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TECHNICAL SPECIFICATION

colour inside

Graphical symbols for diagrams – Guidance on design for standardization in IEC 60617

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CONTENTS

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GRAPHICAL SYMBOLS FOR DIAGRAMS – GUIDANCE ON DESIGN FOR STANDARDIZATION IN IEC 60617

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 63064, which is a Technical Specification, has been prepared by IEC technical committee 3: Information structures and elements, identification and marking principles, documentation and graphical symbols.

The text of this Technical Specification is based on the following documents:

Draft TS	Report on voting
3/1309/DTS	3/1329/RVDTS

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

GRAPHICAL SYMBOLS FOR DIAGRAMS – GUIDANCE ON DESIGN FOR STANDARDIZATION IN IEC 60617

1 Scope

This document gives guidance and basic principles on how to design graphical symbols for diagrams for standardization and inclusion in IEC 60617.

This document does not specify how to apply such graphical symbols in the diagrams.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60617, *Graphical symbols for diagrams* (available at http://std.iec.ch/iec60617)

IEC 62744:2014, *Representation of states of objects by graphical symbols*

IEC 80000 (all parts), *Quantities and units*

IEC 81714-2:2006 *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*

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

ISO 14617 (all parts), *Graphical symbols for diagrams*

ISO 80000 (all parts), *Quantities and units*

ISO 81714-1:2010, *Design of graphical symbols for use in the technical documentation of products – Part 1: Basic rules*

Drawing grid template, available at http://www.iec.ch/standardsdev/resources/draftingpublications/writing_formatting/IEC_template/iec_graphical_symbols_for_diagrams.htm > *The graphical symbols for diagrams template*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
graphical symbol
visually perceptible figure with a particular meaning used to transmit information independently of language

[SOURCE: ISO 17724:2003, 31]

3.2
reference point
origin of the coordinate system used in the description of all the graphical elements of the graphical symbol

[SOURCE: ISO 81714-1:2010, 3.2, modified — the note has been deleted.]

3.3
symbol family
set of graphical symbols with a common conception using graphical characteristics with specific meanings

[SOURCE: ISO 81714-1:2010, 3.3]

3.4
connect node
location on a graphical symbol intended for connection

Note 1 to entry: Graphical symbols are connected via connect nodes of different types to external networks, see IEC 81714-3.

[SOURCE: ISO 81714-1:2010, 3.4, modified — Note 1 has been added.]

3.5
terminal line
line of a graphical symbol ending at a connect node

[SOURCE: ISO 81714-1:2010, 3.5, modified — the note has been deleted.]

3.6
qualifying symbol
qualifier
graphics and/or letter symbol representing a characteristic

Note 1 to entry: ISO 80000 (all parts), IEC 80000 (all parts) and IEC 60027 (all parts) specify letter symbols for use as qualifiers representing a physical quantity.

Note 2 to entry: Qualifying symbols are added to any existing combination of graphical symbols containing at least one graphical symbol. Usually qualifying symbols have a simple graphical presentation.

3.7
orientation
identified position of a graphical symbol with regard to the process flow direction or signal transfer direction

Note 1 to entry: The graphical symbol for diagrams has eight (A, B, C, D, E, F, G, H) possible orientations where the default value is A (see ISO 81714-1:2010, Clause 8).

Note 2 to entry: The term orientation of a graphical symbol is used as synonym for the term variant of a graphical symbol as used in ISO 81714-1:2010, Clause 8.

Note 3 to entry: See also IEC 61082-1:2014, 7.4.4.4.

3.8
grid
pattern of parallel lines crossing each other to form squares

4 Concept considerations

4.1 General

When a graphical symbol for diagrams required to represent an object in a diagram is not found in IEC 60617, the graphical symbols S00059, S00060 or S00061 (see Figure 1) can be applied.

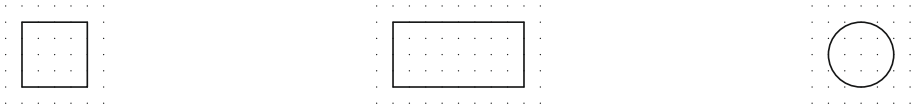

Figure 1 – IEC 60617 graphical symbols for diagrams for basic concept

If this is not suitable then the following rules shall be applied.

The design process shall start by providing a definition of the concept to be represented by the graphical symbol, together with an associated name (see IEC 60617). The concept shall be defined unambiguously.

The designer of the graphical symbol for diagrams shall consider the following issues:

a) Is the name of the proposed graphical symbol for diagrams given with unambiguous textual information corresponding to the intended concept?

b) Do any similar standardized concepts exist in IEC 60617 or ISO 14617 (all parts)?

c) Is the proposed graphical symbol for diagrams a possible member of an existing symbol family?

d) For what kind of diagrams is the new graphical symbol for diagrams intended to be used?

e) Are there similar graphical presentations already standardized in IEC 60617 or ISO 14617 (all parts)?

f) Are there already standardized qualifying symbols which represent the same intended characteristic?

g) Are there application notes relevant to the proposed graphical symbol?

h) Are the graphical symbol elements arcs, lines, etc. arranged in such a way that the intended connect nodes to other elements of a diagram are situated at intersections of the 1 M or 0,5 M orthogonal grid?

i) Is the proposed graphical presentation of the concept clearly understood without using explicitly drawn terminal lines – being part of the graphics of the proposed graphical symbol – or is it necessary to indicate anticipated connections for example by using dotted lines?

