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**IEC 61082: PREPARATION OF DOCUMENTS USED IN ELECTROTECHNOLOGY -
Part 1: General requirements**

CEI 61082 Ed. 2 Etablissement des documents utilisés en électrotechnique -
Partie 1: Prescriptions générales

Introductory note

IEC TC3/MT16 (former SC3B/MT16) has prepared this document. It provides part 1 of the revision the series IEC 61082.

Note to National Committees:

This update has been undertaken to reflect responses of the National Committees on 3B/259/Q Questionnaire on the maintenance of IEC 61082. This document is the result of several SC3B/MT16 meetings during 2000 and 2001.

In the preparation of this CD the following principles were used to modify the original document into this CD.

- The scope of IEC 61082 has been widened from the rules of preparation of documents to the rules of presentation of information in documents;
- Clause numbering has been changed based on ISO/IEC Directives, Part 2 and the subdivision to sections has been deleted.
- Terms and definitions that are not used in Part 1 have been deleted;
- The complete series of IEC 61082 is planned to be restructured. Information in the old IEC 61082-1 that clearly belongs to one of the other part is moved to that part and will be included in the next editions of these parts.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PREPARATION OF DOCUMENTS USED IN ELECTROTECHNOLOGY

Part 1: General requirements

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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International Standard IEC 61082-1 has been prepared by IEC technical committee 3: Information structures, documentation and graphical symbols.

The text of this standard is based on the following documents:

FDIS	Report on voting
3/XX/FDIS	3/XX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 61082 consists of the following parts, under the general title: Preparation of documents used in electrotechnology.

Part 1: General requirements (this part);

Part 2: Function-oriented diagrams;

Part 3: Connection diagrams, tables and lists;

Part 4: Location and installation documents

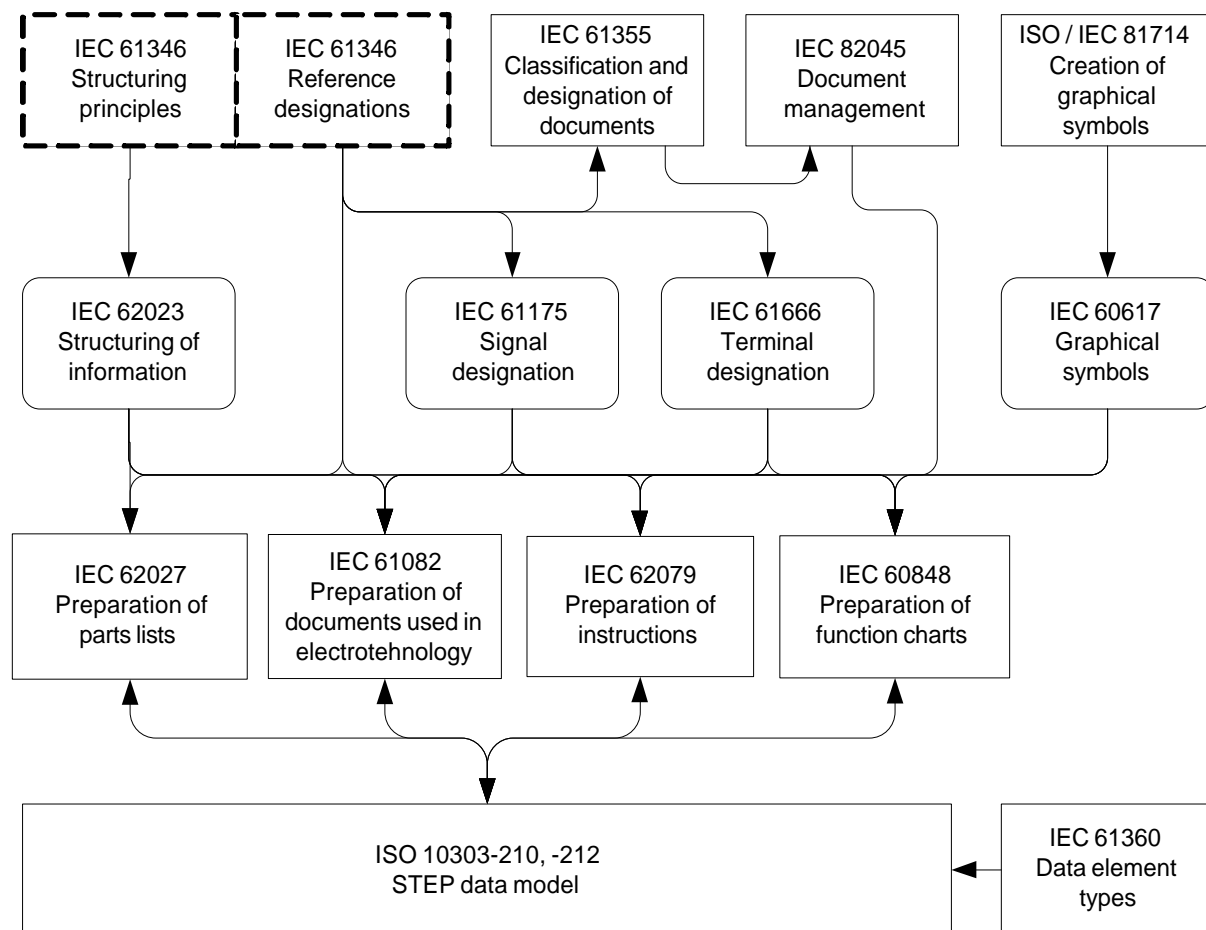
Part 6: Index (will be cancelled when parts 1 and 2 are ready)

The committee has decided that the contents of this publication will remain unchanged until _____. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

IEC 61082 deals with the presentation of information in documents. Part of this information is described in other International Standards. The following illustration provides an overview on the interrelation between these standards.



Specific rules and guidelines for the presentation of information in certain kinds of documents are provided in IEC 61082 Parts 2...4, IEC 60848, IEC 62027 and IEC 62079.

Examples in this part are intended to illustrate a given rule and are not necessarily representative of complete documents. Examples of specific documents are given in relevant parts of IEC 61082.

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PREPARATION OF DOCUMENTS USED IN ELECTROTECHNOLOGY

Part 1: General requirements

1 Scope

This part of IEC 61082 provides general rules and guidelines for the presentation of information in documents used in electrotechnology.

The rules for presentation of information about software and associated programming documents are outside the scope of IEC 61082.

2 Normative references

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

IEC 60027 (all parts)		<i>Letter symbols to be used in electrical technology</i>
IEC 60617		<i>Graphical symbols for diagrams</i>
IEC 60848	1992	<i>Preparation of function charts for control systems (under revision)</i>
IEC 61082-2	1993	<i>Preparation of documents used in electrotechnology - Part 2: Function-oriented diagrams (under revision)</i>
IEC 61082-3	1993	<i>Preparation of documents used in electrotechnology - Part 3: Connection diagrams, tables and lists</i>
IEC 61082-4	1996	<i>Preparation of documents used in electrotechnology – Part 4: Location and installation documents</i>
IEC 61175	1993	<i>Designations for signals and connections</i>
IEC 61286	2001	<i>Information technology – C5258oded graphic character set for use in the preparation of documents used in electrotechnology and for information interchange</i>
IEC 61346-1	1996	<i>Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations Part 1: Basic rules</i>
IEC 61355	1997	<i>Classification and designation of documents for plants, systems and equipment</i>
IEC 61666	1997	<i>Industrial systems, installations and equipment and industrial products - Identification of terminals within a system</i>
IEC 62023	2000	<i>Structuring of technical information and documentation</i>
IEC 62027	2000	<i>Preparation of parts lists</i>
IEC 62079	2000	<i>Preparation of instructions - Structuring, content and presentation</i>
IEC 81714-2	1998	<i>Design of graphical symbols for use in the technical documentation of products - Part 2: Specification for graphical symbols in a computer- sensible form including graphical symbols for a reference library</i>
IEC 82045-1	2001	<i>Document management - Part 1: Principles and methods</i>
IEC 82045-2	(under prep.)	<i>Document management - Part 2: Reference collection of metadata and reference models principles</i>

ISO 31 (all parts)		<i>Quantities and units</i> ¹⁾
ISO 128-22	1999	<i>Technical drawings -- General principles of presentation - Part 22: Basic conventions and applications for leader lines and reference lines</i>
ISO 128-30	2001	<i>Technical drawings -- General principles of presentation - Part 30: Basic conventions for views</i>
ISO 129-1	(under prep.)	<i>Technical drawings – Indication of dimensions and tolerances - Part 1: General principles</i>
ISO 2594	1972	<i>ISO 2594:1972, Building drawings – Projection methods</i>
ISO 3098-5	1997	<i>Technical product documentation - Lettering - Part 5: CAD- lettering of the Latin alphabet</i>
ISO 5455	1979	<i>Technical drawings – Scales</i>
ISO 5456-2		<i>Technical drawings- Projection methods – Part 2: Orthographic representations</i>
ISO 5457	1999	<i>Technical drawings – Sizes and layout of technical drawing sheets</i>
ISO 14617 (all parts)		<i>Graphical symbols for diagrams principles</i>
ISO 81714-1	1996	<i>Design of graphical symbols for use in the technical documentation of products - Part 1: Basic rules</i>
ISO/IEC 2382-1	1993	<i>Information technology – Vocabulary - Part 1: Fundamental terms</i>
ISO/IEC 8613-1	1994	<i>Information technology – Open Document Architecture (ODA) and interchange format: Part 1: Introduction and general principles</i>

¹⁾ Published as a compilation in ISO Standards Handbook, Quantities and units.

3 Definitions

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

NOTE: In the definitions, terms that are defined elsewhere within this clause are shown in *italics*.

3.1 Basic terms

The interrelations among some of the terms are illustrated in Figure 1.

3.1.1

data medium

material on which data can be recorded and from which data can be retrieved.

[ISO/IEC 2382-1, definition 01.01.51]

3.1.2

document

fixed and structured amount of information intended for human perception that can be managed and interchanged as a unit between users and systems.

