide effective feedback, i.e. the user is given immediately perceptible and easily understandable indication that the device is responding to user actuation.

4.2.5 Controllability of physical input devices

4.2.5.1 General considerations

The operation of an input device shall be controllable. This means that the device shall be responsive, and its use shall not interfere with its functionality. The design of the device shall give the user adequate and reliable access. The design shall prevent unintended loss of control during intended use, e.g. slipping for hand operated devices.

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4.2.5.2 Responsiveness

An input device shall be responsive, i.e. the feedback following its actuation shall be consistent, timely and accurate.

4.2.5.3 Non-interference

An input device shall not interfere with its own use; for example, the user's hand or arm shall not block an infrared beam, or cables will not interfere with movements or control of the device during intended use.

4.2.5.4 Reliability of device access

Adequate control of an input device is given when its design prevents unintended loss of control during intended use.

4.2.5.5 Adequacy of device access

The design of an input device shall enable the user to quickly and easily access it (e.g. grasp, position and manipulate) during intended use without adversely affecting performance.

NOTE Positioning of a device depends on its design and the design and adjustment of the workstation and position of the user.

4.2.5.6 Control access

Access to input device controls shall be considered adequate when they can be located and actuated quickly and easily without interfering with the overall use of the device.

EXAMPLE Actuating a mouse button does not move the focus of the pointer.

4.2.6 Biomechanical load

4.2.6.1 General considerations

The biomechanical load shall be minimized, taking into consideration the postures of the entire body and the part of the body relevant for the use of the input device.

The design of the device shall take into consideration the minimizing of static muscle load.

4.2.6.2 Postures

An input device shall be operable without undue deviation from a neutral posture, i.e. the motions of joints involved in operating the device are in the neutral range.

4.2.6.3 Effort

An input device selected for a given task by a specified user population shall be operable without excessive effort.

5 Performance criterion

Since this part of ISO 9241 defines generic ergonomic principles only, there is no performance criterion.

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6 Properties of input devices relevant for usability

6.1 Types of input devices — General considerations

Input devices can be grouped into types from various points of view, e.g. into types such as “pointing devices” or “movement trackers”, in consideration of their functionality, or as “finger operated” or “foot controlled” devices, in consideration of the part of the human body controlling the device.

The great variety of devices to be considered in the 400 series of ISO 9241 (listed below) makes it necessary to find a typology for them:

— armatures;

— bar code readers;

— boards (e.g. whiteboards);

— character recognition;

— chord keyboards;

— digitizing tablets;

— eye and head movement trackers;

— foot controllers;

— force and tactile feedback devices (“haptic devices”);

— game controllers;

— gloves;

— joysticks;

— keyboards and keypads;

— light-pens;

— mice;

— motion capture devices;

— pads;

— pens;

— speech recognition devices;

— stylus (“haptic”) devices;

— touch screens;

— touch tablets;

— trackballs;

— trackpads;

— trackpoint pointing devices.

This list is not exhaustive.

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The devices listed here can be differentiated at least in consideration of the following:

a) bodily action used for operation (see 6.2.1);

b) task primitive (see 6.2.2);

c) dimensionality of control (see 6.2.3);

d) property sensed (see 6.2.4).

Examples of other means of differentiation, not used in this part of ISO 9241, are the following:

— physical variables carrying the information (relative/absolute position, force, velocity, acceleration, etc.);

— multiplicity of control (number of parallel control variables);

— control modality (discrete/continuous);

— control monitoring (one-shot or continuous time, holds last value or returns to nominal value, sequential or "skip-out" the continuum output, etc.);

— control distance function (monotonic, non-monotonic, uni/bipolar, etc.);

— literalness of control (mapping);

— psychological nature of control (causality, exploratory or goal-oriented control).

6.2 Typology of input devices

6.2.1 Typology by bodily action used for operation

The following types of input device are differentiated:

— hand and finger controlled;

— foot controlled;

— mouth controlled;

— speech controlled;

— eye controlled;

— motion controlled.

