TECHNICAL REPORT

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Information technology — Keyboard layouts for alphanumeric inputs — Description of ISO/IEC 9995 issues regarding users' needs and necessary innovations

Technologies de l'information — Dispositions de clavier pour la saisie alphanumérique — Description de problèmes liés à l'ISO/CEI 9995 concernant les besoins utilisateur et des innovations nécessaires

Reference number
ISO/IEC TR 24784:2009(E)

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

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

ISO/IEC TR 24784, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 35, *User interfaces*.

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Introduction

In today's information age, computer systems are found in all areas of business and private life.

They simplify locating electronic information, allow exchange of electronic data and help to increase efficiency in business. The man-machine interface enables dialogue to be conducted between the user and the computer system. Particularly for the keyboard input of alphanumeric data, a common, standardized interface is desirable to minimize the need for users to adjust to different layouts when using different information and communication technology systems.

In order to allow more flexibility for innovation, this Technical Report, in line with ISO/IEC TR 15440 on future keyboards, describes the issues raised over the years about the implementation of ISO/IEC 9995, and proposes changes that should be considered in the ISO/IEC 9995 series. The goals of this Technical Report are

— for ISO/IEC 9995 to apply to all alphanumeric and numeric keyboards across the widest spectrum of applications and environments;

— to simplify the zone and section model;

— to suggest simplified requirements with less complexity for developers and users, test laboratories, and purchasers.

This Technical Report complements ISO 9241-4 by addressing issues such as:

— repositioning sections and zones (e.g. numeric-/editing) to support a more natural posture when shifting between keys and a mouse;

— broadening the applicability of ISO/IEC 9995 for keyboards in mobile IT equipment (PDAs, smart phones, etc.).

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Information technology — Keyboard layouts for alphanumeric inputs — Description of ISO/IEC 9995 issues regarding users' needs and necessary innovations

1 Scope

This Technical Report specifies possible modifications of ISO/IEC 9995-1 to ISO/IEC 9995-8 to fulfil the changed market needs and the requirements for keyboard layouts and allocation of keycap imprints (including letters, numerals, symbols, and other markings on the keycaps) for alphanumeric and numeric input devices for all types of information and communication technology devices and systems including:

— personal computers, workstations, computer terminals, visual display terminals (VDTs);

— electronic typewriters and other machines with alphanumeric and numeric keyboards;

— mobile computer systems and multimedia devices with hardware or virtual keyboards;

— electronic document scanners and multifunction devices incorporating alphanumeric and/or numeric keyboards;

— calculators, telephones and automated teller machines having alphanumeric and/or numeric keypads/keyboards.

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/IEC 9995 (all parts), *Information technology — Keyboard layouts for text and office systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 9995-1:2006 apply.

4 ISO/IEC 9995-1 — “General principles governing keyboard layouts”

This clause lists the proposed modifications of ISO/IEC 9995-1:2006.

4.1 Part 1 — “Introduction”

This clause lists the proposed modifications of ISO/IEC 9995-1:2006 — Introduction.

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4.1.1 Modification Arguments

The text in the introduction section needs to be renewed because it is desired to apply ISO/IEC 9995 not only to office machines, but to apply to all alphanumeric and numeric keyboards across the widest spectrum of today's and upcoming applications and usage of alphanumeric and numeric keyboards. In addition, the standard needs to accommodate the main areas of a keyboard in order to provide freedom for innovation.

4.1.2 New text proposed for “Introduction”

ISO/IEC 9995 defines a framework for the layout of all alphanumeric and numeric keyboards across the widest spectrum of today's and upcoming applications and usage of alphanumeric and numeric keyboards. The functions to be performed by keyboards are grouped into three categories that correspond to the main physical sections of the keyboard. Application of ISO/IEC 9995 in the design of keyboards will provide the user with a unified, predictable man-machine interface by dividing the keyboard into functional areas and sections and allocating functions to keys. One of the major tasks of a universal-usage keyboard is to accommodate the larger sets of characters required by the various applications for which keyboards are used today.

4.2 Part 1, clause 1 — “Scope”

This clause lists the proposed modifications of ISO/IEC 9995-1:2006, Clause 1 — Scope.

