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

Part 12:
Presentation of information

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

Partie 12: Présentation de l'information

Reference number
ISO 9241-12:1998(E)

Contents

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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.

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 9241-12 was prepared by 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: Display requirements with reflections*
— *Part 8: Requirements for displayed colours*
— *Part 9: Requirements for non-keyboard input devices*
— *Part 10: Dialogue principles*
— *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*

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

Introduction

ISO 9241 is a multipart International Standard that deals with both the hardware and software ergonomic aspects of the use of VDTs. The description of the parts, their interrelationships, and a description of the expected users of the parts is described in ISO 9241-1.

This part of ISO 9241 deals with the visual presentation of information using visual display terminals (VDTs). It includes (in clause 4) design objectives which provide high level guidance on the presentation of information. This part of ISO 9241 is concerned with the organization of information and with the usage of coding techniques in order to improve user performance and satisfaction. Clauses 5 to 7 provide recommendations for display design and apply generally to all dialogue techniques. This part of ISO 9241 can be used in conjunction with other forms of guidance. For example, ISO 9241-10 ([2] in annex B) provides seven principles, each of which can be supported by presenting information on displays in appropriate ways.

This part of ISO 9241 serves the following types of users:

a) The user interface designer, who will apply this part of ISO 9241 during the development process.
b) The buyer, who will reference this part of ISO 9241 during the product procurement process, and whose end-users will gain from the potential benefits provided by the standard.
c) Those responsible for ensuring products meet the recommendations in this part of ISO 9241.
d) Designers of user interface development tools to be used by interface designers.
e) Writers of software industry standard guides to be used by interface designers, for example, “interface style guides”.

Other common sources of guidance include software industry “interface style guides”. Once technical issues about the nature of the system hardware and software have been considered, additional guidance can be provided which generally helps to increase the consistency of the interface design. Typically, these industry style guides describe a specific way of implementing the type of higher level general guidance offered in this part of ISO 9241.

The ultimate beneficiary of this part of ISO 9241 will be the end-user at the VDT. Although it is unlikely that the end-user will read this part of ISO 9241 or even know of its existence, its application by designers, buyers, and evaluators should provide user interfaces that are more usable, consistent and that enable greater productivity.

This part of ISO 9241 consists of general recommendations and conditional recommendations concerning presentation of information. General recommendations apply to most users, tasks, environments, and technology. In contrast, conditional recommendations are those that apply only within the specific context for which they are relevant (e.g. particular kinds of users, tasks, environments, technology). Conditional recommendations have an "if-then" structure. The recommendations were developed primarily by reviewing the existing relevant literature and empirical evidence, then generalizing and formulating this work into recommendations for use by the interface designer and/or evaluator.

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

Part 12:
Presentation of information

1 Scope

This part of ISO 9241 provides ergonomic recommendations for the presentation of information and specific properties of presented information on text-based and graphical user interfaces used for office tasks. It provides recommendations for the design and evaluation of visual presentation of information including coding techniques. These recommendations can be utilized throughout the design process (for example as guidance for designers during design, as a basis for heuristic evaluation, as guidance for usability testing). The coverage of colour is limited to ergonomic recommendations for the use of colour for highlighting and categorizing information (see ISO 9241-8 for additional recommendations for the use of colour).

This part of ISO 9241 does not address auditory presentation of information.

Interface design depends upon the task, the user, the environment and the available technology. Consequently, this part of ISO 9241 cannot be applied without a knowledge of the design and the context of use of the interface, and it is not intended to be used as a prescriptive set of rules to be applied in its entirety. Rather, it assumes that the designer has proper information available concerning task and user requirements and understands the use of available technology (this may require consultation with a qualified ergonomics professional as well as empirical testing with real users).

NOTE 1 Although this is an International Standard, some of the conditional recommendations are based on Latin-based language usage and may not apply, or may need to be modified, for use with a different language. For example, in right-to-left languages those conditional recommendations oriented towards left-to-right reading may need to be modified and adapted. In applying those conditional recommendations that assume a specific language base (e.g. alphabetic ordering of coding information, items in a list), care should be taken concerning the intent of this part of ISO 9241 when translation is required to a different language.

NOTE 2 Providing users with the capability to alter the interface to suit their own needs has become a popular approach to software interface design. This is often a desirable feature of the interface. However, providing users with customization capabilities is not an acceptable substitute for an ergonomically designed interface (e.g. default windows, colour settings). Note that customization of the presentation of information may result in deviations from this part of ISO 9241.

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

ISO 9241-8:1997, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 8: Requirements for displayed colours.*

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

ISO 9241-14:1997, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 14: Menu dialogues.*

ISO 9241-15:1997, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 15: Command dialogues.*

ISO 9241-17:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 17: Form filling dialogues.*

ISO/IEC 11581-3:—[1)], *Information technology — User-system interfaces and symbols — Icon symbols and functions — Part 3: Pointers.*

3 Definitions

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

3.1
area
section or region of a display or window

See figure 1.

Key
1 Identification area
2 Input/output area
3 Control area
4 Message area

Figure 1 — Possible layout of different areas

1) To be published.

3.1.1
identification area
area where the title of the displayed information is provided, which can include an indication of the user's current location and task

NOTE It may also identify an application, file, or working environment.

3.1.2
input/output area
area where information is received from users and/or presented to users

3.1.3
control area
area where control information and/or controls for interaction, command entry and command selection is provided

NOTE In some window applications there is no explicit control information, but controls such as buttons, sliders, check boxes, which are used to interact with the system, do appear.

3.1.4
message area
area where information such as status updates and/or other information (e.g. error messages, progress indication, feedback) is provided

NOTE Messages may originate in operating systems, applications, etc.

3.2
code
technique for representing information by a system of alphanumeric characters, graphical symbols or visual techniques (e.g. font, colour or highlighting)

NOTE 1 In general, alphanumeric codes are shorter than the full text needed to express the information content.

NOTE 2 The term "code" is not to be confused with the terms "code" or "coding" in the computer science context, in which these terms refer to the instructions contained in an executable software program and the process of writing the instructions that comprise a software program.

3.2.1
mnemonic code
code conveying information that is meaningful to the user and has some association with the words it represents

NOTE Mnemonic codes frequently consist of alphanumeric characters, making them easier to learn and recall. Many mnemonic codes are abbreviations.

3.3
controls
graphical object, often analogous to physical controls such as dials or radio buttons, which allows a user to navigate within an application, and manipulate displayed objects or their attributes

3.4
cursor
visual indication of the focus for alphanumeric input

3.5
field
delimited area where data are entered or presented, generally consisting of a fixed number of characters or blanks

3.5.1
entry field
field in which users can input data or edit displayed data

See figure 2.

3.5.2
read-only field
field in which data are displayed which cannot be edited

See figure 2.

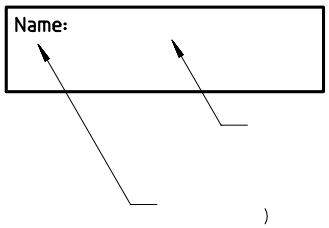


Figure 2 — Example of fields

3.6
group
set of fields that has been made perceptually distinct on the display

3.7
highlighting
display technique for emphasizing critical or important information and making it perceptually prominent

NOTE It may include image polarity reversal, blinking, underscoring, use of colour, contrast enhancement (i.e., brightness coding), addition of graphics (e.g. draw a box around) and size.

3.8
icon
graphical object on a visual display terminal that represents an object, action or a function

3.9
label
short, descriptive title for an entry or read-only field, table, control or object

NOTE In some applications, labels are classified as protected fields. Labels include headings, field prompts, descriptive text (e.g. icon labels).

3.10
list
horizontal or vertical presentation of "data" items in a display which usually changes according to the states of the application

3.11
marker
symbol (e.g. * or ✓) that is used for indicating a status or drawing attention to an item

3.12
pointer
graphical symbol that is moved on the screen according to manipulations of a pointing device

NOTE Users can interact with elements displayed on the screen by moving the pointer to that location and starting a manipulation.

3.13
table
orderly displayed data, often as a number of lists arranged in parallel columns or rectangular arrays, related to each other following a specific rule

3.14
window
independently controllable region on the display screen, used to present objects and/or conduct a dialogue with a user

NOTE A window is usually rectangular and delimited by a border.

See figure 3.

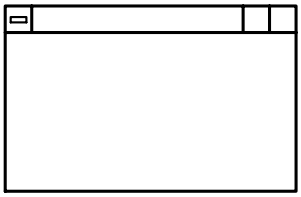


Figure 3 — Illustration of a window

3.14.1
primary window
window that represents a view from an operating system, an application or an object

NOTE It is possible to have more than one primary window presented at the same time.

3.14.2
secondary window
window arising out of user interaction with a primary window, and displayed in the course of a dialogue

NOTE A secondary window can also be a system initiated window.

3.15
windowing format
arrangement of multiple windows which are displayed simultaneously

NOTE There are several types of windowing formats such as tiled, overlapping, and mixed format.

3.15.1
tiled window format
side-by-side window format
formats in which windows are placed side by side and do not overlap

See figure 4.

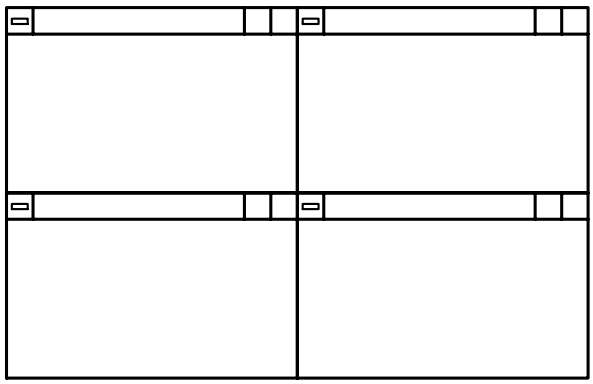
3.15.2
overlapping window format
formats in which windows may partially or completely overlap each other

See figures 5 and 6.

