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Diagrams for the chemical and petrochemical industry

Part 1:
Specification of diagrams

Schémas de procédé pour l'industrie chimique et pétrochimique —

Partie 1: Spécification des schémas de procédé

[Revision of first edition (ISO 10628:1997)]

ICS 01.110; 71.020; 75.020

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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Foreword

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

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ISO 10628-1 was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 10, *Process plant documentation*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

ISO 10628 consists of the following parts, under the general title *Diagrams for chemical and petrochemical industry*:

— *Part 1: Specifications of diagrams*

— *Part 2: Graphical symbols*

Diagrams for chemical and petrochemical industry — Part 1: Specifications of diagrams

1 Scope

This standard specifies the classification, content and representation of flow diagrams. In addition, it lays down rules for drafting flow diagrams for chemical and petrochemical industry.

This standard does not apply to electrical engineering flow diagrams. This standard is a collective application standard of ISO 15519

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 (all parts), *Technical drawings - General principles of presentation*

ISO 3098-2:2000-11, *Technical product documentation - Lettering - Part 2: Latin alphabet, numerals and marks*

ISO 5457:1999-02, *Technical product documentation - Sizes and layout of drawing sheets*

ISO 7200:2004-02, *Technical product documentation – Data fields in title blocks and document headers*

ISO 10209 (all parts), *Technical product documentation; vocabulary*

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

ISO 15519 (all parts), *Specification for diagrams for process industry*

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

ISO 80416-2:2001-07, *Basic principles for graphical symbols for use on equipment - Part 2: Form and use of arrows*

IEC 62424:2008-08, *Representation of process control engineering requests in P&I diagrams and data exchange between P&ID tools and PCE-CAE tools*

3 Terms and definitions

For the purposes of this document, the terms and definitions specified in ISO 10209 (all parts), ISO 14617 (all parts), ISO 15519 (all parts) and IEC 62424 apply.

4 Classification, information content and presentation of flow diagrams

4.1 General

Flow diagrams show the structure and function of the process plants and are part of the entire set of technical documents which are required for planning, assembly, construction, management, commissioning, operation, maintenance, shutdown and decommissioning of a plant.

Flow diagrams are a means by which information is exchanged between parties involved in the construction, assembly, operation and maintenance of such process plants. General rules and recommendations for preparation of flow diagrams given in ISO 15519.

Depending on the information required, a distinction should be made between block diagrams, process flow diagrams and piping and instrumentation diagrams (P&ID).

Each particular type of flow diagram shall take the functional requirements into consideration.

The graphical presentation shall conform to the rules set down in Clause 5. Flow routes and flow directions shall be indicated by lines and arrows.

All equipment, machinery, flow lines (pipelines, transport routes) and valves shall be represented in accordance with ISO 10628-2.

The measuring, control and regulating tasks shall be represented in accordance with IEC 62424.

4.2 Block diagrams

4.2.1 General representation rules

The block diagram depicts a process or process plant in simplified form by means of rectangular frames which are interconnected by flow lines (see Figures A.1 and A.2 for examples).

The rectangular frames may represent the following:

— processes;
— process steps;
— unit operations;
— process plants or groups of process plants;
— plant sections;
— equipment.

The flow lines may represent streams of materials or energy flows.

4.2.2 Basic information

4.2.3 The block diagram shall contain at least the following information:

a) denomination of frames;

b) denomination of ingoing and outgoing materials;

c) direction of main material flows between frames.

4.2.4 Additional information

The block diagram may also contain the following information:

a) denomination of the main material flows between the frames;

b) flow rates or quantities of ingoing and outgoing materials;

c) flow rates or quantities of ingoing and outgoing energy or energy carriers;

d) main material flows between the frames representing energy or energy carriers;

e) characteristic operating conditions.

4.3 Process flow diagrams

4.3.1 General

The process flow diagram depicts a process or a process plant by means of graphical symbols which are interconnected by lines (see Figures A.3 and A.4 for examples).

An utility flow diagram (UFD) is a special type of process flow diagram. It is a schematic representation of the energy utility systems within a process plant, showing all lines and other graphic means required for the representation of transport, distribution and collection of forms of energy. In an utility flow diagram, process equipment can be represented by boxes with inscriptions (e.g. identification numbers) and with utility connections (see Figure A.5 for an example).

The graphical symbols represent equipment and the lines represent flows of mass, energy or energy carriers.

4.3.2 Basic information

The process flow diagram shall contain at least the following information:

a) kind of apparatus and machinery, except drives, needed for the process;

b) reference designations for equipment and machinery, except drives;

c) route and direction of the ingoing and outgoing material and energy flows;

d) denomination and flow rates or quantities of ingoing and outgoing materials;

e) denomination of energy types and/or energy carriers;

f) characteristic operating conditions.

4.3.3 Additional information

The process flow diagram may also contain the following additional information:

a) denomination and flow rates or quantities of materials between the process steps;

b) flow rates or quantities of energy and/or energy carriers;

c) essential valves and their arrangement in the process;

d) functional demands for process measuring and control devices at important points;

e) supplementary operating conditions;

f) characteristic data of equipment and machinery (except drives), given in separate lists, if necessary;

g) characteristic data of drives, given in separate lists, if necessary;

h) elevation of platforms and approximate relative vertical position of equipment.

