

INTERNATIONAL
STANDARD

ISO/IEC
11714-1

First edition
1996-12-15

**Design of graphical symbols for use
in the technical documentation of
products —**

iTeh STANDARD PREVIEW

Part 1:

Basic rules

ISO/IEC 11714-1:1996

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*Création de symboles graphiques à utiliser dans la documentation
technique de produits —*

Partie 1: Règles fondamentales



Reference number
ISO 11714-1:1996(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11714-1 was prepared jointly by Technical Committees ISO/TC 145, *Graphical symbols*, and IEC/TC 3, *Documentation and graphical symbols*. Formal voting has taken place within both ISO and IEC.

This first edition cancels and replaces ISO 3461-2:1987, which has been technically revised. It serves as the basis for the design of graphical symbols in all fields of the technical documentation of products. Applications of this part of ISO 11714 are, for example, future editions of IEC 617 and ISO 14617.

In order to collect all requirements concerning relevant graphical symbols within one single numerical series, ISO/TC 145 and IEC/TC 3, in conjunction with ISO/TC 10, *Technical drawings, product definition and related documentation*, agreed to publish all parts of this International Standard within the 11714 series.

The Technical Management Board of ISO and the Committee of Action of IEC have decided that for each part of this series, one organization shall be chosen responsible. The Technical Committees involved have agreed not to change any part of International Standard 11714 without mutual agreement.

International Standard 11714 consists of the following parts, under the general title *Design of graphical symbols for use in the technical documentation of products*:

(ISO 11714-1) — *Part 1: Basic rules*

(IEC 11714-2) — *Part 2: Specification for graphical symbols in a computer sensible form including graphical symbols for a reference library, and requirements for their interchange.*

Further parts specific to individual subject field requirements are under consideration.

DESIGN OF GRAPHICAL SYMBOLS FOR USE IN THE TECHNICAL DOCUMENTATION OF PRODUCTS – Part 1: Basic rules

1 Scope

This part of ISO 11714 specifies basic rules for the design of graphical symbols for use in the technical documentation of products taking into account basic application needs.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11714. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of 11714 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 31-11:1992, *Quantities and units - Part 11: Mathematical signs and symbols for use in the physical sciences and technology*

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ISO 129: 1985, *Technical drawings - Dimensioning - General principles, definitions, methods of execution and special indications*

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ISO 6428 :1982, *Technical drawings- Requirements for microcopying* 1996

ISO/IEC 8859 (all parts), *Information processing - 8-bit single-byte coded graphic character sets*

ISO/IEC 10367:1991, *Information technology - Standardized coded graphic character sets for use in 8-bit codes*

ISO/IEC 10646-1:1993, *Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Plane*

IEC 1286: 1995, *Information technology - Coded graphic character set for use in the preparation of documents used in electrotechnology and for information interchange.*

3 Definitions

For the purposes of this part of ISO 11714, the following definitions apply.

3.1 graphical symbol

visually perceptible figure used to transmit information independently of language

NOTES —

1 The graphical symbol may represent objects of interest, such as products, functions or requirements for manufacturing, quality control etc.

2 This is not to be confused with the simplified representation of products which is always drawn to scale and may look like a graphical symbol.

3.2 reference point

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

NOTE - The reference point may be used for positioning and transformation, e. g. mirroring, turning, moving.

3.3 symbol family

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

3.4 connect node

location on a graphical symbol intended for connection

3.5 terminal line

line of a graphical symbol ending at a connect node

3.6 text

string of alphabetical, numerical and/or other characters

3.7 arc

curved line without inflection point

4 Markers

In this part of ISO 11714 the following marker is used in order to illustrate positions of connect nodes.

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5 Design of graphical symbols**5.1 Graphic representation**

Graphical symbols shall be designed to convey information concerning a function or a special requirement . This also applies when physical products are to be represented by graphical symbols.

5.2 Design procedure

The design of graphical symbols shall follow the rules defined in clause 6, taking into account

- the description of what the graphical symbol is intended to represent;
- the requirements pertaining to their presentation on paper or other solid media and in data processing;
- the analysis of the consequences when turning, mirroring or scaling (permitting different values of scaling factors on the x- and y-axes, if required);
- if graphical symbols are functionally related, they shall be designed as a symbol family;
- the normal application of the graphical symbol, for example of reference designation (see IEC 1346-1), technical data etc.;
- additional requirements as specified in ISO 6428 shall be applied if microcopying is intended.