3.15.3
mixed format
formats in which tiled and overlapping formats are combined

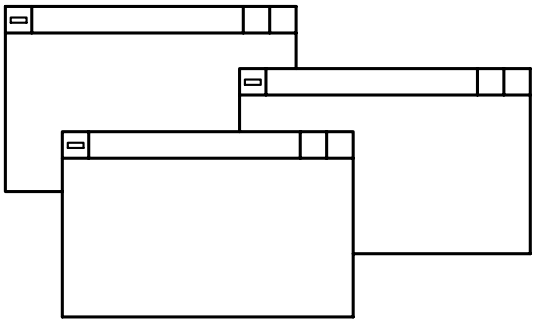
NOTE The initial format may be tiled, but overlapping windows may be used to display transitory elements such as prompts and advisory messages. Alternatively, the initial format may be overlapping, but a window may be split into a set of tiled windows.

See figure 7.



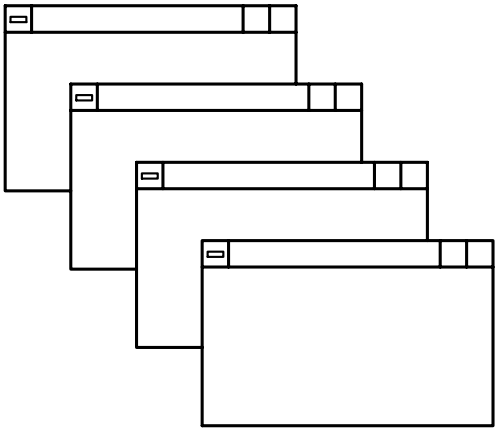
Key
1 Window 1
2 Window 2
3 Window 3
4 Window 4

Figure 4 — Illustration of a tiled window format



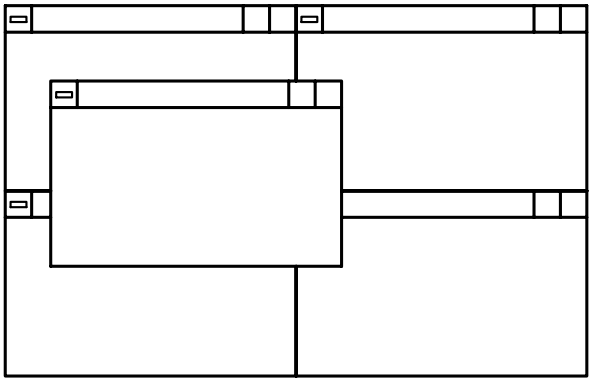
Key
1 Window 1
2 Window 2
3 Window 3

Figure 5 — Illustration of an overlapping window format



Key
1 Window 1
2 Window 2
3 Window 3
4 Window 4

Figure 6 — Illustration of an overlapping window format as “cascade” of windows



Key
1 Window 1
2 Window 2
3 Window 3
4 Window 4
5 Window 5

Figure 7 — Illustration of a mixed format of several windows

4 Application of this part of ISO 9241

4.1 Characteristics of presented information

Presentation of visual information should enable the user to perform perceptual tasks (e.g. searching for information on the screen) effectively, efficiently and with satisfaction. To achieve this goal, it is important that the following characteristics be considered when designing visual information.

Clarity (the information content is conveyed quickly and accurately).

Discriminability (the displayed information can be distinguished accurately).

Conciseness (users are given only the information necessary to accomplish the task).

Consistency (the same information is presented in the same way throughout the application, according to the user's expectation).

Detectability (user's attention is directed towards information required).

Legibility (information is easy to read).

Comprehensibility (meaning is clearly understandable, unambiguous, interpretable and recognizable).

The design rationale for displaying visual information should always be aimed at achieving these characteristics in relation to the context of use of the system and the user requirements.

The design of visual information uses knowledge from various disciplines including
— human physiology (e.g. sensory system),
— psychology (e.g. mental workload),
— ergonomics (e.g. context of use, see ISO 9241-11),
— typography,
— graphical design.

From a human performance perspective, presentation of information can benefit task completion by improving the user's ability to comprehend visual information and increase speed and accuracy with which information can be entered for an application. The recommendations for the organization of information improve visual search and can also facilitate the discriminability of individual information items and groups.

4.2 Applying the recommendations

Each individual recommendation in clauses 5 to 7 should be evaluated for its applicability and, if judged to be applicable, should be implemented, unless there is evidence that to do so would cause deviation from the design objectives or would result in an overall degradation in usability. In judging whether applicable recommendations have been met, evaluators should evaluate the product or observe representative users of the product in the context of accomplishing the user's tasks. A checklist is provided in annex A which gives examples of methods (sample procedures) on how to assess applicability of, and adherence to, each recommendation.

4.3 Evaluation of products

If a product is claimed to have met the applicable recommendations in this part of ISO 9241, the procedure used in establishing requirements for developing, and/or evaluating, the presentation of information shall be specified. The level of specification of the procedure is a matter of negotiation between the involved parties.

Users of this part of ISO 9241 can either utilize the procedures provided in annex A, or develop another procedure tailored to their particular development and/or evaluation environment.

5 Organization of information

5.1 Location of information

Information should be located to meet user expectations and task requirements (for example, see 5.5 and 5.8).

NOTE Information which is located according to user expectations minimizes search time.

5.2 Appropriateness of windows

The use of windows is more appropriate as more of the task requirements and system capabilities listed in 5.2.1 and 5.2.2 apply.

5.2.1 Task requirements

— The user monitors or accesses more than one system, application or process at the same time.

— The user evaluates, compares, or manipulates multiple sources of information, or multiple views of a single source of information (e.g. moving or copying information from one application to another).

— The user frequently alternates between tasks, systems, applications, files, sections or views.

— The user needs to preserve the broader task context while performing individual subtasks (e.g. accessing a customer's credit rating while processing a customer order).

— The user needs to attend to system or application events before primary task operations can continue (for example use of a "pop-up" window to display a caution or error message and request user acknowledgement).

— The user needs occasional access to supplementary dialogue components (e.g. information, menus) near the screen location that is the current focus of user activity (for example, when the user selects an information entry field, the system displays an adjacent window containing the possible values for that field).

5.2.2 System capabilities

— Screen size and resolution: the combined size and resolution of the display allow users to view meaningful amounts of information in multiple windows without requiring the users to perform numerous moving, resizing, or scrolling/paging operations.

— System response: the graphics required to portray windows do not slow display rates noticeably. For example, the system should have sufficient response time to provide feedback about the outcome of window control operations during or immediately following those operations.

NOTE Windows should not be used when they will seriously impede dialogue flow with the users.

5.3 Recommendations for windows

The recommendations for windows provide guidance for the use of independently controllable areas to display information from different sources. These sources might include different operating systems, applications, files within the same application, sections of the same file (e.g. beginning or end of a text file), views or versions of the same information (e.g. character-based and graphical view), or different parts of an application.

5.3.1 Considerations for multiple windows

If information from different sources needs to be displayed or manipulated, multiple windows or a single window with multiple input/output areas should be considered for use.

5.3.2 Unique window identification

A unique window identification (e.g. window name or file name or application name) should be provided for each window.

EXAMPLE In a specific office application, a window is identified by one or more of the following system specifications: system name, application, function, file name, etc.

NOTE It may be useful to include an indication of the user's current location and task within the window identification.

5.3.3 Default window parameters

Default window sizes and locations should be designed to minimize the number of operations users have to perform to complete a task (for example, windows are positioned where they will not obscure task-critical information in other windows).

5.3.4 Consistent window appearance within an application

Within an application, all windows of the same type should have a consistent appearance, if appropriate to the task.

EXAMPLE All windows for a particular help system have a consistent appearance.

NOTE Within certain types of windows there may be subtypes.

5.3.5 Consistent window appearance within a multi-application environment

Within a multi-application environment, all windows of the same type should have a consistent appearance if they are used together and if appropriate to the task.

NOTE Within certain types of windows there may be subtypes.

5.3.6 Indication of primary/secondary window relationships

The relationship between a primary window and its secondary windows should always be visually apparent.

EXAMPLE 1 In a specific office application, secondary windows are contained in the primary window.

EXAMPLE 2 Primary and secondary windows have common window border style, highlighting and colour.

EXAMPLE 3 Primary and secondary windows have a common identifying text label.

5.3.7 Identification of window control elements

Window control elements that perform different functions (e.g. a close-window control and a resize-window control) should be visually discriminable from each other and consistently placed in the same location in each window.

5.3.8 Overlapping window format

An overlapping window format should be used in cases where

— the task requires variable or unconstrained types, sizes, numbers, contents and/or arrangement of windows;

— the visual display is small or of such low resolution that users cannot view meaningful amounts of information in individual tiled windows.

5.3.9 Tiled window format

A tiled format should be used in cases where

— the task requires little or no variation in the size, numbers, contents and arrangement of windows;

— continuous visual access to the information currently displayed (e.g. critical information, information necessarily used for the task) is required;

— the processing required for the rapid manipulation and display of overlapping windows degrades system response time and user task performance.

5.3.10 Selection of window format

If appropriate for the task, users should be allowed to select the preferred windowing format and save the selected format as "default".

5.4 Areas

The recommendations for the organization of information into areas provide guidance on the relative location of areas and the complexity of information displayed in areas.

5.4.1 Consistent location of areas

Areas (i.e. identification, input/output, control, and message area) used in the dialogue within an application should be consistently located.

NOTE 1 The identification area is often located above the input/output area.

NOTE 2 In non-window environments, the control area for command entries is often located at the bottom of the input/output area.

5.4.2 Density of displayed information

The density of displayed information should be such that it is not perceived as overly cluttered by the user.

NOTE 1 For many character-based interfaces, a limit of 40 % (percentage of potential character positions actually populated by characters) is appropriate.

NOTE 2 For graphical user interfaces, other graphical elements such as lines, push-buttons, icons, may be perceived as increasing the density of displayed information.

5.5 Input/output area

The recommendations for organizing information in input/output areas provide guidelines to present information required for the task, to portion displayed information if necessary, and to indicate the relative position of information currently displayed.

5.5.1 Required information

If possible, all of the information required to perform a given task should be displayed in the input/output area. If this is not possible:

a) the information required should be structured into subsets corresponding to task steps;

b) these should support appropriate sub-tasks and be meaningful to the intended users;

c) splitting of information should not result in reduced task performance.

5.5.2 Scrolling and paging

If the amount of information to be displayed exceeds the available input/output area, the user should be provided an easy means (e.g. horizontal or vertical paging/scrolling) to view portions of the information not currently displayed.

When the user has to discern some relationship between separately displayed sets of information, it is desirable to display the two sets of information on a single screen, and scrolling/paging is not always appropriate.

