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Guidelines for the inclusion of documentation aspects in product standards

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee GEL/3, Documentation and graphical symbols.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Guidelines for the inclusion of documentation aspects in product standards

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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GUIDELINES FOR THE INCLUSION OF DOCUMENTATION ASPECTS IN PRODUCT STANDARDS

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62666, which is a technical specification, has been prepared by IEC technical committee 3: Information structures and elements, identification and marking principles, documentation and graphical symbols.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

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

a) the references to relevant standards have been updated and horizontal standards have been designated;

b) a new subclause "Identification of equipment, basic and safety principles" has been added. The reason for this is that a group of standards have been placed under the responsibility of TC 3.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
3/1256/DTS	3/1261/RVC

Full information on the voting for the approval of this technical specification 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 website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This Technical Specification is developed in response to expressed needs for guidelines on requirements for documentation in product and system standards.

This document is written for the target group Product Committee Secretaries, PT- and MT-members, etc. It provides some basic information on documentation principles, explanations and justifications to why the references to documentation standards should be made. It is assumed that experts developing product standards have not necessarily relevant documentation aspects as their primary interest. As a consequence, the text may by some be found too “educational” for a standard. In a guideline it may, however, be more appropriate.

The two annexes are examples intended to be used as templates for how texts should be included in product standards.

GUIDELINES FOR THE INCLUSION OF DOCUMENTATION ASPECTS IN PRODUCT STANDARDS

1 Scope

This Technical Specification provides guidelines to ensure consistency with respect to the specification of requirements for information, documentation and graphical symbols in IEC publications provided by system or product committees.

NOTE 1 Guidelines regarding inclusion of graphical symbols on equipment are presented in IEC 62648.

NOTE 2 This Technical Specification is based on and fully customizes IEC Guide 108.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

NOTE 1 An alphabetical index including all terms is contained at the end of this document.

NOTE 2 Definitions taken over from other International Standards are not necessarily literally cited, but adapted to the form required for terms and definitions according to the ISO/IEC Directives.

3.1
knowledge
body of understanding and skills

Note 1 to entry: The “body of understanding” can e.g. consist of facts, concepts and instructions.

3.2
information
knowledge (see 3.1) that is communicated

3.3
data
representation of information (see 3.2) in a formalized manner suitable for communication, interpretation or processing

Note 1 to entry: Data can be processed by humans or by electronic means.

3.4
data carrier
material on which data (see 3.3) can be stored

3.5
medium
means of representing data (see 3.3) on a data carrier (see 3.4)

3.6
data element type
DET
unit of data (see 3.3) for which the identification, description and value representation have been specified

[SOURCE: IEC 61360-1:2009, 2.3]

3.7
document
fixed and structured amount of information (see 3.2) that can be managed and interchanged as a unit between users and systems

Note 1 to entry: This unit may not necessarily be human perceptible. Information (see 3.2) is usually stored as data on a data medium (see 3.5).

Note 2 to entry: "users" refers in this definition to users of information (see 3.2) and "systems" refers to systems managing information and documentation (see 3.10).

[SOURCE: IEC 82045-1:2001, 3.2.3, modified – Note 1 has been slightly changed and Note 2 has been added.]

3.8
document kind
type of document (see 3.7) defined with respect to its specified content of information (see 3.2) and form of presentation

[SOURCE: IEC 61355-1:2008, 3.6]

3.9
document set
collection of documents (see 3.7) that are managed together as a unit for a specific purpose

Note 1 to entry: Document sets may consist of documents (see 3.7) and composite documents.

[SOURCE: IEC 61355-1:2008, 3.4, modified – The definition has been slightly changed.]

3.10
documentation
collection of documents (see 3.7) related to a given subject

Note 1 to entry: This can include technical, commercial and other documents (see 3.7).

Note 2 to entry: The term may refer to objects in the sense of IEC 81346 series or to other things to be addressed.

Note 3 to entry: A documentation can consist of documents, composite documents and document sets.

Note 4 to entry: The number and kinds of documents in a documentation can differ according to purpose.

[SOURCE: IEC 61355-1:2008, 3.5]

3.11
domain
distinguished part of an abstract or physical space where something exists

Note 1 to entry: A domain can be e.g. an organization or a country or a part of it.

[SOURCE: IEC 62507-1:2010, 3.2]

3.12
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 might exist, exists or did exist.

Note 2 to entry: The object has information (see 3.2) associated to it.

