INTERNATIONAL STANDARD

ISO 81714-1

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1999-12-15

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

Part 1: **Basic rules**

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

Partie 1: Règles fondamentales

Reference number
ISO 81714-1:1999(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 81714-1 was prepared jointly by Technical Committees ISO/TC 10, *Technical drawings, product definition and related documentation*, 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 of ISO 81714-1 cancels and replaces ISO/IEC 11714-1:1996, which has been updated. 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 81714 are, for example, future editions of IEC 60617 and ISO 14617.

In order to collect all requirements concerning relevant graphical symbols within one single numerical series, ISO/TC 10 and IEC/TC 3, in conjunction with ISO/TC 145, agreed to publish all parts of this International Standard within the 81714 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 81714 without mutual agreement.

International Standard 81714 consists of the following parts, under the general title *Design of graphical symbols for use in the technical documentation of products*:

ISO 81714-1 — *Part 1: Basic rules*

IEC 81714-2 — *Part 2: Specification for graphical symbols in a computer sensible form including graphical symbols for a reference library, and requirements for their interchange*

IEC 81714-3 — *Part 3: Classification of connect nodes, networks and their encoding*

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 81714 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 81714. 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 ISO 81714 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.*

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

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

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 61286: 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 81714, 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 81714 the following marker is used in order to illustrate positions of connect nodes.

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 61346-1), 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.

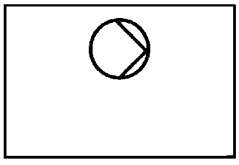


Figure 1 – Pumping system

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.

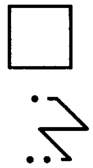
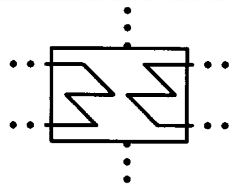
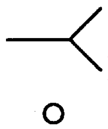
Example	Graphical symbol	Assigned description	Composite graphical symbol	Assigned description
1		Anode Directly heated cath-ode Bulb of a tube		Diode with directly heated cathode
2		Envelope, vessel Heating or cooling coil		Heat exchanger with 3 flowpaths
3		Seat of a check valve Moving part of a check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

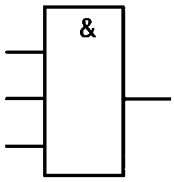


Figure 4 – AND element

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

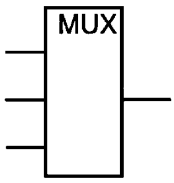


Figure 5 – Multiplexer

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

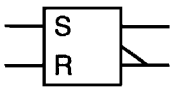


Figure 6 – Bistable element

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

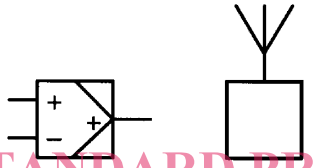
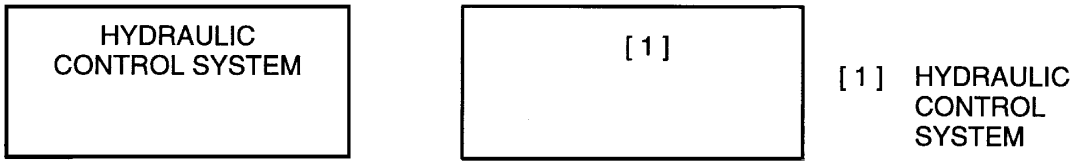


Figure 7 – Feedback controller and radio system

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.

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.