NOTES:

1. The term document is not restricted to its meaning in a legal sense.
2. A document can be designated in accordance with the type of information and the form of presentation, for example overview diagram, connection table, function chart.
3. A document may appear in a static manner on paper and microform or dynamically on (video) display devices.

[ISO/IEC 8613-1, definition 3.58 modified]

3.1.3

drawing (technical)

information, represented graphically in accordance with agreed rules and usually to scale

NOTE - In the electrotechnical field location and installation documents include drawings

3.1.4

documentation

collection of *documents* related to a given subject

[IEC 62023, definition 3.2.2]

NOTE – This may include technical, commercial and/or other documents.

3.1.5

database

collection of data organized according to a conceptual structure describing the characteristics of the data and the relationships among their corresponding entities, supporting one or more application areas.

[ISO/IEC 2382-1, definition 01.08.05]

3.1.6

hyperlink

active link from a point in a *document* to another point in the same *document* or in another *document*.

NOTES –

1. A hyperlink is only available in documents presented on video screens.
2. The hyperlink implies that a user can activate the link in order to get to the other point.

3.1.7

reference designation

identifier of a specific object with respect to the system of which the object is a constituent, based on one or more aspects of that system.

[IEC 61346-1, definition 3.7]

3.1.8

single-level reference designation

reference designation assigned with respect to the object of which the specific object is a direct constituent.

[IEC 61346-1, definition 3.8]

3.1.9

reference designation set

set of *reference designations* of which at least one unambiguously identifies the object of interest.

NOTE - Other members of the set need not necessarily identify the object of interest but other objects of which it is a constituent.

[IEC 61346-1, definition 3.10]

3.2 Terms related to the forms of presentation of information

3.2.1

pictorial form

graphical representation depicting the shape, size, etc. of a physical part or assembly

3.2.2

plan ²⁾

drawing showing a horizontal view, section or cut

3.2.3

diagram ²⁾

graphical representation depicting, by the use of graphical symbols and outlines with inscriptions, the relations among the objects of a system or of a product including the interconnections

3.2.5

map ²⁾

graphical presentation of an installation with respect to its surrounding topography

3.2.6

chart, graph ²⁾

graphical presentation describing the behaviour of a system, for example the relations between two or more variable quantities, operations or states

3.2.7

table, list ²⁾

presentation form using columns and rows

²⁾ The term is used with two different meanings: for the form of presentation (as defined) and for the document.

3.2.8**textual form**

presentation form using text, for example in written instructions and descriptions.

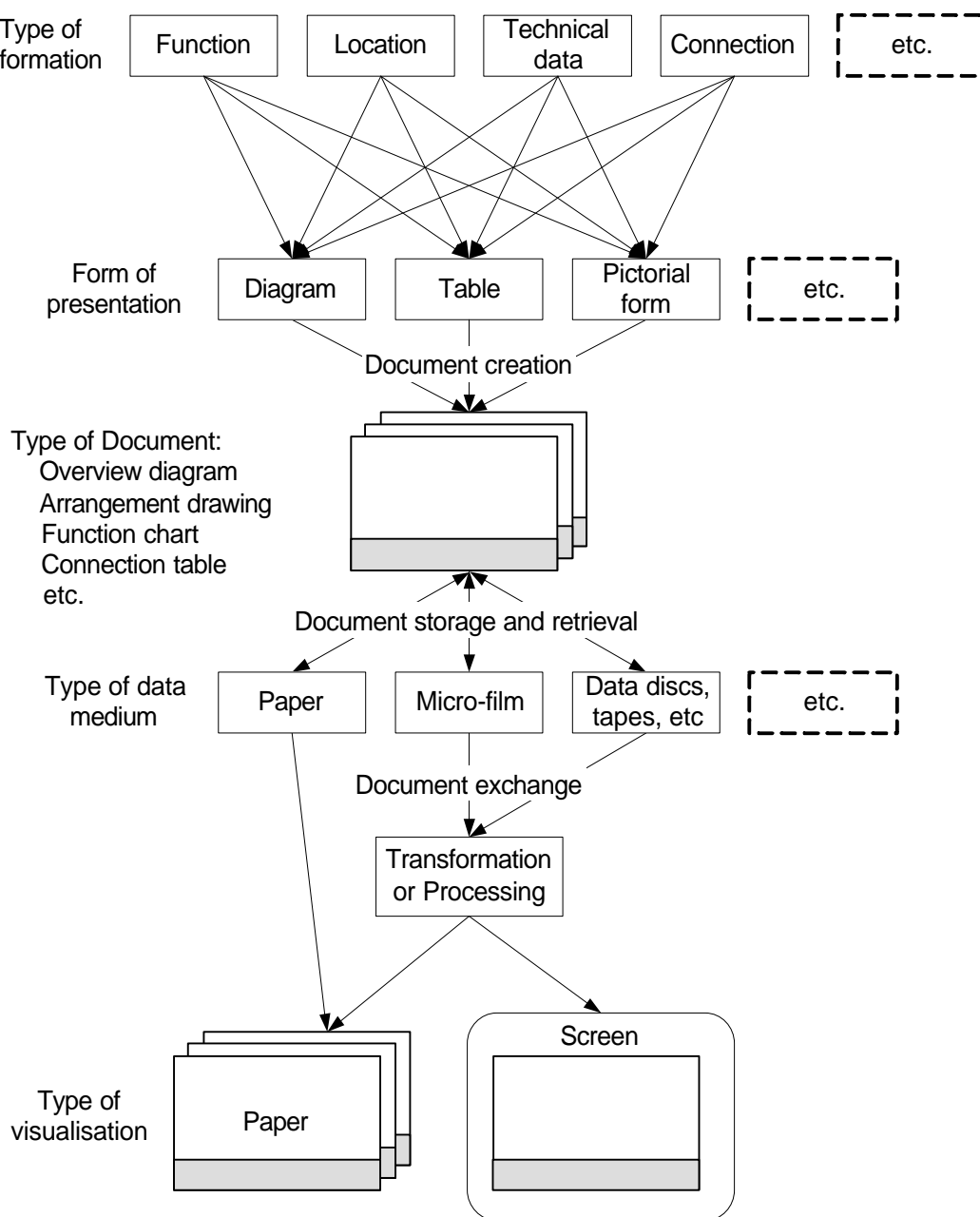


Figure 1 - Interrelations among various types of information, forms of presentation, types of data medium and classification of documents

4 Documentation principles

4.1 General considerations

Technical documentation is essential for the planning, design, manufacture, installation, commissioning, use, maintenance and demolition of a product or a system.

The purpose of the documentation is to provide information in the most appropriate form. In addition it is an essential means to proof and guarantee that safety, environmental and quality requirements related to a product or a system are met.

Technical documentation represents as significant a part of a contract as the supply of equipment, and constitutes an essential element of the after-sales process.

4.2 Structure of documentation

In IEC 61346-1 it is recognised that information on products and systems can be organised in tree-like structures. The structures represent the way in which an object is subdivided into constituent objects, for example the process into smaller processes or a product into sub-products.

In accordance with IEC 61355 a document should describe and be clearly related to one of the objects defined in these structures. The relationship of a document to the object described is normally given by use of the reference designation as part of the document designation.

The use of structure leads to hierarchy in the presentation of information, see IEC 62023. This means that information is presented in subsequent levels, each showing a different degree of details. For example, documents related to the object represented by the top node in a structure consist of overall information of the complete system, while documents related to the other objects represented in the structure consist of more detailed information of the constituents.

The structuring principles also support design and manufacturing based on division of labour or subcontracting. The manufacturer of a component needs to provide all information necessary for the understanding and use of his delivery without taking care of external matters. The integration of the component into a system is presented in a higher level of the documentation structure.