[SOURCE: IEC 81346-1:2009, 3.1]

3.13
characteristic property
defined parameter suitable for the description and differentiation of objects (see 3.12)

[SOURCE: IEC PAS 62569-1:2009, 3.1.6, modified – "Characteristic" has been added to "property" and the note has been deleted.]

3.14
identifier
attribute associated with an object (see 3.12) to unambiguously identify it in a specified domain (see 3.11)

Note 1 to entry: In an identification system several types of identifiers may be required.

[SOURCE: IEC 62507-1:2010, 3.8]

3.15
identification number
ID
string of characters representing the value of the identifier (see 3.14)

Note 1 to entry: It is practice that although the term says “number” the string can contain other types of characters as well.

Note 2 to entry: Note that the term “identifier” (see 3.14) as being an attribute and the term ”identification number” as being the value of that attribute are here considered different things, but they are often mixed in existing definitions.

Note 3 to entry: Identification numbers are often required to be unique (an object (see 3.12) shall have one number only). This is an unnecessary strong requirement, it is sufficient if they are unambiguous within a specified *domain*. An *object* may have more than one identification number.

Furthermore, it is assumed in the definition that an organization may be responsible for more than one identification number domain. This is a commonly occurring situation when organizations are merged, etc.

[SOURCE: IEC 62507-1:2010, 3.5]

3.16
horizontal standard
standard on fundamental principles, concepts, terminology or technical characteristics, relevant to a number of technical committees and of crucial importance to ensure the coherence of the corpus of standardization documents

[SOURCE: IEC Guide 108:2006, 3.1]

3.17
product publication
publication covering a specific product or group of related products

Note 1 to entry: In this document, the term product includes items such as process, service, installation and combinations thereof, commonly known as systems.

Note 2 to entry: "product publication" refers in this document to publications issued by IEC. The same term is sometimes used by product manufacturers with a different meaning.

[SOURCE: IEC Guide 108:2006, 3.2, modified – Note 2 has been added.]

3.18
commissioning
procedures prior, or related, to the handing over of a product ready for putting into service, including final acceptance testing, the handing over of all documentation relevant to the use of the product and, if necessary, instructing personnel

[SOURCE: IEC 82079-1:2012, 3.3]

4 Principal guidelines

4.1 Adaptation to the needs for the system or product

Documentation is a result of development and engineering of a system or a product. Its major purpose is to enable the system or product to be manufactured and supplied to users for intended use.

The provision of information in the form of documentation is an integral part of any delivery of system or a product and one purpose is to transfer knowledge of the system or product from the supplier to the user.

The documents accompanying the system or the product are a subset of the total number of documents on it. Documents for manufacturing and results of testing are examples on other documents. The information accompanying the system or the product should promote correct and safe application and use of the system or product for the remaining part of its life cycle.

Product standards should therefore specify required

- information, and
- documentation.

The primary requirement is on the information needs and the structuring of this information so that required information can be easily accessed by users.

A secondary requirement is how this information is "packaged" and presented in the form of a logically related collection of documents, i.e. the documentation for the system or product on relevant media.

The requirements on the documentation and the amount of documents needed depend on the complexity of the system or product as well as of the intended use and foreseen users and may vary. The specified requirements in the system or product standard should therefore be adapted to the needs in the actual case.

4.2 Adaptation to the structure of the publication

In a product publication, the requirements on information and documentation should preferably be collected in one clause with subclauses for information and documentation requirements respectively.

The requirements should be included by referencing to the relevant specialized documentation standards where available, in order to keep the content of the references up-to-date with actual developments of these standards.

For the sake of understanding and promotion, the referencing should not only be made by listing standard identification numbers of such standards but should also include some introductory information that explains and justifies each reference.

If there are special documentation requirements not yet covered by existing standards, these should be incorporated as text in the system or product standard. In such cases, relevant IEC or ISO committees should also be informed about the missing information for due consideration when existing standards are revised or in order to develop new ones.

Note that before making such a proposal, consideration should be given to the fact that the terminology used in the documentation standards, for example names of document types, may be different compared to the terminology used among experts in the product committee. The database IEC 61355 (http://std.iec.ch/iec61355) contains the recommended terminology, but also a number of synonyms, and suggestions on how to deal with them.

Clause 5 provides information on the requirements covered in available documentation standards. The purpose of this clause is to make readers aware of the content in order to decide whether or not the requirements are relevant for the actual product publication.

