IEC 62744

Edition 1.0 2014-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Representation of states of objects by graphical symbols

Représentation d'états d'objets par des symboles graphiques

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REPRESENTATION OF STATES OF OBJECTS BY GRAPHICAL SYMBOLS

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It has the status of a horizontal standard in accordance with IEC Guide 108.

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

FDIS	Report on voting
3/1194A/FDIS	3/1205/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.

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

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- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

This international standard deals with the representation of operational states of objects by standardized graphical symbols. The graphical symbols presented in standards like IEC 60417, IEC 60617 and ISO 14617 are actually presented in a static form. This standard establishes rules and recommendations for how objects being represented by graphical symbols can be presented with a dynamic behaviour indicating the operational states of objects occurring in practice. This standard provides guidance for developers and designers of graphical symbols, for example in IEC 60617, ISO 14617, IEC 60417 or any other pictorial representation of an object if being requested to consider additional forms for the presentation of operational states.

This standard also provides information relevant to designers of HMI systems, to be installed in rooms with appropriate ambient conditions (e.g. used for supervising systems).

This standard does not define rules for the design of static graphical symbols for diagrams as provided in IEC 61082 and the ISO/IEC 81714 series or for icons and graphical symbols for use on equipment as provided in IEC 60417, ISO 7000 and in the ISO/IEC 11581 series.

This standard does not define a list indicating which existing graphical symbols are available to be used to represent objects in their operational states following the rules established in this standard.

REPRESENTATION OF STATES OF
OBJECTS BY GRAPHICAL SYMBOLS

1   Scope

This international standard provides generic rules for the representation of states of objects by graphical symbols standardized in IEC 60617, ISO 14617, IEC 60417, for example, and for future graphical symbols included in these standards.

NOTE 1   Graphical symbols in IEC 60617, ISO 14617 and IEC 60417 are mostly presented with a single graphic, not representing the different operational states of objects occurring during their life cycle, e.g. in operation, of the object that the graphical symbol represents.

NOTE 2   The graphical symbols in IEC 60617 and ISO 14617 are – at the time of writing of the first edition of this standard – generally shown in the operational state "not energized".

NOTE 3   Within the different periods of an object within its life cycle, i.e. design, manufacturing, operation, disposal, each period counts with different states. However, this standard focuses only on those states occurring during the active operation period from an object put into service until it is taken out of service.

This horizontal standard has the purpose of:

- ensuring the coherence of the corpus of standardization documents;
- avoiding duplication of work and contradictory requirements.

The standard provides operational states of an object as examples that typically occur and which need to be represented by standardized graphical symbols and defines generic rules to be applied. It specifies which types of presentation facilities are recommended to present the different operational states to humans.

States concerning the different types of alarm, their classification and management are not dealt with in this standard.

This standard does neither define rules for the design of static graphical symbols for diagrams as provided in IEC 61082 and the ISO/IEC 81714 series nor for icons and graphical symbols for use on equipment as provided in IEC 60417, ISO 7000 and in the ISO/IEC 11581 series.

This horizontal standard is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 108.

One of the responsibilities of a technical committee is, wherever applicable, to make use of horizontal standards in the preparation of its publications. The content of this horizontal standard will not apply unless specifically referred to or included in the relevant publications.

2   Normative references

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

IEC 60073:2002, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators*

IEC 60417, *Graphical symbols for use on equipment*. Available from http://www.graphical-symbols.info/equipment

IEC 60617, *Graphical symbols for diagrams*. Available from IEC 60617 – Graphical Symbols for Diagrams

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*. Available from http://std.iec.ch/iec61360

IEC Guide 108, *Guidelines for ensuring the coherency of IEC publications - Application of horizontal standards*

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

ISO 7000, *Graphical symbols for use on equipment – Index and synopsis; Registered symbols*

3   Terms, definitions and abbreviations

3.1   Terms and definitions

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

3.1.1
graphical symbol
visually perceptible figure with a particular meaning used to transmit information independently of language

Note 1 to entry: The graphical symbol may represent objects, such as products, functions or requirements for manufacturing and use, quality control, etc.

Note 2 to entry: A graphical symbol is not to be confused with the simplified representation of products which is normally drawn to scale and which can look like a picture.

[SOURCE: ISO 81714-1:2010, 3.1, modified – "and use" added in Note 1, "…like a graphical symbol" replaced by "…like a picture" in Note 2.]

3.1.2
presentation set (of objects)
set of discrete presentation forms of a graphical symbol representing an object, each form representing a defined operational state of the object, used for dynamic presentation

Note 1 to entry: The different forms of a graphical symbol are derived from a basic graphical symbol, such forming a symbol family.

Note 2 to entry: According to IEC 61082-1 a *graphical symbol* will represent the object in a de-energized *operational state*, i.e. in the position OFF.