4.2.1 Modification arguments

In today’s information age, computer systems are found in all areas of business and private life. They simplify locating electronic information, allow exchange of electronic data and help to increase efficiency in business. The man-machine interface enables dialogue to be conducted between the user and the computer system. Particularly for the keyboard input of alphanumeric data, a common, standardized interface is desirable to minimize the need for users to adjust to different layouts when using different information and communication technology systems.

4.2.2 New text proposed for “Scope”

ISO/IEC 9995 specifies the requirements for keyboard layouts and allocation of keycap imprints (including letters, numerals, symbols, and other markings on the keycaps) for alphanumeric and numeric input devices for all types of information and communication technology devices and systems including:

— personal computers, workstations, computer terminals, visual display terminals (VDT's);

— electronic typewriters and other machines with alphanumeric and numeric keyboards;

— mobile computer systems including UMPCs, PDAs etc. and multimedia devices with hardware keyboards (e.g. linear keyboards, foldable keyboards) or virtual keyboards (e.g. touchscreens, projection keyboards);

— electronic document scanners and multifunction devices incorporating alphanumeric and/or numeric keyboards;

— calculators, telephones and automated teller machines having alphanumeric and/or numeric keypads/keyboards.

4.3 Part 1, clause 5.2 — “Physical division of keyboard into sections and zones”

This clause lists the proposed modifications of ISO/IEC 9995-1:2006, clause 5.2 — Physical division of keyboards into sections and zones.

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4.3.1 Modification arguments

ISO/IEC 9995-1:2006 defines four sections with multiple zones:

— alphanumeric section, zones ZAO ZA4 (5 zones);

— editing section, zones ZEO ZE2 (4 zones);

— function section, zones ZFO ZF4 (5 zones);

— numeric section, zones ZNO ZN6 (7 zones).

This is quite complex. In today's market we see more and more innovative keyboard solutions that ignore those allocations, and indeed, there is no reason to have such amount of zones. A second issue appears because the editing and function keys overlap in both sections and it is not always clear what editing/what function is. To simplify the standard, the editing section and the function section should be merged together and the number of zones should thus be reduced.

4.3.2 New text proposed for "Physical division of keyboard into sections and zones"

This subclause introduces the concept of sections and zones. The various functions that can be performed by a keyboard are grouped into three categories, arranged in three keyboard sections as follows:

— alphanumeric section: ZA0 alphanumeric zone, ZA1 and ZA2 function zones (see Figure 1);

— numeric section: numeric zone ZN0 and function zone ZN1 (see Figure 2);

— editing-/function section: cursor key zone ZEF0, editing-/function zone ZEF1 (see Figure 3).