6.2.2 Typology by task primitive

The following types of input device are differentiated:

— code entry;

— pointing;

— dragging;

— selecting;

— tracing.

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6.2.3 Typology by degrees of freedom (dimensions)

The following types of input device are differentiated:

— single dimension;

— two dimensions;

— three dimensions.

6.2.4 Typology by the property sensed

The following types of input device are differentiated:

— pressure;

— motion;

— position;

— sound (speech, frequency, pitch and loudness);

— optical properties (shape, colour, brightness.

For the purposes of the 400 series of ISO 9241, the typology according to 6.2.1 will be used to group the provisions for certain types of input devices.

6.3 Functional properties

Functional properties of input devices that are treated within the 400 series of ISO 9241 are those related to the usability of a product, e.g. properties of keys (size, keytop shape, strike surface etc.) or mechanical properties of the housing such as slope for keyboards.

Functional properties not related to usability, such as the material used for a tablet, are not subject to ergonomic considerations and will not be treated in the 400 series.

6.4 Electrical properties

Electrical properties of input devices such as voltage, power consumption, electromagnetic immunity are mostly not associated with usability. The 400 series of ISO 9241 will only consider the following properties.

— Those that could impair usability.

EXAMPLE 1 The thickness of the cabling for a mouse.

EXAMPLE 2 The weight of batteries of hand-held devices.

EXAMPLE 3 No visible warning for low battery voltage.

— Those influenced by overriding considerations, and which thus cannot be influenced by the designer.

EXAMPLE 4 Electrical safety considerations may require certain design parameters.

NOTE Electrical properties of input devices such as voltage, power consumption, electromagnetic immunity are mostly not associated with usability. In the 400 series, only such electrical properties will be treated that can impair usability, e.g. thickness of the cabling for a mouse or the weight of batteries of hand-held devices. For properties related to electrical safety, overriding provisions of other standards and regulations exist that need careful consideration in the design of the product. For each device, potential interference between electrical properties and usability will be named and referenced to the relevant standard or regulation.

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6.5 Mechanical properties

Mechanical properties to be treated in the 400 series of ISO 9241 are limited to aspects associated with usability.

EXAMPLE The thermal conductivity of a hand-held device or its weight.

For each type of device, specific mechanical properties are relevant and are listed in ISO 9241-410.

6.6 Maintainability-related properties

Maintainability-related properties of input devices are not treated in the 400 series of ISO 9241, except for common user activities, e.g. cleaning of keytops or changing of batteries.

The provisions of the 400 series will not cover maintenance issues not related to the work of the user.

6.7 Safety-related properties

Properties of input devices that need to be considered for the user's safety and health, such as those related to electrical safety, are mostly treated by other regulations, e.g. by engineering standards. In the 400 series of ISO 9241, properties related to safety will be referenced to the relevant standard. Only such properties without appropriate consideration in other regulations will be treated if associated with usability, e.g. weight of hand-held devices for continuous operation.

6.8 Interdependency with software

The usability of nearly all input devices is influenced by software. In some cases, the influence of software may be significant, but not fully determinant, in the overall usability, e.g. for keyboards. In other cases, software can form the overriding feature of an input device. Examples for such cases are tablets of different size or microphones as acoustic input devices.

In general, input devices for interactive systems as physical units function with the help of software either resident in the device, or supplied by the operating system or by a specific program (mostly a driver). Thus, the "product" as it is understood according to ISO 9241-11 is represented by the relevant characteristics achieved by the interaction of hardware and software.

While the usability of input devices is dependent on software to a certain degree, the usability of software is fully dependent on input (and output) devices. For this reason, the 400 series of ISO 9241 will consider issues related to the interdependence of input devices and software. One relevant aspect is the influence of the software on the usability of a physical input device.

EXAMPLE Control/display ratio of a mouse.

For the provisions of ISO 9241-400, the device under consideration comprises the physical unit and software resident in the device or delivered with the physical unit.

6.9 Interdependency-with-use environment

The interdependency-with-use environment is

a) the influence of the use of a device exerted on the environment, and

b) the influence of the environment on the usability of the device.