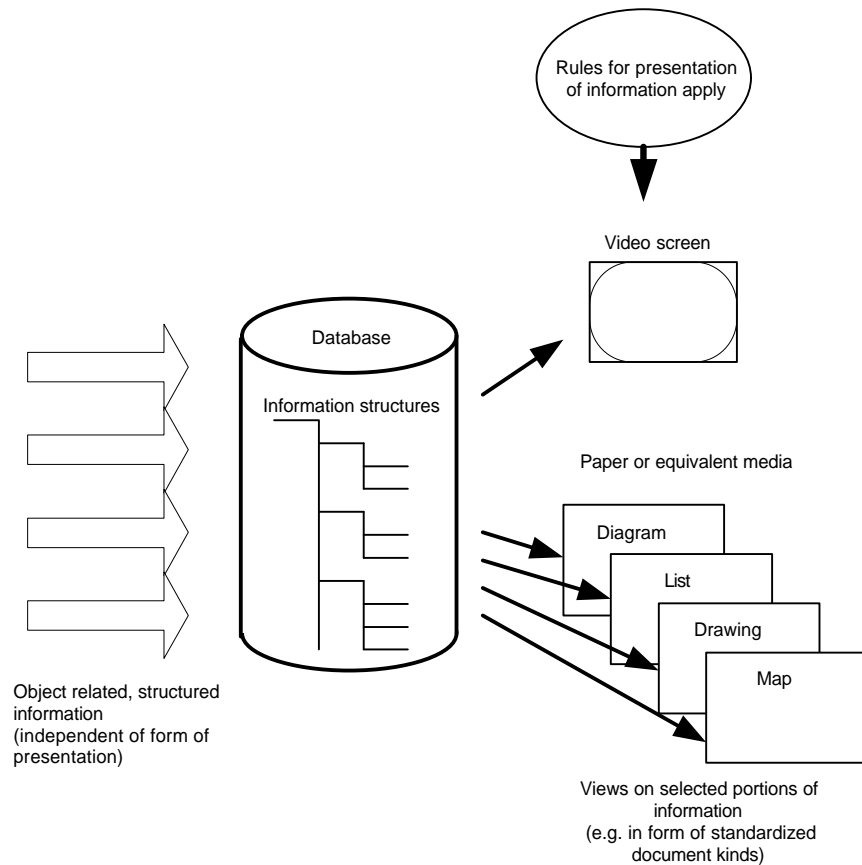
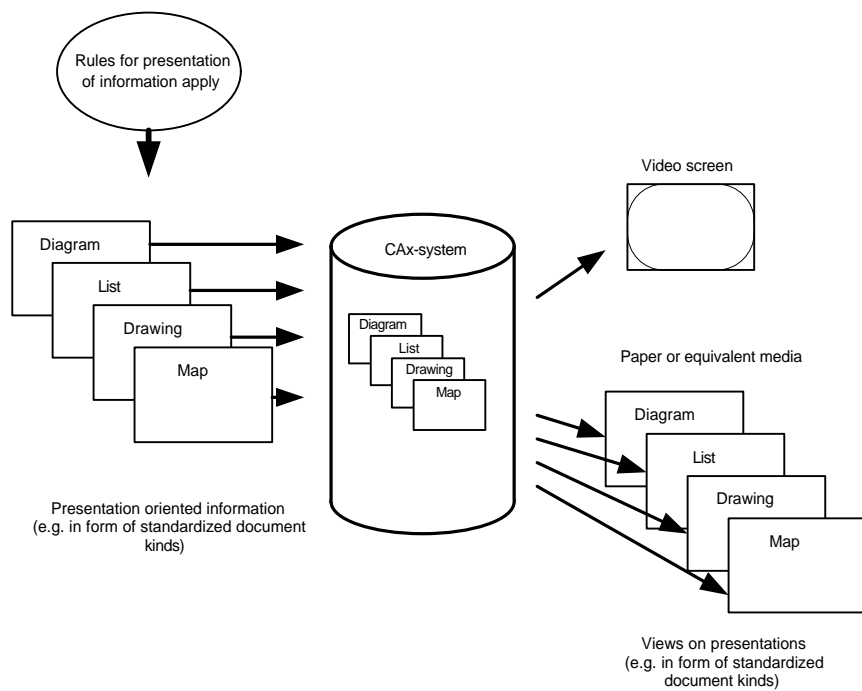
4.3 Presentation of information

The document, i.e. the presentation of information in the context of this International Standard, shall be unambiguous and aimed at practical use. This implies that the same information may be presented in different documents applying the same or a different document kind. The information shall be consistent throughout all places of presentation.

When information is stored in a database independent from any form of presentation, this information can be made accessible by distinct views in the moment it is needed and in the form most suitable for the intended purpose, provided adequate tools are available applying the rules of this International Standard (see Figure 2).

Document kinds (see IEC 61355) represent possible and predefined forms of presentations.

When information is stored dependent on a form of presentation, i.e. as a document, the rules of this International Standard applies when the document is being prepared (see Figure 3). The document could be prepared by means of a CAx-system or directly on paper or equivalent.

**Figure 2 – Documents generated****Figure 3 – Documents prepared**

4.4 Document identification

Each document shall be identified within a specific context with at least one unambiguous identifier.

NOTE 1 – An unambiguous identifier could be:

- an organisation based document identification; or
- international document numbering system (i.e. ISBN, ISSN); or
- based on the international article numbering system (i.e. EAN, UPC).

For the purpose of structuring of documentation, a document should be designated in accordance with IEC 61355, clause 5.

NOTE 2 - IEC 61355 requires an object designation and a document classification code as part of the document designation. An object designation as described in IEC 61355 is either a reference designation in accordance with IEC 61346-1 or any other unambiguous identifier.

5 General rules for presentation of information

5.1 General

Whenever information is presented to a user, the presentation shall be legible under the intended conditions of use. The legibility depends on:

- the used forms of presentation;
- how the presentation is split into different pages;
- the sizes of a page, see clause 5.3.4;
- the foreseen size modifications of a page;
- the use of simplification techniques, see clauses 5.4.1.4, 5.4.3.2 and 5.4.7.5;
- the use of hyperlinks, see clause 5.7;
- the used medium for information presentation e.g. paper, film, screen or video display;

The information can be presented by combinations of:

- a) symbols; see clause 5.4.1;
- b) lines; see clause 5.4.7;
- c) text and text strings; see clauses 5.3.3.6, 5.3.3.7 and 5.3.3.9;
- d) pictures; see clause 5.3.3.11
- e) colours; see clause 5.3.3.12

5.2 Page identification

A document may consist of more than one page. In order to identify each page, a page identifier needs to be applied in addition to the document identifier. A single document page is identified by the combination of the document identifier and the page identifier.

NOTE 1 – The page counting number as described in IEC 61355 clause 7.2, is considered to be a page identifier related to a document designation.

If a page of a document is associated with more than one document identifier, the page shall be given different page identifiers for the different document identifiers.

NOTE 2 – The page identification of a page related to different document identifiers might look the same.

Page identification shall be presented adjacent to the document identifier with which it is associated.

5.3 Page layout

5.3.1 General

A page is divided into:

- one or more identification areas; and
- one or more content areas.

Each page of a document shall have an identification area clearly separated from the content area, for example by a frame

Each content area shall be clearly separated from other content areas and the identification area, for example by a frame.

Figure 4 shows examples of pages with one or more identification areas and one or more content areas.

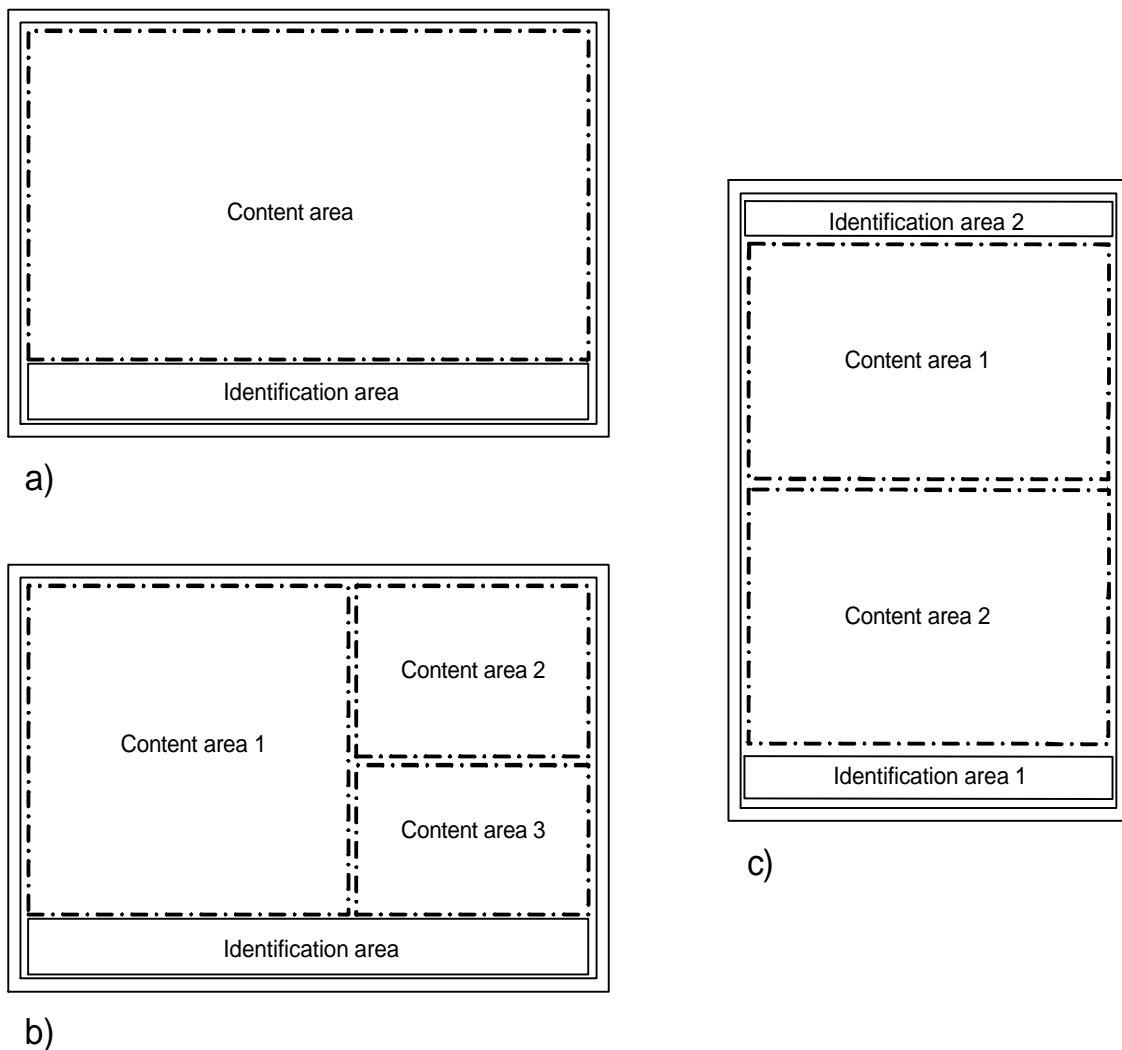


Figure 4 - Examples of pages with defined identification areas and content areas

- a) a page with one identification area and one content area
- b) a page with one identification area and two content areas
- c) a page with two identification areas and two content areas

5.3.2 Identification area

The information to be presented in the identification area is part of the metadata of the document as indicated in IEC 82045-1 and IEC 82045-2.

One identification area shall be located at the bottom of the page. Additional identification areas may be located along the other sides of the page, see Figure 4.

Within the identification area located at the bottom, the information related to the identification and classification of the document shall be located to the right. Annex B.1 lists an extract of the collection of metadata of IEC 82045-2 that should be considered for inclusion. Annex B.2 shows an example of the layout of an identification area.

Annex B.3 shows examples of the location of the identification areas for different page sizes.

NOTE: In technical drawings the identification area is represented by a title block, see ISO 7200 and ISO 7200-1.