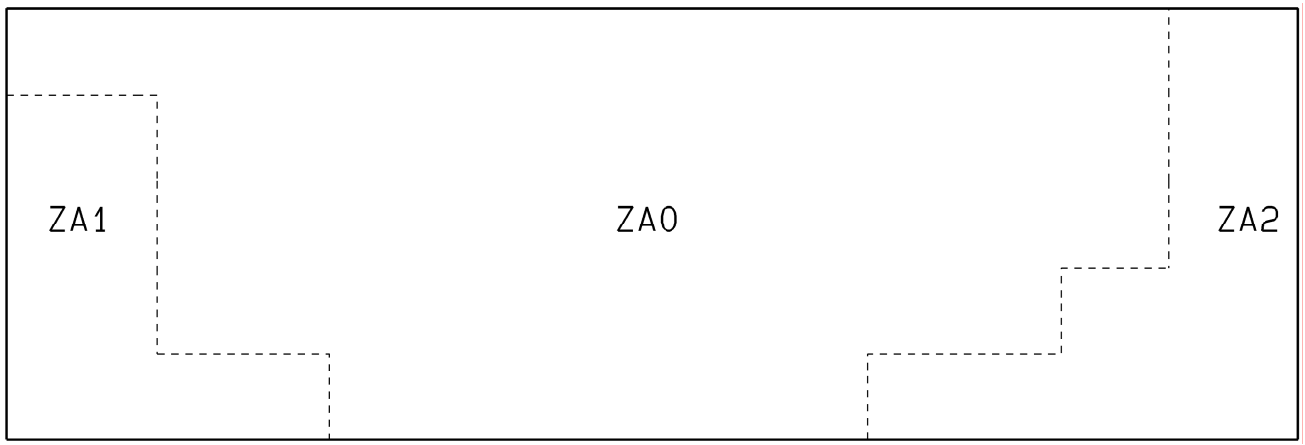

Figure 1 — Layout of zones — Alphanumeric section

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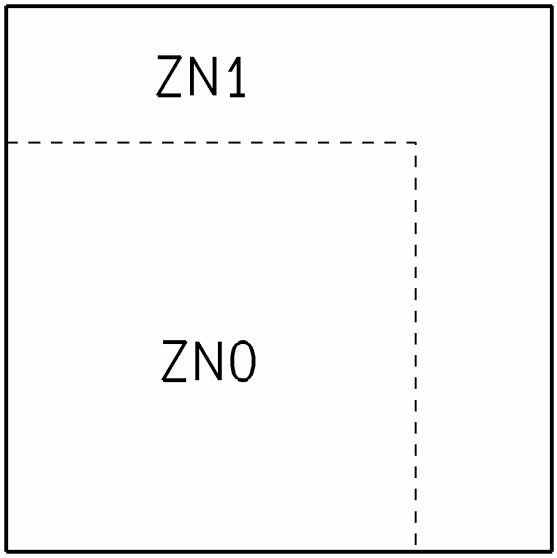

Figure 2 — Layout of zones — Numeric section

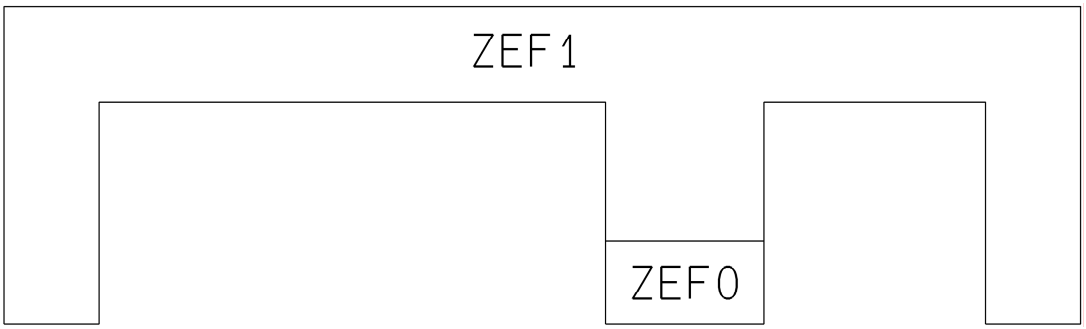

Figure 3 — Layout of zones — Editing-/function section

4.4 Part 1, clause 6.1 — "Placement of sections"

This clause lists the proposed modifications of ISO/IEC 9995-1:2006, clause 6.1 — Placement of sections.

4.4.1 Modification arguments

ISO/IEC 9995-1:2006 specifies the editing section and the function section. Except the cursor keys, the arrangement of the editing keys has changed and the editing and function keys overlap in both sections. A definition problem come up, what is editing/what is function?

4.4.2 Adaptation of "Placement of sections"

The goal is to merge the editing section and the function section together (see also clause 8 editing section and clause 9 function section of this Technical Report).

4.5 Part 1, clause 7 — "Key position numbering system"

This clause lists the proposed modifications of ISO/IEC 9995-1:2006, clause 7 — Key position numbering system.

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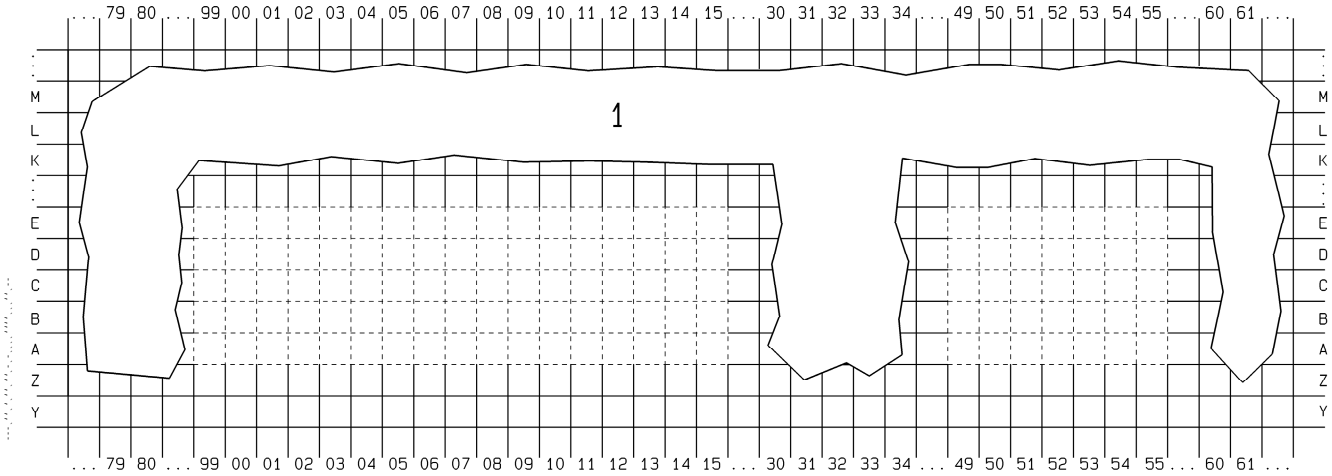
4.5.1 Modification arguments