NOTE Techniques such as windows, split-screens, keywords, indexing, etc. can facilitate the overview of two sets of information.

5.5.3 Indication of relative position of displayed information

If the information exceeds the available input/output area, the relative position and proportion of the information currently displayed should be indicated in relation to the total amount of information (e.g. a scroll bar, slider, or "page x of y" indication).

5.6 Groups

The recommendations for groups provide guidelines for arranging information into groups. Grouping information on the screen helps the user to perceive, find, and interpret/comprehend information more easily.

5.6.1 Distinction of groups

Groups should be perceptually distinct according to spacing and location (see figure 8). If necessary, other means should be used to improve distinctiveness (e.g. a box around the group).

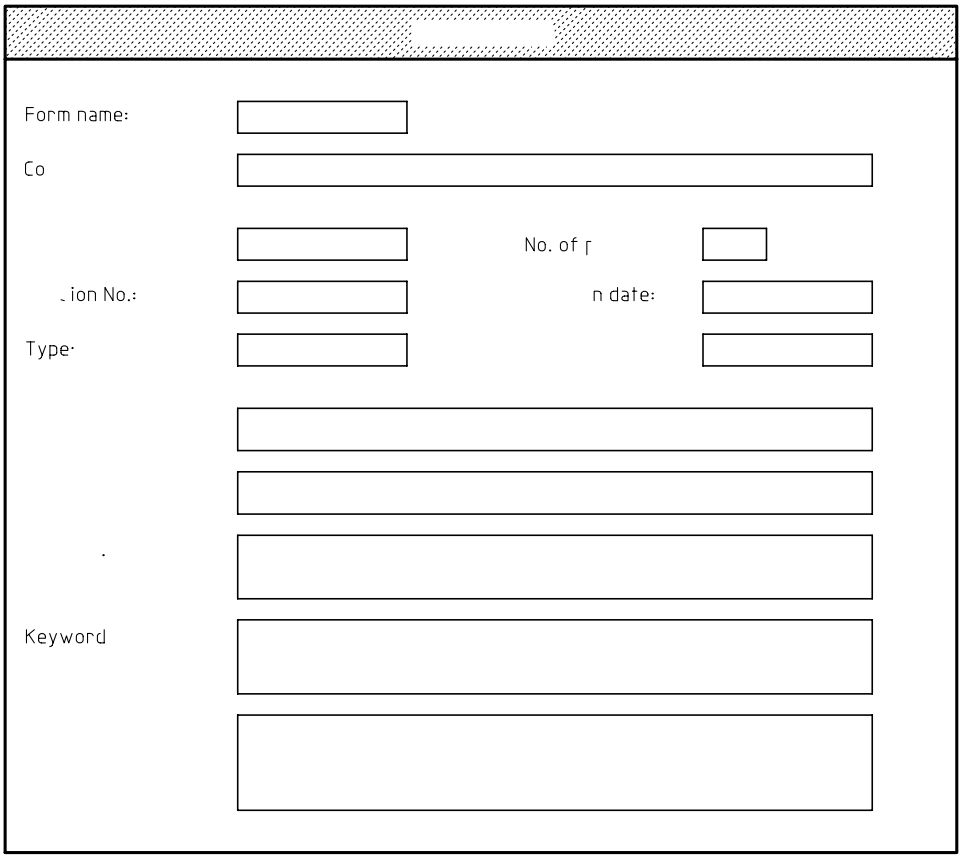


Figure 8 — Example of grouping

NOTE When grouping information, the application of the following gestalt principles can be helpful.

a) Law of proximity (see figure 9)

EXAMPLE

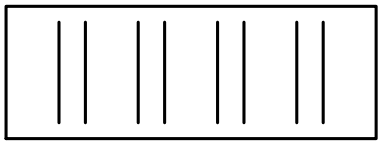


Figure 9 — Illustration of law of proximity

Elements in close spatial proximity are perceived as belonging to each other. This is the case with two parallel lines, as well as, for example, with fields and labels, or windows and their shadows.

b) Law of similarity (see figure 10)

EXAMPLE

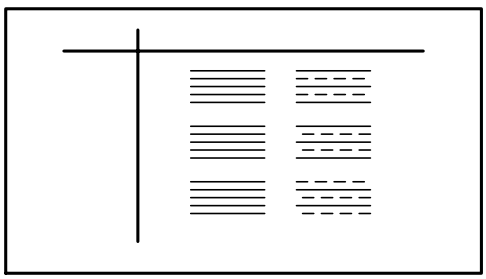


Figure 10 — Illustration of law of similarity

Elements are perceived as belonging to each other if they are similar. In the example, the observer perceives columns instead of rows.

c) Law of closure (see figure 11)

EXAMPLE

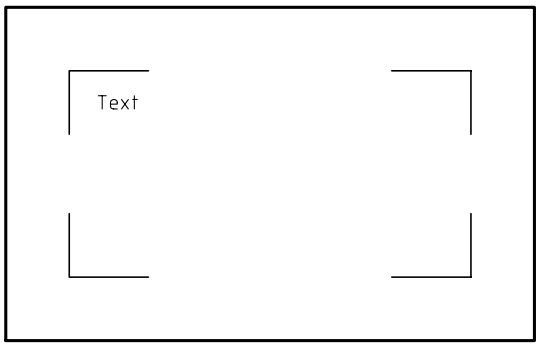


Figure 11 — Illustration of law of closure

Non-existent parts of a figure are added or incomplete figures are completed automatically. This is the case with all groups of data that are spatially separated and where the observer attempts to build a coherent figure.

5.6.2 Sequencing

If the task requires a specific sequence, information should be grouped and placed in an order which supports that sequence.

5.6.3 Use of conventions

Groups of information should be arranged to follow common formats, conventions and customs (e.g. addresses).

5.6.4 Functional grouping

If the task does not require a specific sequence, task-related information should be organized into groups that are semantically related (i.e. meaningful to the user).

5.6.5 Visually distinct groups — "chunks"

If task performance requires rapid visual search, the number of groups should be minimized and each group should span as close as possible to about 5° visual angle. Character size should not be decreased in order to get more information into the group, as readability will be impaired (see ISO 9241-3:1992, subclauses 5.4 to 5.6 and 5.8 to 5.12).

For character-based interfaces the recommended group area spans approximately 5 to 6 lines in vertical length top to bottom and 10 to 12 characters in width. Groups exceeding these limits require more eye movements and therefore greater search times.

5.7 Lists

Lists are used for organizing information. The recommendations for lists provide rules for ordering, numbering, and layout of information, the usage of headers, and guidelines for lists extending beyond the display area.

5.7.1 List structure

Lists should be organized in a logical or natural order appropriate to the task.

NOTE If no such order is applicable, alphabetic ordering can be considered.

5.7.2 Item separation

Items and groups of items in a list should be visually distinct from one another to support visual scanning.

5.7.3 Alphabetic information

The format of lists of alphabetic information should depend on language conventions, for example, vertical lists of alphabetic information are left-justified for languages which read from left to right. See figure 12.

NOTE Indentation can be used to indicate subordination in hierarchical lists.

Figure 12 — Illustration of left-justified alphabetic information

5.7.4 Numeric information (see figure 13)

Numeric information without decimal signs (comma or point) should be right-justified.

Numeric information containing decimal signs should be aligned with respect to the decimal sign.

Figure 13 — Illustration of alignment of numeric information

5.7.5 Fixed font size

A fixed font size with constant spacing should be used in numeric lists.

5.7.6 Item numbering

When listed items are numerically labelled, the numbering should begin with "1" (one), not "0" (zero), unless this conflicts with user expectations.

5.7.7 Continuity of item numbering

If a list of numbered items exceeds the available input/output area and has to be paged/scrolled for its continuation, items should be numbered continuously in relation to the first item in the initial input/output area.

In menus this recommendation does not apply to number designators used for option selection and execution (see ISO 9241-14:1997, 7.2.6 and 7.2.7).

5.7.8 Indication of list continuation (see figure 14)

If a list extends beyond the available display area, an indication of list continuation should be provided (e.g. “more” after the last displayed item, “page 2 of 3”, or a scroll bar indicator; see also 5.5.3).

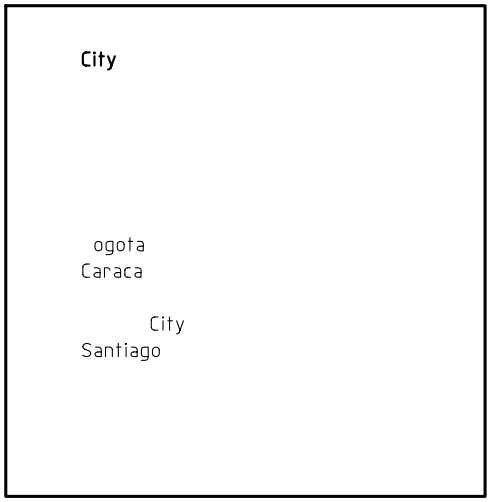


Figure 14 — Indication of list continuation

5.8 Tables

Tables are appropriate to organize information into visual meaningful subsets. The recommendations for organizing information in tables provide guidance for the arrangement of tabular information in an appropriate format.

5.8.1 List organization in tables (see figure 15)

Tabular information should be arranged such that the material most relevant to the user or with the highest priority is displayed in the leftmost column, and associated but less significant material in columns further to the right, unless this conflicts with user expectations.

This applies to languages which are read from left to right.

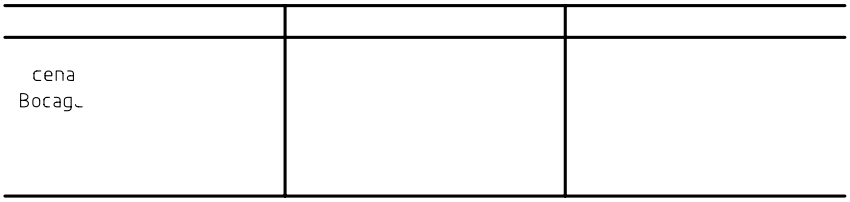


Figure 15 — Example of a list organization in a table

5.8.2 Consistency with paper forms

If paper forms are used in the task, the information display format and the paper forms should be designed to match each other whenever feasible.

For data entry tasks see ISO 9241-17.

5.8.3 Maintaining column and row headings

If a table uses column and row headings and extends beyond the available display then the headings associated with the visible columns and/or rows should always be visible.