Annex A is intended as a template for a clause for “Technical documentation” in a product standard for a comprehensive system or equipment (for example industrial plant or installation), which requires comprehensive documentation. The product may in this case also be expected to be modified by the user during its remaining life time and its documentation therefore to be updated and maintained by the user. The number of needed technical documents can in this case be high.

Annex B is intended as a template for a clause for “Technical documentation” in a product standard for a relatively simple (from a user perspective) consumer product that requires a simple installation or no installation at all. The supplied documentation is not intended to be updated nor maintained by the user, and it therefore focuses on the activities to be performed by the end user. In this situation, the amount of technical documents needed can be expected to be low.

Note that these annexes are examples only which can be reduced as well as extended for a specific purpose. The annexes are noted as informative in this document but the annexes show an example of text to be used normatively in a product standard, therefore the annexes use the “shall” instead of “ should”.

All IEC deliverables shall be prepared in accordance with the ISO/IEC Directives, Part 2. Clause 28 and 29 of the directives regarding the use of figures, including drawings, diagrams and graphical symbols in publications are based on and refer also to publications described in the following, i.e. the requirements on documentation in product standards are applicable also to the publications themselves.

5 Requirements to be covered

5.1 Information requirements

The general purpose of the documentation of a system or a product is to enable its development, provide information for its manufacturing or assembly, document in test reports its required properties or performance and to transfer knowledge of the system or product from the supplier to the user.

The purpose of that part of the documentation accompanying a delivered system or product is to provide the information necessary for the remaining activities in the life cycle of it, i.e. usually for the installation and application, the operation and maintenance, and of the disassembly and recycling.

The amount of information can be very large, and the structuring of it, and thus also the structuring of the documentation, is therefore important for quick and efficient retrieval of information. Therefore the requirements in standards shall point out the necessity of well organized and informative documentation, both with regard to single products and to systems.

The basis for the structuring of information is the assumption that

– **descriptive information** shall be structured in a way that “models” how a **user** of the information perceives the system or product from different aspects, and
– **activity related information** shall be structured along activities during the life cycle of the delivered system or product.

Both of these major types of information shall normally be provided. In simpler cases (e.g. a small consumer product), they may be provided in one single document.

Note that the document kind “Instructions for use” is the minimum set of information that shall be supplied for any product, see IEC 82079-1.

In more complex cases (e.g. industrial plants and installations with separately defined sub-systems and components), the information needs to be structured into sets of documents.

The basis for the structure of the sets of documents, i.e. the scope of information to be presented in each document, is:

a) organize the documentation with regard to the sub-systems and components building up the entire system or product, see IEC 62023 and IEC 81346-1;
b) within a system or a product or its constituents, prepare the descriptive documentation with regard to the kind of information contained (for example circuit diagram, assembly drawing, etc.), see IEC 61355 for possible document kinds;
c) organize the documentation containing activity related information with regard to the life cycle of the system or product, within the framework defined in accordance with a), see IEC 61355 for possible document kinds.

The documentation shall be so prepared that duplication of information among the documents is minimized. Thus, the complete set of documents for a certain system or product prepared by the manufacturer or supplier in accordance with relevant documentation standards shall be considered as the basic or the source documentation for that system or product.

The source information (documents, database content, etc.) shall be kept by the owner party in accordance with the applicable requirements of the ISO 9000 series or for any legal purposes or policies of the owner party.

Any agreed other requirements on structuring or distribution of documentation in certain containers (structured to suit the user organisations or to be structured to suit the agreed types of media to be supplied, etc.) shall be considered copies and may not influence the structure of the original documentation. In other words, any such supplied document set shall be considered as a copy. It may be a subset of the original document set.

5.2 Documentation requirements

5.2.1 General

The documentation shall be supplied in the most appropriate form for conveying the information, for example: drawings, diagrams, charts, tables, instructions (text, audio, and video). Standards related to products and systems shall not only require that documents should be included in the delivery but also that the documents shall be prepared and named in accordance with relevant documentation standards.

The documentation shall be supplied as a document set on a medium or on media suitable for the environment where the information is expected to be needed, for example paper, electronic file on ROM (separated from the delivered system or product or integrated into it), or via Internet. Due to the varying needs and continuous development in this area, the types of medium might need to be agreed by the involved parties along the contract.

For the sake of clarification of the responsibility for the delivered system or product and as a record of the business transaction, the documentation shall at least be delivered as a document set in non-revisable form.

NOTE As an example of a non-revisable form, the PDF-A format as specified in ISO 19005-1 can be mentioned. This format is specifically recommended for long archiving periods.

A delivered system or product can be foreseen to be changed or modified after delivery. As a consequence, its documentation might need to be revised. To facilitate this, the documentation (or parts of it) might additionally need to be delivered as a document set in revisable form. Deliveries of revisable document sets should be agreed by the involved parties along the contract.

5.2.2 Structuring of the documentation

5.2.2.1 General

The structuring is dealt with in the following standards.

IEC 81346-1, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules (horizontal standard)* is a standard published jointly by IEC and ISO. It describes structuring principles for systems and products in general, and the subdivision of these into constituent objects.

IEC 62023, *Structuring of technical information and documentation (horizontal standard)* uses the structuring principles established in the IEC 81346 series and transforms them into structuring principles for related information and documentation by requiring that each defined object shall have a logically self-contained documentation of its own. This principle makes it possible to include, for example, documentation from sub-suppliers into larger contexts in a logical way and without any rework.

The IEC 81346 series and IEC 62023 provide a “back bone” for the organization of descriptive information in the form of documents as well as the organization of the information inside many documents.

IEC 61355-1, *Classification and designation of documents for plants, systems and equipment – Part 1: Rules and classification tables (horizontal standard)* provides further guidance on how to organize a physically delivered document set and provides also a classification system for retrieval purposes.

IEC 82079-1, *Preparation of instructions for use – Structuring, content and presentation – Part 1: General principles and detailed requirements (horizontal standard)* specifies requirements for activity related information along the life cycle of the system or product.

5.2.2.2 Consideration of software within a product

Modern products often contain software with associated data, to be executed either

a) by a processor integrated in the product,

b) by a processor or processors elsewhere in the overall system of which the product is a component, or

c) by any computer (e.g. PC) as a product by itself.

In the first case, in accordance with IEC 81346-1, the software and its associated data is considered as any other component of the actual product and documented (at least) in the product-oriented structure of this.

In the second and third case, the software is considered as one or more components of their own in the overall system. In this case, a software program may be associated with the relevant component executing it (in the product-oriented structure) and the data sets associated with the components to which they belong (in the product structure, the function-oriented structure or both).

In any case, the executing software, integrated or not, shall be documented by documents included in the ordinary documentation structure for the delivered system or product.

NOTE For software documentation for user guidance systems, see IEC 61506 *Industrial-process measurement and control – Documentation of application software*.

5.2.3 Identification and classification

5.2.3.1 Identification and classification of objects within the system or product

Identification is a necessary prerequisite for relating the system or product and its components to the content of the supplied documentation.

The identification of objects within a supplied system or product is based on the structuring principles defined in IEC 81346-1: *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules (horizontal standard)*.

Together with IEC 81346-2*: Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Classification of objects and codes for classes (horizontal standard)*, it provides a classification system for objects to be used together with the structuring principles of IEC 81346-1. Together, these two standards provide a reference designation system for identification of the defined objects/components within the supplied system or product, and also of objects in the existing environment such as rooms and areas.

Within a system, in which several components are connected, there is a need also to unambiguously identify signals, terminals and cables.

IEC 61175-1, *Industrial systems, installations and equipment and industrial products – Designation of signals – Part 1: Basic rules (horizontal standard),* describes how to create unambiguous designations of signals within a system, based on the reference designations for objects. The standard contains also a classification system for signals. IEC 61666 *Industrial systems, installations and equipment and industrial products – Identification of terminals within a system (horizontal standard)* describes how to create unambiguous designations of terminals within a system for the purpose of description of electrical and other networks.

IEC 81714-3 (horizontal standard) contains a classification of networks and product terminals, which shall be considered in the case of managing multiple types of networks, and products with different types of terminals connected to different types of networks.

In order to properly associate the objects identified in the documentation with the “real world” components, etc., labelling of the latter may be required.

Rules for labelling are provided in IEC 81346-1 already mentioned, and in IEC 62491, *Industrial systems, installations and equipment and industrial products – Labelling of cables and cores*.

NOTE 1 Such labelling is in addition to the usual product marking.

NOTE 2 Related to the use of labelling is the use of graphical symbols on the equipment for the provision of information to the user. Symbols for use on equipment are contained in IEC 60417 – ISO 7000 DB (http://www.graphical-symbols.info/equipment) *Graphical symbols for use on equipment*. For further information on how to deal with these in product standards, refer to a guideline published as IEC 62648.

5.2.3.2 Identification of equipment, basic and safety principles

All standards presented in this subclause are designated Basic Safety standards.