Simplifying the standard leads to a common section for editing/function keys. (see 4.4.1 and 4.4.2) Therefore an adjustment of the key position numbering system is necessary.

4.5.2 New text proposed for “Key position numbering system”

Grids are specified for three separate sections: alphanumeric section, editing-/function section (see Figure 4), and numeric section.



Key

1 editing/function section

Figure 4 — Editing-/function section

The reference rows and the relevant reference columns are defined as follows:

— Row A is the row containing the space bar in the alphanumeric section.

— Row K is the first row of editing- or function keys above the alphanumeric section.

— Column 01 is the column containing the key with the digit one in the alphanumeric section.

— Column 30 is the first column of editing- or function keys on the right side beyond the alphanumeric section.

— Column 51 is the column containing the key with the digit one in the numeric section.

— Column 60 is the first column of editing- or function keys on the right side beyond the numeric section.

— Column 80 is the first column of editing- or function keys on the left side beyond the alphanumeric section.

4.6 Part 1, clause 8.1 — “Group positions”

This clause lists the proposed modifications of ISO/IEC 9995-1:2006, clause 8.1 — Group positions

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4.6.1 Modification arguments

The first paragraph of clause 8.1 describes that graphic characters within the same group shall be placed within the same column on the key. This leads to the fact that the symbol of the third level is located on the sloped site (keyface) of the keycap (see Figure 5), or all three symbols on one keycap are imprinted in a small size (see Figure 6).

For better legibility — especially for elderly and people with disabilities — the following is proposed.

If only one group exists, the symbol of the third level may be placed in the right column of the key. Many of the present country layouts use anyway only one group.

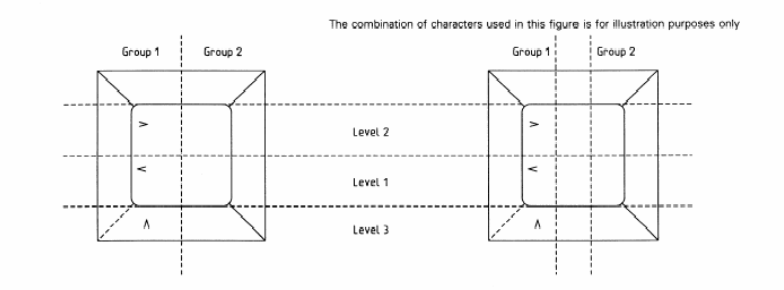

Figure 5 — Two level allocations marked on top, one level marked on keyface

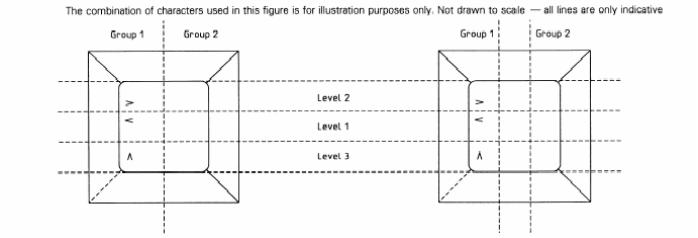

Figure 6 — Three level allocations marked on top

4.6.2 Adaptation of "Group positions"

Add the following possibility for group positions: If a keyboard is intended for a population that is supposed to not use more than one group, then the symbol of the third level of group one can also be placed in the right column of the key (see Figure 7).