5.8.4 Facilitating visual scanning

A distinctive feature to facilitate scanning should be provided. For example, techniques such as inserting a blank line approximately every five lines should be used, see figure 16. Other techniques (e.g. colour or lines) could be used to aid scanning or to indicate table areas.

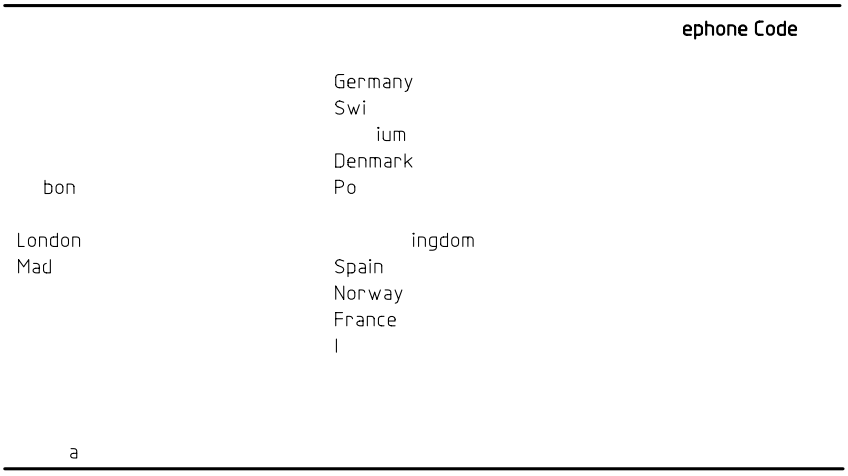


Figure 16 — Example of facilitating visual scanning by inserting blank lines

5.8.5 Column spacing

Columns in tables should be perceptually distinct.

Techniques for making columns perceptually discriminable include providing approximately three to five spaces on the left, lines between columns, colours, etc.

5.9 Labels

Labels are used to designate the meaning of information items. The recommendations for designing labels provide rules for distinguishing between information items and for construction of labels.

5.9.1 Labelling screen elements

Screen elements (e.g. fields, items, icons and graphs) should be labelled unless their meaning is obvious and can be understood clearly by the intended users (for icon labels, see ISO 9241-14:1997, 8.4.1).

If labelling of icons is not practicable (e.g. due to space limitation), system-initiated object identification (e.g. tool tip, quick info, balloon help) is an acceptable alternative.

5.9.2 Label designation

Labels should explain the purpose and content of the designated information item.

5.9.3 Grammatical construction of labels

Labels should be grammatically consistent, e.g. consistent use of noun-verb combinations.

5.9.4 Label position

Labels should be consistently located adjacent to the designated information item.

EXAMPLE 1 In an application, all the field labels are placed consistently to the left of the displayed field.

EXAMPLE 2 In an application, all the icon labels are placed consistently below the displayed icon.

EXAMPLE 3 In an application, labels for radio buttons are consistently located to the right.

5.9.5 Distinction of labels and associated information

Labels should be distinguishable from the information which they are designating (e.g. entry fields, items, icons, and graphs).

EXAMPLE In an application, labels and the associated information are distinguished clearly by spaces.

5.9.6 Label format and alignment

Labels and fields should be consistently formatted (e.g. font, size, shape) and aligned (left or right-justified) (for alignment see ISO 9241-17:1998, 5.2.7 and 5.2.8).

5.9.7 Labels for units of measurement

The units of measurement for displayed information should be either included in the label or added to the right of the read-only or entry field, unless the unit is obvious to the intended user.

EXAMPLE 1 Distance (km): 1,5

EXAMPLE 2 Distance: 1,5 (km)

5.10 Fields

The recommendations provide guidance for organizing information in fields. They deal with field length, format, positioning of items, distinction of entry and read-only fields. Additional recommendations for entry fields in form filling dialogues can be found in ISO 9241-17:1998, 5.3.

5.10.1 Distinction of different field types

Entry fields and read-only fields should be visually distinct (e.g. by label, format, shape, colour, etc.). If required by the task, user-entered data should be distinguishable from system-generated data in entry fields (e.g. defaults).

5.10.2 Partitioning long information items

Long information items should be partitioned into groups with a specified number of characters which are consistently used for entry and display.

EXAMPLE A 10-digit telephone number is represented as 10 00 33 45 35 or 100 033 4535.

A space should be used as a separator, unless this conflicts with existing conventions or user expectations.

EXAMPLE A 6-digit bank code is represented as 339 456.

Numbers and letters should not be mixed in one group unless there is a convention for this.

5.10.3 Entry field format

If a data entry field requires a specific format then the formats of the entry field should be clearly indicated (e.g. by a prompt or field help) unless obvious. See figure 17.

This recommendation is most relevant for users not familiar with field format.

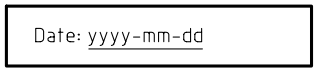


Figure 17 — Example of format indication

5.10.4 Entry field length

The length of a non-scrolling fixed length entry field should be clearly indicated as in figure 18.

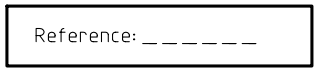


Figure 18 — Example of an indicated field length

6 Graphical objects

6.1 General recommendations for graphical objects

6.1.1 Distinctive states of graphical objects

Coding techniques should be used to indicate different states of graphical objects.

EXAMPLE 1 The active window is visually distinguished from other windows by a different pattern of the window border.

EXAMPLE 2 The state of pressed push-buttons is visually distinguished from the non-pressed push-buttons by different shadows.

6.1.2 Differentiating objects of identical type

If identical graphical representations (icons) are used for different objects, each representation should be given a unique identity by a text label.

EXAMPLE To differentiate between three printers, the system provides unique names attached to the printer icons.

6.2 Cursors and pointers

The recommendations provide guidance for the usage of cursors and pointers.

For pointer appearance, format and shape see ISO/IEC 11581-3.

6.2.1 Designation of cursor and pointer position

Cursors and pointers should indicate their position with distinctive visual features (e.g. shape, blink, colour and brightness).

6.2.2 Cursor occlusion of characters

Cursors should not obscure any character displayed in the position of the cursor.

6.2.3 Cursor and pointer location

Cursors or pointers should remain stationary until a change of position is initiated by the user.

NOTE For certain tasks, it may be more efficient if the system automatically repositions the cursor to anticipate the next task step.

6.2.4 Cursor "home" position

If there is a predefined home position for the cursor, that position should be consistent within active input/output areas.

6.2.5 Initial position for entry fields

When entry fields are first displayed, the cursor should be automatically positioned in the most appropriate entry field for the user's current task and expectations. The position of the cursor should be apparent to the user.

NOTE The top left-hand entry field is the common default position for the cursor, when there is no other more appropriate entry field.

6.2.6 Point designation accuracy

If positioning accuracy is required, as in graphic interactions, the displayed pointer should include a point designation feature (e.g. cross-hair or V-shaped symbol).

6.2.7 Different cursors/pointers (see figure 19)

Cursors and pointers used for different functions (e.g. text entry versus direct manipulation) should be visually distinct.

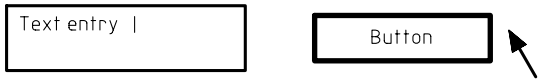


Figure 19 — Left: example of text entry (a vertical cursor), right: example of direct manipulation (a pointer)

6.2.8 Active cursor/pointer

If more than one cursor or pointer is simultaneously displayed (e.g. in computer-supported cooperative work), the active cursor/pointer should be visually distinct from those which are currently not active.

6.2.9 Multiple cursors and pointers

If the same displayed information is used by more than one user/operator interacting simultaneously, a visually distinct cursor and/or pointer for each individual user should be provided.

7 Coding techniques

Code constructions or rules of code should always be designed together with the intended users and according to their expectations and tasks. If additional codes are necessary, they should be checked with the user. Generally, rules for code construction should be explained to users.

Using codes can help designers reduce the amount of clutter (lack of order, poor spacing and displaying unnecessary information) on a visual display by representing information in "short form" (or abbreviated form) using text and/or graphics. Employing codes can also improve user performance in information entry by increasing speed and reducing errors. Poorly coded information causes a user's dialogue with the system to be slower and error-prone.

7.1 General recommendations for codes

The recommendations in 7.1.1 to 7.1.7 provide guidance for construction of codes. The types of codes used should be related to the type of intended user, the user's task and/or the application. The types of codes depend upon a number of factors, one of which is the skill level of the intended user.

7.1.1 Distinctiveness of codes

Codes should be used which are perceptually distinct from each other.

EXAMPLE In an office application, the distinctiveness between the codes is enhanced by reducing redundant elements, that are identical across items: AI3404 or AI3402 is replaced by A-04 or A-02.

7.1.2 Consistent coding

Codes should be used consistently with the same meaning or the same function.

NOTE If different applications are employed by the same user, it is beneficial to task performance for codes to be used consistently with the same meaning or function across applications.

7.1.3 Meaningfulness

Meaningfulness should be built into codes however and whenever possible, see figure 20. Meaningfulness is increased when clear associations exist between coded information and its intended meaning. Preference should be given to mnemonic codes over arbitrary codes because mnemonic codes are meaningful. Task performance is more accurate and rapid, if codes are meaningful.

Figure 20 — Meaningful coding

7.1.4 Access to meaning of code

When the meaning of a code is not obvious to the user, information about the meaning of the code should be easily accessible.

7.1.5 Use of standards or conventional meaning

Codes should be assigned according to established standards or conventional meanings for an intended user group (e.g. postal code).

EXAMPLE 1
In America: "Off"-position = switches in down position.
In Great Britain: "Off"-position = switches in up position.

EXAMPLE 2 The maximum value of a horizontally oriented slider is at the rightmost position.

7.1.6 Rules of code construction

Rules of code construction should be established for the specification of codes. They should be applied consistently and unambiguously.

7.1.7 Removal of codes

If the absence of information is important to the user's task, a code should be used to indicate the absence of this information rather than removing a code.

EXAMPLE If a network connection is no longer available, the icon representing the network connection is shown crossed out rather than removed from the screen.

7.2 Alphanumeric coding

The recommendations in 7.2.1 to 7.2.3 provide guidance for construction of alphanumeric codes.

