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Information technology — Segmented keyboard layouts

Technologies de l'information — Disposition des claviers segmentés

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 15411 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 35, *User interfaces*.

Annex A of this International Standard is for information only.

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Introduction

This International Standard provides guidance on the technical requirements which are important in the three-dimensional layout of segmented keyboards.

Segmentation of the alphanumeric section of the keyboard allows the two segments to be placed in non-coplanar and non-linear alignment. Segmented keyboards are intended to allow altered spatial layout of the keyboard segments relative to the user. The altered orientation may allow the user to attain greater comfort, to decrease the rate of onset of fatigue and to reduce the possibility of pain.

Major contributing influences on the effectiveness and productivity provided by a segmented keyboard are the typing skills of the user. Touch typists can take full advantage of the differing angles provided, whereas, unskilled users may find some alternative keyboard layouts unusable.

It should be noted that, for a significant portion of the population, the standard keyboard may provide the correct spatial configuration. Enforcing unwanted keyboard angles upon these individuals could have negative effects.

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Information technology — Segmented keyboard layouts

1 Scope

This International Standard defines the differing requirements necessary when considering the various types of segmented keyboards. The scope of this International Standard encompasses the three-dimensional layout of segmented, traditional style keyboards classified as having:

- a. Adjustable alphanumeric segments;
- b. Fixed angle alphanumeric segments.

This International Standard covers the following keyboard areas:

- Alphanumeric area
- Function area
- Text editing area
- Numeric area
- Cursor control area

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 9241-4:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 4: Keyboard requirements*.

ISO 9241-9, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 9: Requirements for non-keyboard input devices*.

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 9995-3:1994, *Information technology — Keyboard layouts for text and office systems — Part 3: Complementary layouts of the alphanumeric zone of the 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 6: Editing section*.

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

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 adjustable segmented keyboard

a keyboard which has the alphanumeric section divided into two segments which can be moved relative to each other in any plane

3.2 alphanumeric keyboard

a matrix of keys as specified in ISO/IEC 9995-1

3.3 alphanumeric section

as defined in ISO/IEC 9995-2

3.4 cursor control keys

as defined in ISO/IEC 9995-5

3.5 editing section

as defined in ISO/IEC 9995-5

3.6 fixed angle segmented keyboard

a keyboard which has the alphanumeric section divided into two segments which are fixed relative to each other, not necessarily linear or co-planar

3.7 function section

as defined in ISO/IEC 9995-6

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3.8 home row of keys

row C as defined in ISO/IEC 9995-1

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3.9 keyboard

an arrangement of typing and function keys laid out in a specified manner

3.10 lateral inclination γ

the angle (γ) formed by the inclination of the central regions of the alphanumeric segments relative to the horizontal plane, calculated from the angle of the line formed by the tops of the undepressed keys C01 and C05 on the left segment, and C06 and C10 (see Key position numbering system ISO/IEC 9995-1) on the right segment and the horizontal plane (see Figure 2)

NOTE Lateral inclination is intended to alter pronation/supination angles.

3.11 neutral posture

for flexion/extension and ulnar deviation/radial deviation, neutral wrist posture is defined in ISO 9241-9

NOTE For this International Standard, neutral wrist posture also encompasses pronation and supination. This is the rotation of the forearm where the person does not exert significant muscular effort in rotation of the forearm in either pronation or supination.

3.12 numeric keyboard or numeric keypad

an array of three rows of three keys (for the numerals 1 - 9), a zero/decimal area and any additional optional keys

NOTE The numeric keypad may be permanently affixed, detachable or separate from the alphanumeric segments.

3.13**numeric section**

as defined in ISO/IEC 9995-4

3.14**pronation**

as defined in ISO 9241-9

3.15**radial deviation**

as defined in ISO 9241

3.16**shoulder abduction**

movement of the upper arm laterally away from the body

3.17**shoulder flexion**

movement of the upper arm in a forward direction

3.18**slope α**

the angle (α) formed by the elevation of the back (or front) of the keyboard, calculated from the height difference between rows A and E (see Figure 2)

NOTE Slope adjustment can influence wrist flexion/extension.

3.19**splay angle β**

the angle (β) formed by the two alphanumeric segments; measured as the angle formed by the perpendiculars of the line drawn through the centres of the home row of keys: for the left segment, the centre of keys C01 and C05; for the right segment C06 and C10 (see ISO/IEC 9995-1)

NOTE Splay adjustment is used to reduce ulnar deviation (see Figure 1).

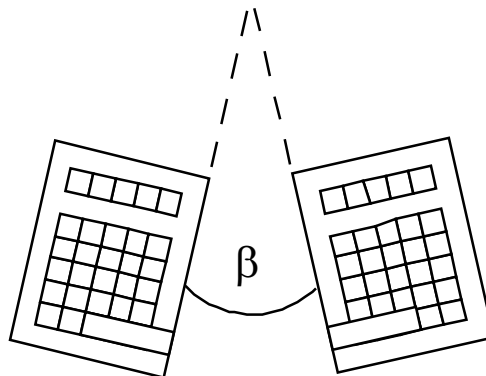


Figure 1 — Splay angle β of a segmented keyboard

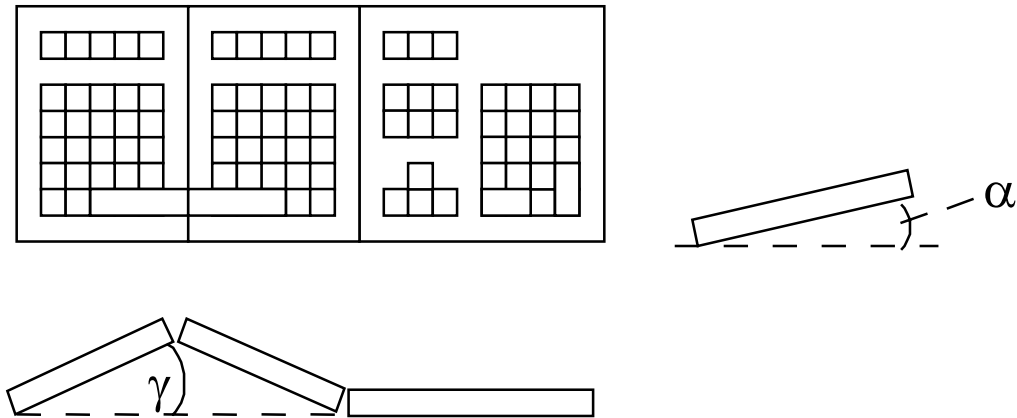


Figure 2 — Slope α and lateral inclination γ of a segmented keyboard

**3.20
supination**

as defined in ISO 9241-9

**3.21
ulnar deviation**

as defined in ISO 9241-9

**3.22
Visual Display Terminal (VDT)**

the equipment by which users interact with a computer system

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NOTE A VDT will generally present information on a display. It also provides the means for inputting information into a computer system, most commonly by means of a keyboard. The term VDT includes both the display and the keyboard and any other electronic equipment required to support the terminal.

**3.23
wrist extension**

as defined in ISO 9241-9 (also known as dorsiflexion)

**3.24
wrist flexion**

as defined in ISO 9241-9

**3.25
wrist rest**

a surface or apparatus to support the forearm at the wrist during typing or in between typing bouts

4 Guiding principles

Design of the segmented keyboard requires the consideration of the population's and individual user's: gender, anthropometric dimensions, ranges of movement and positions of comfort. Both adjustable and fixed angle segmented keyboards have the aim of improving wrist and upper limb posture by segmenting the alphanumeric sections of the keyboard and angling them to advantageously alter their spatial relationship relative to the user. This segmentation allows for the reduction of pronation and ulnar deviation. The altered positions are intended to permit the attainment of neutral wrist postures without adversely altering the natural posture of the rest of the body or the productivity of the user.

Major contributing influences on the effectiveness and productivity provided by a segmented keyboard, are the typing skills of the user. Touch typists can take full advantage of the differing angles provided, whereas, unskilled users may find some alternative keyboard layouts unusable. For the unskilled user, the ability to be able to easily

sight the keys is an essential part of typing. Acute lateral angulation (γ) may make it more difficult to see the key legends. Similarly, increasing the splay (β) angle can create a split in the visual field.

The adjustable segmented keyboard allows the user to find the appropriate angles for their individual anatomical and work requirements. By varying the splay (β) and lateral inclination (γ) of the left and right keyboard segments, the user of the adjustable segmented keyboard should be able to adjust the keyboard to attain the greatest amount of comfort and productivity during typing. That is, the keyboard should allow the user to obtain neutral wrist postures by elevating the central region of the keyboard to reduce pronation; and to provide a separation of the alphanumeric segments to reduce ulnar deviation. The user may empirically find the most suitable angle for comfort and productivity.

The fixed, angle segmented keyboard also aims to allow neutral wrist postures by compensating for pronation and ulnar deviation of the forearms and wrists. These keyboards, because of their intrinsic fixed designs, approximate the required angles for the general population. Design of the keyboard will by necessity be a compromise between the choice of angles, the population's variances and the typing skills of the users. These variables need to be considered by the manufacturer in their selection of segment angles.

5 Design requirements and measurement metrics

Mandatory requirements are identified by the presence of the word "shall"; "should" statements are recommendations and usually objectively quantified.

Design requirements have three sections:

- a. The general requirements for segmented keyboards within the scope of this International Standard (clause 5); and further specific requirements describing:
- b. Adjustable segmented keyboards (clause 6). Both ISO/IEC 9995 conformant (subclause 6.2.1) and non conformant (subclause 6.2.2); and also [ISO/IEC 15411:1999](https://standards.iteh.ai/catalog/standards/sist/d4597f24-c5df-4f89-bd96-1846692c0c/iso-iec-15411-1999)
- c. Fixed angle segmented keyboards (clause 7). <https://standards.iteh.ai/catalog/standards/sist/d4597f24-c5df-4f89-bd96-1846692c0c/iso-iec-15411-1999>

5.1 General design of the keyboard

5.1.1 Segmentation of alphanumeric section

The alphanumeric section shall be divided such that columns to the left of and including column 05 (see ISO/IEC 9995-1, clause 7) shall be allocated to left hand usage and columns to the right of and including column 06 allocated for right hand usage.

5.1.2 Key position E6

Key position E6 may be allocated to either left or right hand usage.

5.1.3 Numeric key pad alignment

If there is a numeric keypad provided, its angle relative to the user should not be dependent on the adjustment of the main section.

5.1.4 Dimensions of the keyboard

The minimum size of the keyboard is limited by the requirements for key spacing and key top size (see ISO 9241-4). The overall dimension of the keyboard should exceed this minimum size by as little as possible.

5.1.5 Slope of the keyboard (α)

The slope of the individual key segments shall comply with ISO 9241-4.

5.1.6 Adjusting mechanism

All keyboards may be adjustable in slope, and in the case of adjustable segmented keyboards, in splay, and lateral inclination from the horizontal.