Only in ideal cases is interdependency with the environment nonexistent or negligible.

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6.10 Documentation

In general, documentation is part of a product. This issue will be considered in the 400 series of ISO 9241 as far as it is related to usability. For example, products may be designed and delivered for users with special training or for work areas with special conditions as indicated in the documentation. In consideration of such aspects, the documentation is relevant for usability. Most parts of a product's documentation, however, will not be related to usability, and thus will not be considered within the framework of the 400 series.

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Annex A
(informative)

Overview of the ISO 9241 series

This annex presents an overview of ISO 9241: its structure, subject areas and the current status of both published and projected parts, at the time of publication of this part of ISO 9241. For the latest information on the series, see: http://isotc.iso.org/livelink/livelink?func=ll&objId=651393&objAction=browse&sort=name.

Part no.	Subject/title	Current status
1	General introduction	International Standard (intended to be replaced by ISO/TR 9241-1 and ISO 9241-130)
2	Guidance on task requirements	International Standard
3	Visual display requirements	International Standard (intended to be replaced by the ISO 9241-300 subseries)
4	Keyboard requirements	International Standard (intended to be replaced by ISO 9241-400 subseries)
5	Workstation layout and postural requirements	International Standard (intended to be replaced by ISO 9241-500)
6	Guidance on the work environment	International Standard (intended to be replaced by ISO 9241-600)
7	Requirements for display with reflections	International Standard (intended to be replaced by the ISO 9241-300 subseries)
8	Requirements for displayed colours	International Standard (intended to be replaced by the ISO 9241-300 subseries)
9	Requirements for non-keyboard input devices	International Standard (intended to be replaced by the ISO 9241-400 subseries)
11	Guidance on usability	International Standard
12	Presentation of information	International Standard (intended to be replaced by ISO 9241-111 and ISO 9241-141)
13	User guidance	International Standard (intended to be replaced by ISO 9241-124)
14	Menu dialogues	International Standard (intended to be replaced by ISO 9241-131)
15	Command dialogues	International Standard (intended to be replaced by ISO 9241-132)

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Part no.	Subject/title	Current status
16	Direct-manipulation dialogues	International Standard (intended to be replaced by ISO 9241-133)
17	Form filling dialogues	International Standard (intended to be replaced by ISO 9241-134)
20	Accessibility guidelines for information/communication technology (ICT) equipment and services	Under preparation
Introduction		
100	Introduction to software ergonomics	Planned
General principles and framework		
110	Dialogue principles	International Standard
111	Presentation principles	Planned to partially revise and replace ISO 9241-12
112	Multimedia principles	Planned to revise and replace ISO 14915-1
113	GUI and controls principles	Planned
Presentation and support to users		
121	Presentation of information	Planned
122	Media selection and combination	Planned to revise and replace ISO 14915-3
123	Navigation	Planned to partially revise and replace ISO 14915-2
124	User guidance	Planned to revise and replace ISO 9241-13
129	Individualization	Planned
Dialogue techniques		
130	Selection and combination of dialogue techniques	Planned to incorporate and replace ISO 9241-1:1997/Amd 1:2001
131	Menu dialogues	Planned to replace ISO 9241-14
132	Command dialogues	Planned to replace ISO 9241-15
133	Direct-manipulation dialogues	Planned to replace ISO 9241-16
134	Form-based dialogues	Planned to replace ISO 9241-17
135	Natural language dialogues	Planned
Interface control components		
141	Controlling groups of information (including windows)	Planned to partially replace 9241-12
142	Lists	Planned
143	Media controls	Planned to partially revise and replace ISO 14915-2