7.2.1 Length of character strings

Codes should be short, preferably with six or fewer characters (consistent with providing meaningfulness, unique codes and ability to add additional codes).

NOTE There are inevitable trade-offs among these factors (for example, using the fewest number of characters conflicts with the goal of supporting the ability to add additional codes).

7.2.2 Alphabetic vs. numeric codes

Alphabetic codes should generally be used rather than numeric codes, unless it can be shown that numeric codes offer greater meaningfulness to the intended users for a particular task.

EXAMPLE http://www.iso.ch/ is used instead of http://123.45.78.112.

7.2.3 Use of upper case

If alphabetic coding is used for input, upper-case and lower-case letters should have the same meaning, unless this is contrary to user expectations.

7.3 Abbreviations for alphanumeric codes

The recommendations for abbreviations in 7.3.1 to 7.3.5 mainly apply to input. They provide recommendations to shorten information and to avoid confusing similarities (see also ISO 9241-15:1997, 6.2).

7.3.1 Length of abbreviations

The length of abbreviations should be as short as possible. The length will depend on the number and similarity of words to be abbreviated.

7.3.2 Abbreviations of different length

If, in a set of abbreviations of equal length, some abbreviations can be shortened without ambiguity, this should be permitted to minimize required keystrokes.

7.3.3 Truncation

Truncation to construct codes should be considered, when this can be done without ambiguity.

EXAMPLE Always take the first three letters for commands (e.g. abbreviation: abb).

7.3.4 Deviation from the rules of code construction

If an abbreviation has to deviate from the rule used for code construction (e.g. identical words, misleading), the extent of the deviation should be minimized. If more than 10 % of all abbreviations are deviations, the rule used for code construction should be changed.

7.3.5 Conventional and task-related abbreviations

Conventional and task-related abbreviations should be used when they are required to meet user expectations.

7.4 Graphical coding

The recommendations for graphical coding in 7.4.1 to 7.4.6 provide rules for the design of symbols and considerations for improving the effectiveness of graphical coding.

7.4.1 Levels of graphical codes

The number of levels or degrees of coding that need to be perceived should be limited.

EXAMPLE In an application, no more than three size codes are used.

7.4.2 Construction of icons

Icons should be constructed in such a way that they are easily discerned and discriminated. They should be easily and clearly comprehended.

NOTE ISO 11581-1 ([3] in annex B) covers some aspects of the construction of icons. Examples of icons can be found in ISO 11581-2[4].

7.4.3 Three-dimensional coding

The use of graphical techniques to create the perception of three dimensions should be considered to help users discriminate between different categories of information.

7.4.4 Geometric shapes

Coding with geometric shapes should be considered to help users discriminate between different categories of information on graphic displays.

For every category of information, a unique and discriminable geometric shape should be used. The overall number of different categories and geometric shapes to be displayed should be minimized.

7.4.5 Line coding

If coding by different appearances of lines is used, variations in line type (e.g. solid, dashed, dotted) and line width (boldness) should be clearly discriminable.

NOTE Line coding can be used, for example, on maps and graphs. Approximately eight combinations of line types and line widths are discriminable.

7.4.6 Line orientation (see figure 21)

If line orientation is used for coding a direction or value, contextual information should be provided, so that direction or values are accurately identifiable.

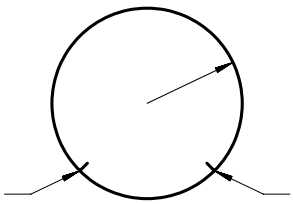


Figure 21 — Contextual information to facilitate discrimination of line orientation

7.5 Colour coding

The recommendations for colour coding in 7.5.1 to 7.5.10 provide guidance for screen design with colours and considerations applying to the use of colour. This is concerned with the usage of colours while ISO 9241-8 is primarily concerned with the description of factors affecting colour appearance.

7.5.1 Colour as auxiliary coding

Colour should never be the only means of coding because some people discriminate certain colours poorly or cannot discriminate on the basis of colour at all. Colour is a good auxiliary code. It should be made redundant with some other coding techniques.

7.5.2 Indication of meaning

Indiscriminate use of colours should be avoided as it may cause displays to appear "busy" or cluttered and may reduce the effectiveness of colour coding on other displays (see ISO 9241-8:1997, clause 6).

7.5.3 Attachment to categories of information

If colour is used as the dominant code, each colour should only represent one category of information. If the same colour is used for different categories of information, the user's recognition of the intended meaning may be hindered.

EXAMPLE In a particular system, all types of messages indicating dangerous situations have been identified as a single category of information. The colour red is used as the background colour for these messages.

7.5.4 Colour-coding conventions

Familiar colour-coding conventions should be followed, taking the context into account (e.g. red = warning; yellow = caution; green = OK or available). The use of colour should also be consistent with task conventions and cultural conventions.

7.5.5 Number of colours used

If colour coding is used, the colours should be readily distinguishable by the user. It is preferable to use no more than six colours in addition to black and white (see ISO 9241-8:1997, clause 6).

This maximum does not refer to colours within images or graphical representations also on a display.

7.5.6 Saturated blue

Saturated blue should be avoided for display of text or symbols on a dark background (small, saturated blue elements are often difficult to reliably discriminate and bring into clear focus) (see ISO 9241-8:1997, 6.7).

7.5.7 Selection of colours for non-colour units

If information is presented on both colour VDTs and monochrome VDTs, colours should be chosen in such a way that they are displayed in discriminable grey levels on the monochrome VDT.

7.5.8 Chromostereopsis

Highly saturated colours of spectrally extreme wave lengths (like red and blue), which produce unintended depth effects or excessive accommodation, should not be used adjacently as texts or backgrounds in reading tasks (see ISO 9241-8:1997, 6.7).

7.5.9 Foreground colours

If foreground colours are used on a neutral background (i.e. white, grey or black, see ISO 9241-8:1997, 3.1) then foreground colours that are far apart on the 1976 CIE UCS Chromaticity Diagram should be chosen to improve the user’s ability to distinguish between them.

EXAMPLE Light yellow is used together with blue.

7.5.10 Background colours

Colours with high saturation (and bright white) should be avoided as background colours.

NOTE A good background colour is, for example, light grey.

7.6 Markers

The recommendations in 7.6.1 to 7.6.4 for highlighting alphanumeric text with markers provide guidance on the selection and positioning of these special symbols.

7.6.1 Special symbols for markers

Markers (e.g. *) should be considered for drawing attention to selected alphanumeric items, see figure 22.

NOTE Markers are used for permanent selection.

* = Cities with more than 6 million inhabitants.

Figure 22 — Illustration of usage of markers

7.6.2 Markers for selection

Different markers should be used to indicate single selection and multiple selection.

7.6.3 Unique use of symbols for markers

Markers should be used consistently. Where possible, these symbols should not be used for any other purpose or displayed under conditions where a confusion with other markers might occur.

7.6.4 Positioning of markers (see figure 23)

Markers should be positioned close to the items marked. However, the markers should not appear to be part of the displayed items. Markers and items should be designed and positioned in a way which allows them to be identified clearly by the users.

Figure 23 — Illustration of positioning of markers

7.7 Other coding techniques

The recommendations for coding with other visual techniques provide several specific possibilities for the presentation of information.

7.7.1 Blink coding

If blink coding is used, it should be considered for applications where a displayed item implies an important task requirement for user attention.

If a blinking cursor is used, only one other blink code should be used on the screen at the same time.

For blink rates see ISO 9241-3:1992, 5.22.

7.7.2 Highlighting by blinking

If highlighting by blinking is intended and if reading items is important, an alternative method should be considered for highlighting the item.

EXAMPLE A symbol is added to mark the item, and the symbol is blinked rather than the item. This technique attracts attention without affecting legibility.

NOTE Blinking items are not easy to read and can cause fatigue, if used too much.

7.7.3 Size coding

Size coding, varying the size (height and width) of displayed characters or symbols, should only be considered for applications where displays have low overall density.

NOTE Usually, at least two or three sizes can be readily distinguished for information categorization.

7.7.4 Luminance (brightness) coding

Luminance (brightness coding) should only be used for applications which require discrimination between two categories of displayed items (i.e. treat brightness as a two-valued code, bright and normal) (see ISO 9241-3:1992, 5.21).

7.7.5 Image polarity reversal

If image polarity reversal (reverse video) is used, it should be considered for items which require user attention. Image polarity reversal should be used consistently for one purpose (see also ISO 9241-3:1992, 5.19).

7.7.6 Underlining

If underlining is used, it should be used for emphasizing and/or designating an item. Underlining should not reduce the legibility of the item.

7.7.7 Coding of areas

If areas in diagrams need to be distinguished, filling the areas with different coding techniques (hatch, shading, dotting, etc.) should be considered instead of colours. Texture coding should also be considered for use together with colour to provide redundant coding.

Annex A
(informative)

Sample procedure for assessing applicability and adherence

A.1 General

This annex provides an example of a procedure for determining whether the applicable recommendations in this part of ISO 9241 have been met. It should be noted that the procedure described below is provided as guidance and is not a rigid process to be used as a substitute for the standard itself. This procedure provides a two-stage process for

1) determining which recommendations are relevant, and
2) determining whether those relevant recommendations have been adhered to.

Interface design depends upon the task, the user, the environment, and the available technology. Consequently, this part of ISO 9241 cannot be applied without a knowledge of the design and use context of the interface and it is not intended to be used as a prescriptive set of rules to be applied in its entirety. Rather, it assumes that the designer has proper information available concerning task and user requirements and understands the use of available technology (this could require consultation with a qualified ergonomics professional as well as empirical testing with real users).

The evaluation procedure should be based on an analysis of typical users, their typical and critical tasks, and their typical usage environments. Evaluations generally fall into the two following categories:

a) When users and user tasks are known, evaluators evaluate the product or observe representative users of the product in the context of accomplishing typical and critical user tasks in a typical usage environment.
b) When specific users and user tasks are not known, evaluators evaluate all of the aspects of presentation of information used in the product being evaluated.

Determination of whether a product meets a given recommendation should be based on the set of properties of presentation of information encountered during the evaluation described above. Aspects of presentation of information that can be shown to be better than ones that meet the recommendations described in this part of ISO 9241 would also be accepted as meeting the recommendations of the standard.

Users of this part of ISO 9241 could demonstrate how they met the recommendations by listing the method used to judge applicability (as described in A.3); the method used to judge adherence (as described in A.4); and the results.