5.3.3 Content area

5.3.3.1 General

A content area is related to only one single page.

A content area is delimited by a boundary frame, see clause 5.4.2. When there is only one content area on a page the symbol used to indicate a boundary frame need not be shown.

5.3.3.2 Module

All graphical entities shall be related to the module M as a unit.

The unit M should for paper presentations or equivalent take one of the following values in millimetres:

1,8 (2,0) mm; 2,5 mm; 3,5 mm; 5 mm; 7 mm; 10 mm; 14 mm; 20 mm.

It is recommended not to use a module size less than 2,5 mm. If the module size 1,8 (2,0) mm is used, the legibility of the document should be ensured.

NOTE – IEC 81714-2 specifies that the minimum module size for the creation of graphical symbols is 2,0 mm instead of 1,8 mm.

5.3.3.3 Reference grid

For reference purposes, see clause 5.6, pages or content areas presenting information in pictorial or diagram form on paper or equivalent should have a reference grid of 16M or 20M.

For the value of M see clause 5.3.3.2.

Note - For example if M is chosen to 2,5 mm, the reference grid will be 40 mm or 50 mm.

The grid numbering should start at the upper-left corner of the area of the page that is available for content areas. The rows of the grid shall be identified by capital Latin letters A, B, C, ... excluding I and O. The columns of the grid shall be sequentially numbered starting from 0 or 1, see Figure 5.

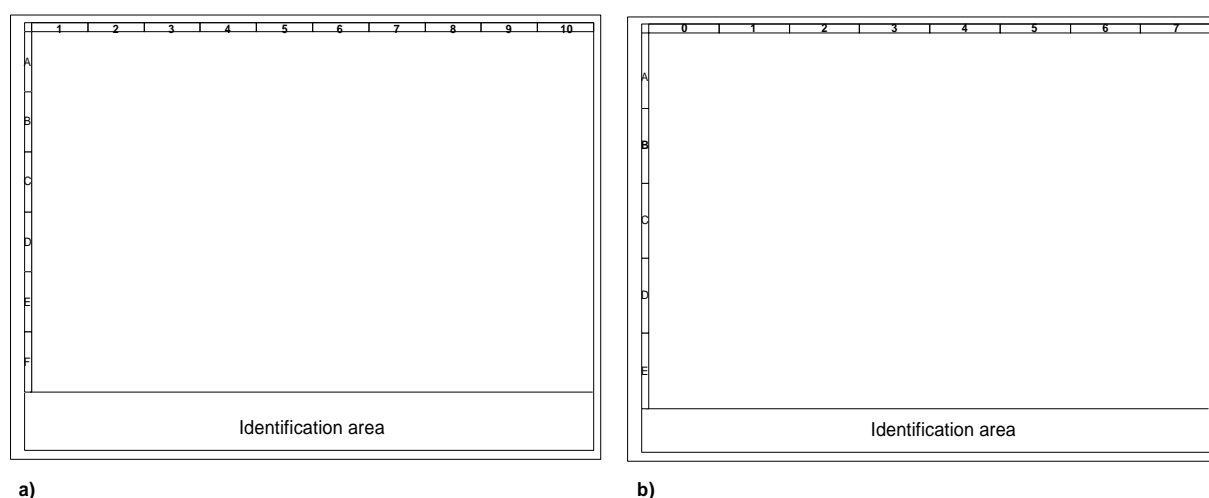


Figure 5 – Examples of reference grids

- a) Page A3 landscape, module size 2,5 mm, reference grid 16 M
- b) Page A3 landscape, module size 2,5 mm, reference grid 20 M

5.3.3.4 Drawing grid

A content area intended for presentation of information in pictorial or diagram form may be provided with a drawing grid of $1M$ used for the positioning of symbols, lines and text. The origin of the drawing grid is the lower, left corner of the content area.

For the value of M see clause 5.3.3.2.

5.3.3.5 Line widths

The possible line widths are: $0,1 * (\sqrt{2})^n * M$, with $n = 0, 1, 2, 3, \dots$

For the value of M see clause 5.3.3.2.

Note: For example if M is chosen to 2,5 mm the line width would be 0,25 mm, 0,35 mm, etc...

If two or more lines of the same line type but with different widths are used, the ratio between these line widths shall be at least 2:1.

NOTE – ISO 6428 provides rules for microcopying of presentations that may have influence on the choice of line widths.

5.3.3.6 Text fonts

Lettering type CB, vertical (V) of ISO 3098-5 should be used for presentations in pictorial or diagram form. Both tabular and proportional lettering according to ISO 3098-5 may be used.

The character spacing factor should be zero, see annex E.2.7 of IEC 81714-2. When tabular lettering is used the character aspect ratio should be 0,81 in accordance with clause 6.7.2 of IEC 81714-2

Only one kind of text font should be used within a presentation.

The text height shall comply to: $(\sqrt{2})^n * M$, with $n = 0, 1, 2, 3, \dots$

For the value of M see clause 5.3.3.2.

Note: For example if M is chosen to 2,5 mm, the text height would be 2,5 mm, 3,5 mm, etc...

Sloped (inclined) lettering, type CB (S) of ISO 3098-5, may be used for letter symbols for quantities.

If another text font than one of the lettering types of ISO 3098-5 is used, the text font of characters shall be in line with the stroke style presented in ISO 3098.

For documents intended to be exchanged between CAX-systems the rules of IEC 81714-2 shall be considered.

5.3.3.7 Text orientation

A text within a document shall be readable when viewing a document from the bottom edge or from the right-hand edge, see Figure 6.

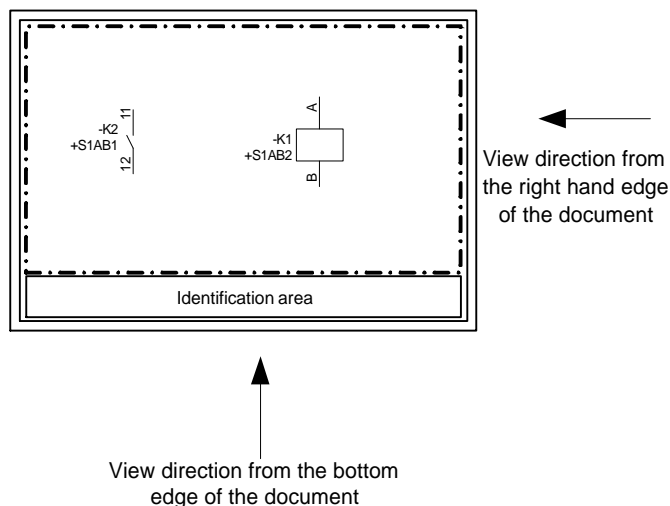


Figure 6 - Viewing directions of a document

5.3.3.8 Quantities, units and values

Quantities, units and values should be represented by letter symbols in accordance with IEC 60027 or other appropriate IEC standards for letter symbols. For items outside the scope of IEC, ISO 31 is applicable.

5.3.3.9 Presentation of ranges and series

A range shall be presented by using the “HORIZONTAL ELLIPSIS” (...) between the lower and upper limits.

A series shall be presented by using:

- the character “COMMA” (,) between each element of the series; or
- the characters “COMMA” and “HORIZONTAL ELLIPSIS” (,...) between the lower and upper limits when the series consists of numbers and the increment is one; or
- the characters “COMMA” and “HORIZONTAL ELLIPSIS” (,...) between the lower and upper limits when the series consists of consecutive ascending letters of the Latin alphabet.

Examples:

The numerical series 1, 2, 3 and 4 can be written 1,...4.

The alphabetical series C, D, E, F and G can be written C,...G

The alphabetical series a, b, c, d and e can be written a,...e

Combinations of upper-case and lower-case letters in a series, for example A,...c shall not be used, due to its possible ambiguous interpretation.

NOTE – Upper-case letters I and O are not used neither in reference designations according to IEC 61346-1 nor in terminal designations according to IEC 60445, IEC 60446 and IEC 61666. This implies that in such cases the upper-case letter J follows the upper-case letter H, and the upper-case letter P follows the upper-case letter N.

If the same letter indicates the individual elements of a series prefixed or suffixed by a different number the series may be presented as shown for the numerical series.

Examples:

The series 1U, 2U, 3U, 4U can be written 1U,...4U

The series R2, R3, R4, R5 can be written R2,...R5

If the individual elements of a series are indicated by the same number prefixed or suffixed by a different letter the series may be presented as shown for the alphabetical series

Examples:

The series 1U, 1V, 1W, 1X, 1Y, 1Z can be written 1U,...1Z

The series R2, S2, T2 can be written R2,...T2

Items of a non-consecutive order may be represented within a sequence. In this case, the representation of the different items shall be separated by using the character COMMA (,) for example 1, 3, 6. If confusion is likely, the group shall be enclosed in parentheses, for example (1, 3, 6).

Within a grouped representation of different items a series representation may occur.

Example:

The series 1, 8, 9, 10, 11, 12, 14, A, B, C and D can be written 1, 8,...12, 14, A,...D

If computer-supported systems are used in presenting information the horizontal ellipsis shall be realised either as:

- a sequence of three characters FULL STOP; or
- a single character HORIZONTAL ELLIPSIS (...) as specified in IEC 61286.

5.3.3.10 Scales

If information is presented to scale, the scale should be chosen in accordance with ISO 5455.

A scale bar may be included for information purposes.

5.3.3.11 Pictorial presentation

Information in pictorial form of presentation shall be presented in accordance with ISO 128-30 following the orthographic projection method according to ISO 5456-2.

For information on buildings in pictorial form, the rules in ISO 2594 apply.

5.3.3.12 Colours

Colours should be used only as complementary information. Perception of different colours shall not be the only means for understanding presentations.

NOTE – The uses of colours for some specific purposes are given in ISO 3864, IEC 60204-1, and IEC 60073.

The meaning of the colours used shall be stated in the document or in supporting documentation.