NOTE When this option is used, an end-user would not be able to physically add labels representing extra groups on the right side of the keycap (e. g. stickers to represent Korean group in addition to the non-Korean national group).

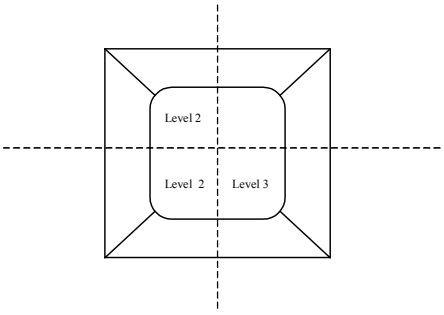

Figure 7 — Three level allocations marked on top

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5 ISO/IEC 9995-2 — "Alphanumeric section"

This clause lists the proposed modifications of ISO/IEC 9995-2:2002 — Alphanumeric section.

5.1 Part 2, clause 6 — "Division into zones"

This clause lists the proposed modifications of ISO/IEC 9995-2:2002, clause 6 — Division into zones.

5.1.1 Modification arguments

ISO/IEC 9995 specifies five zones for alphanumeric section (see Figure 8). This is complex and not necessary. It could be simplified to zones ZA0, ZA1 and ZA2. Therefore it is necessary to adjust the figure and the text in ISO/IEC 9995-2.

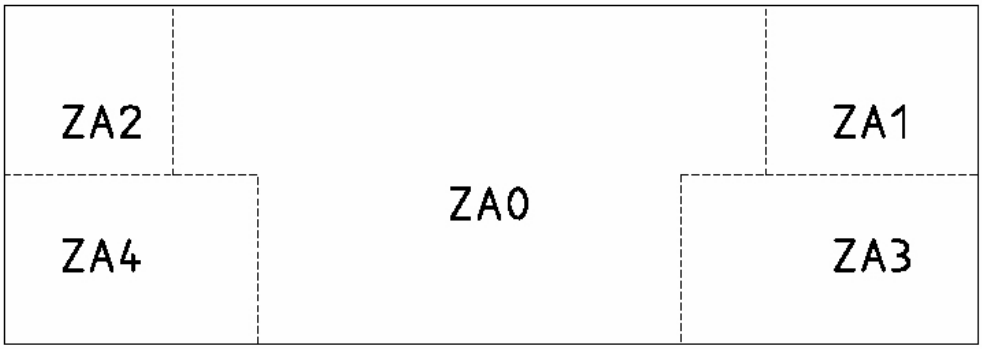

Figure 8 — Division of the alphanumeric section into zones (current version)

5.1.2 Adaptation of "Division into zones"

New text should read "ZA0 is the alphanumeric zone of the alphanumeric section. The zones ZA1 and ZA2 are the function zones of the alphanumeric section (see Figure 1)".

Add Figure 1 of this Technical Report in ISO/IEC 9995-2.

5.2 Part 2, clause 8.3 — "Minimum function key requirements"

This clause lists the proposed modifications of ISO/IEC 9995-2:2002, clause 8.3 — Minimum function key requirements.

5.2.1 Modification arguments

The allocation of some function keys of the alphanumeric section is not specified in the current standard.

5.2.2 Adapted text for "Minimum function key requirements"

It is intended in the future that a standardized requirement be stated that all keys, including function keys, be customisable. ISO/IEC 24757 has functionality to accommodate these requirements.

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5.2.2.1 Level 3 select

For keyboards with characters allocated at level 3, at least one key for the function level 3 select shall be provided.

Specifically, for the harmonized 48 graphic key keyboard arrangement, at least one Level 3 select key shall be provided in zone ZA1 or ZA2, either in row A or in row B.

5.2.2.2 Return

One key for the function return shall be provided. All or part of this key shall be in row C, adjacent to the right-hand end of the row of graphic keys.

NOTE It is recommended that this key occupies row C and row D.

5.2.2.3 Backspace/Backward erase

One key for the function backspace/backward erase shall be provided in row A or row E, adjacent to the right-hand end of the row of graphic keys.

NOTE Space bar is a graphic key.

5.2.2.4 Alternate (Alt)

If a key for the function alternate is provided it shall be allocated in row A, adjacent to the left of the space bar. If there is a writing-system-related function key provided adjacent to the left of the space bar, the alternate key shall be allocated next left to this function key.