A.2 Applicability

The applicability of a recommendation is based on two factors:

a) Whether the conditional statement, if included as part of the provision, is true. A particular recommendation is (or is not) applicable when the conditional if-statement is (or is not) true.
b) The design environment. A particular recommendation may not be applicable because of user, task, environment and technology constraints such as unknown user community, variations in tasks, office environment, screen resolution, lack of a pointing device. However, if the design environment did involve user characteristics, tasks, or technology features addressed by a particular recommendation, that recommendation would be applicable.

The methods which are appropriate to determine the applicability of a particular recommendation are:

a) system documentation analysis,

b) documented evidence,

c) observation,

d) analytical evaluation,

e) empirical evaluation.

The following clause (A.3) describes each of the applicability methods in more detail.

A.3 Description of applicability methods

A.3.1 System documentation analysis

System documentation analysis refers to the analysis of any documents which may describe the general and specific presentation of information. Such documents may include design documents containing system and user requirements, manuals, user guides, etc.

A.3.2 Documented evidence

Documented evidence refers to the analysis of any relevant documented information about the task requirements or characteristics, flow of work, user skills, user aptitudes, existing user conventions or biases, test data from the design of similar systems, etc. Such information may be used to determine whether a given recommendation is applicable.

A.3.3 Observation

Observation means simply to examine or inspect the presentation of information for the presence of a particular observable property. Observations can be made by anyone who has the necessary skill to systematically check the presentation of information and determine if it has the particular properties associated with the applicability of given conditional recommendations. Due to their obvious nature, such observations can readily be confirmed by another person.

A.3.4 Analytical evaluation

Analytical evaluation pertains to "informed" judgments concerning the presentation of information by a relevant expert. This method is typically used for the evaluation of properties which can be judged only in the context of other information or knowledge. In addition, analytical evaluation may be appropriate when the system exists only in terms of design documents, user populations are not available for empirical evaluation, or time and resources are constrained. Analytical evaluation can be used to determine whether a particular recommendation is applicable.

Analytical evaluation can be performed by any suitably qualified person who has the necessary skill and experience to judge the relevant property of the presentation of information. Where these properties concern the application of ergonomic principles, the expert needs to possess appropriate skills in software ergonomics. If the properties concern the work environment, system characteristic, or other aspects of the design, the judge needs to be an expert in the particular relevant domain.

A.3.5 Empirical evaluation

Empirical evaluation refers to the application of test procedures using representative end-users to determine the applicability of a recommendation. This method is most appropriate when a prototype or the actual system is available, and potential or actual user population representatives are available. Many kinds of test procedures could

be used, but in each case the test subjects need to be representative of the end-user population and be of sufficient number that the results can be generalized for the user population as a whole.

It should be noted that empirical evaluation needs to be conducted by individuals possessing appropriate skills in testing methodology and evaluation techniques.

A.4 Adherence

If a recommendation is applicable on the basis of the criteria described in A.2, it is then necessary to determine whether or not the recommendation has been met. Adherence is determined by using one or more of the methods listed below.

NOTE The methods which are appropriate to determine adherence for a particular recommendation are listed in conjunction with that recommendation in the checklist in table A.1.

a) Measurements.

b) Observation.

c) Documented evidence.

d) Analytical evaluation.

e) Empirical evaluation.

It is important to note that the results of applicability tests are often important in determining adherence. The various adherence methods are further described in A.5.

A.5 Description of adherence methods

A.5.1 Measurements

Measurements refer to measuring or calculating a variable concerning the presentation of information. An example of such properties is system response time. Adherence is determined by comparing the obtained value from the measurement with the value stated in the recommendation.

A.5.2 Observation

Observation means simply to examine or inspect the presentation of information to confirm that a particular observable condition has been met. Observations could be made by anyone who has the necessary skill to systematically check the presentation of information and determine if a statement concerning an observable property has been consistently applied. The observed property is compared with the recommendation to determine adherence.

A.5.3 Documented evidence

For adherence, documented evidence refers to any relevant documented information related to the adherence of presentation of information to the appropriate conditional recommendations. Such evidence may include existing user conventions or biases, prototype test data, test data from the design of similar systems, etc.

A.5.4 Analytical evaluation

As stated in A.3.4, analytical evaluation pertains to "informed" judgements concerning the presentation of information by a relevant expert. This method is typically used for the evaluation of properties which can be judged only in the context of other information or knowledge. In addition, analytical evaluation can be an appropriate

adherence method when the system exists only in terms of design documents, user populations are not available for empirical evaluation, or time and resources are constrained.

As stated in A.3.4, analytical evaluation can be performed by any suitably qualified person who has the necessary skill and experience to judge the relevant property of the presentation of information. For adherence, the expert also needs to have the skills and knowledge necessary to reliably judge the appropriateness and usability of a particular design solution. It also should be noted that analytical evaluation can verify the tenability of a design, but cannot validate the design. Validation can be accomplished only by using empirical evaluation.

A.5.5 Empirical evaluation

Empirical evaluation refers to the application of test procedures using representative end-users to determine the adherence to a recommendation. As stated in A.3.5, this method is most appropriate when a prototype or the actual system is available and potential or actual user population representatives are available. Many kinds of test procedures could be used, but in each case the test needs to be representative of the end-user population and be of sufficient number that the results can be generalized for the user population as a whole. The task performance of end-users using the presentation of information could be analysed to determine adherence with the various conditional recommendations.

Typically, empirical evaluations are used to determine adherence by comparing the test results against specific recommendations for presentation of information. However, it is often necessary to also evaluate test results in terms of effectiveness.

A.6 Procedure

The procedure in figure A.1 can be followed in evaluating a particular application with respect to the recommendations in this part of ISO 9241.

A.6.1 “If clause” conditional recommendations

a) **Applicability** — Each recommendation has an if-condition either in the statement itself, or implied in the title to a subclause. For ech conditional recommendation, the applicability of the if-statement should be determined using the methods proposed to test if the if-condition is true or not. Also, when there is a set of optional conditional recommendations, the applicable approach should be determined using the proposed method(s).

b) **Adherence** — For each applicable conditional recommendation as defined in a), the adherence to the recommendation should be determined using the proposed methods.

A.6.2 Other conditional recommendations

a) **Applicability** — Non-conditional "if statement" recommendation are generally appropriate to any presentation of information. However, a number of the sections are applicable only if the presentation of information utilizes such features.

b) **Adherence** — For each non-conditional "if statement" recommendation as determined in a), information about adherence to the recommendation as described in A.6.1 b) is necessary. If there are valid reasons for not following the proposed recommendation, both the reasons and the design solution chosen also would be of interest to users of this part of ISO 9241.

As an aid for applying the procedures described above, a checklist is provided in table A.1.

A.7 Checklist

The checklist in Table A.1 is intended as an aid for both designers and evaluators of presentation of information in evaluating both the applicability of, and adherence to, the conditional recommendations in this part of ISO 9241. This checklist contains a "short version" of all of the recommendations of this part of ISO 9241 and provides a logical structure to assist users in determining applicability. Many of the conditional recommendations allow a number of alternative solutions. The checklist depicts such interdependencies by means of "and"/"or" connectors. These connectors are shown only for conditional recommendations within a particular clause (it is assumed that the clauses have inherent "ands" to the degree that the clause is applicable). In some cases, "and/or" is specified because the choices are not mutually exclusive.

A.7.1 Description of the checklist

A.7.1.1 Recommendations column

The first column of the checklist contains the "short version" conditional recommendations, connected by the logic connectors, and separated by subclause. Since each conditional recommendation is numbered with its subclause number, users can look up the full text easily in the relevant clauses of this part of ISO 9241.

A.7.1.2 Applicability columns

The first two columns of the Applicability portion of the checklist are provided for recording the result of the applicability determination by a checkmark in the "Y" or "N" column. In addition, this part of the checklist indicates which of the applicability methods are relevant for each of the conditional recommendations and provides space to "check off" the method used by the designer or evaluator. Those methods that are not relevant for a particular recommendation are shaded to make the checklist easier to use. The codes used for the applicability methods are:

S = System documentation analysis

D = Documented evidence

O = Observation

A = Analytical evaluation

E = Empirical evaluation

DM = Different Method (method other than above used)

If a different method is used (i.e. "DM" is checked), that method can be described in the Comments column. It also should be noted that checking off the applicability methods used is considered an optional feature of the checklist.

A.7.1.3 Adherence columns

This part of the checklist indicates which methods are appropriate for determining adherence to each of the conditional recommendations and provides space for designers or evaluators to "check off" the method used. Those methods that are not relevant for a particular recommendation are shaded to make the checklist easier to use. If the result of the adherence test is positive, the "P" column is checked (for "passed") and if the result is negative, the "F" column is checked (for "failed"). The codes used for the adherence methods are:

M = Measurement

O = Observation

D = Documented evidence

A = Analytical evaluation

E = Empirical evaluation

DM = Different Method (method other than above used)

NOTE Users of this part of ISO 9241 may freely reproduce the checklist in this annex so that it can be used for its intended purpose and may further publish the completed checklist.

As for applicability, if a different method is used ("DM" checked), that method can be described in the Comments column. Also, as noted for applicability, checking off the methods used to evaluate adherence is considered an optional feature of the checklist.

A.7.1.4 Comments

The Comments column provides space for additional statements and comments pertaining to each of the conditional recommendations and can be used to indicate the source of the assessment (e.g. name of expert, title of documented evidence) as well as for describing "Different Methods" when used. Since different solutions (methods) can be appropriate in specific situations, it is best to describe such unique solutions in the Comments column. This description can include how these solutions relate to the design recommendations for presentation of information and appropriate dialogue principles.

A.7.2 Summary data

Users of the Applicability and Adherence checklist could summarize the results of the evaluation by computing an adherence rating (AR). The AR is the percentage of the applicable recommendations successfully adhered to (i.e. the number of checkmarks in the "P" column divided by the number of checkmarks in the "Y" column). It is highly recommended that all of the data (i.e. number of Ps and the number of Ys) be reported in conjunction with the ARs. However, it should be noted that the AR is no more than an arithmetic count which cannot be used as a reliable measurement of the degree of adherence with applicable recommendations without taking into account the respective weights of the items (both by themselves and in the context of use).