4.2 Shape of graphical symbols for diagrams

The visual impression of graphical symbols for diagrams shall be:

- simple, in order to provide good perceptibility and reproducibility;
- easily associated information of the concept, i.e. either self-evident, or easy to learn and to remember.

Graphical symbols for diagrams with the same visual impression representing different information should be avoided. Due to the limited number of graphical elements and the limited number of their combinations, different concepts may be assigned the same graphical shape. In such cases, a separate graphical symbol shall be assigned to each concept identified by a separate identifier (see ISO 81714-1:2010, 6.16).

Graphical symbols for diagrams with different shapes should not represent the same concept. Depending on needs, different shapes may represent the same information such as in Form 1, Form 2, and so on. For a human reader, the meaning of a graphical symbol for diagrams can normally be recognized because of the context of the diagram. If not, such graphical symbols for diagrams shall be provided with supplementary information in the diagram.

4.3 Operational states

Graphical symbols for diagrams shall be designed in orientation A, as defined in IEC 81714-2:2006, Figure 3.

For a graphical symbol for diagrams having a potential change of shape depending on its operational state, the following requirements shall be followed:

- the at-rest (unaffected) position for objects with automatic return (e.g. a spring-loaded safety valve, a relay with spring return),
- the non-active position for objects without automatic return (e.g. a shut-off valve in a closed position, an electromechanical switching device in an open-circuit position), and
- the de-energized position.

If a graphical symbol for diagrams is also used for indicating other operational states, the requirements established in IEC 62744:2014, Table 1 shall apply.

NOTE IEC 62744:2014 provides generic rules for the representation of states of objects by graphical symbols for diagrams standardized in IEC 60617, ISO 14617 (all parts) and IEC 60417. IEC 62744:2014, Table 1 provides examples of generically defined operational states of an object.

4.4 Qualifying symbols

Qualifying symbols representing physical quantities shall be exclusively taken from the letter symbols as specified in IEC 80000 (all parts), ISO 80000 (all parts) and IEC 60027 (all parts).

5 Grids and module

5.1 Orthogonal grid system

As a basis for the design of a graphical symbol for diagrams, an orthogonal grid system of parallel lines spaced 1 M apart, where M is the module, shall be used. See Annex A.

For the detailed design of graphical symbols for diagrams, 1 M is subdivided into 0,5 M. See also Annex A and ISO 81714-1:2010, Figure 9.

For the purpose of inclusion of graphical symbols in IEC 60617 the size of module M = 2,5 mm is defined.

NOTE 1 The dots 1 M apart are not part of a graphical symbol. The dots are used for presenting dimensions of a graphical symbol for standardization and inclusion in IEC 60617.

NOTE 2 The electronic grid template for the design of graphical symbols is available under the following URL: http://www.iec.ch/standardsdev/resources/draftingpublications/writing_formatting/IEC_template/iec_graphical_symbols_for_diagrams.htm > *The graphical symbols for diagrams template*.

5.2 Layers for designing graphical symbols for diagrams

Each graphical symbol for diagrams shall be designed in orientation A using the orthogonal grid system. It is foreseen that a drawing layer technique is applied, applying six layers where each layer has a specific purpose as follows:

- Layer 1: presenting the graphical symbol of the concept (see 3.1);
- Layer 2: presenting qualifying symbols (see 3.6);
- Layer 3: presenting the 1 M dots;
- Layer 4: presenting the 1 M grid;
- Layer 5: presenting the 0,5 M grid;
- Layer 6: presenting the 0,1 M grid.

For examples of the orthogonal grid system, see Annex A.

NOTE 1 The foreseen organization of the different layers separates the graphical presentation of a graphical symbol for diagrams to be extracted for presentation purposes. Layer 2 allows adding qualifying symbols without changing the graphical symbol presented in Layer 1. The combination of Layer 1 with Layer 2 allows the extraction of existing graphics for visualization purposes. Layer 3 provides the information of the locations of the connect nodes. Layer 4 is the grid serving as basis for the design of a symbol. Layers 5 and 6 are for the convenience of the designer and can be switched off or on depending on the designer's needs.

NOTE 2 For location of textual information to be added to the graphical symbol for diagrams, see IEC 81714-2:2006, Figure 29.

NOTE 3 The colour of the 1 M orthogonal grid in the electronic template is chosen as colour grey (RGB colour code: #808080).

5.3 Drawing of symbols for diagrams

The graphical symbols shall be drawn by using the achromatic colour black (RGB colour code: #000000).

The graphical symbol for diagrams shall be drawn in vector graphics.

5.4 Margin

The margin around the graphical symbols for diagrams should be at least 1 M.

5.5 File format

The graphical symbol for diagrams shall be submitted in an editable PDF file to maintain the vector graphics and to keep the layers. In addition, it is recommended to submit a PNG in 300 pixel per inch by converting it from the PDF file.

NOTE The editable PDF file allows to generate other files such as SVG, PNG.

6 Design process for graphical symbols for diagrams

The proposed graphical symbol may be composed of one or more graphical symbols complemented by one or more qualifying symbols.

The graphical symbol designer shall consider the following sequence: