INTERNATIONAL STANDARD

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9241-4

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Ergonomic requirements for office work with visual display terminals (VDTs) —

Part 4:
Keyboard requirements

Exigences ergonomiques pour travail de bureau avec terminaux à écrans de visualisation (TEV) —

Partie 4: Exigences relatives aux claviers

ISO 9241-4:1998(E)

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faee1a79e870/iso-9241-4-1998

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.

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.

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

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

— *Part 1: General introduction*

— *Part 2: Guidance on task requirements*

— *Part 3: Visual display requirements*

— *Part 4: Keyboard requirements*

— *Part 5: Workstation layout and postural requirements*

— *Part 6: Guidance on the work environment*

— *Part 7: Requirements for display with reflections*

— *Part 8: Requirements for displayed colours*

— *Part 9: Requirements for non-keyboard input devices*

— *Part 10: Dialogue principles*

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— *Part 16: Direct-manipulation dialogues*

— *Part 17: Form filling dialogues*

Annexes A and B of this part of ISO 9241 are for information only.

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Introduction

The keyboard is currently the principal input device used by operators to enter information into interactive office computer systems. Keyboard design can have a significant impact on efficiency, effectiveness and satisfaction. The requirements and recommendations are based on ergonomic principles.

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Ergonomic requirements for office work with visual display terminals (VDTs) —

Part 4:
Keyboard requirements

1 Scope

This part of ISO 9241 applies to linear detachable keyboards designed for stationary use. It provides guidance on the design of keyboards used for typical office tasks so that the limitations and capabilities of users are considered. It provides guidance based on ergonomic factors for keyboard layout arrangements, the physical characteristics of the individual keys and the overall design of the housing containing the keys. This part of ISO 9241 specifies methods for testing conformance by measuring the physical attributes of a keyboard. It also includes a proposed alternative test method for keyboards that do not conform to the physical design requirements and recommendations, based on a user performance test and subjective rating scales.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9241. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9241 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2469:1994, *Paper, board and pulps — Measurement of diffuse reflectance factor.*

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

ISO 9241-3:1992, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 3: Visual display requirements.*

ISO 9241-5:—[1]), *Ergonomic requirements for office work with visual display terminals — Part 5: Workstation layout and postural requirements.*

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1) To be published.

ISO/IEC 9995-1:1994, *Information technology — Keyboard layouts for text and office systems — Part 1: General principles governing keyboard layouts.*

ISO/IEC 9995-2:1994, *Information technology — Keyboard layouts for text and office systems — Part 2: Alphanumeric section.*

ISO/IEC 9995-4: 1994, *Information technology — Keyboard layouts for text and office systems — Part 4: Numeric section.*

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

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

ISO/IEC 9995-7: 1994, *Information technology — Keyboard layouts for text and office systems — Part 7: Symbols used to represent functions.*

ISO/IEC 9995-8: 1994, *Information technology — Keyboard layouts for text and office systems — Part 8: Allocation of letters to the keys of a numeric keypad.*

IEC 417:1973, *Graphical symbols for use on equipment. Index, survey and compilation of single sheets.*

3 Definitions

For the purposes of this part of ISO 9241, the following definitions apply.

3.1 Technical definitions

3.1.1
cursor
visual indication of the focus for alphanumeric input
[ISO 9241-12:—[1)]

3.1.2
cursor keys
array of keys which control the movement of the cursor on the display screen and are labelled with arrows indicating the direction of cursor movement caused by the individual keys

3.1.3
dished profile keyboard
keyboard in which the side profile of the keys resembles a continuous concave curve
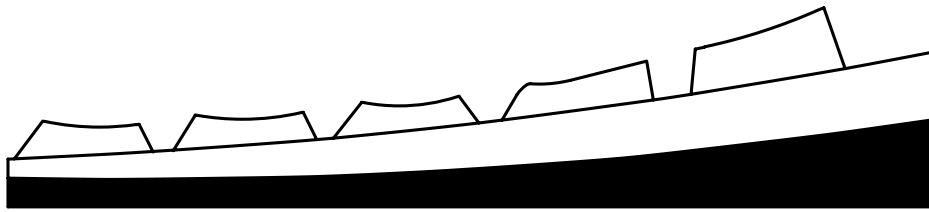(see figure 1)

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1) To be published.

Figure 1 — Example of a dished profile keyboard

3.1.4
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 2)

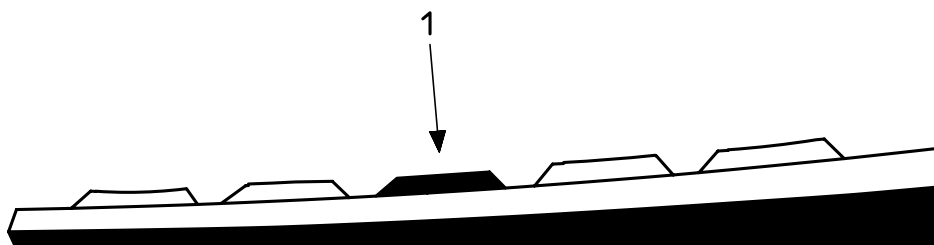**Figure 2 — Example of a flat profile keyboard**

3.1.5
home row
row of the keyboard to which the fingers typically return between keystrokes
(see figure 3)