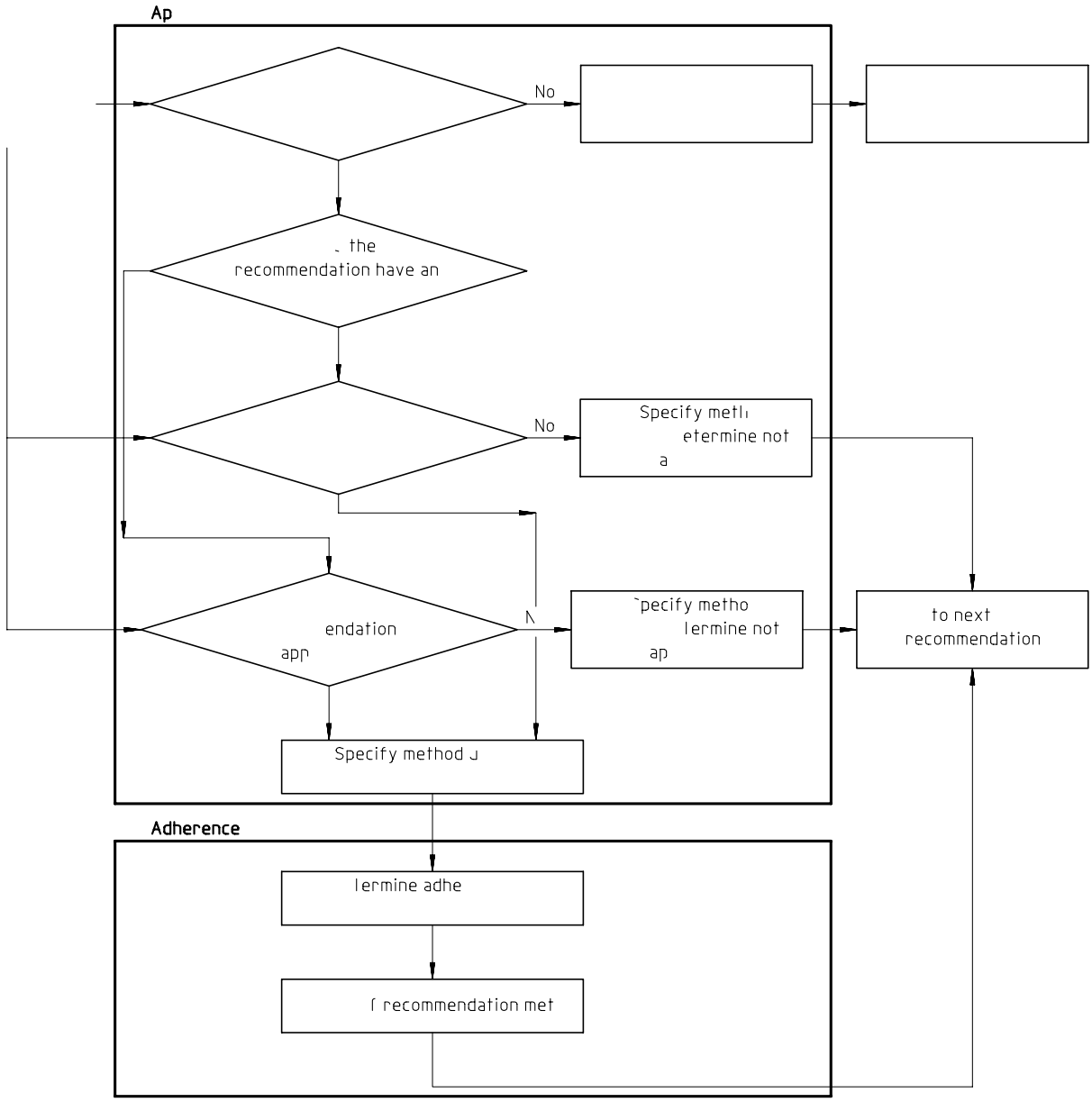


Figure A.1 — Decision process (evaluation situation)