General rules for assigning particular meanings to certain visual, acoustic and tactile indications in order to increase the safety of persons and property are specified in IEC 60073 *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators.* IEC 60447 *Basic and safety principles for man-machine interface, marking and identification – Actuating principles* establishes general actuating principles for manually operated actuators forming part of the man-machine interface associated with electrical equipment, in order to increase the safety through the safe operation of the equipment.

The identification terminals of electrical equipment and terminations of certain designated conductors are shown in IEC 60445 *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and 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. Furthermore, minimum requirements and general rules on marking electrical equipment with ratings and other characteristics to enable the proper and safe selection and installation of electrical equipment related to any supply of electricity shown in IEC 61293 *Marking of electrical equipment with ratings related to electrical supply – Safety requirements*.

A minor standard defining letter codes for the designation of some distinct colours to be applied to the text of descriptions, drawings and markings in the electrotechnical field is IEC 60757 *Code for designation of colours*. Additionally, the standard IEC 60152 *Identification by hour numbers of the phase conductors of 3-phase electric systems* recommends how to identify the conductors of 3-phase interconnected systems by the use of hour (clock-face) numbers of the phase sequence.

5.2.3.3 Identification and classification of documents

All documents shall be identified by a document identification number in order to allow unambiguous referencing. Identification numbers are normally unambiguous only within a specific context (defined “domain”). Therefore, several document identification numbers may be needed. Two domains are essential (but other domains may be required):

– the domain of the issuing organization, and

– the domain created by the system or product *per se*.

All documents shall be provided with a document identification number that relates it to the responsible issuer of the document and which is unambiguous within the domain defined by this issuer.

For complex systems, it is usually advantageous to apply also document designation codes that classify the documents and relate them to the objects/components within the system.

Aspects of identification of documents are dealt with in a number of standards.

IEC 62023, *Structuring of technical information and documentation* requires that the identification of a main document shall have a close relation to the part number that identifies the object described. IEC 61082-1 *Preparation of documents used in electrotechnology – Part 1: Rules (horizontal standard)* contains the basic requirements concerning identification of documents and the presentation of identification numbers therein.

IEC 61355-1, *Classification and designation of documents for plants, systems and equipment – Part 1: Rules and classification tables (horizontal standard)* contains the basic requirements for classification.

References to these standards are in most cases sufficient in product standards. If it is required with a deeper look into the subject, the following standards provide additional requirements:

IEC 62507-1, *Requirements for identification systems enabling unambiguous information interchange – Part 1: Principles and methods (horizontal standard)*,

IEC 82045-1 and IEC 82045-2, *Document management – Part 1: Principles and methods (horizontal standard)*, and *Part 2: Metadata elements and information reference model (horizontal standard).*

5.2.4 Document kinds, their purpose and preparation

Document kind is a term used to characterize a document with regard to the information provided and how it is presented. Example: Information on connections can be presented either in a diagram (connection diagram) or in a table (connection table).

NOTE "Document kind" does not signify "Title". For further information, refer to IEC 82045-2.

IEC 61355-1, *Classification and designation of documents for plants, systems and equipment – Part 1: Rules and classification tables (horizontal standard)* lays down principles for the naming of document kinds and their encoding, and the associated IEC 61355 (http://std.iec.ch/iec61355) provides information on the expected (and in many cases also standardized) content of information.

IEC 61082-1, *Preparation of documents used in electrotechnology – Part 1: Rules (horizontal standard),* provides general rules for the preparation of documents and specific presentation rules for the most commonly used document kinds. This standard includes many normative references to other documentation standards, including such standards issued by ISO. A reference to IEC 61082-1 therefore implicitly specifies a substantial part of required references.

IEC 61082-1 provides rules for the most common document kinds such as diagrams (overview diagrams, function diagrams, circuit diagrams and connection diagrams), drawings (e.g. arrangement drawings), tables (e.g. connection tables) and charts (e.g. sequence charts). A number of other standards are available for specific document kinds:

IEC 60848, *GRAFCET specification language for sequential function charts*,

IEC 62027, *Preparation of object lists, including parts lists (horizontal standard)*,

IEC 82079-1, *Preparation of instructions for use – Structuring, content and presentation – Part 1: General principles and detailed requirements (horizontal standard)*,

IEC PAS 62569-1, *(series of international standards in preparation) Generic specification of information on products* provides information of how a product description shall be structured and what kind of information is to be provided.

5.2.5 Graphical symbols

Diagrams (like overview diagrams, function diagrams, circuit diagrams, connection diagrams, etc.) normally form an essential part of electrotechnical documentation, either as separate document kinds, or as illustrations in other kinds of document, where it is required to describe the connecting network between components.

IEC 60617 *Graphical symbols for diagrams* (http://std.iec.ch/iec60617) provides a huge set of graphical symbols to be used for the preparation of different kinds of diagrams. It includes for example symbols for

– conductors and connecting devices,
– basic passive components,
– semiconductors and electron tubes,
– production and conversion of electrical energy,
– switchgear, controlgear and protective devices,
– measuring instruments, lamps and signalling devices,
– telecommunications transmission, switching and peripheral equipment,
– architectural and topographical installation plans and diagrams,
– binary logical elements,
– analogue and hybrid elements.

If nevertheless some symbols are missing, guidance on how to create combinations and new ones are provided in IEC 61082-1, already mentioned above. If this does not help and there still is a lack of graphical symbols for the actual product type and its description, the product TC should consider developing the missing ones for inclusion in the IEC 60617 database in collaboration with TC3.

IEC 60617 covers symbols for electrotechnical symbols and “technology neutral” function symbols. If there is a need for symbols for mechanical equipment and for process control, the accompanying standard ISO 14617 (all parts) *Graphical symbols for diagrams*, should also be referenced.

The requirements for the design of graphical symbols to be used for library purposes in CAD and other systems are described in:

IEC 81714-2, *Design of graphical symbols for use in the technical documentation of products – Part 2: Specification for graphical symbols in a computer sensible form, including graphical symbols for a reference library, and requirements for their interchange (horizontal standard)* provides detailed guidance on how to design such symbols.

IEC 62744, *Representation of states of objects by graphical symbols (horizontal standard)* provides rules and recommendations for graphical symbols, dynamic representation of operational states in applications like SCADA, control systems, simulation, icons on graphical user interfaces, etc.

5.2.6 Characteristic properties and data element types

Technical specifications (like function specifications, detail specifications, data sheets, etc.) are also essential parts of electrotechnical/electromechanical documentation, either as separate document kinds or as parts of other kinds of documents, when it is essential to clearly express the characteristic properties of an object.

If such technical specifications are intended to be computer interpretable, for example for the purpose of retrieval of products with specific characteristic properties or for evaluation, the characteristic properties have further on to be unambiguously identified in a machine readable form.

IEC 62569, *Generic specification of information on products* is a series of publications that describes how to express characteristic properties in and how to structure computer interpretable technical specifications for products.

IEC 61360 is a series of standards including the data base *IEC Component Data Dictionary,* IEC CDD (http://std.iec.ch/iec61360), a dictionary of rigorously defined and identified data element types (DETs) used to express the characteristic properties of different product types, ensuring that the properties are also unambiguously computer interpretable.

In a product standard, it is appropriate to refer to this dictionary as a means to express the characteristic product properties.

CDD (IEC 61360-4) is a dictionary in continuous development and all product types are not yet covered. If there is a lack of DETs for the actual product type, the product TC should consider developing the missing ones for inclusion in the dictionary in collaboration with SC3D.

The methodology for the creation of such DETs is described in the associated standards:

IEC 61360-1, *Standard data element types with associated classification scheme for electric components – Part 1: Definitions – Principles and methods (horizontal standard)*,

IEC 61360-2 – *Standard data element types with associated classification scheme for electric components – Part 2: EXPRESS dictionary schema (horizontal standard).*

Further information is available in ISO/IEC Guide 77, *Guide for specification of product properties and classes – Part 1: Fundamental benefits*, *– Part 2: Technical principles and guidance*, and *– Part 3: Experience gained.*

The above mentioned standards presume that the values for the characteristic properties are provided for a product “as supplied”. It may be required in a technical specification to further qualify the values of characteristic properties with regard to their development over their life time, how they have been obtained (measured), etc. The methodology for how to do this is dealt with in IEC PAS 62569-1, *Generic specifications of information on products – Part 1: Principle and methods*. An international standard based on the PAS is in preparation.

5.3 Requirements on documentation generated by tools other than CAx tools

Many systems and products require programming, configuring or setting before they can be taken into service in the intended context. This adaptation of the system or product is part of the installation and commissioning activities. The result of these activities, in the form of information on the configuration, settings, etc. is necessary for the use during the remaining parts of the life cycle and shall therefore be documented.

In simple cases, this adaptation may be carried out manually, by operation of switches, potentiometers, etc. and the result entered in existing documentation, or in the form of setting lists, etc.

