

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, and requirements for their interchange

The European Standard EN 81714-2:2007 has the status of a British Standard

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National foreword

This British Standard was published by BSI. It is the UK implementation of EN 81714-2:2007. It is identical with IEC 81714-2:2006. It supersedes BS EN 81714-2:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/3, Documentation and graphical symbols.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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**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, and requirements for their interchange
(IEC 81714-2:2006)**

Création de symboles graphiques
utilisables dans la documentation
technique de produits -
Partie 2: Spécification
pour symboles graphiques
sous forme adaptée à l'ordinateur,
y compris les symboles pour bibliothèque
de références et exigences relatives
à leur échange
(CEI 81714-2:2006)

Gestaltung von graphischen Symbolen
zur Anwendung in der technischen
Produktdokumentation -
Teil 2: Spezifikation für graphische
Symbole in rechnerinterpretierbarer Form
einschließlich graphischer Symbole
für eine Referenzbibliothek
und Anforderungen
für ihren Datenaustausch
(IEC 81714-2:2006)

This European Standard was approved by CENELEC on 2006-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 81714-2:2006, prepared by IEC TC 3, Information structures, documentation and graphical symbols, in cooperation with ISO subcommittee SC 1, Basic conventions, of ISO technical committee 10, Technical product documentation, was submitted to the formal vote and was approved by CENELEC as EN 81714-2 on 2006-10-01 without any modification.

This European Standard supersedes EN 81714-2:1998.

The main changes with respect to EN 81714-2:1998 are as follows:

Subclauses 6.16, 6.18 and Annex D contain the major changes; other changes are basically updates.

The following dates were fixed:

- | | | |
|--|-------|------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2007-10-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2009-10-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 81714-2:2006 was approved by CENELEC as a European Standard without any modification.

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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, and requirements for their interchange

1 Scope

This part of International Standard 81714 specifies requirements for graphical symbols to be included in a reference symbol library in a computer sensible form, and requirements for their interchange among computer aided tools. The reference symbol library may be used as a basis for the design and editing of documents, and for the interchange of documents and graphical symbol libraries among computer-aided tools.

The specification of a physical file format required for the interchange is not included in this standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60617-DB, *Graphical symbols for diagrams*

IEC 61082-1, *Preparation of documents used in electrotechnology – Part 1: General requirements*

IEC 61286:2001, *Information technology – Coded graphic character set for use in the preparation of documents used in electrotechnology and for information interchange*

IEC 61346-1:1996, *Industrial systems, installations and equipment, and industrial products – Structuring principles and reference designations – Part 1: Basic rules*

IEC 61346-2:2000, *Industrial systems, installations and equipment, and industrial products – Structuring principles and reference designations – Part 2: Classification of objects and codes for classes*

IEC 61360-1:2004, *Standard data element types with associated classification scheme for electric components – Part 1: Definitions – Principles and methods*

IEC 61360-4, *Standard data element types with associated classification scheme for electric components – Part 4: IEC reference collection of standard data element types and component classes*

IEC 61666:1997, *Industrial systems, installations and equipment and industrial products – Identification of terminals within a system*

IEC 61966-2-1:1999, *Multimedia systems and equipment – Colour measurement and management – Part 2-1: Colour management – Default RGB colour space – sRGB*

IEC 81714-3:2004, *Design of graphical symbols for use in the technical documentation of products – Part 3: Classification of connect nodes, networks and their encoding*

ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange*

ISO/IEC 7942-1:1994, *Information technology – Computer graphics and image processing – Graphical Kernel System (GKS) – Part 1: Functional description*

ISO/IEC 9592-1:1997, *Information technology – Computer graphics and image processing – Programmer's Hierarchical Interactive Graphics System (PHIGS) – Part 1: Functional description*

ISO 128-20:1996, *Technical drawings – General principles of presentation – Part 20: Basic conventions for lines*

ISO 128-21:1997, *Technical drawings – General principles of presentation – Part 21: Preparation of lines by CAD-systems*

ISO 639-1:2002, *Codes for the representation of names of languages – Part 1: Alpha-2-code*

ISO 3098-0:1997, *Technical product documentation – Lettering – Part 0: General requirements*

ISO 3098-5:1997, *Technical product documentation – Lettering – Part 5: CAD lettering of the Latin alphabet, numerals and marks*

ISO 3166-1:1997, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes*

ISO 6428:1982, *Technical drawings – Requirements for micro copying*

ISO 6523-1:1998, *Information technology – Structure for the identification of organizations and organization parts –Part 1: Identification of organization identification schemes*

ISO 10303-201:1994, *Industrial automation systems and integration – Product data representation and exchange – Part 201: Application protocol: Explicit draughting*

ISO 81714-1:1999, *Design of graphical symbols for use in the technical documentation of products – Part 1: Basic rules*

3 Terms and definitions

For the purposes of this document, and in addition to the definitions contained in ISO 81714-1 and IEC 61346-1, the following terms and definitions apply.

3.1 Graphical symbols for use on documents

3.1.1

function symbol

graphical symbol representing an object with a defined behaviour, and provided with input and output functional nodes

NOTE Example of function symbol: the symbol S01567 in IEC 60617 for an AND-function.

3.1.2

product symbol

graphical symbol representing an object with a defined behaviour, and provided with nodes, specifically implemented in either hardware or software

NOTE Example of product symbol: the symbol S01579 of IEC 60617 for an AND-gate with negated output (part of SN7410).

