

INTERNATIONAL STANDARD

CONSOLIDATED VERSION

BASIC SAFETY PUBLICATION

Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors

CONTENTS

FOREWORD	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Methods of identification	9
5 Application of identification means	9
6 Identification by colours	10
6.1 General	10
6.2 Use of single colours	10
6.2.1 The use of the single colours GREEN and YELLOW	10
6.2.2 Neutral or mid-point conductor	10
6.2.3 Line conductor in AC system	11
6.2.4 Line conductor in DC system	11
6.2.5 Functional earthing conductor	11
6.2.6 Functional bonding conductor	11
6.3 Use of bi-colour combinations	11
6.3.1 Permitted colours	11
6.3.2 Protective conductor	11
6.3.3 PEN conductor	12
6.3.4 PEL conductor	12
6.3.5 PEM conductor	13
6.3.6 Protective bonding conductor	13
7 Identification by alphanumeric notation	13
7.1 General	13
7.2 Equipment terminal identification – Marking principles	14
7.3 Identification of certain designated conductors	16
7.3.1 General	16
7.3.2 Neutral conductor	16
7.3.3 Protective conductor	17
7.3.4 PEN conductor	17
7.3.5 PEL conductor	17
7.3.6 PEM conductor	17
7.3.7 Protective bonding conductor	17
7.3.8 Functional earthing conductor	17
7.3.9 Functional bonding conductor	17
7.3.10 Mid-point conductor	17
7.3.11 Line conductor	17
7.3.12 System-referencing-conductor	18
Annex A (informative) Colours, alphanumeric notations and graphical symbols used for identification of conductors and terminals	19
Annex B (informative) List of notes concerning particular conditions in certain countries	23
Bibliography	28
Figure 1 – Single element with two terminals	14

Figure 2 – Single element with four terminals: Two endpoints and two intermediate points	14
Figure 3 – Three-phase equipment with six terminals.....	15
Figure 4 – Three-element equipment with twelve terminals: Six endpoints and six intermediate points	15
Figure 5 – Equipment with groups of elements.....	16
Figure 6 – Interconnection of equipment terminals and certain designated conductors.....	16
 Table A.1 – Colours, alphanumeric notations and graphical symbols used for identification of conductors and terminals	 19

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60445 edition 7.1 contains the seventh edition (2021-07) [documents 3/1491/FDIS and 3/1517/RVD] and its amendment 1 (2026-01) [documents 3/1753/FDIS and 3/1766/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

IEC 60445 has been prepared by IEC technical committee 3: Documentation, graphical symbols and representations of technical information. It is an International Standard.

It has the status of a basic safety publication in accordance with IEC Guide 104.

This seventh edition cancels and replaces the sixth edition published in 2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the definitions have been aligned with IEC 60050-195:2021 and IEC 60050-826:—¹;
- b) the provisions for colour to be used for identification of certain designated conductors are made requirements and not only recommendations;
- c) introduction of a new subclause on marking of protective terminals for multiple power supply inputs on equipment.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
3/1491/FDIS	3/1517/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The reader's attention is drawn to the fact that Annex B lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this standard.

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

- reconfirmed,
- withdrawn, or
- revised.

¹ Third edition under preparation. Stage at time of publication: IEC FDIS 60050-826:2021.

1 Scope

This document applies to the identification and marking of terminals of electrical equipment such as resistors, fuses, relays, contactors, transformers, rotating machines and, wherever applicable, to combinations of such equipment (e.g. assemblies), and it also applies to the identification of terminations of certain designated conductors. It also provides general rules for the use of certain colours or alphanumeric notations to identify conductors with the aim of avoiding ambiguity and ensuring safe operation. These conductor colours and alphanumeric notations are intended to be applied on cores, busbars, and electrical equipment, and in cables or installations.

This basic safety publication focusing on safety essential requirements is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

It is not intended for use by manufacturers or certification bodies. One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications. The requirements of this basic safety publication will not apply unless specifically referred to or included in the relevant publications.

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 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

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

Bibliography

IEC 60050-195:2021, *International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock*

IEC 60050-826:—², *International Electrotechnical Vocabulary (IEV) – Part 826: Electrical installations*

IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60227-2, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods*

IEC 60757, *Code for designation of colours*

IEC 61666:2010, *Industrial systems, installations and equipment and industrial products – Identification of terminals within a system*

IEC 62491, *Industrial systems, installations and equipment and industrial products – Labelling of cables and cores*

IEC Guide 104, *The preparation of safety publications and the use of basic safety publications and group safety publications*

ISO/IEC Guide 51, *Safety aspects – Guidelines for their inclusion in standards*

National Fire Protection Association, NFPA 70, *National Electrical Code*

² Third edition under preparation. Stage at time of publication: IEC FDIS 60050-826:2021.