6 Design principles

6.1 Shape

The shape of a graphical symbol shall be:

- simple, in order to improve perceptibility and reproducibility;
- easily associated with its intended meaning, i. e. either self-evident, or easy to learn and to remember.

Graphical symbols with the same shape representing different information should be avoided.

Due to the limited number of graphical elements and the limited number of combinations of these elements, different meanings may have to be assigned to graphical symbols having the same shape. In these cases, a separate graphical symbol shall be assigned to each meaning.

Graphical symbols with different shapes shall not represent the same information.

For a human reader, the meaning of a graphical symbol can normally be recognized because of the context of the document. If not, such graphical symbols shall be provided with supplementary information.

6.2 Operational state

Graphical symbols having an element representing a movable part in a product, for example a valving element in a directional valve for fluid power and a contact in an electromechanical switching device, shall be designed in a position that corresponds to:

- the at-rest (unaffected) position for products with automatic return (for example: a spring return);
- the non-active position for products without automatic return (for example: a closed valve, an electromechanical switching device in open-circuit position).

If operational states other than those specified here are required, the relevant information should be given in the standard for graphical symbols.

6.3 Classes of graphical symbols

Two classes of graphical symbols are recognized:

- class 1 - graphical symbols providing basic information;
- class 2 - graphical symbols providing supplementary information.

Graphical symbols belonging to class 2 should be designed without relation to any specific context in order to make their application as broad as possible. These graphical symbols are intended to be used only together with graphical symbols of class 1.

Graphical symbols belonging to class 1, normally reduced in size, may be used to provide supplementary information as well (see figures 1 and 2).

NOTE — The graphical symbols providing the basic information for a pump as shown in figure 1, and for a capacitor as shown in figure 2, are used in each of the combinations as a graphical symbol giving supplementary information.

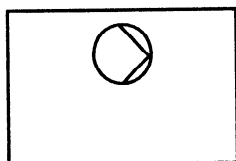


Figure 1 – Pumping system




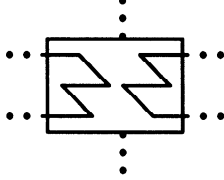
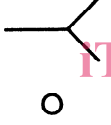



Figure 2 – Electrostatic microphone

6.4 Combination of graphical symbols

6.4.1 General

Graphical symbols may be combined to form a new graphical symbol. The information represented by the new composite graphical symbol shall be consistent with the information represented by its constituents. Examples of combinations of graphical symbols are shown in figure 3.

| Example | Graphical symbol | Assigned description | Composite graphical symbol | Assigned description |
|---------|--|---|---|------------------------------------|
| 1 |  | Anode Directly heated cathode Bulb of a tube |  | Diode with directly heated cathode |
| 2 |  | Envelope, vessel Heating or cooling coil |  | Heat exchanger with 3 flowpaths |
| 3 |  | Seat of a check valve Moving part of a check valve |  | Check valve / non-return valve |

NOTE – The dotted lines shown in example 2 are not part of the graphical symbol (see 6.12)

Figure 3 – Examples of combinations of graphical symbols

6.4.2 Graphical symbols for complex assemblies

The graphical symbol representing an assembly shall be constructed by combining the graphical symbols representing the constituents of that assembly.

If the graphical symbol for a complex assembly, either for reasons of complexity or lack of graphical symbols representing the constituents, cannot be constructed in the above way, the following applies.

The graphical symbol shall be based on a simple solid outline, being supplemented preferably within this outline by information according to a) through f) or combinations of these as shown below. The outline should preferably be that of a square or, if necessary, a rectangle or any other closed shape.

a) Graphical symbol(s) representing the most significant constituent(s) (see figure 1).

b) Mathematical signs and/or formulas, letter symbols for quantities, chemical formulas, graphs and symbols of International Standards. Mathematical signs shall be in accordance with ISO 31-11 (see figure 4).

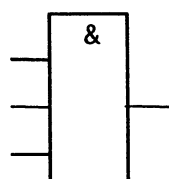


Figure 4 – AND element

c) An abbreviation, preferably mnemonic, based on the English language (see figure 5).

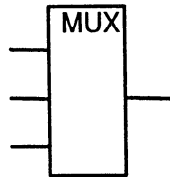


Figure 5 – Multiplexer

d) Graphical symbols providing supplementary information related to each input and each output (see figure 6).

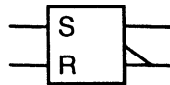


Figure 6 – Bistable element

e) Graphical symbols providing supplementary information related to the assembly as a whole, located inside or outside the continuous outline (see figure 7).

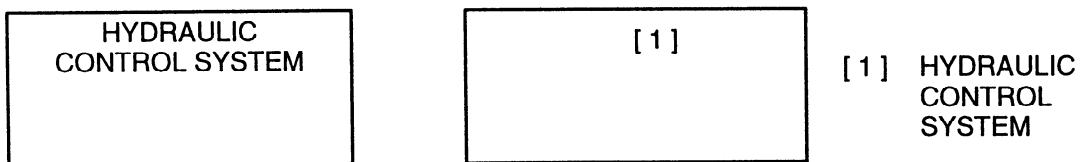


Figure 7 – Feedback controller and radio system

f) If it is impossible to describe the meaning of the graphical symbol by the methods given in a) through e), a short descriptive text may be added.

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This text should be written in English, independent of the language(s) used, e.g. in a diagram. However, for use limited to a defined language region, a different language may be used instead. The text may be located inside or outside the outline (see figure 8) and should be as short as possible.



NOTE — Location of the text outside the outline distinguishes an international graphical symbol from language-related information and facilitates reproduction in different languages.

Figure 8 – Hydraulic control system

6.4.3 Graphical symbols including flow direction

Graphical symbols applying a flow direction, used to provide supplementary information, shall be applied in such a way that the overall flow is emphasized (see figure 16).

6.5 Grid; module

As a basis for the design of a graphical symbol, an orthogonal grid of parallel lines spaced 1 M apart, where M is the module, shall be used. This grid may be subdivided into a 0,1 M or a 0,125 M grid (see figure 9). For the same graphical symbol or symbol family, only one of these two grid systems shall be used and indicated in an appropriate document.