3.1.3

graphical symbol occurrence

graphical symbol presented in a diagram including the presentation of data associated with the object being represented

3.1.4

reference symbol

graphical symbol unambiguously identified and provided with openings for presentation of data associated with an object represented in a diagram by a graphical symbol occurrence

NOTE Examples for graphical symbols equipped with openings are shown in Figures 12 and 13.

3.2 Nodes

3.2.1

connect node; port; terminal

point of access of an object intended for connection

NOTE The connection may refer to

- a) a physical interface among conductors and/or contacts, or piping and/or duct systems to provide a signal or energy or material flow path;
- b) an association of functional nature established among logical elements, software modules, etc. for conveying information.

3.2.2

(schematic) connect node

location on a graphical symbol intended for connection

NOTE 1 (Schematic) connect nodes represent the terminals of the object of interest.

NOTE 2 A (schematic) connect node may not have a graphical shape. It may consist of an imaginary point associated with a graphical symbol.

3.2.3

node name

identification of a connect node.

3.2.4

coded connect node class

encoded classification of a connect node

3.2.5

(schematic) electrical node

connect node designed for connecting to a representation of an electrical network

3.2.6

(schematic) functional node

connect node designed for connecting to a representation of a functional network

3.2.7

(schematic) linkage node

connect node designed for connecting to a representation of a mechanical linkage network

NOTE Figure 1 shows examples of linkage nodes and networks.

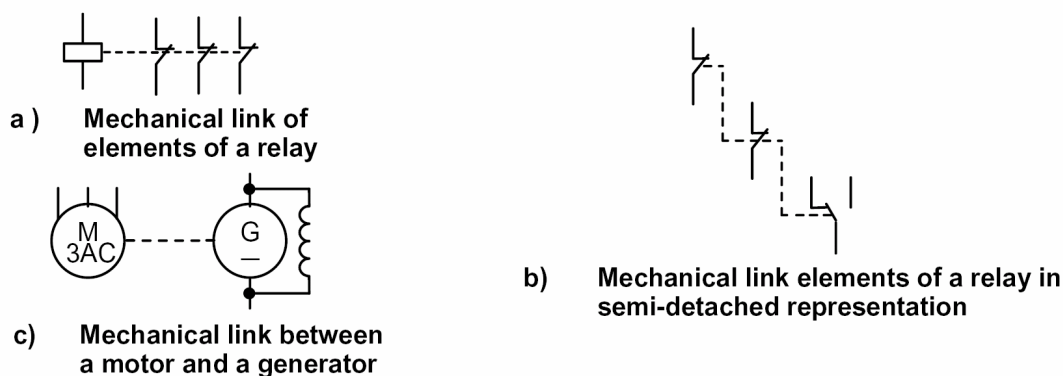


Figure 1 – Examples of presentation of connect node linkage

3.2.8

(schematic) matter node

connect node designed for connecting to a representation of a network intended for transport of matters

NOTE Matters are gas, fluid or solid.

3.2.9

(schematic) optical node

connect node designed for connecting to a representation of an optical fibre network

3.2.10

(schematic) wave node

connect node designed for connecting to a representation of a wave propagation network

NOTE Examples of wave propagation networks: infrared light, radio transmission.

3.3 Administration of openings

3.3.1

opening

definition of a possibility to enter information associated with the object being represented by a graphical symbol occurrence

3.3.2

descriptive block

openings intended for the presentation of descriptive information

3.3.3**identifying block**

openings intended for the presentation of reference designations

3.3.4**connect block**

openings intended for the presentation of data associated with a connect node

3.3.5**text**

collection of alphabetical, numerical and/or other characters conveying human interpretable information

3.4 Graphical constructs**3.4.1****graphical primitives**

constructs like lines, circular arcs, polylines, ellipsis, etc., needed to draw a figure in a computer-aided drawing system

3.4.2**scaling factor**

factor by which the coordinates of all defined points of the symbol will be enlarged or reduced in size in relation to the reference point of the symbol

3.5 Routing and placing of graphical symbols in diagrams**3.5.1****embedded area**

area containing the graphical symbol

3.5.2**connecting line directions**

specification of directions under which connecting lines may be drawn onto a schematic connect node

3.6 Administration of graphical symbols**3.6.1****layer**

self-contained group of data that can be manipulated or displayed individually

3.6.2**symbol classification**

classification of an object represented by a graphical symbol

3.6.3**symbol classification code**

encoded classification of an object represented by a graphical symbol

3.6.4**symbol description**

textual description of the meaning of a graphical symbol

3.6.5**symbol name**

identifier of a graphical symbol within a symbol library

3.6.6

symbol type

attribute for a classification of a graphical symbol used, e.g. for a simplified management of symbols in CAE-systems and allowing special evaluations (e.g. for terminals, devices, detached representation, attached representation, etc.)

3.6.7

variant name

identifying name of a variant of a symbol

3.7 Text

3.7.1

character body

rectangle used to enclose a single character shape

NOTE All character bodies of the same type face have the same height (see ISO 7942).

3.7.2

character aspect ratio [ISO 10303-201];

character expansion factor [ISO/IEC 9592-1]

relation of width to height of a character body

3.7.3

character justification

alignment of a character in its character body

[ISO/IEC 9592-1]

3.7.4

character spacing factor

space between sequent character bodies

[ISO/IEC 9592-1]

3.7.5

tabular lettering

lettering with characters having a constant width of all character bodies

NOTE The width of the character body is defined by its width to height (b/h) ratio.

3.7.6

proportional lettering

lettering with characters having individual width of character bodies

NOTE The width of the character body is defined by the appearance of the character.