5.2.2.5 Control (Ctrl)

If a key for the function “Control” (Ctrl) is provided it shall be allocated furthest left in row A or alternatively furthest left in row B. If a key for the function “Control” (Ctrl) and a key for the function “Function” (Fn) are both allocated in row A, then they shall be adjacent and one of them to the leftmost position of row A. It is recommended that the control key be in the leftmost position to avoid confusion between portable computer keyboards and desktop keyboards.

5.2.2.6 Function (Fn)

If a key for the function “Function” (Fn) is provided it shall be allocated in row A, left of the space bar and the key for the function “Alternate” (Alt).

NOTE Fn key is typically used on portable computer keyboards. It is recommended in this situation that an external keyboard plugged to the portable computer have a fall back solution (e. g. a customisable key combination equivalent to the Fn key) provided by the portable computer manufacturer. In the future it is intended to have a standardized requirement to preclude the current practice of hard-wiring the Fn key to replace it by the key combination level 2 select + escape, so that this key combination be usable in the same way on portable and desktop keyboards.

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6 ISO/IEC 9995-3 — "Complementary layouts of the alphanumeric zone of the alphanumeric section"

This clause lists the proposed modifications of ISO/IEC 9995-3:2002 — Complementary layouts of the alphanumeric zone of the alphanumeric section. It is the intention to enhance ISO/IEC 9995-3 with the following 3 extensions.

6.1 Part 3 — Enhanced Latin keyboard

A new clause should specify how to generate more Latin characters from the keyboard. This will allow more than one accent to be added to a Latin character, so that e. g. Vietnamese can be keyed in. It is the intention that as much as possible of the Latin collections of ISO/IEC 10646 can be covered. Also some special characters commonly used should be added. This would possibly be done using more than one group.

6.2 Part 3 — Extensions beyond the Latin script

This part should specify more groups beyond the Latin script e.g. Cyrillic collections of ISO/IEC 10646, and also some special characters commonly used.

6.3 Part 3 — Guidelines for national variants

More guidelines should be added for the making of national keyboard standards in order to encompass for the Latin script and other scripts.

7 ISO/IEC 9995-4 — "Numeric section"

This clause lists the proposed modifications of ISO/IEC 9995-4:2002 — Numeric section.

7.1 Part 4, clause 6 — "Division into zones"

This clause lists the proposed modifications of ISO/IEC 9995-4:2002, clause 6 — Division into zones.

7.1.1 Modification arguments

The allocation of key positions to zones is strictly specified (The keys in positions A54 to D54 are in zone ZN1. The key in position E54 is in zone ZN2. The keys in positions E51 to E53 are in zone ZN3.). So the allocation of functions to key can be described directly with the key positions.

For the zones ZN4, ZN5, and ZN6 no key allocations are specified. The number of zones (ZN0 to ZN6) in the numeric section might be misunderstood by the user of the standard. Therefore the number of zones should be reduced to one numeric zone and one function zone.

7.1.2 Adaptation of "Division into zones"

New text should read "The numeric section is divided into zones as illustrated in Figure 2."

Add Figure 2 of this Technical Report in ISO/IEC 9995-4.

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7.2 Part 4, clause 10 — "Allocation of functions to the keys of the function zones"

This clause lists the proposed modifications of ISO/IEC 9995-4:2002, clause 10 — Allocation of functions to the keys of the function zones

7.2.1 Modification arguments

7.2.2 An additional note for clarification. Additional text for "Allocation of functions to the keys of the function zones"

NOTE The allocation of these functions is not primarily intended for character entry but rather to be used to execute arithmetic functions. The labelling of the functions ÷ and x can use the / and * symbols as alternates in a programming context.

8 ISO/IEC 9995-5 — "Editing section"

This clause lists the proposed modifications of ISO/IEC 9995-5:2006 — Editing section.

8.1 Part 5, clause 6 — "Division into zones"

This clause lists the proposed modifications of ISO/IEC 9995-5:2006, clause 6 — Division into zones.

8.1.1 Modification Arguments

ISO/IEC 9995-5:2006 specifies the editing section and its division into three zones. (ZE0, ZE1, ZE2).

The idea is to merge the editing section and the function section.

8.1.2 Adaptation of "Division into zones"

There are two zones (ZEF0, ZEF1) in this section. The arrangement, the number, and the location of the cursor keys are specified in clause 8.2 of this Technical Report.