5.3.4 Sizes

The size of paper pages or equivalent shall conform to ISO 5457, clause 3.1. Size A3 is recommended when pictorial or diagram form presentations are used; size A4 is recommended when textual form presentation is used.

The elongated sizes defined in ISO 5457, clause 3 shall not be used.

5.3.5 Reproduction

For documents on paper or equivalent media intended to be reproduced or microfilmed, centring marks complying with ISO 5457 clause 4.3 may be added to facilitate reproduction or microfilming.

5.4 Object presentation

5.4.1 Symbols

5.4.1.1 Choice of symbols

Symbols shall conform to IEC 60617, considering the rules of ISO 81714-1. Symbols to be used in CAX-applications shall in addition conform to IEC 81714-2.

When symbols of different forms are possible to use, the symbol appropriate to the purpose of the presented information shall be chosen.

For objects outside the scope of IEC 60617, symbols of ISO 14617 should be considered.

When an appropriate symbol does not exist, either the general symbols S00059, S00060 or S00061 in IEC 60617 shall be applied, or a symbol may be constructed following the rules of IEC 60617 and ISO 81714-1 (see normative Annex A).

5.4.1.2 Symbol size

The meaning of a symbol is defined by its shape and by its content. The size and line thickness does not affect the meaning.

The symbols in IEC 60617 are shown on a grid pattern with a module M to specify symbol proportions. Symbols used in documentation should preferably retain the same size related to the module M.

A symbol may be enlarged or reduced in order to:

- increase the number of inputs or outputs;
- facilitate the inclusion of additional information;
- emphasise certain aspects;
- facilitate the use of a symbol as qualifying symbol or
- suit the scale of a drawing, plan or map.

When enlarged or reduced the general shape of the symbol shall be maintained. The minimum size of a symbol shall be such that the rules for line width, spacing of lines, lettering, etc. can be applied.

5.4.1.3 Arrangement and orientation of symbols

Most symbols of IEC 60617 are designed for a signal flow from left to right and the symbols should be shown as in IEC 60617.

In some cases it is necessary to deviate from the basic orientation of the symbols. Therefore, the symbols may be turned or mirror-imaged if the meaning will not thereby be changed. However, in some cases it may be necessary to redesign the symbol following the rules of ISO 81714-1.

Symbols containing letters, qualifying symbols, graphs or input/output labels, shall be oriented so that they can be read when viewing a document from the bottom edge or from the right-hand edge.

5.4.1.4 Simplified presentation

A number of identical symbols in a group may be represented by a single symbol, using one of the following methods:

- the single symbol should be provided with a short oblique stroke and a figure indicating the number of symbol elements represented by the single symbol (see Figure 7.a and Figure 7.e); or
- the represented number of symbols by the single symbol should be indicated by a figure followed by a multiplication sign within square brackets, for example [3x] (see Figure 7.b and Figure 7.e).

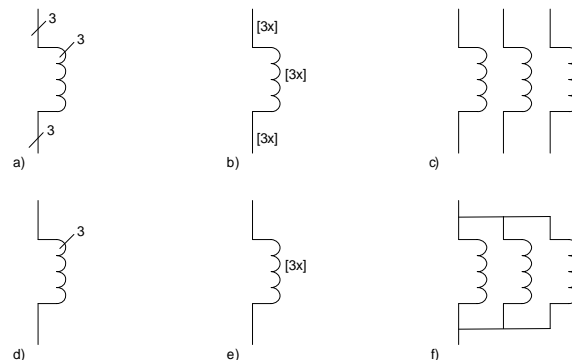


Figure 7 -

Simplified presentation

- a) Three independent circuits using an oblique stroke
- b) Three independent circuits using the multiplication sign
- c) Three independent circuits, complete presentation
- d) One circuit with three objects using an oblique stroke
- e) One circuit with three objects using the multiplication sign
- f) One circuit with three objects, complete presentation

Repeated presentation may be simplified by presenting only a part of the complete symbol with the indication that just a part of the symbol is shown (see Figure 8).

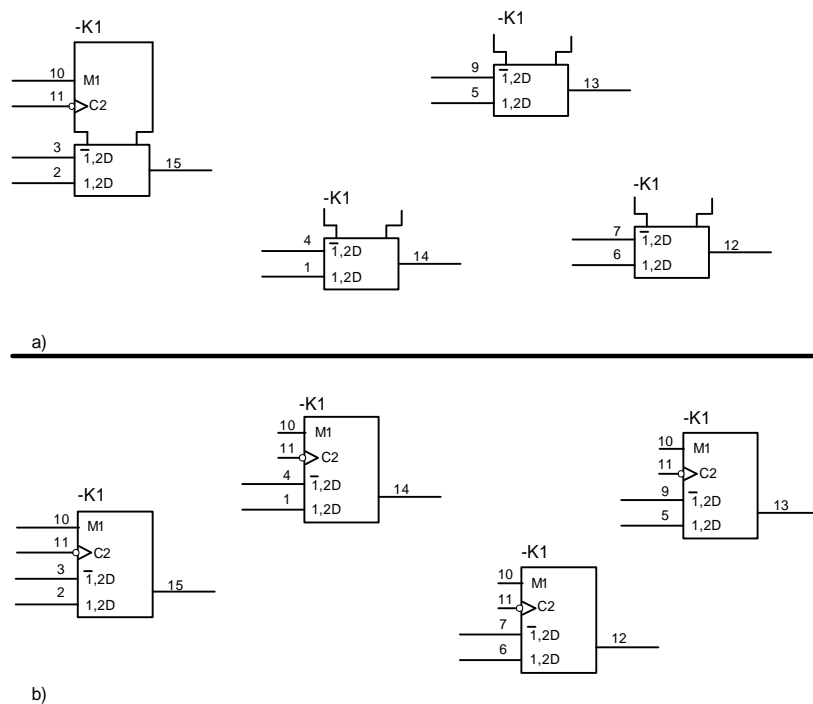


Figure 8 – Simplified repeated presentation of a quadruple multiplexer
a) The common control block not shown for each representation
b) The common control block indicated for each representation

5.4.2 Boundary frames

A boundary frame, delimiting a group of objects associated physically, mechanically or functionally, shall be shown in accordance with symbol S00064 in IEC 60617.

NOTE – Symbol S00064 is a dashed dotted line.

Objects within a unit represented by a boundary frame may be represented in a simplified form, provided a reference to a more detailed document is given, see Figure 9.

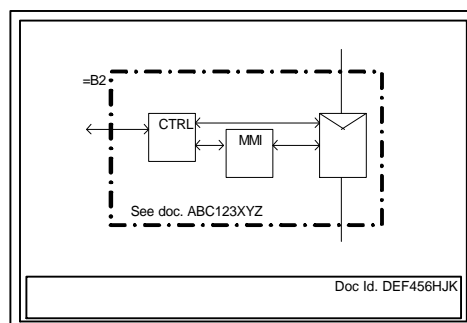


Figure 9 - Boundary frame with a reference to another document

5.4.3 Reference designations

5.4.3.1 General

For objects having a reference designation or a reference designation set in accordance with IEC 61346-1, at least one unambiguous reference designation shall be shown at every representation of the object.

The reference designation shall be readable from the bottom edge of the page and should be located above or to the left of the object representation, see IEC 81714-2 for further details.

A reference designation shall be presented on a single line.

For the presentation of a reference designation set the following applies (see Figure 10):

- the reference designation set may be presented on a single line or on successive lines;
- if the reference designations are presented on successive lines each reference designation shall start on a new line;
- if more than one reference designation is presented on the same line, and if not clearly separated for example as in a table, the character SOLIDUS (/) shall be used as the separator sign between the different reference designations;
- the order of the presented reference designations in a reference designation set has no significant meaning.

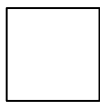
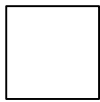
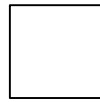
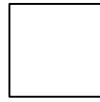
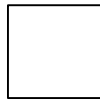

Reference designations	Possible graphical presentations	
	All presented on the same line	Each presented on one line
=A1 -B2 +C3	=A1/-B2/+C3 	=A1 -B2 +C3 
=D4-E5+F6	=D4-E5+F6 	=D4-E5+F6 
=G7-H8 +J9	=G7-H8/+J9 	=G7-H8 +J9 

Figure 10 – Presentation of reference designations of a reference designation set

5.4.3.2 Simplification techniques

According to IEC 61346-1 the reference designation is the representation of a path in a tree-like structure. Different objects may therefore have a common initial portion, including at least one single-level reference designation, of their paths starting from the top of the structure tree, see Figure 11.

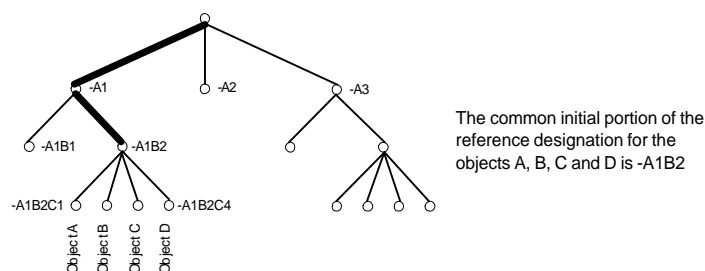


Figure 11 – The common initial portion of reference designations

If objects presented inside a boundary frame have reference designations with the same initial portion, this initial portion may be shown once outside the boundary frame according to 5.4.3.1, and shall then not be shown at the individual objects, see Figure 12

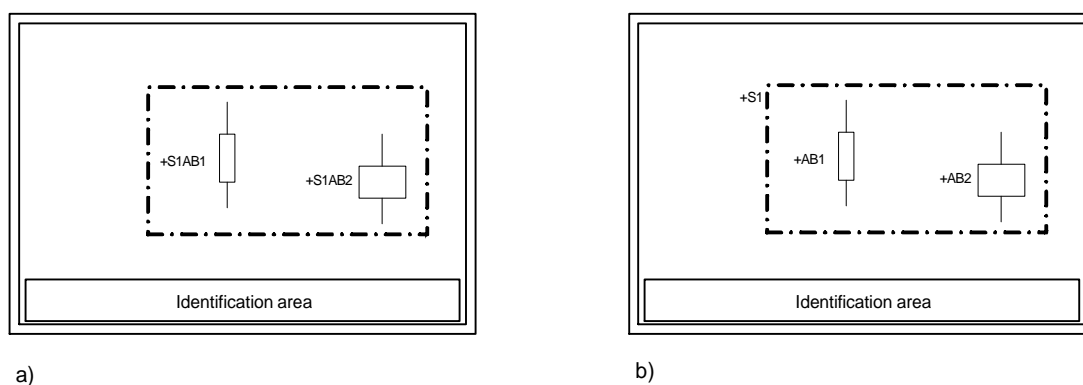


Figure 12 - Presentation of reference designations at a boundary frame
a) The common initial portion shown at each object
b) The common initial portion shown once at a boundary frame

If the last single-level reference designation is of a different aspect than the first single-level reference designation of the constituent object, the common initial portion shall be suffixed with the prefix sign of the latter, see Figure 13.