In more complex cases, specific tools such as programming units may be required for these adaptation activities. Such tools can be made available as, for example:

– an integrated part of the actual system or product;
– a specific accessory, connectable to the system or product when needed;
– a software for installation in an ordinary computer in turn intended to be connected to the system or product when needed; or
– a software available on the Internet, connectable to the system or product when needed.

In such cases, if the tool is claimed to be generating documentation (“self-documenting”), this documentation should be required to fulfil the same standards as the ordinary documentation for the system or product. Then the produced documentation can easily be integrated into the overall documentation of the system or product and managed in document management systems.

Annex A
(informative)

Example of a clause specifying documentation requirements for a complex system or product

A.1 Technical documentation

The information necessary for installation, operation, maintenance and demolition of the system shall be supplied together with the system or product in appropriate forms and on media relevant for the expected use. The documentation shall be suited for being used for the life-time of the product. In the case of electronic descriptions, the readability of the documentation needs to be taken into account.

In addition to the information supplied with the equipment, also the information necessary for the engineering and manufacture and for possible after-market operations on the equipment including information that may be required by authorities shall be kept by the manufacturer/supplier.

The amount of information and thus the number of documents can vary with the complexity of the system.

The information shall be supplied in suitable language variants.

NOTE 1 In some countries, the requirement to use specific languages is covered by legal requirements.

NOTE 2 An agreement with the user can be required to settle which languages and which media and, if electronic, which file formats that shall be used for the documents supplied with the equipment.

A.2 Information to be provided

The information provided with the system shall include:

a) a well defined and identified point of entry, from which the entire set of information can be logically accessed (e.g. by referencing) in a systematic way (i.e. a main document (an object list or list of documents) associated with the “top object” (i.e. the system or product as a whole) referencing sets of information for the sub-objects);
b) information on installation and mounting including:
   – a clear comprehensive description of the system, its installation and mounting, and the connection to the electrical and possible other supplies;
   – electrical and possible other supply requirements;
   – information on other requirements on the physical environment (e.g. lighting, vibration, noise levels, atmospheric contaminants) where appropriate;
c) information on the functioning and operation, including:
   – overview of the structure of the system or product (e.g. by overview diagram or structure diagram);
   – details of the connection as required (e.g. by circuit diagrams and connection tables);
   – programming or configuring, as necessary for use;
   – sequence of operation;
   – information regarding aspects such as load currents, peak starting currents and permitted voltage drops, as applicable;
d) information on safety matters:
   – a description of the safety devices and their interlocking functions;

- a description of the means provided where it is necessary to suspend a normal safety device (for example for setting or maintenance);
- information on possible residual risks, indication of whether any particular training is required and specification of any necessary personal protective equipment;

e) information on maintenance, including:
- frequency and type of inspection;
- frequency and type of maintenance;
- frequency and method of functional testing particularly of the protective devices and circuits;
- instructions on the procedures for safe maintenance;
- guidance on the adjustment, maintenance and repair:
- information on required tools;

  In the case that tools are not required, this should be stated as well.
- information on spare parts;

  In the case that spare parts are not recommended, this should be stated as well.
- information on handling, transportation and storage and possible time constraints;

f) information on disassembly and recycling, including:
- information on used materials;
- disposal;

g) information about conformity with applicable international standards, including:
- information about standards used for manufacturing;
- information about standards used for engineering;

h) information about identification of the object (see IEC 62507-1).

A.3 Requirements for documents and documentation

A.3.1 General requirements

The structuring of the documentation shall be based on IEC 81346-1 and IEC 62023.

All documents belonging to a document set shall be (directly or indirectly) referenced from a main document (see IEC 62023), serving as point of entry to the documentation.

Reference designations for designated objects, including cables and other conductors, shall be in accordance with IEC 81346-1 and IEC 81346-2. Terminal designations should be in accordance with IEC 61666. Signal designations should be in accordance with IEC 61175-1.

Documents shall be prepared in accordance with IEC 61082-1 and standards listed as normative references therein.

Names of document kinds should comply with those referenced in IEC 61355.

Instructions for use shall be in accordance with IEC 82079-1.

Object lists including parts lists shall be in accordance with IEC 62027, preferably class B.

A.3.2 Main document

If the supplied system or product is documented as one object (see IEC 62023), all documents shall be listed with document identification numbers and titles in a drawing or document list pertaining to this object.

