

Basic and safety principles for man-machine interface, marking and identification — Coding principles for indication devices and actuators

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National foreword

This British Standard has been prepared by Technical Committee GEL/16 and is the English language version of EN 60073:1996 *Basic and safety principles for man-machine interface, marking and identification — Coding principles for indicating devices and actuators*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 73:1996, published by the International Electrotechnical Commission (IEC). It supersedes BS EN 60073:1993 which is withdrawn.

Cross-references

Publication referred to	Corresponding British Standard
IEC 50(441):1984	BS 4727 <i>Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms</i> Part 2 <i>Terms particular to power engineering</i> Group 06:1985 <i>Switchgear and controlgear terminology (including fuse terminology)</i>
IEC 447:1993	BS EN 60447:1994 <i>Man-machine interface (MMI) — Actuating principles</i>
IEC 617 series	BS EN 60617 series <i>Graphical symbols for diagrams</i>
IEC 1310-1:1995	BS EN 61310-1 <i>Safety of machinery — Indication, marking and actuation</i> Part 1:1995 <i>Requirements for visual, auditory and tactile signals</i>
ISO 7000:1989	BS 7324:1990 <i>Guide to graphical symbols for use on equipment</i>

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 24, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Descriptors: Indicator light, push-button, mechanical indicator, colour

English version

Basic and safety principles for man-machine
interface, marking and identification
Coding principles for indication devices and actuators
(IEC 73:1996)

Principes fondamentaux et de sécurité
pour les interfaces homme-machines,
le marquage et l'identification
Principes de codage pour les dispositifs
indicateurs et les organes de commande
(CEI 73:1996)

Grund- und Sicherheitsregeln für
die Mensch-Maschine-Schnittstelle,
Kennzeichnung
Codierungsgrundsätze für Anzeigen-geräte
und Bedienteile
(IEC 73:1996)

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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 document 16/356/FDIS, future edition 5 of IEC 73, prepared by IEC TC 16, Basic and safety principles for man-machine interface, marking and identification, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60073 on 1996-10-01.

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) 1997-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-07-01

Annexes designated “normative” are part of the body of the standard.
Annexes designated “informative” are given for information only.
In this standard, Annex A and Annex ZA are normative and Annex B, Annex C and Annex D are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 73:1996 was approved by CENELEC as a European Standard without any modification.

In the official version, for Annex D, Bibliography, the following note has to be added for the standard indicated:

IEC 204-1 NOTE Harmonized as 60204-1:1992 (modified).

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0 Introduction

This basic safety publication is intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 104 [1]¹⁾ and in ISO/IEC Guide 51 [2]¹⁾.

It should be noted that one of the responsibilities of a technical committee is, wherever possible, to include or refer to the requirements of basic safety publications in standards for equipment within its scope. Consequently, the requirements of this basic safety publication apply only if they are included, or are referred to in those standards.

Supervision and intervention are the principal tasks of personnel engaged in the monitoring and control of equipment or processes.

Indicating devices for the representation of conditions, and actuating devices to enable intervention under normal and fault conditions, are essential to this purpose.

The information presented should meet the needs of the users for the monitoring and control tasks which they are required to perform, for example, in extensive industrial processes.

Safety and ergonomic aspects should also be taken into account. The use of only a single means of coding is often insufficient to ensure unambiguous representation of information.

Apart from an unambiguous marking of the indicating and actuating devices there is a requirement for a clear and consistent system of coding.

The choice of a code will depend on the information which it is intended to impart. This may relate to the state of equipment (or part of it), to the condition of a process, and/or to the effects which this condition has on persons, property and the environment.

The user is required to decide on which of these criteria the coding for the relevant application is to be based.

1 Scope

This International Standard establishes general rules for assigning particular meanings to certain visual, acoustic and tactile indications in order to

- increase the safety of persons, property and/or the environment through the safe monitoring and control of the equipment or process;
- facilitate the proper monitoring, control and maintenance of the equipment or process;

- facilitate the rapid recognition of control conditions and actuator positions.

This standard is for general application:

- from simple cases such as single indicator lights, push-buttons, mechanical indicators, light emitting diodes (LEDs) or video display screens to extensive control stations which may include a wide variety of devices for controlling an equipment or process;
- where the safety of persons, property and/or the environment is involved, and also where the above-mentioned codes are used to facilitate the proper monitoring and controlling of equipment;
- where a particular kind of coding is to be assigned by a technical committee to a special function.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards. IEC 27, *Letter symbols to be used in electrical technology*.

IEC 50(441):1984, *International Electrotechnical Vocabulary (IEV) — Chapter 441: Switchgear, controlgear and fuses*.

IEC 50(845):1987, *International Electrotechnical Vocabulary (IEV) — Chapter 845: Lighting*.

IEC 417, *Graphical symbols for use on equipment — Index, survey and compilation of the single sheets*.

IEC 447:1993, *Man-machine interface (MMI) — Actuating principles*.

IEC 617, *Graphical symbols for diagrams*.

IEC 1310-1:1995, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals*.

ISO 3864:1984, *Safety colours and safety signs*.

ISO 7000:1989, *Graphical symbols for use on equipment — Index and synopsis*.

ISO 8201:1987, *Acoustics — Audible emergency evacuation signal*.