A reference designation of a constituent object is found by concatenating the common initial portion with the reference designation of the constituent objects that starts with the same prefix sign as the last prefix sign shown in the common initial portion, see Figure 13.

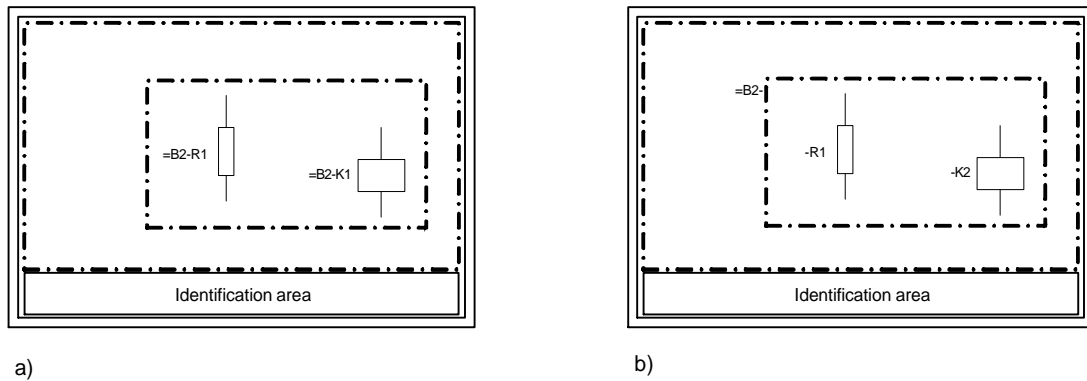


Figure 13 - Presentation of reference designations including different aspect

- a) The common initial portion shown at each object
- b) The common initial portion shown once at a boundary frame

If the objects presented are associated with more than one reference designation, each reference designation can be simplified presented, see Figure 14.

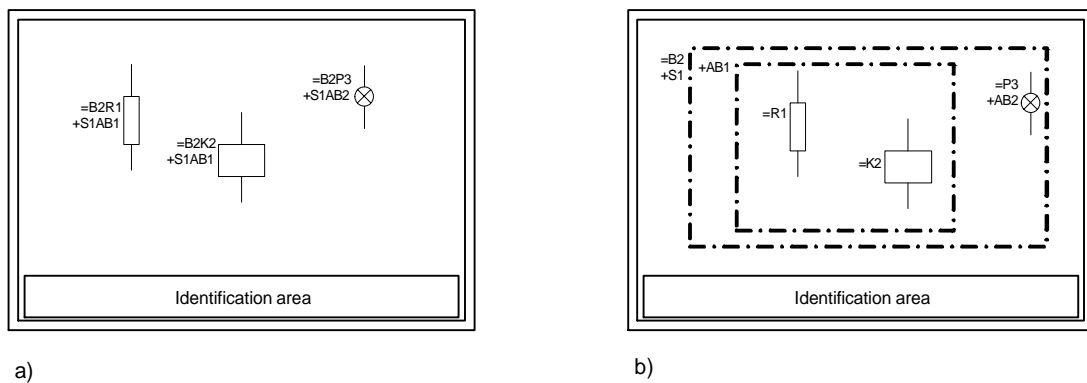


Figure 14 - Presentation of reference designation sets at a boundary frame

- a) The complete reference designation set shown at each object
- b) The common initial portions shown once at a boundary frame

The common initial portion of the reference designations for all objects shown within a content area may be shown top, left to the outside of the content area, delimited from the correspondent content area by using the line for a boundary frame according to 5.4.2, see Figure 15.

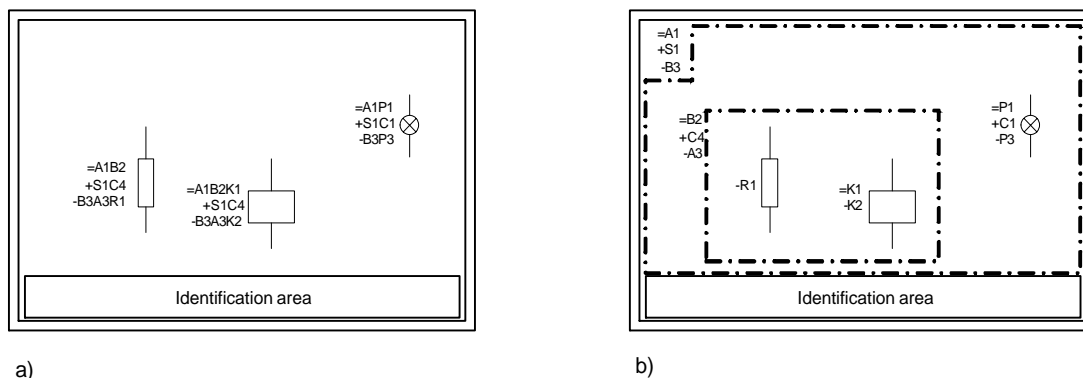


Figure 15 - Presentation of reference designation

- a) The common initial portion shown at each object
- b) The common initial portion shown once at a content area (page)

If the character GREATER THAN (>) is preceding a reference designation or a signal designation (see clause 5.4.5), this implies that the reference designation or signal designation shall not be preceded by any other reference designation appearing on that page of the document, see Figure 16.

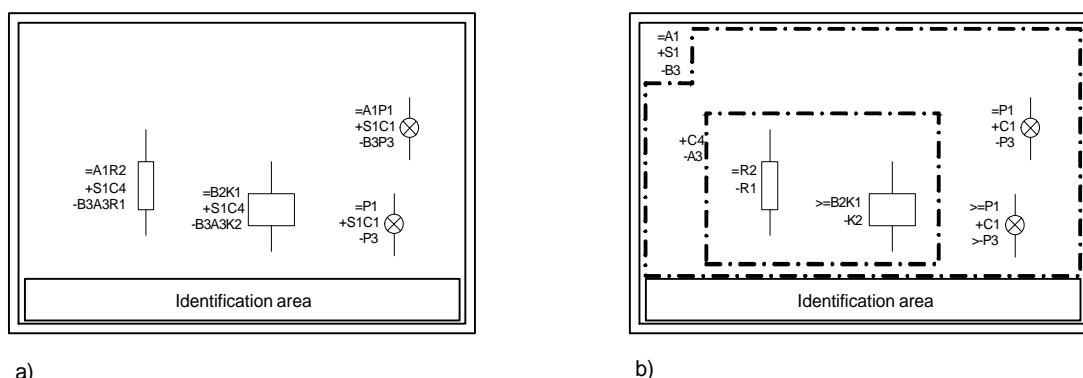


Figure 16 - Presentation of reference designations excluded from concatenation

- a) Complete reference designations shown at each object
- b) Common initial portion shown once and reference designations being excluded from this initial portion

If a single level in a set of reference designations is simplified presented with a series following the rules in clause 5.3.3.9, the indicated series shall be enclosed in parentheses. The complete single level reference designation shall be presented at the lower and upper limit.

Example 1: -A2C4(-F1,...-F4), meaning -A2C4F1, -A2C4F2, -A2C4F3 and -A2C4F4

Example 2: =B2(-C1,-D3,-F5), meaning =B2-C1, =B2-D3 and =B2-F5

Example 3: =Q3(=1,...=4)=H1, meaning =Q3=1=H1, =Q3=2=H1, =Q3=3=H1 and =Q3=4=H1

5.4.4 Terminal designations

Terminal designations shall be applied in accordance with IEC 61666.

Terminal designations shall be located above horizontal connecting lines and to the left of vertical connecting lines. Terminal designations shall be oriented along the connecting lines, see IEC 81714-2 for further details.

Simplified representation of terminal designations can only be performed for terminals belonging to the same object, following the rules for the simplified presentation of series and ranges, see clause 5.3.3.9.

5.4.5 Signal designations

Signal designations shall be applied in accordance with IEC 61175.

Signal designations shall be located above horizontal connecting lines and to the left of vertical connecting lines. Signal designations shall be oriented along the connecting lines.

5.4.6 Technical data for objects

Technical data of an object shall be clearly related to the object representation.

The technical data shown adjacent to the object representation shall be located below or to the right of the reference designation, see Figure 17 and IEC 81714-2 for further details.

Technical data may also be located inside shape of graphical symbols as long as the meaning with the symbol is not changed.

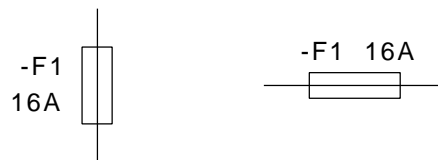


Figure 17 – Presentation of technical data

5.4.7 Connections

5.4.7.1 Electrical or functional connections

If a connection is shown by using a connecting line, the connecting line shall be in accordance with symbol S00001 in IEC 60617.