8.2 Part 5, clause 7 — "Cursor zone arrangement and location"

This clause lists the proposed modifications of ISO/IEC 9995-5:2006, clause 7 — Cursor zone arrangement and location.

8.2.1 Modification arguments

ISO/IEC 9995-5:2006, clause 7 specifies the arrangement and the location of the cursor keys. If the location of cursor keys becomes more flexible, a chance come up to build smaller keyboards, especially for mobile devices (see Figure 9).

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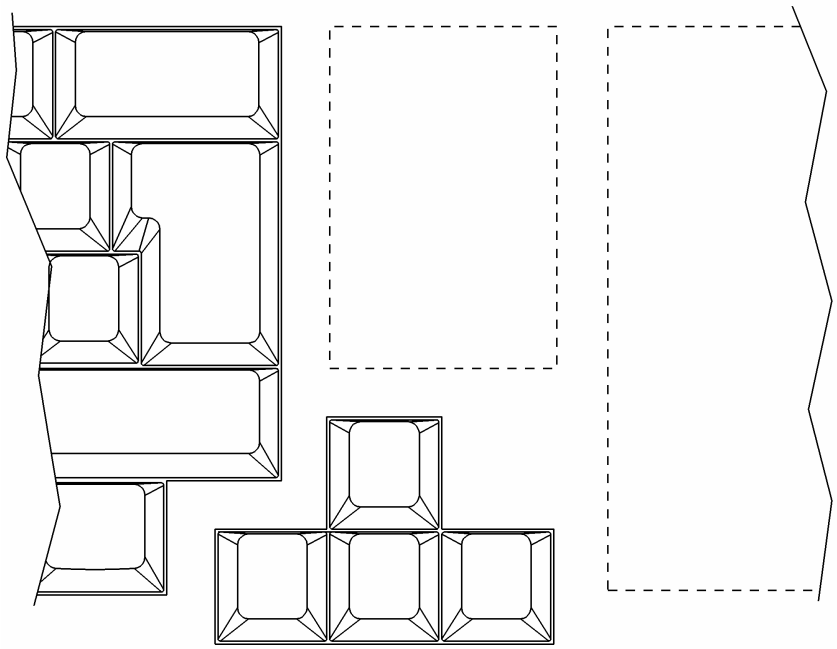

Figure 9 — Example for smaller keyboard

8.2.2 Adaptation of "Cursor zone arrangement and location"

The four basic cursor control functions are: Cursor up, Cursor down, Cursor left, Cursor right. The cursor keys shall be arranged in one of two ways: The "cross" arrangement (see 8.2.2.1) or the "inverted T" arrangement (see 8.2.2.2). This document does not indicate a preference for a particular arrangement.

8.2.2.1 "Cross" arrangement

The "cross" arrangement is shown in Figure 10 as located in rows A, B and C. It may alternatively be located in rows B, C and D or in rows Z, A and B, or partially in between these rows.

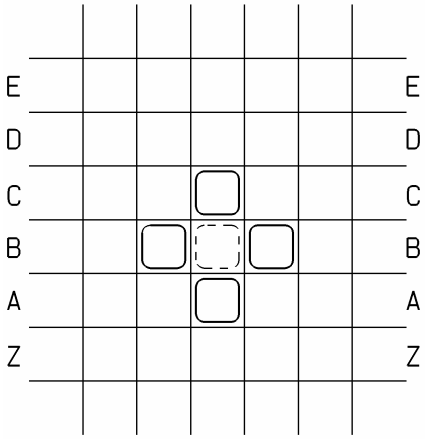

Figure 10 — "Cross" arrangement

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8.2.2.2 "Inverted T" arrangement

The "inverted T" arrangement is shown in Figure 11 as located in rows A and B. It may alternatively be located in rows B and C or in rows C and D or in rows Z and A, or partially in between these rows.