3.7.7

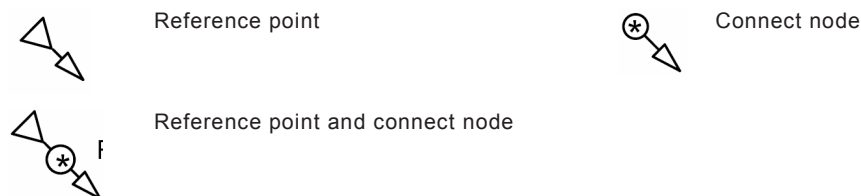
line distance factor

factor defining the distance between succeeding base lines of a text in relation to the lettering height of the characters

4 Markers

4.1 Markers for reference points and connect nodes

In this standard the following markers are used for documentation purposes.



Where it is necessary to specify in this standard the type of a (schematic) connect node, the asterisk (*) is replaced by the letter code indicating the type according to IEC 81714-3.

4.2 Markers for alignment of text

For the documentation of alignment and reading direction of connect block, descriptive block, identifying block and textfields, the following markers are used in this standard. In accordance with ISO 3098-5 each alignment is encoded by a number as shown in Figure 2. See also Annex G.

Top	1		4		7	
Centre	2		5		8	
Bottom	3		6		9	
		Left		Centre		Right

Figure 2 – Encoding of text alignment

5 Reference symbols

Good and user-oriented documentation of products is of vital interest to users. As the preparation of documentation is an essential cost factor, companies preparing documentation aim to prepare documentation at low cost, with a minimum of time and in sufficient and consistent quality. Therefore, it is of high industrial interest to have a very efficient tool for the preparation of such documentation.

Diagrams contain a number of graphical symbols, each symbol associated with the presentation of other information belonging to the object being represented. In the preparation of graphical symbols, attention shall be given, concerning the readability of this information, to different flow directions of information and/or energy in the diagram, and to the overall understanding of the diagram. In order to reduce the amount of work in the preparation of diagrams, graphical symbols are stored in symbol libraries.

In a diagram, only an occurrence of the definition of a graphical symbol contained in a library is used. By this method, the system need not incorporate a graphical symbol as an embedded object within the diagram. If used in a diagram, it simply refers to the relevant symbol definition in the relevant library. This is an effective method of keeping data volume of a diagram very low.

The graphical symbol definition contained in a library does not know where it will be applied. Therefore the variable data belonging to the object of interest that the graphical symbol is intended to represent, need to be entered when occurring (presented) on a diagram and will then be associated with the diagram. Data associated with the occurrence of a symbol in a diagram will normally override possible defaults specified in the symbol definition of the library.

It has been identified that the following items such as

- increased interoperability among different disciplines;
- increased multi-supplier environment;
- increased data sharing;

will be important elements of the future business environment.

With respect to the preparation of diagrams and the use of graphical symbols, the above can be made possible only if graphical symbols are made available in a coordinated way (see also Annex B). Coordinated graphical symbols can be achieved by introducing reference symbols and a reference symbol library. Most graphical symbols of IEC 60617 and ISO 14617 may be used as basis for such reference symbols. As the graphical symbols shown in the referred to standards do not reflect the additional needs for an effective use in computer-aided design systems, this standard specifies the CAx-requirements which should be met. For more details see Annex A.

The use of reference symbols will facilitate

- common understanding of the use of symbol libraries within the applications;
- reuse of common function or product concepts when working in a multi-supplier environment;
- efficient exchange mechanism for symbols used on diagrams;
- efficient symbol definitions;
- better and sufficient quality, adding concepts supporting automatic design;
- supporting the reuse (multiple use) within different phases of a process chain with a minimum of changing sizes and adapting graphical symbols, etc.;
- extending the use of existing functionality in CAx-systems.

6 Specifications for symbols including symbols for a reference library

6.1 General

Reference symbols shall be defined in accordance with ISO 81714-1 and following the additional rules of this standard.

The rules of this standard should also be applied for the creation of graphical symbols not included in a reference symbol library.

A reference symbol may be equipped with any number of openings with defined locations, intended for the presentation of data associated with the object that the graphical symbol will represent in a diagram. In the context of this standard, the content of these openings will be visualized in text fields. For the openings defined in this standard, recommendations are given in Annex E with respect to data type and length.

NOTE 1 If not otherwise stated the dimensions given in this standard refer to the centre of lines, circles, etc.

NOTE 2 The minimum distances indicated in this standard cover the requirements specified by ISO 81714-1. In addition, the existing mechanical tolerances of printer and plotter equipment have been considered.

6.2 Variants of graphical symbols

6.2.1 General

For use in diagrams up to eight different possible variants of a graphical symbol may be needed taking into account the control (information, signal) flow and process (matter, energy) flow of the graphical symbol itself, and providing that the reading direction of alphanumerical characters or other labels associated with the graphical symbol is parallel to the control flow.

These eight variants are defined without considering any further recommendations regarding their use on a diagram.

The variants are named A to H independently whether they are used or not.

The definitions of the variants are as shown in Figure 3.

A		E	
B		F	
C		G	
D		H	

Figure 3 – Variants of a graphical symbol

For the purpose of unambiguous assignment of the name of the variant the following rules apply:

- if there is only one direction of flow and if it is doubtful whether it should be considered as control or process flow (e.g. resistor, capacitor, contact), it shall be considered as control flow;
- if the directions of the control and process flow are parallel, the control shall be given preference;
- if two or more variants are graphically equal, the variant with the lowest letter starting with the variant name A shall be used.