CIE (International Commission on Illumination): Publication No. 2-2 (TC 1.6):1975, *Colors of light signals*

¹⁾ Figures in square brackets refer to the bibliography given in Annex D.

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1

coding

the systematic representation of specific signals or values by another set of signals, which has to conform to a definite set of rules [IEC 1310-1:1995, 3.22]

3.2 Indicating device

A mechanical, optical or electrical device providing visual, acoustic or tactile information.

3.2.1

acoustic signal²⁾

a message conveyed by means of tone, frequency and intermittency, emanating from a sound source

3.2.2

tactile signal²⁾

a message conveyed by means of vibration, force, surface roughness, contour or position

3.2.3

visual signal²⁾

a message conveyed by means of brightness, contrast, colour, shape, size or position

3.3

actuator

the part of the actuating system which receives a human actuating action [IEC 447:1993, 3.1]

NOTE For the purpose 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 function.

3.4

mechanical indicator

indicating device which forms an integral part of a mechanical or electro-mechanical switching device (e.g. circuit-breaker) and which indicates whether it is in the OPEN or CLOSED position or an intermediate position (e.g. star position of a star-delta starter) but which is not intended as a manual actuator

3.5

man-machine interface (MMI)

the parts of the equipment intended to provide a direct means of communication between the operator and the equipment, and which enable the operator to control and monitor the operation of the equipment [IEC 447:1993, 3.3]

NOTE Such parts may include manually operated actuators, indicating devices and screens.

3.6

signal light

object or apparatus designed to emit a light signal [IEV 845-11-05]

3.7

light emitting diode (LED)

solid-state device embodying a p-n junction, emitting optical radiation when excited by an electric current [IEV 845-04-40]

3.8

illuminated actuator

actuator with an integrated light source giving visual indication by illumination. The operation of the light source may be related to or independent of the actuator action

3.9

hue

attribute of a visual sensation according to which an area appears to be similar to one of the perceived colours, red, yellow, green, and blue, or to a combination of two of them [IEV 845-02-35]

3.10

brightness

attribute of a visual sensation according to which an area appears to emit more or less light [IEV 845-02-28]

3.11

saturation

chromaticness, colourfulness, of an area judged in proportion to its brightness [IEV 845-02-41]

NOTE For given viewing conditions and at luminance levels within the range of photopic vision, a colour stimulus of a given chromaticity exhibits approximately constant saturation for all luminance levels, except when the brightness is very high.

3.12

contrast

a) 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.*).

b) 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 luminances of the stimuli considered, for example: $\Delta L/L$ near the luminance threshold, or L_1/L_2 for much higher luminances. [IEV 845-02-47]

²⁾ For the purpose of this standard the definition differs from that in IEC 447.

4 Coding principles

4.1 General

Coding principles shall be established at an early stage of system design and shall be consistent with those used for other equipment within the same plant or process.

The choice of a certain code will depend on the tasks of the personnel and the associated service conditions in which these tasks have to be fulfilled.

It is recommended to apply one or more of the following means of indication coding:

Visual codes:

- by colour;
- by shapes;
- by position;
- by changing characteristics over time (flashing).

Acoustic codes:

- by type of sound;
- by pure tone;
- by changing characteristic over time.

Tactile codes:

- by shapes;
- by force;
- by vibration;
- by position;
- by changing characteristic over time.

Table 1 gives examples of these means of coding.

The meaning of the selected codes shall be unambiguous and shall be explained in the associated documentation of the particular equipment and/or the plant.

4.2 Visual codes

Colour and changing of elements over time (flashing) are the most effective visual means of attracting attention. Therefore these codes shall be used with consistent meanings; colours for giving priority and flashing for attracting attention.

Where persons with defective colour vision may be employed as operators, it is recommended that colour shall not be the sole means of coding.

Where the meaning of colour relates to the safety of persons or the environment (see 4.2.1.1) then supplementary means of coding shall be provided.

When certain service conditions will not permit the application of colours in the specified definition then alternative codes to colours shall be provided (see 4.2.2 and the following subclauses of clause 4).

NOTE "Supplementary to another code" means "in addition to" (e.g. shape in addition to colour). "Alternative to another code" means "instead of" (e.g. shape instead of colour).

Table 1 — Means of coding

Means	Characteristic
Visual codes	
Colour	— Hue — Saturation — Brightness — Contrast
Shape	— Figure (alphanumeric, pictographs, graphical symbols, lines) — Form (character font, size, line width) — Texture (line type, shading, dotting)
Position	— Location (absolute, relative) — Orientation (with or without reference system)
Time	Changing over time (flashing): — Brightness — Colour — Shape — Position
Acoustic codes	
Type of sound	— Tone — Noise — Spoken message
Pure tone	— Selected frequency
Time	Change of — Frequency composition over time — Sound volume over time — Total duration
Tactile codes	
Shape	— Form — Surface roughness
Force	— Amplitude
Vibration	— Amplitude — Frequency
Position	— Location (absolute, relative) — Orientation (with or without reference system)
Time	Change of: — Force over time — Vibration over time

4.2.1 Coding by colours

Specific meanings are assigned to specific colours (see Table 2) and these colours shall be easily identifiable and distinguishable from the background colour and any assigned colours. Certain colours shall be reserved for safety applications.

For clarity, it is recommended that the number of colours used in a given application is kept to the minimum practicable.