INTERNATIONAL STANDARD

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Specification for diagrams for process industry —

Part 1: General rules

Spécifications pour schémas de l'industrie de traitement —

Partie 1: Règles générales

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15519-1 was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 10, *Process plant documentation and tpd-symbols*.

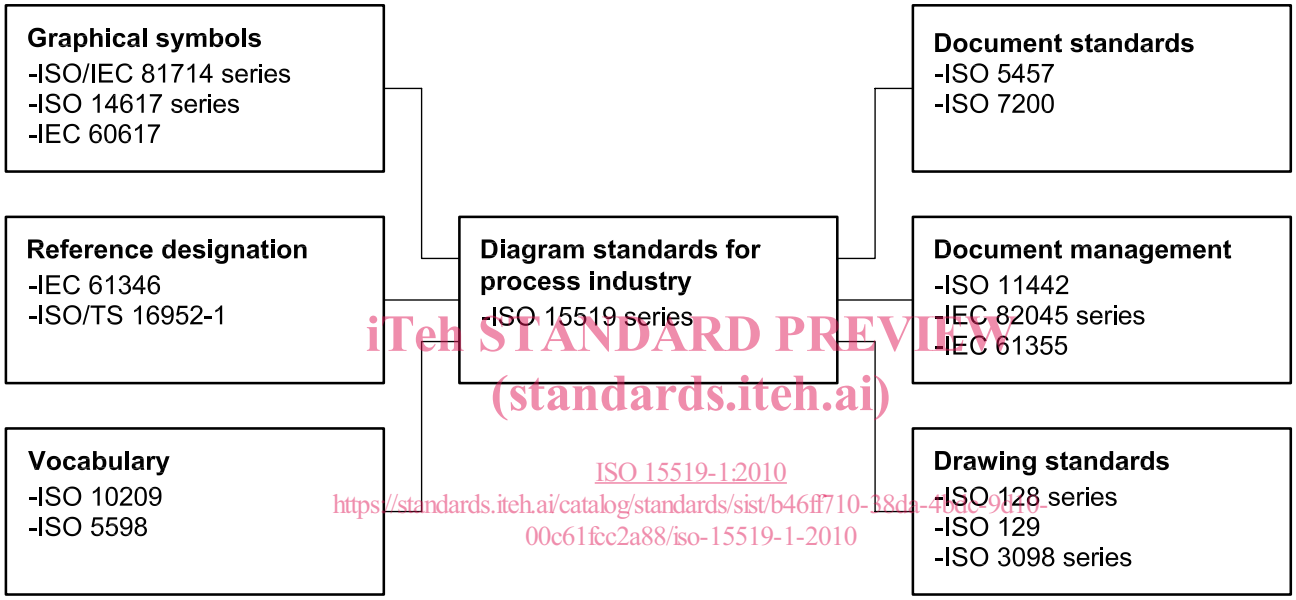
ISO 15519 consists of the following parts, under the general title *Specification for diagrams for process industry*:

— *Part 1: General rules*

Introduction

This part of ISO 15519 deals with preparation of diagrams and associated documents and data for process industry.

Together with rules for the preparation of diagrams and associated documents and data, this part of ISO 15519 includes rules and recommendations for the application of associated standards in diagrams, for example graphical symbols and reference designation. The following diagram gives an overview of interrelations between these standards.



Graphical symbols

In this part of ISO 15519 references are made to symbols and rules in the ISO 14617 series by using registration numbers. Three types of registration number are used in ISO 14617:

— 101 registration number for a symbol;

— R101 registration number for an application rule;

— X101 registration number for an application example.

When reference is made to ISO 14617, the description is in italics, e.g. “Symbol 255: *Circular motion*”.

Cross-references to referred symbols, rules and examples in the ISO 14617 series can be found in the registration number index in ISO 14617-1.

Collective application standards

Technical committees, requiring a field specific standard, are allowed, in co-operation with ISO/TC 10, to develop their own collective application standard for preparation of diagrams in accordance with the rules given in this part of ISO 15519. Application standards should not be contradictory with respect to this source standard.

Figures

Figures in this part of ISO 15519 are only examples for illustration of a given rule.

Specification for diagrams for process industry —

Part 1:
General rules

1 Scope

This part of ISO 15519 provides general rules and guidelines for the preparation and presentation of information in diagrams for process industry.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 128-20 *Technical drawings — General principles of presentation — Part 20: Basic conventions for lines*

ISO 128-21, *Technical drawings — General principles of presentation — Part 21: Preparation of lines by CAD systems*

ISO 128-22, *Technical drawings — General principles of presentation — Part 22: Basic conventions and applications for leader lines and reference lines*

ISO 3098-0, *Technical product documentation — Lettering — Part 0: General requirements*

ISO 3098-5, *Technical product documentation — Lettering — Part 5: CAD lettering of the Latin alphabet, numerals and marks*

ISO 5457, *Technical product documentation — Sizes and layout of drawing sheets*

ISO 6428, *Technical drawings — Requirements for microcopying*

ISO 7200, *Technical product documentation — Data fields in title blocks and document headers*