Note 3 to entry: This includes audible and visible but not tangible (e.g. BRAILLE) presentation facilities

3.1.3
operational state
defined states within the being-in-service period which an *object* can have

3.1.4
acoustic signal; auditory signal
message conveyed by means of tone, frequency and intermittency, emanating from a sound source

[SOURCE: IEC 60073:2002, 3.2.1]

3.1.5
tactile signal
message conveyed by means of vibration, force, surface roughness, contour or position

[SOURCE: IEC 60073:2002, 3.2.2]

3.1.6
visual signal
message conveyed by means of brightness, contrast, colour, shape, size or position

Note 1 to entry: Flashing visual characteristics may be used to attract attention, and especially to give additional emphasis

[SOURCE: IEC 60073:2002, 3.2.3, modified – Note 1 to entry added.]

3.1.7
actuator
part of the actuating system which receives a human actuating action

Note 1 to entry: For the purposes of this standard, the actuator in the case of an interactive screen display is considered to be that part of the screen display which represents the actuator functions.

[SOURCE: IEC 60447:2004, 3.1, modified – The notes have been replaced by Note 1 to entry.]

3.1.8
man-machine interface
MMI
human-machine interface
HMI
part of the equipment intended to provide a direct means of communication between the operator and the equipment, and which enables the operator to control and monitor the operation of the equipment

Note 1 to entry: Such parts may include manually operated actuators, indicators and screens.

[SOURCE: IEC 60447:2004, 3.3, modified – addition of "human-machine interface (HMI)".]

3.1.9
brightness
attribute of a visual sensation according to which an area appears to emit more or less light

[SOURCE: IEC 60050-845:1987, 845-02-28]

3.1.10
contrast
1) in the perceptual sense: Assessment of the difference in appearance of two or more parts of a field seen simultaneously or successively (hence: brightness contrast, lightness contrast, colour contrast, simultaneous contrast, successive contrast, etc.)

2) in the physical sense: Quantity intended to correlate with the perceived brightness contrast, usually defined by one of a number of formulae which involve the luminance of the stimuli considered, for example: $\Delta L\ /\ L$ near the luminance threshold or L_1/L_2 for much higher luminance

[SOURCE: IEC 60050-845:1987, 845-02-47]

3.1.11
perceived colour
colour
attribute of visual perception consisting of any combination of chromatic and achromatic content. This attribute can be described by chromatic colour names such as yellow, orange, brown, red, pink, green, blue, purple, etc., or by achromatic colour names such as white, grey, black, etc., and qualified by bright, dim, light, dark, etc., or by combinations of such names.

Note 1 to entry: Perceived colour depends on the spectral distribution of the colour stimulus, on the size, shape, structure and surround of the stimulus area, on the state of adaptation of the observer's visual system, and on the observer's experience of the prevailing and similar situations of observation.

Note 2 to entry: See Notes 1 and 2 to IEC 60050-845:1987, 845-03-01.

Note 3 to entry: Perceived colour may appear in several modes of colour appearance. The names for various modes of appearance are intended to distinguish among qualitative and geometric differences of colour perceptions. Some of the more important terms of the modes of colour appearance are given in IEC 60050-845:1987, 845-02-19, 20, 21.

Other modes of colour appearance include film colour, volume colour, illuminant colour, body colour, and Ganzfeld colour. Each of these modes of colour appearance may be further qualified by adjectives to describe combinations of colour or their spatial and temporal relationships. Other terms that relate to qualitative differences among colours perceived in various modes of colour appearance are given in IEC 60050-845:1987, 845-02-22, 23, 24, 25.

[SOURCE: IEC 60050-845:1987, 845-02-18, modified (addition of "colour" to term)]

3.1.12
contrast sensitivity
S_c
reciprocal of the least perceptible (physical) contrast, usually expressed as $L / \Delta L$, where L is the average luminance and ΔL is the luminance difference threshold

Note 1 to entry: The value of contrast sensitivity S_c depends on the luminance and on the viewing conditions, including the state of adaptation.

[SOURCE: IEC 60050-845:1987, 845-02-48]

3.1.13
spatial frequency
inverse of the period of a repetitive spatial phenomenon. The dimension of the spatial frequency is inverse length.

[SOURCE: IEC 62220-1:2003, 3.15]

3.1.14
signal light
object or apparatus designed to emit a light signal

[SOURCE: IEC 60050-845:1987, 845-11-05]

3.1.15
object
entity treated in a process of development, implementation, usage and disposal

Note 1 to entry: The object may refer to a physical or non-physical "thing", i.e. anything that will exist, exists or existed.

Note 2 to entry: The object has information associated to it.

[SOURCE: IEC 81346-1:2009, 3.1, Note 1 to entry modified]

3.1.16
instructions for use
information provided by the supplier of a product to the user, containing all the necessary provisions to convey the actions to be performed for the safe and efficient use of the product

Note 1 to entry: Instructions for use of a single product comprise one or more documents.

[SOURCE: IEC 82079-1:2012, 3.19]

3.1.17
process flow diagram
representation of a process or a process plant by means of graphical symbols, interconnected by flow lines; the graphical symbols represent equipment and the lines represent flows of mass and energy or energy carriers

[SOURCE: IEC 61355-D00042 (2008-04), modified – "The process flow diagram depicts" was replaced by "representation of".]