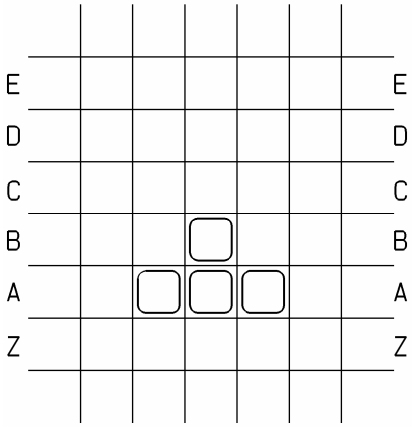

Figure 11 — "Inverted T" arrangement

8.3 Part 5, clauses 10 to 12

This clause list the proposed modifications of ISO/IEC 9995-5:2006:

clause 10 — Arrangement and location of the editing zone

clause 11 — Functions of the editing zone

clause 12 — Allocation guidelines

8.3.1 Modification arguments

Clauses 10 to 12 of ISO/IEC 9995-5:2006 specify the arrangement and location of the editing zone, that functions and the allocation. A definition problem comes up, what is editing/what is function? The idea is to merge the editing section and the function section. (see also clause function section)

8.3.2 Adaptation of "Editing zone"

Editing keys need to be placed in the editing-/function section (see Figure 4).

The arrangement of keys with editing functions must be expedient. Examples for editing functions are: Delete, Insert, Next Page, Previous Page.

Possible arrangement is shown in Figure 12.

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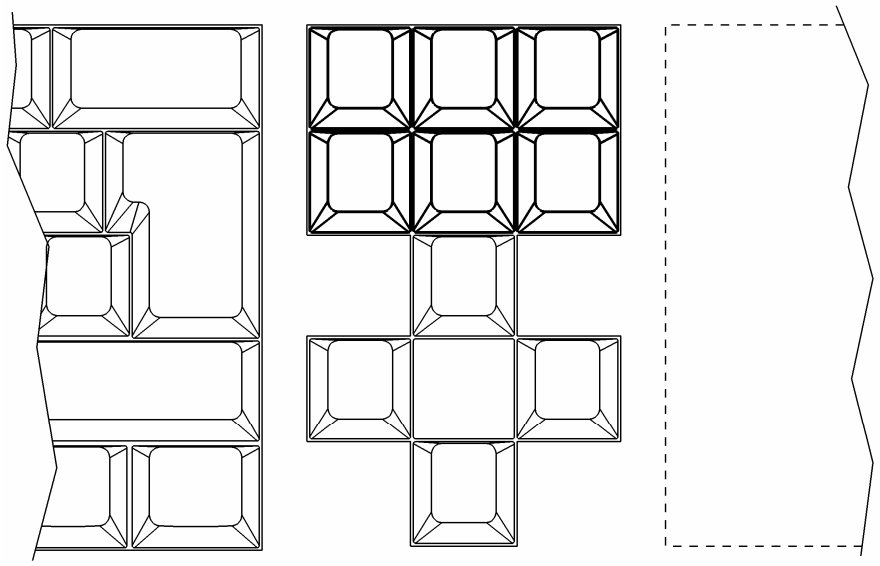

Figure 12 — Arrangement and location of additional editing keys

9 ISO/IEC 9995-6 — "Function section"

This clause lists the proposed modifications of ISO/IEC 9995-6:2006 — Function section.

9.1 Part 6, clause 6 — "Division into zones"

This clause lists the proposed modifications of ISO/IEC 9995-6:2006, clause 6 — Division into zones.

9.1.1 Modification arguments

ISO/IEC 9995-6:2006 specifies the function section and the division into five zones (ZF0, ZF1, ZF2, ZF3, ZF4). A definition problem come up, what is editing/what is function? The idea is to merge the editing section and the function section. The number of zones could be reduced to a practical minimum.

9.1.2 Adaptation of "Division into zones"

Function keys need to be placed in the editing-/function section (see Figure 4).

9.2 Part 6, clause 6.2 — "Key allocations"

This clause lists the proposed modifications of ISO/IEC 9995-6:2006, clause 6.2 — Key allocations.

9.2.1 Modification arguments

Clause 6.2 of ISO/IEC 9995-6:2006 specifies the allocation and location of the control function Escape as well as distinction requirements.

If the requirements for the Escape key become more flexible, a chance come up to build smaller keyboards, especially for mobile devices.

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9.2.2 Adaptation of “Key allocations”

If the control function key Escape is provided, it shall be located in row K or above and in column 00 or to the left. Location of other function keys are not specified.

10 ISO/IEC 9995-7 — “Symbols used to represent functions”

There is no change required in ISO/IEC 9995-7.

11 ISO/IEC 9995-8 — “Allocation of letters to the keys of a numeric keypad”

There is no change required in ISO/IEC 9995-8.

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