NOTE 1 – Symbol S00001 is a continuous line.

When two or more connecting lines are joined at a specific point, the junction shall be in accordance with symbols S00019, S00020, S01414 or S01415 in IEC 60617, see Figure 18.

NOTE 2 – The symbol S01414 indicates that there are two physical electrical connections being presented by one connecting line, indicating the direction of the electrical connection that enters. The symbol S01415 is used for graphical bundling indicating the direction of the bundle that enters.



Figure 18 – Symbols representing joining of connecting lines

5.4.7.2 Mechanical links

Mechanical links shall be shown in accordance with symbols S00144 or S00147 in IEC 60617.

NOTE – Symbol S00144 is a dashed line. Symbol S00147 is a double continuous line

5.4.7.3 Arrangement and orientation of connecting lines

Connecting lines shall be oriented horizontally or vertically except in those cases where oblique lines improve the legibility.

Connecting lines should not interfere with other symbols, see IEC 81714-2, subclause 6.11.2.

Bends and cross-over of lines should be restricted to a minimum. To avoid bends and cross-overs, lines may be interrupted. In this case, and also when a line is interrupted on one page and continues on another, the ends of the interrupted line shall be mutually referenced. The ends of the interrupted line should be drawn so that they can easily be recognised, see 5.6

The space between two parallel lines shall be at least 1M.

The minimum distance between parallel lines where text is to be shown in between shall be twice the lettering height and not less than 2M.

5.4.7.4 Technical data for signals

Technical data about signals shall be placed along the connecting lines, above horizontal connecting lines and to the left of vertical connecting lines, and must not touch or cross the connecting line.

If it is not possible to show the information adjacent to the connecting line, it should be shown at a distance from the connecting line, enclosed (preferably within a circle), with a leader line to the connecting line. It may also be placed elsewhere in the content area with a reference to the connecting line to which it applies, for example by means of signal designations or reference and terminal designations.

Waveforms may be included and should be shown in the way that they normally appear on an oscilloscope screen, detailed as far as necessary for the application.

5.4.7.5 Simplified presentation

Multiple parallel connecting lines may be represented by one line (i.e. bundle) using one of the following methods:

- the parallel lines are interrupted and a cross-line after a short space represents the bundle (See Figure 19.a);
- the number of parallel connecting lines represented by the bundle shall be indicated either by adding as many oblique strokes as the number of connections (see symbol S00002 of IEC 60617 and Figure 19.b), or by adding one stroke followed by the figure for the number of connections (see symbol S00003 of IEC 60617 and Figure 19.c).

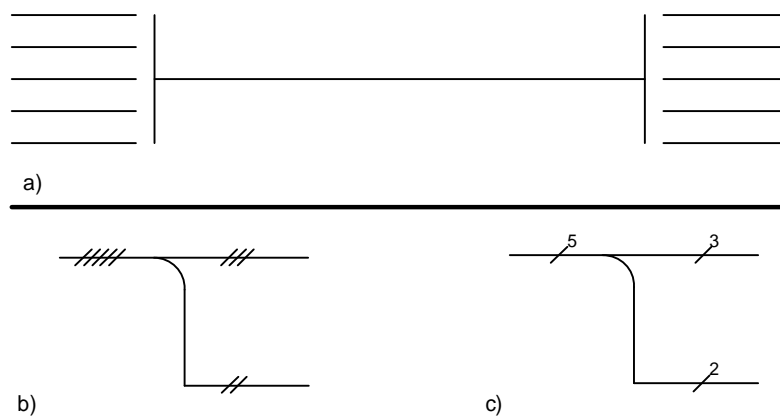


Figure 19 - Presentation of bundles
a) Using a cross-line and a space
b) Indication by a number of strokes
c) Indication by numbers

The sequential order of the parallel lines at both ends of the bundle should be unambiguously indicated, see Figure 20.

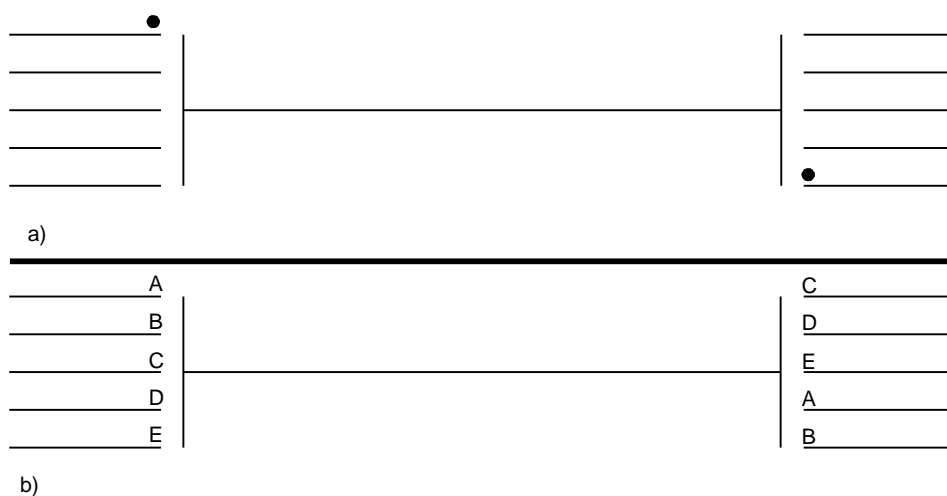


Figure 20 - Indication of sequence within bundles
a) Using a dot to indicate the first connection
b) Indicating the individual connections

5.5 Presentation of auxiliary items

5.5.1 Dimension lines

Dimension lines including their terminators and the indication of the origin shall be in accordance with ISO 129. Examples of terminators are shown in Figure 21.

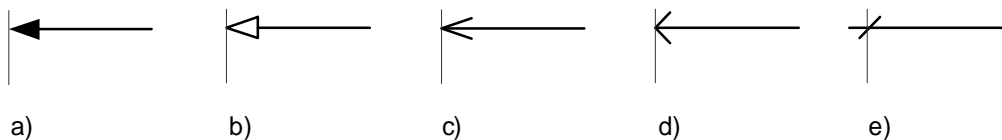


Figure 21 - Terminators of dimension lines

(from ISO 129 (now as DIS))

- a) Arrowhead, closed and filled 15°
- b) Arrowhead, closed 15°
- c) Arrowhead, open 15°
- d) Arrowhead, open 90°
- e) Oblique stroke

5.5.2 Leader lines and reference lines

Leader lines and reference lines shall be presented in accordance with ISO 128-22. Examples are shown in Figure 22.

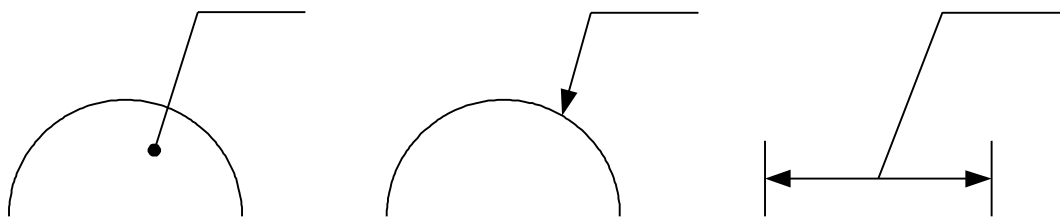


Figure 22 – Examples of leader lines
(from ISO 128-22)

5.5.3 Explanatory notes and markings

An explanatory note should be used when the meaning cannot otherwise be conveyed. It should be placed adjacent to where it applies, or a reference should be made to a note placed elsewhere in the content area. In the case of multi-page presentation of information, all notes of a general character should appear on the first page.

If informative markings (for example graphical symbols according to IEC 60417) for man-machine control functions appear on an equipment panel, these same markings should appear adjacent to the corresponding graphical symbol in the underlying presentation of information.

5.6 Cross-references

If a document designation according to IEC 61355 is used, this shall be applied for cross-referencing among different documents or pages of a document, for example from an arrangement drawing to a parts list. The document designation comprises the designation of the described object and the document kind designation. The page identification, i.e. the page counting number, and the page grid reference may be included if this information is of importance (for example interrupted connection lines on a circuit diagram).

Note - Object designation, document kind designation, page counting number and grid reference are independent pieces of information that can be written in one line.

Cross references shall be clearly differentiated from other designations.

The following examples represent possible cases:

/B2	: Reference to zone B2 on the same page
/2	: Reference to column 2 on the same page
/2/	: Reference to page 2
/3/B2	: Reference to zone B2 on page 3 of the same presentation
&FS/3/B2	: Reference to zone B2 on page 3 of a circuit diagram (&FS) describing the same object
&FS	: Reference to a set of circuit diagrams (&FS) of the same object
=EA2=S1&FS/3/B2	: Reference to zone B2 on page 3 of a circuit diagram (&FS) describing another object (=EA2=S1)
=EA2=S1&FS/3/	: Reference to page 3 of a circuit diagram (&FS) describing another object (=EA2=S1)

If no document designation according to IEC 61355 is used, one of the other identifiers shall be applied for the purpose of cross-referencing.

Example for usage:

An arrangement drawing shows a reference to a parts list	: parts list see &PB
An arrangement drawing can show a reference to page 3 of a parts list	: parts list see XYZ123456/3.

5.7 Hyperlinks

Hyperlinks may be used as a means for facilitating navigation between different sets of information, e.g. pages of a document, between documents or to external information sources.

The navigation and references shall not be dependent on the functioning of hyperlinks.

Hyperlinks may also be used for linking documents or document parts that constitute a document. However, special care should be taken when the document is under version control, see IEC 82045-1 subclause 4.5.