3.1.18
continuous process
process in which an item is produced without interruption

Note 1 to entry: Although chemicals are mainly manufactured in batches, this is still considered a continuous process since the variables that control the process can be varied continuously.

3.1.19
glare
condition of vision in which there is discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or to extreme contrasts

[SOURCE: IEC 60050-845:1987, 845-02-52]

3.1.20
achromatic (perceived) colour
perceived colour devoid of hue. The colour names white, grey and black are commonly used or, for transmitting objects, colourless and neutral

[SOURCE: IEC 60050-845:1987, 845-02-26, modified – Part 2 has been deleted.]

3.1.21
state
mode of being

3.1.22
signal word
word that calls attention to a product safety label and designates a category of risk

[SOURCE: ISO 3864-2:2004, 3.14]

3.1.23
safety colour
colour with special properties to which a safety meaning is attributed

[SOURCE: ISO 17724:2003, 66]

3.1.24
visual danger signal
visual signal indicating imminent onset or actual occurrence of a dangerous situation, involving risk of personal injury or equipment disaster, and requiring some human response to eliminate or control the danger or requiring other immediate action

Note 1 to entry: A distinction is made between two types of visual danger signal: visual warning signal and visual emergency signal.

[SOURCE: ISO 11428:1996, 3.1]

3.1.25
visual warning signal
visual signal indicating the imminent onset of a dangerous situation requiring appropriate measure for the elimination or control of the danger

[SOURCE: ISO 11428:1996, 3.1.1]

3.1.26
visual emergency signal
visual signal indicating the beginning or the actual occurrence of a dangerous situation requiring immediate action

[SOURCE: ISO 11428:1996, 3.1.2]

3.2   Abbreviations

SCADA   Supervision, Control And Data Acquisition

HMI   Human Machine Interface

CAE   Computer Aided Engineering

4   General

Visual displays are widely used for human interaction for many types of products and systems. Typically for the modern type of display is that the graphic representation of an object is not static but will react dynamically due to the automatic behaviour of the product/system or due to manual actions by the operator leading to change, for example colour, shape, etc. In the case that standardized graphical symbols, as presented in IEC 60617, ISO 14617, or IEC 60417, are used on these displays, it is often required that the dynamic behaviour of the represented object needs to be reflected by an identified change of the related graphical symbol.

Some examples including time- and state-dependent graphical symbols for use on screens and displays are:

– icons used on screens of personal computers, mobile equipment, mobile phones and touch screens;

– dynamic graphical symbols used on console and monitor screens of Human-Machine Interface (HMI) systems and Supervisory Control and Data Acquisition System (SCADA);

– icons and graphical symbols used in "interactive" documents, such as instruction for use and process flow diagrams, presented in electronic form, and

– engineering tools, for example Computer Aided Engineering tool (CAE), including test features with visual presentation of simulated or actual engineering result.

5 Reasons for dynamic representation of objects

5.1 General

This clause describes the reasons for a change of the presentation form of a graphical symbol in order to indicate to the human which operational state of the object is represented.

5.2 Change of state of an object in the supervised process

The reason for using a dynamic graphical symbol is the case where the graphical symbol is used in a supervisory system to represent an object, which, by changing its operational state, will influence the supervised process. This is applicable for SCADA system and other industrial processes like process control systems, etc.

It is recognized that even if the supervision basically uses only two states (e.g. ON/OFF) it is required also to indicate the other occurring states.

Table 1 provides examples of generically defined operational states of an object.

**Table 1 – Generic operational states used during
operation of an object (informative / exemplary)**

Nr.	Term	Definition
1	OFF; DISCONNECTED	state of an object de-energized, passive or not running NOTE 1 The term OFF MODE is used in the context of describing the state of an object concerning its power demands (see IEC 62542), and is not corresponding to the operational state defined in this standard. NOTE 2 The term DISCONNECTED is used in the context of describing the state of an object concerning its power demands (see IEC 62542), and does not correspond to the operational state defined in this standard.
2	CLOSING DOWN	state of an object preparing for the OFF state NOTE This can for example be cleaning the process details of the object so it can be used for processing again the next day. This can be automatically or manually performed
3	STOPPED	state of a process manually or automatically aborted and made passive or not running
4	FINISHED	state of a process having fulfilled its assigned task and made de-energized, passive or not running
5	SELECTED	state of an object chosen and waiting for a command NOTE After execution of the command, the operational state SELECTED is finished. If the command is not executed within a defined period of time, the selected object will return into the operational state it had before the last selection occurred. For a new action the object needs to be selected again.
6	COMMAND ACKNOWLEDGED	state of an object having received a check back indication confirming that the actual action command for changing the operational state of the object has been accepted NOTE The accepted action is based on the previous command for changing the operational state of the object.
7	IN TRANSITION	state of an object having received an accepted command for execution NOTE The transition period is finished when the object has reported that it has changed from its previous state.
8	ON	state of an object energized, active or running. NOTE The term ON MODE is used in the context of describing the state of an object concerning power demands (see IEC 62542), and is not corresponding to the operational state defined in this standard.
9	AUTO	the object (with its sub-objects) is under automatic control
10	MANUAL	the object (with its sub-objects) is under manual control