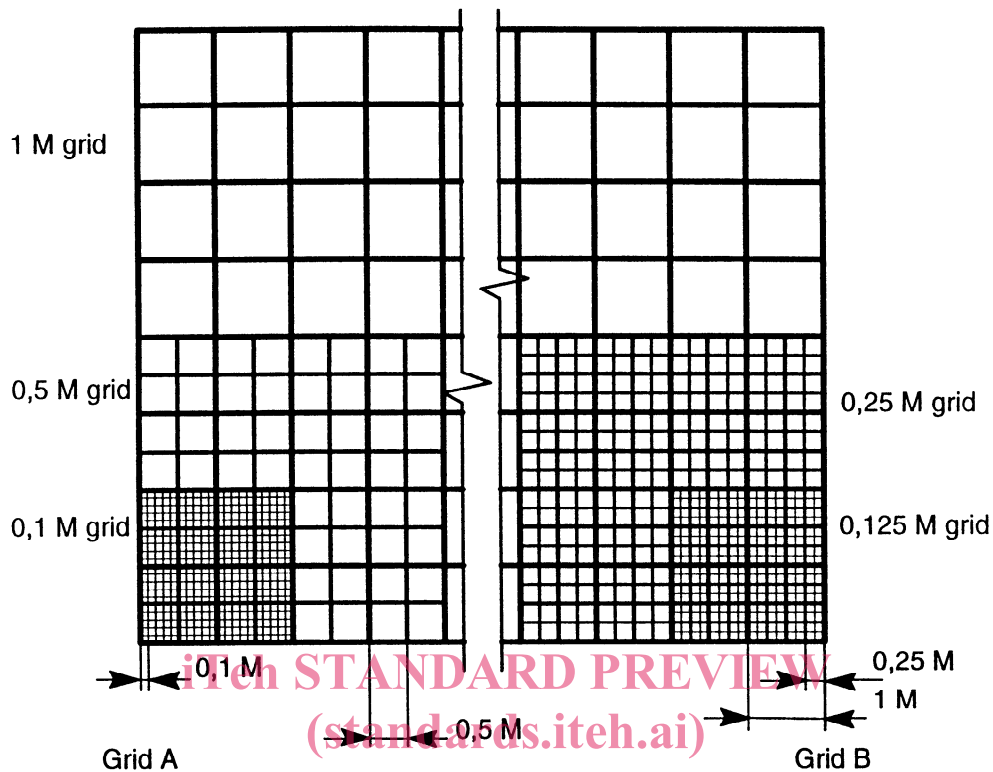


Figure 9 – Examples of grids

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6.6 Line width

The relation between the line width and the module size M used for the design of graphical symbols shall be 0,1. Characters and lines of graphical symbols should have the same line width. If additional line widths are required, the ratio between any two line widths should be at least 2:1. Standardized line widths given in ISO 128-20 are recommended.

6.7 Arcs and lines

Line types should be in accordance with ISO 128-20. Lines which come into contact or intersect at an acute angle should not have angles of less than 15° . Straight lines which do not run parallel to grid lines should have increments of 15° or should be defined with gradient ratios (for example 1:1, 2:1, 3:1, 4:1). Straight lines should begin and end on an intersection of the grid.

The end points of an arc shall lie on intersections of the grid. Curves shall consist only of arc segments and/or straight lines.

The following applies to straight lines and arcs defining the outline of a graphical symbol on which connect nodes are required (see figure 10):

- the axis of horizontal and vertical lines shall lie on the 0,5 M or 1 M grid;
- the axis of inclined lines or arcs shall intersect as many intersections of the 0,5 M grid as connect nodes are needed.

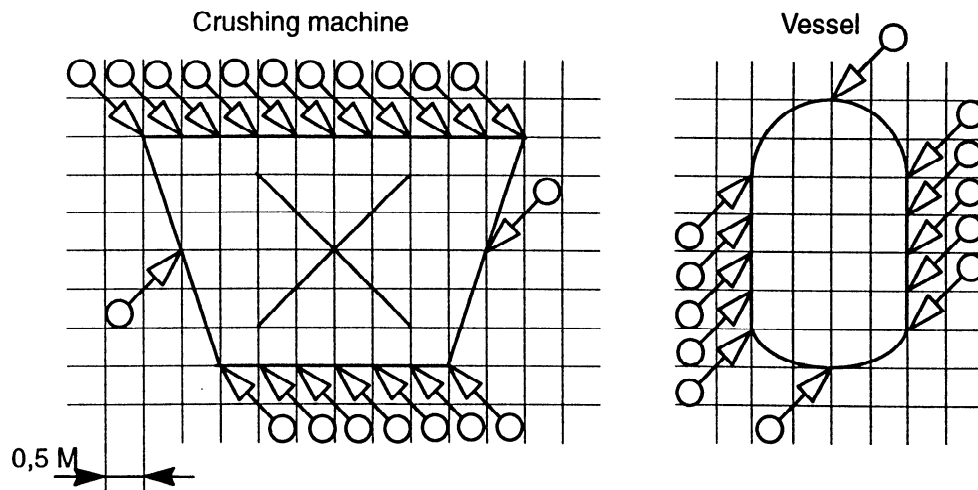


Figure 10 – Examples of graphical symbol outlines containing connect nodes

6.8 Minimum space between parallel lines

The minimum space between parallel lines shall be at least twice the line width of the widest line.

6.9 Hatched and filled areas

For hatched areas, the requirements with respect to the minimum space between parallel lines and to the line width shall be applied.

Filled areas should be avoided.

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6.10 Connect node

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If required, the graphical symbol should be provided with the appropriate number of connect nodes representing inputs and outputs.

6.11 Position of a connect node

A connect node should lie on an intersection of the 1 M or the 0,5 M grid (see for example figure 10).

If it is intended to position text between connect nodes or parallel terminal lines, the minimum space between these nodes or lines shall be 2 M.

6.12 Terminal line

If a terminal line is required, it should be as short as practicable.

In those cases where the graphical symbol does not include terminal lines and the connection lines should be attached to the graphical symbol in a specific manner, the connection lines should be indicated by dotted lines (see figure 3, example 2).

6.13 Reference point

For use in computer-aided systems, graphical symbols require a reference point. It shall lie on an 0,5 M or 1 M intersection of the same grid as that used for the design of the graphical symbol.

NOTE — Further recommendations regarding the location of the reference point may be given in other relevant International Standards.