NOTE The above rule is considered as the general rule for the definition of variants for graphical symbols. It may be that specific variants need to be excluded for reasons of ambiguity or for economic reasons, etc. If this occurs, the relevant international standard, where the relevant graphical symbol is defined, should list the allowed variants according to the rules established in this standard.

6.2.2 Examples of variants of graphical symbols

Examples of variants of graphical symbols are shown in Figures 4, 5 and 6.

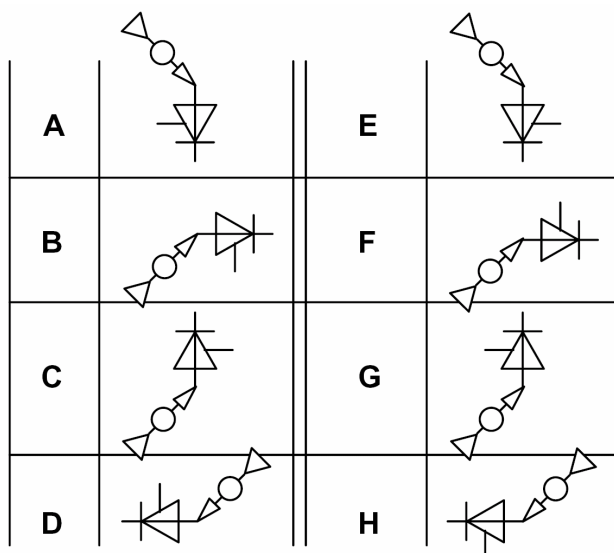


Figure 4 – Example of variants of a graphical symbol representing a thyristor

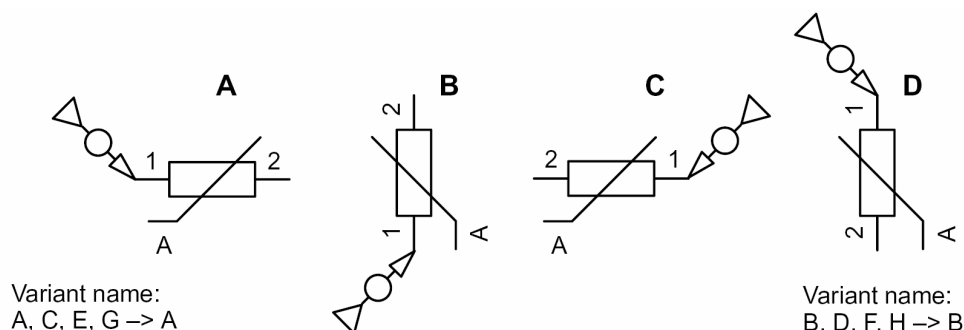


Figure 5 – Example of variants of a graphical symbol representing a variable resistor showing terminal designations with respect to the product aspect

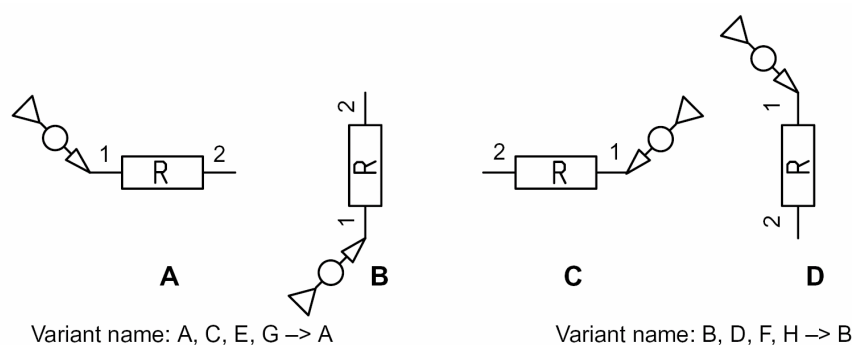


Figure 6 – Example of variants of a graphical symbol representing a resistor

NOTE IEC 60617 and ISO 14617 provide (at the time of writing this standard) one variant of each graphical symbol without indicating which variant it is.

6.2.3 Variants of composite graphical symbols

Composite graphical symbols including a presentation of a link, for example mechanical, pneumatic, hydraulic, etc. of operating devices, methods and mechanical controls, shall be defined in variant A with the linkage, considered as a control flow, taking effect from left to right as shown in Figure 7.

NOTE This reduces considerably the amount of symbols to be stored in a library. IEC 60617 and ISO 14617 do (at the time of writing this standard) not fully comply with this requirement.



Figure 7 – Graphical symbols indicating a delayed action

6.3 Scaling

The scaling factors for symbols shown in IEC 60617 and ISO 14617 shall be the same in the X and Y directions. If the size of a symbol is modified, all parts shall be modified by the same scaling factor, retaining the relationship to any reference point. Both the line width and the grid module M remain unchanged (see Figure 8).