Table A.1 — Applicability and adherence checklist

Recommendations		Applicability								Adherence								Comments
		Results		Method Used						Method Used						Results		(including sources)
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
5	**Organization of information**																	
5.3	**Recommendations for windows**																	
5.3.1	**Considerations for multiple windows** If information from different sources needs to be displayed or manipulated, multiple windows or a single window with multiple I/O areas are used.																	
5.3.2	**Unique window identification** Unique window identification (e.g. window name or file name or application name) provided for each window.																	
5.3.3	**Default window parameters** Default window sizes and locations designed to minimize the number of operations users have to perform to complete a task.																	
5.3.4	**Consistent window appearance within an application** All windows of the same type have a consistent appearance, if appropriate to the task.																	
5.3.5	**Consistent window appearance within a multi-application environment** All windows of the same type have a consistent appearance, if used together and if appropriate to the task.																	
5.3.6	**Indication of primary/secondary window relationships** Relationship between primary window and secondary windows is always visually apparent.																	
5.3.7	**Identification of window control elements** Window control elements for different functions (e.g. a close-window control and a resize-window control) are visually discriminable from each other and consistently placed in the same location in each window.																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
5.3.8	**Overlapping window format** Overlapping window format used in cases where																	
	— task requires variable or unconstrained types, sizes, numbers, contents and/or arrangement of windows. **and/or**																	
	— visual display is small or of such low resolution that users cannot view meaningful amounts of information in individual tiled windows.																	
5.3.9	**Tiled window format** Tiled format used in cases where																	
	— task requires little or no variation in the size, numbers, contents and arrangement of windows. **and/or**																	
	— continuous visual access to the information currently displayed (e.g. critical information, information necessarily used for the task) is required. **and/ or**																	
	— processing required for the rapid manipulation and display of overlapping windows degrades system response time and user task performance.																	
5.3.10	**Selection of window format** If appropriate for task, users are allowed to select the preferred windowing format.																	
5.4	**Areas**																	
5.4.1	**Consistent location of areas** Areas (i.e. identification, input/output, control, and message area) used in the dialogue within the application are consistently located.																	
5.4.2	**Density of displayed information** Density of displayed information not perceived as overly cluttered by the user.																	
5.5	**Input/output area**																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
5.5.1	**Required information** If possible, all of the information required to perform a given task should be displayed in the I/O area if this is not possible:																	
	a) Information is structured into subsets corresponding to task steps. **and/or**																	
	b) Subsets support appropriate sub-tasks and are meaningful to the intended users. **and/or**																	
	c) Splitting of information should not result in reduced task performance.																	
5.5.2	**Scrolling and paging** If amount of information to be displayed exceeds available input/output area, user is provided an easy means (e.g. horizontal or vertical paging/scrolling) to view portions of the information not currently displayed.																	
5.5.3	**Indication of relative position of displayed information** If available information exceeds input/output area, relative position and proportion of the information currently displayed is indicated in relation to total amount of information required (e.g. a scroll bar, slider, or "page x of y" indication).																	
5.6	**Groups**																	
5.6.1	**Distinction of groups** Groups are perceptually distinct according to spacing and location. **and**																	
	If necessary, other means are used to improve distinctiveness (e.g. a box around the group).																	
5.6.2	**Sequencing** If task requires specific sequence, information is grouped to follow that sequence.																	
5.6.3	**Use of conventions** Groups of information are arranged to follow common formats, conventions and customs (e.g. addresses).																	
5.6.4	**Functional grouping** If task does not require specific sequence, task-related information is organized into groups that are semantically related (i.e. meaningful to the user).																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
5.6.5	**Visually distinct groups-"chunks"** If task performance requires rapid visual search, number of groups are minimized. **and**																	
	Each group spans as close as possible to about 5° visual angle. **and**																	
	Character size is not decreased so far that readability is impaired.																	
5.7	**Lists**																	
5.7.1	**List structure** Lists are organized in logical or natural order appropriate to the task.																	
5.7.2	**Item separation** Items and groups of items in a list are visually distinct from one another to support visual scanning.																	
5.7.3	**Alphabetic information** Vertical lists of alphabetic information are left-justified for languages which read from left to right.																	
5.7.4	**Numeric information** Numeric information without decimal signs (comma or point) is right-justified. **and**																	
	Numeric information containing decimal signs is aligned with respect to the decimal sign.																	
5.7.5	**Fixed font size** Fixed font size with constant spacing used in numeric lists.																	
5.7.6	**Item numbering** When listed items are numerically labelled, numbering begins with "1" (one), not "0" (zero), unless this conflicts with user expectations.																	
5.7.7	**Continuity of item numbering** If a list of numbered items exceeds the available input/output area and must be paged/scrolled for its continuation, items are numbered continuously in relation to the first item in the initial input/output area.																	
5.7.8	**Indication of list continuation** If a list extends beyond the available display area, an indication of list continuation is provided																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments
		Results		Method Used						Method Used						Results		(including sources)
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
5.8	**Tables**																	
5.8.1	**List organization in tables** Tabular information is arranged such that the material most relevant to the user or with the highest priority is displayed in the leftmost column, and associated but less significant material in columns further to the right, unless this conflicts with user expectations.																	
5.8.2	**Consistency with paper forms** If paper forms are used in the task, the information display format and the paper forms are designed to match each other whenever feasible.																	
5.8.3	**Maintaining column and row headings** If a table uses column and row headings and extends beyond the available display then the headings associated with the visible columns and/or rows are always visible																	
5.8.4	**Facilitating visual scanning** A distinctive feature to facilitate scanning is provided.																	
5.8.5	**Column spacing** Columns in tables are perceptually distinct.																	
5.9	**Labels**																	
5.9.1	**Labelling screen elements** Fields, items, icons and graphs are labelled unless their meaning is obvious and can be understood clearly by the intended users.																	
5.9.2	**Label designation** Labels should explain the purpose and content of the designated information item.																	
5.9.3	**Grammatical construction of labels** Labels are grammatically consistent, e.g. consistent use of noun-verb combinations.																	
5.9.4	**Label position** Labels should be consistently located adjacent to the designated information item.																	
5.9.5	**Distinction of labels and associated information** Labels should be distinguishable from the information which they are designating.																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
5.9.6	**Label format and alignment** Labels and fields are consistently formatted (e.g. font, size, shape) and aligned (left or right-justified)																	
5.9.7	**Labels for units of measurement** The units of measurement for displayed information are either included in the label **or**																	
	Added to the right of the read-only or entry field, unless the unit is obvious to the intended user.																	
5.10	**Fields**																	
5.10.1	**Distinction of different field types** Entry fields and read-only fields are visually distinct (e.g. by label, format, shape, colour, etc.). **and**																	
	If required by the task, user-entered data are distinguishable from system-generated data in entry fields (e.g. defaults).																	
5.10.2	**Partitioning long information items** a) Long information items are partitioned into groups with a specified number of characters which are consistently used for entry and display. **and**																	
	b) A space should be used as a separator, unless this conflicts with existing conventions or user expectations. **and**																	
	c) Numbers and letters are not mixed in one group unless there is a convention for this.																	
5.10.3	**Entry field format** If a data entry field requires a specific format then the formats of the entry field are clearly indicated (e.g. by a prompt or field help) unless obvious.																	
5.10.4	**Entry field length** The length of a non-scrolling fixed length entry field is clearly indicated.																	
6	**Graphical objects**																	
6.1	**General recommendations for graphical objects**																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments
		Results		Method Used						Method Used						Results		(including sources)
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
6.1.1	**Distinctive states of graphical objects** Coding techniques are used to indicate different states of graphical objects.																	
6.1.2	**Differentiating objects of identical type** If identical graphical representations (icons) are used for different objects, each representation is given a unique identity by a text label.																	
6.2	**Cursors and pointers**																	
6.2.1	**Designation of cursor and pointer position** Cursors and pointers indicate their position with distinctive visual features (e.g. shape, blink, colour, and brightness).																	
6.2.2	**Cursor occlusion of characters** Cursors do not obscure any character displayed in the position of the cursor.																	
6.2.3	**Cursor and pointer location** Cursors or pointers remain stationary until a change of the position is activated by the user.																	
6.2.4	**Cursor "home" position** If predefined home position for cursor, that position is consistent within active input/output areas.																	
6.2.5	**Initial position for entry fields** When entry fields are "first" displayed, the cursor is automatically positioned in the most appropriate entry field for the user's current task and expectations. **and**																	
	The position of the cursor is apparent to the user.																	
6.2.6	**Point designation accuracy** If positioning accuracy is required, as in graphic interactions, the displayed pointer includes a point designation feature (e.g. cross-hair or V-shaped symbol).																	
6.2.7	**Different cursors/pointers** Cursors and pointers used for different functions (e.g. text entry versus direct manipulation) are visually distinct.																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments
		Results		Method Used						Method Used						Results		(including sources)
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
6.2.8	**Active cursor/pointer** If more than one cursor or pointer is simultaneously displayed, the active cursor/pointer is visually distinct from those which are currently not active (e.g. in computer-supported cooperative work).																	
6.2.9	**Multiple cursors and pointers** If the same displayed information is used by more than one user/operator interacting simultaneously, a visually distinct cursor and/or pointer is provided for each individual user.																	
7	**Coding techniques**																	
7.1	**General recommendations for codes**																	
7.1.1	**Distinctiveness of codes** Codes are used which are perceptually distinct from each other.																	
7.1.2	**Consistent coding** Codes are used consistently with the same meaning or the same function.																	
7.1.3	**Meaningfulness** Meaningfulness built into codes **and**																	
	Mnemonic codes are used.																	
7.1.4	**Access to meaning of code** When meaning of the code is not obvious to the user, information about the meaning of the code is easily accessible.																	
7.1.5	**Use of standards or conventional meaning** Codes are assigned according to established standards or conventional meanings for an intended user group (e.g. postal code).																	
7.1.6.	**Rules of code construction** Rules of code construction are established for the specification of codes **and**																	
	Rules are applied consistently and unambiguously																	
7.1.7	**Removal of codes** If absence of information is important to task, a code is used to indicate the absence of this information rather than removing a code.																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
7.2	**Alphanumeric coding**																	
7.2.1	**Length of character strings** Codes are short, preferably with six or fewer characters (consistent with providing meaningfulness, unique codes and ability to add additional codes).																	
7.2.2	**Alphabetic vs. numeric codes** Alphabetic codes are generally used rather than numeric codes, unless it can be shown that numeric codes offer greater meaningfulness to the intended users for a particular task.																	
7.2.3	**Use of upper case** If alphabetic coding is used for input, upper-case and lower-case letters have the same meaning, unless this is contrary to user expectations.																	
7.3	**Abbreviations for alphanumeric codes**																	
7.3.1	**Length of abbreviations** The length of abbreviations is as short as possible.																	
7.3.2	**Abbreviations of different length** If, in a set of abbreviations of equal length, some abbreviations can be shortened without ambiguity, this is permitted to minimize required keystrokes.																	
7.3.3	**Truncation** Truncation to construct codes should be considered, when this can be done without ambiguity.																	
7.3.4	**Deviation from the rules of code construction** If an abbreviation must deviate from the rule of code construction (e.g. identical words, misleading), then the extent of the deviation is minimized. **and**																	
	Less than 10% of all abbreviations are deviations.																	
7.3.5	**Conventional and task related abbreviations** Conventional and task related abbreviations are used only when they are required to meet user expectations (i.e. this is not affected by rule of code construction).																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
7.4	**Graphical coding**																	
7.4.1	**Levels of graphical codes** The number of levels or degrees of coding are limited.																	
7.4.2	**Construction of icons** Icons constructed in a way that they are easily discerned and discriminated and easily and clearly comprehended.																	
7.4.3	**Three-dimensional coding** The use of techniques to create the perception of three dimensions considered to help users discriminate between different categories of information.																	
7.4.4	**Geometric shapes** Coding with geometric shapes considered to help users discriminate different categories of information on graphic displays.																	
7.4.5	**Line coding** If coding by different appearances of lines is used, variations in line type (e.g. solid, dashed, dotted) and line width (boldness) are clearly discriminable.																	
7.4.6	**Line orientation** If line orientation is used for coding a direction or value, contextual information is provided, so that direction or values are accurately identifiable.																	
7.5	**Colour coding**																	
7.5.1	**Colour as auxiliary coding** Colour should never be used as the only means of coding.																	
7.5.2	**Indication of meaning** Indiscriminate use of colours should be avoided so displays do not appear "busy" or cluttered.																	
7.5.3	**Attachment to categories of information** If colour is used as the dominant code, each colour only represents one category of information.																	
7.5.4	**Colour-coding conventions** Familiar colour-coding conventions are followed taking the context into account. **and**																	
	Use of colour is consistent with task conventions and cultural conventions.																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comments (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
7.5.5	**Number of colours used** If colour coding is used, the colours are readily distinguishable by the user. Preferably no more than six colours used in addition to black and white.																	
7.5.6	**Saturated blue** Saturated blue should be avoided for display of text or symbols on a dark background.																	
7.5.7	**Selection of colours for non-colour units** If information is presented on both colour VDTs and monochrome VDTs, colours are displayed in discriminable grey levels on monochrome VDT.																	
7.5.8	**Chromostereopsis** High saturation of spectrally extreme wave lengths (like red and blue), not used adjacently as texts or backgrounds in reading tasks (see ISO 9241-8).																	
7.5.9	**Foreground colours** If foreground colours are used on a neutral background (i.e. white, grey or black) then colours that are far apart on the 1976 CIE UCS Chromaticity Diagram are chosen to improve user's ability to distinguish between them.																	
7.5.10	**Background colours** Colours with high saturation (and bright white) are avoided as background colours.																	
7.6	**Markers**																	
7.6.1	**Special symbols for markers** Special symbols also known as "markers" (e.g. *), are considered for drawing attention to selected alphanumeric items.																	
7.6.2	**Markers for selection** Different markers are used to indicate single selection and multiple selection.																	
7.6.3	**Unique use of symbols for markers** Symbols for markers are not used for any other purpose or displayed under conditions where a confusion with other markers might occur. **and**																	
	Markers are used consistently.																	

Table A.1 — *(continued)*

Recommendations		Applicability								Adherence								Comment (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
7.6.4	**Positioning of markers** Markers are positioned close to the items marked. **and**																	
	Markers do not appear to be part of the displayed items. **and**																	
	Markers and items are designed and positioned to be identified clearly by the users.																	
7.7	**Other coding techniques**																	
7.7.1	**Blink coding** a) when used, considered for applications where a displayed item implies an important task requirement for user attention. **and**																	
	b) If blink cursor is used, more than one additional blink code on the screen at one time avoided.																	
7.7.2	**Highlighting by blinking** If highlighting by blinking is intended and if reading items is important, then an alternative method is considered for highlighting the item.																	
7.7.3	**Size coding** Varying the size of displayed characters or symbols (height and width), is only considered for applications where displays have low overall density.																	
7.7.4	**Luminance (brightness) coding** Luminance (brightness coding) only used for applications which require discrimination between two categories of displayed items (i.e. treat brightness as a two-valued code, bright and normal).																	
7.7.5	**Image polarity reversal** If used, only considered for items which require user attention. **and**																	
	Image consistently used for one purpose.																	
7.7.6	**Underlining** Used only to emphasize and/or designate an item **and**																	
	The legibility is not reduced.																	

Table A.1 — *(concluded)*

Recommendations		Applicability								Adherence								Comments (including sources)
		Results		Method Used						Method Used						Results		
		Y	N	S	D	O	A	E	DM	M	O	D	A	E	DM	P	F	
7.7.7	**Coding of areas** If areas in diagrams or graphical objects need to be distinguished, filling the areas with different coding techniques (hatch, shading, dotting, etc.) considered instead of colours. **and**																	
	Texture coding considered for use together with colour to provide redundant coding.																	

Key

Y = Yes (if applicable)
N = No (if not applicable
S = System documentation analysis
D = Documented evidence
O = Observation
A = Analytical evaluation
E = Empirical evaluation
DM = Different method
M = Measurement
P = Pass (met recommendation)
F = Failed (did not meet recommendation)

Annex B
(informative)

Bibliography

[1] ISO 9241-1:—[1], *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 1: General introduction.*

[2] ISO 9241-10:1996, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 10: Dialogue principles.*

[3] ISO 11581-1:— [2], *Information technology — User System Interfaces — Icon symbols and functions — Part 1: Icons — General.*

[4] ISO 11581-2:— [2], *Information technology — User System Interfaces — Icon symbols and functions — Part 2: Object icons.*

1) To be published. (Revision of ISO 9241-1:1992)

2) To be published.

ICS 13.180; 35.180

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