If the supplied system or product is split into several objects and structurally organized, the main document for the top object shall list the documents pertaining to this level only with document identification numbers and titles and refer to objects on the next lower level. The main documents for these (next lower level) objects list relevant documents on that level, etc.

If the supplied system or product makes repetitive use of the same (identical) type of sub-system or component, complete documentation for each of these occurrences is not required. It is sufficient if one set of documentation for each is being repetitively referenced from a higher structural level.

For very simple machines, the relevant information can be contained in one document, provided that the document shows all the devices of the machine and enables the connections to the supply network to be made.

A.3.3 Labelling

Components, cables and cores in the system or product shall be recognizable in order to relate them to the technical documentation.

Reference designations for designated components, including cables and cores, shall be in accordance with IEC 81346-1 and IEC 81346-2. For cables and cores, one of the labelling methods defined in IEC 62491 shall be applied.

A.4 Specific requirements for certain kinds of information

A.4.1 Information on installation and mounting

<Add if appropriate.>

A.4.2 Information on factory and site testing

<Add if appropriate.>

A.4.3 Information on function and operation

<Add if appropriate.>

A.4.4 Information on maintenance

<Add if appropriate.>

A.4.5 Information on disassembly, recycling and disposal

<Add if appropriate.>

Annex B
(informative)

Example of a clause specifying documentation requirements for a simple (consumer) product

B.1 Technical documentation

Information necessary for operation, maintenance and demolition of the product shall be supplied in appropriate forms and on media relevant for the expected use, for example on paper or on an electronic medium packed together with the product. Updated documentation may, in addition, be provided by the supplier via the Internet.

In addition to the information supplied with the product, also the information necessary for the engineering and manufacture and for possible after-market operations on the equipment including information that might be required by authorities shall be kept by the manufacturer/supplier.

All information shall be supplied in agreed languages.

NOTE In some countries, the requirement to use specific languages is covered by legal requirements.

B.2 Information to be provided

The information provided with the product shall include:

a) a well defined and identified point of entry, from which the entire set of information can be logically accessed (e.g. by referencing);
b) identification of the product;
c) conformance with directives, if applicable;
d) declarations providing the information that the product is in line with actual valid legal requirements for the region where the product is intended to be used;
e) information safety matters;
f) information on installation and mounting including:
   – a clear description of the product, its installation and mounting, if necessary, and the connection to the electrical supply;
   – electrical supply requirements;
   – information on other requirements on the physical environment (e.g. lighting, vibration, noise levels, atmospheric contaminants) where appropriate;
g) information on the functioning and operation, including:
   – overview of the structure of the product (e.g. by simplified pictorial representation or overview diagram);
   – details of the connection, as required;
   – programming or configuring, as necessary for use;
   – sequence of operation;
h) information on maintenance, if required, including:
   – frequency and method of functional testing;
   – instructions on the procedures for safe maintenance;
   – guidance on the adjustment, maintenance and repair, particularly of the protective devices and circuits:

- information on required tools;
- information on spare parts;
- information on handling, transportation and storage;

i) information on disassembly and recycling, including:
   - information on used materials;
   - disposal.

B.3 Requirements for documents and documentation

B.3.1 General requirements

The structuring of the documentation shall be based on IEC 81346-1 and IEC 62023, to the extent required for clarity.

All documents belonging to the document set (supposed to be a low number) shall be clearly identified and mutually referenced.

If more than 3 documents are required, it is recommended to consider the principle of using a main document, see IEC 62023.

Instructions for use shall be in accordance with IEC 82079-1.

Other documents shall be prepared in accordance with IEC 61082-1 and standards listed as normative references therein.

Names of document kinds should comply with those referenced in IEC 61355.

B.3.2 Labelling

Components, cables and cores in the system or product shall be recognizable in order to relate them to the technical documentation.

Reference designations for designated components, including cables and cores, shall be in accordance with IEC 81346-1 and IEC 81346-2. For cables and cores, one of the labelling methods defined in IEC 62491 shall be applied.

B.3.3 Specific requirements for some kinds of information

B.3.3.1 Information on installation and mounting

<Add if appropriate.>

B.3.3.2 Information on testing

<Add if appropriate.>

B.3.3.3 Information on function and operation

<Add if appropriate.>

B.3.3.4 Information on maintenance

<Add if appropriate.>

B.3.3.5 Information on disassembly, recycling and disposal

<Add if appropriate.>

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1 Available at http://www.graphical-symbols.info/equipment

2 Available at http://std.iec.ch/iec60617

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