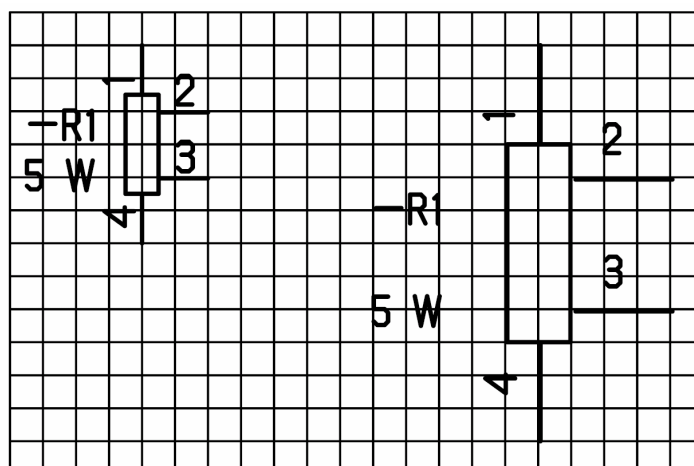


Figure 8 – Example of enlarging a symbol with a scaling factor 1:2

For the purpose of interchange of diagrams and libraries, information on the applied scaling factors shall be transferred.

6.4 Module sizes in reference libraries

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

For the support of implementation in systems and for the purpose of interchange of symbol reference libraries, the value of the originally used module size M shall be transferred, whether it may be needed by the receiving system or not.

NOTE In a presentation, the modification of the value implies that all graphical entities are modified. See Figure 9.

For the presentation on paper or equivalent media it is recommended to select the value of M from the following series:

Dimensions in millimetres

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

The module size of 2,0 has been used and considered as practically equivalent to 1,8 mm and therefore included in the above list.

For legibility reasons, it is recommended not to use a module size less than 2,5 mm. If the module size 1,8 (2,0) is used, care should be taken to ensure legibility of resulting documentation.

NOTE In an actual application, a physical value for M must be selected. Consideration needs to be given to the legibility of a document due to different forms of handling of the document such as microfilming, photocopying with/without size reduction, faxing, etc. In the case of microfilming, the requirements of ISO 6428 apply.

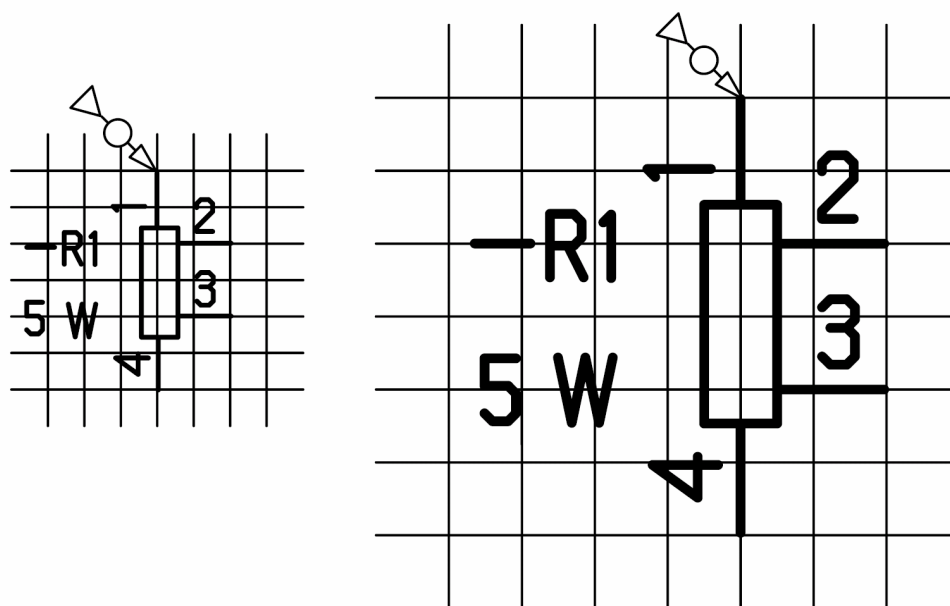


Figure 9 – Example of a change of the module size

6.5 Use of layer technique

This standard does not specify requirements concerning layers. However, the use of layers may be convenient for the administration of information related to the different disciplines involved in a project. The information assigned to each layer may be considered as a restricted area to other disciplines. In an interdisciplinary project, the use of the different layers shall be agreed upon.

6.6 Constructs used in the creation of graphical symbols

6.6.1 General

For the creation of graphical symbols, the following graphical primitives are recommended to be available:

- polylines;
- elliptic arc;
- patterns;
- text.

NOTE 1 A line is considered to be a subtype of a polyline.

NOTE 2 An ellipse, circle and circular arc are considered to be subtypes of an elliptic arc.

NOTE 3 A rectangle and polygon (closed polyline) are considered to be a subtype of a polyline.

6.6.2 Spline

For a computer-aided tool supporting the spline functionality, the spline function may be used to depict, for example, transient reactions, transient conditions of a process, plant, system within a graphical symbol as shown in Figure 10.



Figure 10 – Example of use of the spline function

If a spline function is used for the presentation of such curves, the curve should, for economical reasons, be transferred as a polyline.

6.6.3 Lines

The line width shall be $0,1 \times M$, see ISO 81714-1.

For additional requirements concerning single lines not covered by ISO 128-20 and ISO-21, see Annex F.

For the purpose of interchange of diagrams and libraries, the attributes describing the line font, curve appearance and related colour shall be transferred. See also Annex C.

6.6.4 Grouping of lines

For the explicit definition of more complex lines, a mechanism is defined producing such lines by a combination of two or more single lines based on ISO 128-20 and ISO 128-21. It is described as line font relationship shown in Annex C. See also Annex F.

For the purpose of interchange of diagrams and libraries, the attributes describing the line font relationship shall be transferred. See also Annex C.

6.6.5 Colours

Colours shall be specified according to the RGB model specified in ISO/IEC 9592-1. If no colour is defined, the colour black shall be assumed. The recommended colours are shown in Figure 11. Each colour is composed of a three-tuple of the red, green and blue proportions.