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

ISO/TS 16952-1, *Technical product documentation — Reference designation system — Part 1: General application rules*

ISO 80000 (all parts), *Quantities and units*

ISO 81714-1:1999, *Design of graphical symbols for use in the technical documentation of products — Part 1: Basic rules*

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*

IEC 60617DB[1)] *Graphical symbols for diagrams*

IEC 61355-1, *Classification and designation of documents for plants, systems and equipment — Part 1: Rules and classification tables*

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

IEC 81346-1:2009, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 1: Basic rules*

IEC 82045-2, *Document management — Part 2: Metadata elements and information reference model*

3 Terms and definitions

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

3.1 Basic terms

3.1.1
document
fixed and structured amount of information intended for human perception which can be managed and interchanged as a unit between users and systems

NOTE 1 The term document is not restricted to its meaning in a legal sense.

NOTE 2 A document can be designated in accordance with the type of information and the form of presentation, for example overview diagram, connection table, function chart.

NOTE 3 Adapted from ISO/IEC 8613-1:1994, definition 3.58.

3.1.2
document type
document defined with respect to its specific content of information and form of presentation

EXAMPLE Overview diagram, parts lists, etc.

NOTE Adapted from IEC 62023:2000, definition 3.2.2.

3.1.3
documentation
continuous and systematic compilation and processing of recorded information for the purpose of storage, classifying, retrieval, utilization or transmission

[ISO 5127:2001, definition 1.2.01]

3.1.4
process
sequence of chemical, physical or biological operations for the conversion, transport or storage of material or energy

[ISO 10628:1997, definition 3.1]

1) DB = Database. (12-month subscription to online database comprising parts 2 to 13 of IEC 60617.)

3.1.5
process plant
facilities and structures necessary for performing a process

[ISO 10628:1997, definition 3.6]

3.1.6
graphical symbol
visually perceptible figure used to transmit information independently of language

[ISO 81714-1:1999, definition 3.1]

3.2 Document types

3.2.1
drawing
technical information, given on an information carrier, graphically presented in accordance with agreed rules and usually to scale

[ISO 10209-1:1992, definition 2.11]

3.2.2
diagram
technical document showing the functions of the objects composing a system and their interrelations using graphical symbols

3.2.3
overview diagram
diagram providing a comprehensive view of an object with low degree of detailing

[IEC 61082-1:2006, definition 3.4.1]

3.2.4
network map
overview diagram showing a network on a map

EXAMPLE Networks for district heating, district cooling, natural gas including generating stations and sub-stations.

3.2.5
block diagram
overview diagram predominantly using block symbols

EXAMPLE Rectangular symbols.

3.2.6
process flow diagram
diagram illustrating the configuration of a process system or process plant by means of graphical symbols

3.2.7
function diagram
diagram providing information about the functional behaviour of a system

NOTE Adapted from IEC 61082-1:2006, definition 3.4.2.

3.2.8
circuit diagram
diagram providing information about the circuitry of an object(s)

[IEC 61082-1:2006, definition 3.4.3]

3.2.9
piping and instrumentation diagram
P&I D
process flow diagram representing the technical realization of a process system by means of graphical symbols for equipment, connections and process measurement and control functions

3.2.10
installation diagram
document showing the location of the components of an installation and their interconnections by means of graphical symbols

3.2.11
parts list (document)
list of elements of an object(s)

[IEC 62027:2000, definition 3.3.1]

3.3 Reference designation

3.3.1
reference designation
identifier of a specific object with respect to the system of which the object is a constituent, based on one or more aspects of that system

[IEC 81346-1:2009, definition 3.7]

3.3.2
object
entity treated in the process of design, engineering, realization, operation, maintenance and demolition

NOTE 1 The entity can refer to a physical or non-physical "thing", or to a set of information associated with it.

NOTE 2 Depending on its purpose, an object can be viewed in different ways called "aspects".

[IEC 81346-1:2009, definition 3.1]

3.3.3
aspect
specific way of selecting information on or describing a system or an object of a system

EXAMPLES: what the system or object is doing (function viewpoint);

how the system or object is constructed (product viewpoint);

where the system or object is located (location viewpoint).

[IEC 81346-1:2009, definition 3.6]

3.3.4
multi-level reference designation
reference designation derived from a structure path through an overall system

[IEC 81346-1:2009, definition 3.9]

3.3.5
reference designation set
set of reference designations of which at least one unambiguously identifies the object of interest

[IEC 81346-1:2009, definition 3.10]

4 Documentation principles

4.1 General

This clause introduces the standard and gives an overview of the content with focus on important issues. It also, to a certain degree, gives information about subjects which are dealt with in other standards dealing with documentation of technical products.

This clause also describes diagrams as part of the technical product documentation relations to, for example, the life-cycle aspect, reference designation, interrelations to electrical and instrumentation and control disciplines, etc.

4.2 Technical product documentation

4.2.1 General

Technical product documentation constitutes all technical information about a product or a system in the form of drawings, diagrams, parts lists, reference designations, technical specifications, etc. Diagrams as specified in this part of ISO 15519 are part of this technical product documentation.