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Part no.	Subject/title	Current status
Domain-specific guidance		
151	Guidance on World Wide Web software user interfaces	Under preparation
152	Interpersonal communication	Planned
153	Virtual reality	Planned
Accessibility		
171	Guidance on software accessibility	Under preparation
Human-centred design		
200	Introduction to human-centred design standards	Planned
210	Human-centred design of interactive systems	Planned to revise and replace ISO 13407
Process reference models		
220	Human-centred lifecycle processes	Planned to revise and replace ISO/PAS 18152
Methods		
230	Human-centred design methods	Planned to revise and replace ISO/TR 16982
Ergonomic requirements and measurement techniques for electronic visual displays		
300	Introduction to requirements and measurement techniques for electronic visual displays	Under preparation
302	Terminology for electronic visual displays	Under preparation
303	Requirements for electronic visual displays	Under preparation
304	User performance test methods	Under preparation
305	Optical laboratory test methods for electronic visual displays	Under preparation
306	Field assessment methods for electronic visual displays	Under preparation
307	Analysis and compliance test methods for electronic visual displays	Under preparation
308 [a]	Surface conduction electron-emitter displays (SED)	Under preparation

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Part no.	Subject/title	Current status
Physical input devices		
400	Principles and requirements for physical input devices	International Standard
410	Design criteria for physical input devices	Under preparation
411	Laboratory test and evaluation methods for the design of physical input devices	Planned
420	Selection procedures for physical input devices	Under preparation
421	Workplace test and evaluation methods for the use of physical input devices	Planned
Workstation		
500	Workstation layout and postural requirements	Planned to revise and replace ISO 9241-5
Work environment		
600	Guidance on the work environment	Planned to revise and replace ISO 9241-6
Application domains		
710	Introduction to ergonomic design of control centres	Planned
711	Principles for the design of control centres	Planned to revise and replace ISO 11064-1
712	Principles for the arrangement of control suites	Planned to revise and replace ISO 11064-2
713	Control room layout	Planned to revise and replace ISO 11064-3
714	Layout and dimensions of control centre workstations	Planned to revise and replace ISO 11064-4
715	Control centre displays and controls	Planned to revise and replace ISO 11064-5
716	Control room environmental requirements	Planned to revise and replace ISO 11064-6
717	Principles for the evaluation of control centres	Planned to revise and replace ISO 11064-7
Tactile and haptic interactions		
900	Introduction to tactile and haptic interactions	Planned
910	Framework for tactile and haptic interactions	Planned
920	Guidance on tactile and haptic interactions	Under preparation
930	Haptic and tactile interactions in multimodal environments	Planned
940	Evaluation of tactile and haptic Interactions	Planned
971	Haptic and tactile interfaces to publicly available devices	Planned

[a] Provisional number.

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Bibliography

[1] ISO 6385:2004, *Ergonomic principles in the design of work systems*

[2] ISO 7000:1989, *Graphical symbols for use on equipment — Index and synopsis*

[3] ISO/IEC 9995-2:2002, *Information technology — Keyboard layouts for text and office systems — Part 2: Alphanumeric section*

[4] ISO/IEC 9995-4:2002, *Information technology — Keyboard layouts for text and office systems — Part 4: Numeric section*

[5] ISO/IEC 9995-5:1994, *Information technology — Keyboard layouts for text and office systems — Part 5: Editing section*

[6] ISO/IEC 9995-6:1994, Information technology — *Keyboard layouts for text and office systems — Part 6: Function section*

[7] ISO/IEC 9995-7:2002, *Information technology — Keyboard layouts for text and office systems — Part 7: Symbols used to represent functions*

[8] ISO 11226:2000, *Ergonomics — Evaluation of static working postures*

[9] ISO 11228-1:2003, *Ergonomics — Manual handling — Part 1: Lifting and carrying*

[10] ISO 13406-2, *Ergonomic requirements for office work visual displays based on flat panels — Part 2: Ergonomic requirements for flat panel displays*

[11] IEC 60417-DB, *Graphical symbols for use on equipment*[4)]

[12] EN 1005-1:2001, *Safety of machinery — Human physical performance — Part 1: Terms and definitions*

[13] CIE 17.4:1987, *International lighting vocabulary; Chapter 845: lighting*

4) Online database, updated permanently. Access is on a subscription basis, alternatively for a period of three, six, 12 or 24 months. Preview available at http://domino.iec.ch/IEC60417.

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