NOTE — On a typical keyboard, the home row is row C of ISO/IEC 9995 in the alphanumeric section as well as in the numeric section.
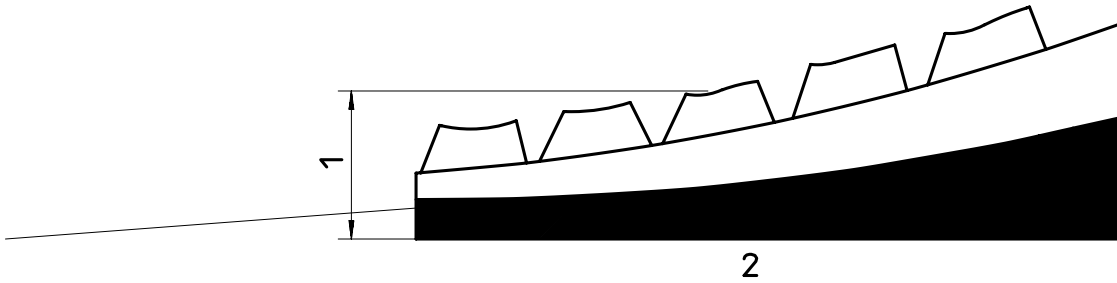
1

Key

1   Home row

3.1.6
home row height
height from the centre of the strike surface of an unactuated key in the home row to the support surface
(see figure 4)

Key

1   Home row height

2   Row C

Figure 4 — Home row height

3.1.7
keyboard profile
geometric (i.e. flat, stepped, sloped, dished or sculptured) configuration of the top of the keys

3.1.8
keyboard slope
angle (α) 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
(see figure 5)

NOTE — For keyboards without an E row, use rows B to D.

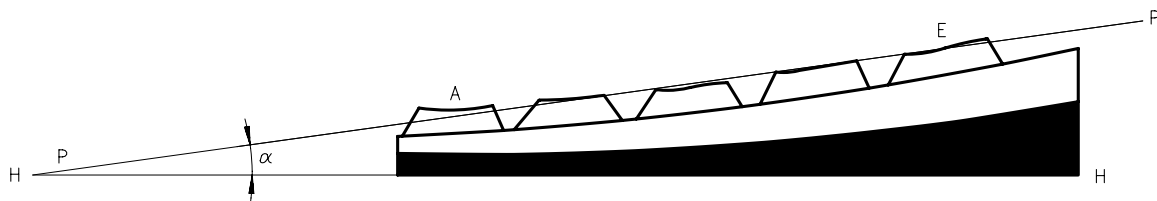**Figure 5 — Keyboard slope**

3.1.9
key displacement
key movement from its rest position to its fully depressed position

3.1.10
key force
force required to displace a key to a specified position

3.1.11
key roll over
ability of a keyboard to register the correct order of activation of a set of keys

3.1.12
layout
spatial allocation of keys on a keyboard

3.1.13
numeric keypad
array of keys in the numeric section to which are allocated the ten digits 0 to 9 and the decimal separator (see figure 6)
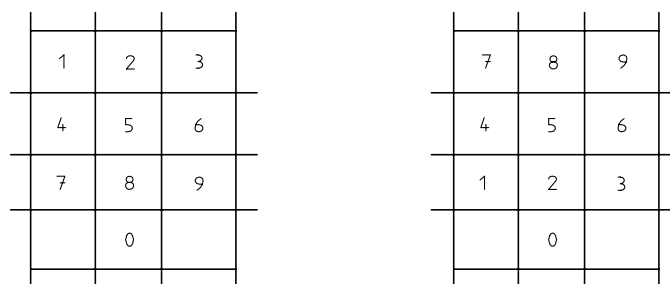
Figure 6 — Numeric keypad [1-2-3 (telephone) layout, left; 7-8-9 (calculator) layout, right]

3.1.14
palm-rest
platform placed in front of the keyboard or embedded in the keyboard on which the operator may place the palm of their hands

3.1.15
principle section
alphanumeric, editing, function, and numeric sections

3.1.16
ramp action
kinaesthetic sensation during key actuation in which the force required to actuate the key increases as the key is displaced

3.1.17
sculptured profile keyboard
keyboard in which the side view of the keytops is shaped in other than a straight line

3.1.18
sloped profile keyboard
keyboard in which the side profiles of the keys are all sloped (pitched) at the same angle with respect to the base

3.1.19
snap action
sudden drop in force required to further displace a key

3.1.20
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
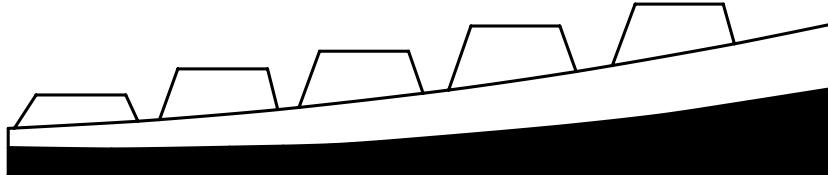(see figure 7)

Figure 7 — Example of a stepped profile keyboard

3.1.21
strike surface
area on the top surface of the key which the finger contacts during key actuation

3.1.22
tactile indicator keys
keys in the home row which contain a tactile aid for recentering the hands

3.1.23
visual display terminal (VDT)
functional unit consisting of at least a visual display and an input device

3.2 Usability-related definitions

3.2.1
diffuse reflection
diffusion by reflection in which, on the macroscopic scale, there is no regular reflection
[CIE Publ. 17.4:1987, IEV 845-04-47]

3.2.2
efficiency
resources expended in relation to the accuracy and completeness with which users achieve goals
[ISO 9241-11]

3.2.3
effectiveness
the accuracy and completeness with which users achieve specified goals
[ISO 9241-11]

3.2.4
feedback
information to the user indicating that a key has been actuated