The technical product documentation for a product or a system shall be structured and each document classified to ease creation of references between documents in order to ease navigation within the documentation. IEC 61355 deals with classification of documents. IEC 61355 to a certain degree applies to the ISO field.

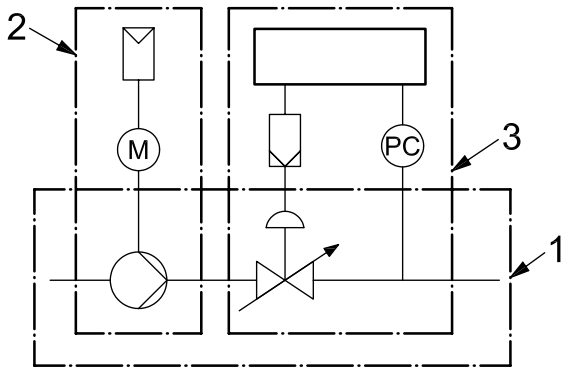
In the matrix of technical product documentation, diagrams and associated information, for example reference designation and parts lists, constitutes the functional and structural part of the documentation of the product or system, which makes diagrams one of the most important documents.

4.2.2 Interrelations between diagrams for different purposes

A typical system or process plant consists of the process system, instrumentation and control system and electrical power supply system; see Figure 1.

The matching process documentation consists of process diagrams, instrumentation and control diagrams and electrical power supply diagrams.

The interface between the disciplines shall be co-ordinated in order to secure, unambiguously, exchange of information. Documentation specifications shall specify the types of document which should apply for information interchange between the disciplines.



Key

1 process
2 electrical
3 control

Figure 1 — Interrelations between process, electrical and instrumentation and control

4.2.3 Life cycle aspects

Diagrams should be planned and developed with due consideration to the intended use during the life cycle phases. The result is that diagrams should not only be prepared for engineering and manufacturing phases but also for operation and maintenance phases.

Engineering and manufacturing companies should be aware that a diagram is not only used for a short period during engineering and manufacturing but for several years during operation and maintenance phases.

ISO 15226 gives recommendations for documentation during the life cycles of a product.

4.2.4 Reference designation

Each object in a diagram should be assigned a unique reference designation, which should appear from a parts list or a database common to the process plant.

This part of ISO 15519 deals with representation of reference designation according to IEC 81346-1 which is a standard common to both IEC and ISO fields.

4.2.5 Documentation guidelines

In order to secure homogeneity and legibility of all diagrams in a process plant typically consisting of several sub-systems, it is recommended – for each diagram type – to establish a documentation guideline in which requirements for sheet sizes, graphical symbols, connections, reference designation, etc., are specified. Examples of typical diagrams for the actual process plant should be included.

4.3 Representation aspects

4.3.1 General

Presentation of information in diagrams shall be unambiguous and well arranged in order to ensure legibility. Further, the intended or foreseeable conditions of use should be taken into consideration when preparing diagrams. The following aspects are of importance for legibility:

— the intended medium for presentation, for example paper or screen;

— the use of unambiguous graphical symbols;

— the amount of information in one sheet and eventual split up into more sheets;

— the size of the sheet;

— the presentation of technical information;

— the use of reference designation.

4.3.2 Document sheet split up

In this part of ISO 15519, split up of the document sheet into two areas is introduced: an identification area that contains document information for identification and management of the document, for example title block with content, metadata, etc., and a content area that contains the technical information of the document in the form of graphical symbols, reference designation, etc.

4.3.3 Presentation forms

This part of ISO 15519 mainly focuses on diagrams presented on paper. When diagrams are prepared predominately for screen presentation, special attention should be taken in order to secure legibility with respect to, for example:

— colours;

— screen resolution;

— distance between and thickness of lines.

4.4 Focus area in this part of ISO 15519

The technical part of this part of ISO 15519 covers four focus areas:

— general document rules, for example document sheet, lines, lettering, etc. (Clause 5);

— diagram specific subjects, for example reference designations, graphical symbols, connections, port designations, technical data, location reference system, etc. (Clauses 6 to 12);

— layout principles and layout rules for diagrams, etc. (Clause 13);

— types and contents of diagrams (Clause 14).

5 Document sheets

5.1 General

5.1.1 Document sheet sizes

Document sheet sizes shall conform to ISO 5457. The following aspects shall be considered for selection of document sheet size:

— the amount of information to be presented in the sheet to ensure legibility and overview;

— the composition and complexity of the design;

— the possibility of using a smaller size, but with an increased number of sheets;

— the size of a specific type of document should not be changed within a document set.

Elongated formats should not be used. However, when necessary, the elongation shall be in accordance with ISO 5457. Format A3 is thus allowed, elongated to A2, A1 and A0.

5.1.2 Borders, frames, centring and grid reference system

Border and frame markings shall comply with ISO 5457, which includes:

— centring marks for documents that are prepared for microfilming;

— grid reference system for location reference between documents, within documents and within sheets. The grid reference system consists of columns and rows. A zone is the cross-section of a column and a row. Columns are designated with numbers. Rows are designated with letters. See Figure 2.