4.4 Piping and instrumentation diagrams (P&ID)

4.4.1 General

The piping and instrumentation diagram (P&ID) is based on the process flow diagram and depicts the technical realization of a process by means of graphical symbols representing equipment and piping, together with graphical symbols for process measurement and control functions (see Figures A.6 for an example).

All equipment, valves and fittings shall be represented in accordance with ISO 10628-2.

The process measuring and control tasks shall be represented in accordance with IEC 62424.

Auxiliary systems may be represented by rectangular frames with references to separate flow diagrams.

4.4.2 Basic information

The piping and instrumentation diagram shall contain at least the following information:

a) function and type of equipment and machinery, including drives, conveyors and installed back-up/reserve equipment;

b) identification numbers of apparatus and machinery, including drives;

c) characteristic data of equipment and machinery, given in separate lists if necessary;

d) indication of nominal sizes, pressure ratings, material and type of piping, e.g. by stating the pipeline number, piping class or identification number;

e) details of equipment, machinery, piping, valves and fittings;

f) process measuring and control functions, with identification number;

g) characteristic data of drives, given in separate lists if necessary.

4.4.3 Additional information

The piping and instrumentation diagram may also contain the following additional information:

a) denomination and flow rates or amounts of energy or energy carriers;

b) route and direction of flow of energy or energy carriers;

c) type of essential devices for process measuring and control;

d) essential construction materials for equipment and machinery;

e) elevation of platforms and approximate relative vertical position of equipment;

f) reference designations of valves and fittings;

g) denomination of equipment.

5 Drafting rules

5.1 General

5.1.1 Sheet sizes

A1 size as defined in ISO 5457 shall preferably be used for drawing sheets. Considering the various copying techniques (reduction) available, long sizes and sizes larger than A1 are to be avoided.

5.1.2 Title block

The basic title block for drawings and lists (with additional fields) as shown in ISO 7200 shall be used.

5.2 Layout of flow diagrams

Dimensions of the graphical symbols for equipment and machinery – except for pumps, drives, valves and fittings – should reflect the actual relative dimensions in terms of scale and elevation.

Devices to be expected at the uppermost level of the plant shall be shown at the top of the drawing and those expected to be located at the lowest level shall be shown at the bottom of the drawing.

The graphical symbols for process-related measuring and control functions for equipment, machinery and piping, as well as those representing piping and valves, shall be shown in the logical position corresponding to their functions.

5.3 Connecting lines

5.3.1 Line widths

Line widths shall be related to the grid module for flow diagrams, M = 2,5 mm.

To obtain a clear representation, different line widths shall be used. Lines representing main flows or main piping shall be highlighted.

The following line widths as specified in ISO 128 (all parts) shall be used:

a) 1,0 mm (0,4 M) for main flow lines;

b) 0,5 mm (0,2 M) for

- graphical symbols representing equipment and machinery, except valves and fittings and piping accessories,
- rectangular frames representing unit operations, process equipment etc.,
- subsidiary flow lines,
- energy carrier lines and auxiliary system lines;

c) 0,25 mm (0,1 M) for

- graphical symbols representing valves and fittings and piping accessories,
- symbols representing process measuring and control functions, control and data transmission lines,
- reference lines,
- other auxiliary lines.

Line widths less than 0,25 mm (0,1 M) shall not be used.

5.3.2 Minimum space of parallel lines

The minimum space between parallel lines shall be at least twice the width of the widest line, but at least equal to 1 mm. Space between flow lines should be greater than 10 mm.

5.3.3 Flow direction

Normally, the main flow direction shall be drawn from left to right and from top to bottom.

Inlet and outlet arrows conforming to ISO 80416-2 shall be used to indicate the flows of essential substances into and out of the plant depicted in the diagram.

Arrows are to be incorporated in the lines to indicate the direction of the flows within the flow diagram. In order to facilitate understanding, arrows may be used at the inlets to equipment and machinery (except for pumps) and upstream of pipe branches.

Arrows for inlet or outlet of essential substances see Figure 1.

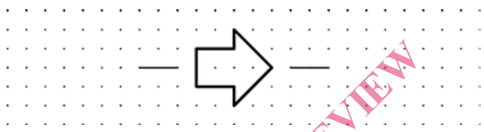


Figure 1

Arrows for receprocoating for inlet or outlet of essential substances see Figure 2.

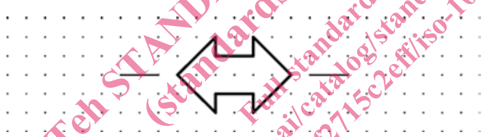


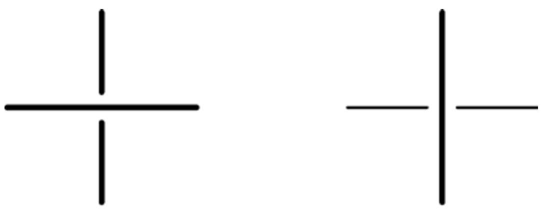
Figure 2

If a diagram consists of several sheets, it is recommended that lines representing incoming and outgoing flows and piping shall be drawn in such a manner that these lines continue at the same level when the individual sheets are placed next to one another horizontally and are aligned vertically.

5.3.4 Connections

When pipes represented by the same line width cross, but are not connected to each other, the line depicting the vertical pipe shall be interrupted (see Figure 3a).

When pipes represented by different line widths cross, but are not connected to each other, the line depicting the thinner pipe shall be interrupted (see Figure 3b).



a) Crossing pipes represented by the same line widths

b) Crossing pipes represented by different line widths