6 CAx conformance requirements

Computer-aided tools stated to be in compliance with this International Standard should comply with the following standards where relevant:

- IEC 60617 for the shapes of graphical symbols for diagrams;
- IEC 60848 for the preparation of function charts;
- IEC 61082 part 2 for the preparation of function-oriented diagrams;
- IEC 61082 part 3 for the preparation of connecting diagrams, tables and lists;
- IEC 61082 part 4 for the preparation of location-oriented diagrams;
- IEC 61175 for the designation of signals;
- IEC 61346 for reference designations;
- IEC 61355 for the management of documents by means of document classification and designation;
- IEC 61666 for the identification of terminals within a system;
- IEC 62023 for the structuring of information;
- IEC 62027 for the preparation of parts lists;
- IEC 62079 for the preparation of instructions;
- ISO 81714-1 for the creation of graphical symbols;
- IEC 81714-2 for graphical symbols;
- IEC 82045 for the management of administrative data related to documents;

Annex A

(normative)

Construction of a symbol for an object which does not have a symbol in IEC 60617

When the graphical symbol required is not found in the IEC 60617, the symbols S00059, S00060 or S00061 can be applied, or it may be possible to create one from the existing ones as explained below.

Pick the symbol for the basic concept and then combine it with one or more appropriate supplementary symbol.

Supplementary symbols are:

- primarily symbols of IEC 60617 explicitly depicted as "Qualifiers" in their application class;
or
- principally, any other symbol in IEC 60617, if necessary suitably modified in size.

The supplementary symbols can be placed inside, outside or across the basic symbol. No simple rule can be given, since the placement to a high degree depends on the shapes of the symbols, available space in or around the basic symbol, etc.

Do not overload the symbol. Limit the number of supplementary symbols to what is required to emphasise the wanted concept.

For further guidance on the design of symbols, please refer to the ISO 81714-1 and IEC 81714-2.

The IEC 60617 contains numerous examples on how this is done. In the IEC 60617 database, look at a complex symbol and follow the links under the attribute "Applying" to see how the symbol is built from a set of more simple ones.

A symbol created as a combination of already existing symbols and in line with the rules given in ISO 81714-1 and IEC 81714-2 is considered to be in line with IEC 60617.

Annex B

(informative)

Document management information and title blocks

B.1 Presentation of document management information

A title block shown on a document page includes for example the following information in accordance with IEC 82045-2 (at present available as CD under 3B/328/CD):

(Note for the purpose of this draft: Numbers shown in the list refer to 3B/328/CD, numbers beginning with the letter X are not defined by now and should be considered for inclusion.)

- Document Id (1)
- Revision Id (7)
- Language code (9)
- Title (11)
- Document kind (17)
- Document kind classification code (18)
- Page counting number (X3)
- Creator (19)
- Creator organization (20)
- Preparation date (21)
- Checked by (31)
- Check date (33)
- Revised by (X1)
- Revision date (X2)
- Replacing (60)
- Replaced by (62)
- Based on (64)
- Object designation (69)
- Project name (70)
- Contract Id (75)
- Customer (83)
- Page number (93)
- Total pages (X4)

B.2 Example of the layout of an identification area

Figures B.1 and B.2 show a possible arrangement of this information as an example for a title block on a page of the size A3. The numbers in parenthesis shown in figure B.1 refer to the information listed in annex B.1.

Note – The example is intended to show how document management information may be introduced in the title block of a technical document. It does not present all information necessary for document management, nor does it intend to regularise the graphical design of title blocks or the length of text fields. The international standard for title blocks is ISO 7200, which is presently under revision.

Prep.	(21), (19)	(83)		(20)
Check	(33), (31)			
Rev.	(X2), (X1)	Replacing (60)	Replaced by (62)	Based on (?)

(11)	Object designation (69)		DCC (18)	Page counting number (X3)
	Lang.: (9)	Contract (75)		
	Rev. (7)	Document ID (1)		Page / Total pages (93) / (X4)

Figure B.1 – Example of the arrangement of information in a title block

Prep.	2001-11-11, P. Name	XYZ Company Water Supply North		ABC Company
Check	2001-11-15, C. Name			
Rev.	2001-12-23, R. Name	Replacing	Replaced by	Based on

Pumping of supply water, Control Circuit diagram	Object designation =G1K1		DCC &EFS	Page counting number MA1
	Lang.: EN	Contract WSS-95-123		
	Rev. A	Document ID X1-Y2-123456-78		Page / Total pages 14 / 27

Figure B.2 – Example of a filled-in title block

B.3 Examples of the location of identification areas

Figure B.3 shows examples of possible locations of identification areas related to different page sizes and orientations.

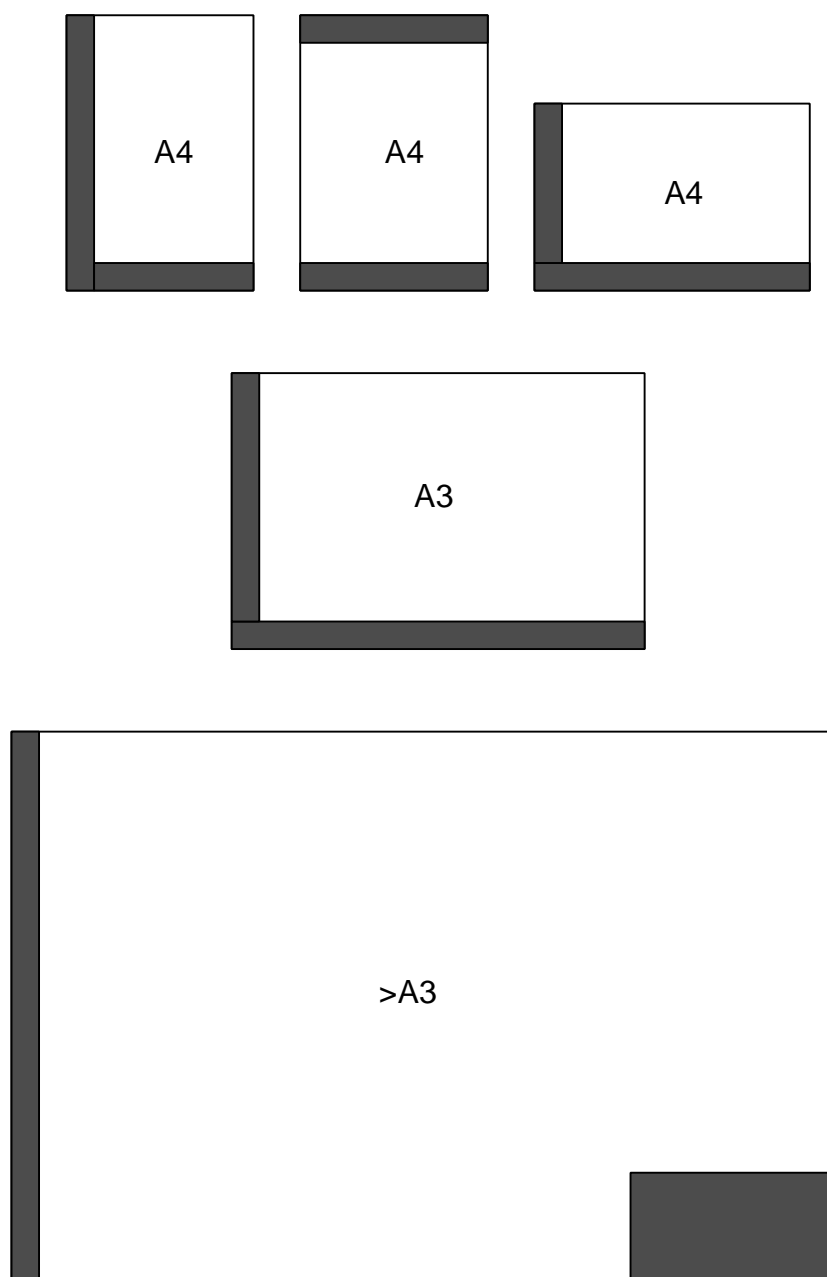


Figure B.3 – Examples of locations of identification areas

Annex C

(informative)

Bibliography

The following list is a collection of international publications being referred to for information within this international standard.

IEC 60073	1996	<i>Basic and safety principles for man-machine interface, marking and identification - Coding principles for indication devices and actuators</i>
IEC 60204-1	1997	<i>Safety of machinery - Electrical equipment of machines Part 1: General requirements</i>
IEC 60417		<i>Graphical symbols for use on equipment</i>
IEC 60445	1999	<i>Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals and of terminations of certain designated conductors, including general rules of an alphanumeric system</i>
IEC 60446	1999	<i>Basic and safety principles for man-machine interface, marking and identification - Identification of conductors by colours or numerals</i>
ISO 3864	1984	<i>Safety colours and safety signs</i>
ISO 6428	1982	<i>Technical drawings - Requirements for microcopying</i>
ISO 7200	1984	<i>Technical drawings – Title block</i>
ISO 7200-1	(under prep.)	<i>Technical product documentation – Document headers and title blocks – Part 1: General structure and content</i>

The following list is a non-exhaustive selection of the most generally applicable ISO standards with rules for technical drawings.

ISO 128-21	1997	<i>Technical drawings -- General principles of presentation - Part 21: Preparation of lines by CAD systems</i>
ISO 128-23	1999	<i>Technical drawings -- General principles of presentation - Part 23: Lines on construction drawings</i>
ISO 128-24	1999	<i>Technical drawings -- General principles of presentation - Part 24: Lines on mechanical engineering drawings</i>
ISO 128-25	1999	<i>Technical drawings -- General principles of presentation - Part 25: Lines on shipbuilding drawings</i>
ISO 128-34	1999	<i>Technical drawings -- General principles of presentation - Part 34: Views on mechanical engineering drawings</i>
ISO 128-40	2000	<i>Technical drawings -- General principles of presentation - Part 40: Basic conventions for cuts and sections</i>
ISO 128-44	2000	<i>Technical drawings -- General principles of presentation - Part 44: Sections on mechanical engineering drawings</i>
ISO 128-50	1984	<i>Technical drawings -- General principles of presentation - Part 50: Basic conventions for representing areas on cuts and sections</i>
ISO 2594	1972	<i>Building drawings – Projection methods</i>