Name	Colour proportions in %		
	R(red)	G(green)	B(blue)
Black	0	0	0
Red	100	0	0
Green	0	100	0
Blue	0	0	100
Yellow	100	100	0
Magenta	100	0	100
Cyan	0	100	100
White	100	100	100
Grey	50	50	50

Figure 11 – Recommended colours

NOTE 1 This standard does not specify any meaning to a colour.

NOTE 2 ISO 10303-201 uses normalized colour proportions, i.e. each proportion is covered within a range of 0...1.

NOTE 3 For the definition of the actual appearance of the RGB colour space, reference is made to IEC 61966-2-1.

For the purpose of interchange of diagrams and libraries, the colour proportions composing the colour shall be transferred. See also Annex C.

6.6.6 Fill area

If a fill area is required, it shall be applied only for those graphical primitives having a closed contour, such as polygons, rectangles, circles and ellipses.

In this standard a fill area is either a hatching pattern or a solid filled area.

6.6.6.1 Hatching pattern

A single hatching pattern shall be specified by the following collection of attributes and by the collection of attributes associated with the entities curve appearance and colour as shown in Annex C.

For the purpose of interchange of diagrams and libraries, the attributes associated to a hatching pattern shall be transferred. See also Annex C.

6.6.6.2 Grouping of hatching patterns

For the explicit definition of more complex patterns, a mechanism is defined producing such patterns by a combination of two or more single hatching patterns. It is described as a hatching pattern relationship shown in Annex C.

Annex H offers a set of predefined patterns, each composed of at least two hatching patterns, which may be used in the design of graphical symbols. Each predefined pattern shall be identified by its pattern name, be associated with its draughting role and refer to the source reference from which the pattern and draughting role are taken.

NOTE All patterns shown in Annex H may be explicitly reproduced, using the hatching pattern relationship as shown in Annex C.

For the purpose of interchange of diagrams and libraries, the attributes associated with a hatching pattern relationship shall be transferred. See also Annex C.

6.6.6.3 Solid filled area

The optical impression to a human reader of a solid filled area may be received by the following possibilities:

- applying the construct hatching pattern and setting the value of the (perpendicular) displacement equal to the value of the line width and selecting the line font to be a solid line;
- applying the construct solid filled area.

Both constructs offer the possibility to vary the colour.

6.7 Text

6.7.1 Default values

The final sequence, position and content of the text fields depend on the application. The information to all text fields used in the diagram shall be transferred. Defaults in text fields of graphical symbols, if any, shall be transferred together with the symbol data. However, during diagram data transfer, these default values of the symbol library will be overwritten by the respective data used in the diagram.

6.7.2 Lettering

Both tabular and proportional lettering according to ISO 3098-5 may be used. Proportional lettering is encoded by P; tabular lettering is encoded by T.

If tabular lettering is applied, the character aspect ratio should be 0,81.

The spacing between characters shall be in accordance with ISO/IEC 9592-1.

NOTE 1 Inquiries in industry indicate that the defined character aspect ratio is the most appropriate for a quick presentation.

NOTE 2 Instead of the character aspect ratio as in ISO 10303-201, ISO/IEC 9592-1 applies the term character expansion factor.

NOTE 3 If a text font as shown in ISO 3098-5 is applied, the character spacing factor can be set to zero.

6.7.3 Text font

The text font of characters shall be in line with the stroke style presented in ISO 3098.

NOTE In some application areas, the term "typeface" is used instead of "text font".

6.7.4 Set of characters

The characters to be applied in the design of graphical symbols shall be chosen in accordance with ISO 81714-1.

NOTE 1 For the creation of graphical symbols for IEC 60617 or ISO 14617, only those characters shown in ISO/IEC 646, Table 5, International Reference Version (IRV) and IEC 61286 are used.

NOTE 2 The characters shown in IEC 61286 are included in ISO/IEC 10646. IEC 61286 provides a cross-reference table to ISO/IEC 10646.

NOTE 3 An implementation of the characters shown in ISO/IEC 646, Table 5 (IRV) and IEC 61286, by applying ISO/IEC 10646, is conform with the requirements of this standard.

6.7.5 Character justification

The characters used in text strings shall be centred and aligned within each character box. See also Annex G.

6.7.6 Control functions in text strings

If control functions are required, for example in order to apply italic lettering, superscript or subscript notations, the control functions specified in ISO/IEC 6429 shall be used.

NOTE Control functions needed in the design of graphical symbols and in diagrams are under consideration within ISO/IEC JTC1/SC2 for its inclusion in a revised edition of ISO/IEC 6429. Control functions occur within the stream of characters.

6.7.7 General labels in graphical symbols

If general labels are required, the openings for these labels shall be named LBL_1 up to LBL_n, where n is a serial number (see Figure 12). See also 6.14.4 of ISO 81714-1. Standardized labels should be used. Examples are shown in Figure 13.

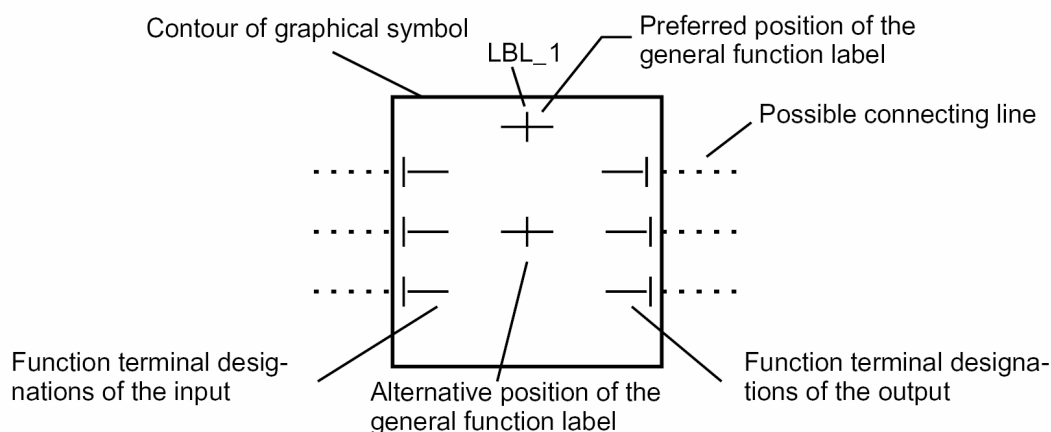


Figure 12 – General labels in graphical symbols and their alignment

NOTE In ISO 81714-1, general labels are called text related to the graphical symbol as a whole. In the context of IEC 60617, the term general qualifying symbol is also used.



Figure 13 – Use of general labels in graphical symbols

6.7.8 Graphical symbols associated with data element type definitions

IEC 60617 as well as ISO 14617 supply, in the context of graphical symbols, information that is identifiable as data element types following the terminology defined in IEC 61360-1. Data element types, if available, shall be taken from the IEC reference collection in IEC 61360-4. New data element types shall be defined and documented, separately from the definition of the graphical symbol, following the rules defined in IEC 61360-1.

Example:

The symbol identified as S00965 (Lamp, general symbol) in the IEC 60617 database is associated with two data elements *colour_code* and *light_source_code* (see Annex K).

6.8 Connect nodes

6.8.1 Connect node classification

All graphical symbols shall be provided with the appropriate numbers of schematic connect nodes.

Each connect node shall be provided with a classification of its type. The classes and their encoding by letter codes are defined in IEC 81714-3.

For the purpose of interchange of diagrams and libraries, the coded connect node class shall be transferred. See also Annex C.

6.8.2 Position of schematic connect nodes

All schematic electrical / functional nodes shall be situated on intersections of the 1 M grid, preferably at intervals of 2 M or multiples thereof as shown in Figures 14 and 15, taking into account possible presentations of product terminal designations.

NOTE For position of other schematic connect node types, see ISO 81714-1.

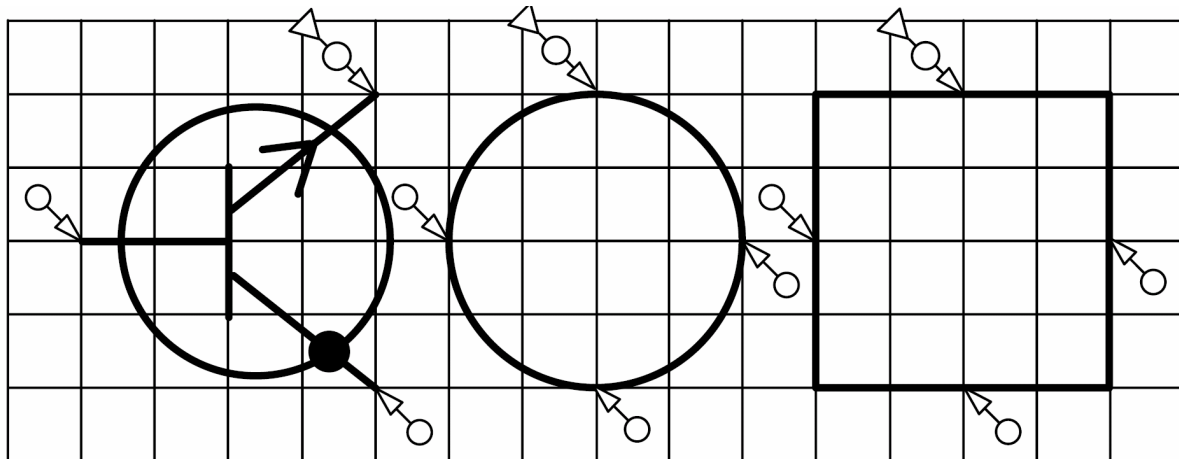


Figure 14 – Examples of location of schematic connect nodes

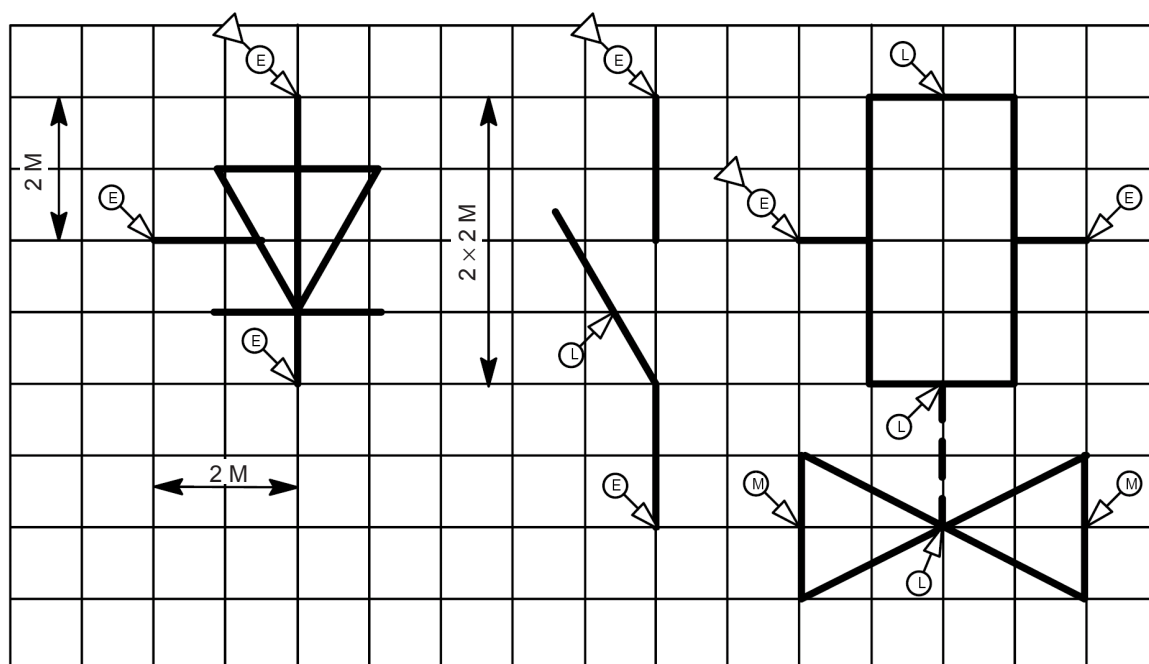


Figure 15 – Examples of locations of schematic connect nodes

6.8.3 Connect block

A schematic connect node may be provided with a number of openings, i.e. a connect block, in order to accommodate the terminal designation set in accordance with IEC 61666.

- If a function terminal designation is likely to be presented at a schematic connect node, this schematic connect node shall be provided with one or more openings for the presentation of the function terminal designation(s) associated with the terminal(s) the schematic connect node represents. The name of these openings shall be FCTN_TERM_DES_n, where n is a serial number. For function terminal designations, standardized labels should be used.
- If a product terminal designation is likely to be presented at a schematic connect node, this connect node shall be provided with one opening named PROD_TERM_DES for the presentation of the product terminal designation(s) associated with the terminal(s) the schematic connect node represents.

NOTE Terminal designations and functional terminal designations are classified in ISO 81714-1 as text related to input or output.

- If a location terminal designation is likely to be presented at a schematic connect node, this connect node shall be provided with one opening for the presentation of the location terminal designation(s) associated with the terminal the connect node represents. The name of this opening shall be LOC_TERM_DES. – If a connect node is likely to be associated with a location cross-reference in a diagram, this schematic connect node shall be provided with an opening named CROSS_REF for the presentation of such a cross-reference.

6.8.4 Location and justification of the textfield for the product terminal designation

For the positioning of the reference point and the justification of the textfield for the product terminal designation the following applies:

- the reference point of a textfield shall be positioned on a $1/10 M$ grid;
- the distance between the terminal line, if any, of the corresponding schematic connect node or the expected connecting line shall be $0,3 M$;
- the minimum distance between the string body (see Figure 16) and any other line, arc or text belonging to the graphical part of the symbol shall be as near as possible to $0,3 M$ but not less than $0,3 M$;
- the reference point of the textfield shall not be positioned on a grid line that is used to define the position of the corresponding schematic connect node;
- the justification shall be directed off the reference symbol and along the terminal line of the expected connecting line in accordance with IEC 61082-1;
- the product terminal designation shall be located above the horizontal terminal/expected connecting lines and to the left of vertical terminal/expected connecting lines in accordance with IEC 61082-1. See Figures 16 and 17.

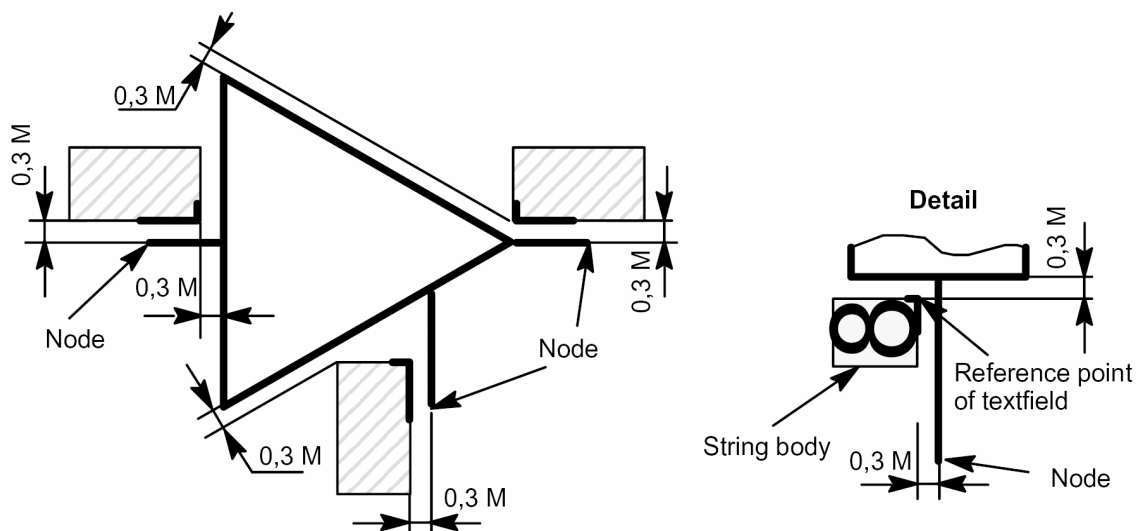


Figure 16 – Example of position of the textfield for product terminal designations