INTERNATIONAL STANDARD

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Graphical symbols for diagrams —

Part 3: Connections and related devices

Symboles graphiques pour schémas —

Partie 3: Connexions et dispositifs associés

Reference number
ISO 14617-3:2002(E)

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Fax + 41 22 749 09 47
E-mail copyright@iso.ch
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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 3.

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 part of ISO 14617 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14617-3 was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 10, *Process plant documentation and tpd-symbols*.

ISO 14617 consists of the following parts, under the general title *Graphical symbols for diagrams*:

— *Part 1: General information and indexes*

— *Part 2: Symbols having general application*

— *Part 3: Connections and related devices*

— *Part 4: Actuators and related devices*

— *Part 5: Measurement and control devices*

— *Part 6: Measurement and control functions*

— *Part 7: Basic mechanical components*

— *Part 8: Valves and dampers*

— *Part 9: Pumps, compressors and fans*

— *Part 10: Fluid power converters*

— *Part 11: Devices for heat transfer and heat engines*

— *Part 12: Devices for separating, purification and mixing*

— *Part 15: Installation diagrams and network maps*

Other parts are under preparation.

Introduction

The purpose of ISO 14617 in its final form is the creation of a library of harmonized graphical symbols for diagrams used in technical applications. This work has been, and will be, performed in close cooperation between ISO and IEC. The ultimate result is intended to be published as a standard common to ISO and IEC, which their technical committees responsible for specific application fields can use in preparing International Standards and manuals.

Graphical symbols for diagrams —

Part 3:
Connections and related devices

1 Scope

This part of ISO 14617 specifies graphical symbols for functional connections, mechanical links, pipelines and related devices such as connection joints, ISO ports, terminals, quick-release couplings and connectors, in diagrams.

For the fundamental rules of creation and application of graphical symbols in diagrams, see ISO 81714-1.

For an overview of ISO 14617, information on the creation and use of registration numbers for identifying graphical symbols used in diagrams, rules for the presentation and application of these symbols, and examples of their use and application, see ISO 14617-1.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 14617. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 14617 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2553, *Welded, brazed and soldered joints — Symbolic representation on drawings*

ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers*

ISO 14617-1:2002, *Graphical symbols for diagrams — Part 1: General information and indexes*

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

3 Terms and definitions

For the purposes of this part of ISO 14617, the following terms and definitions apply.

NOTE 1 The list has been restricted to terms whose meaning is not obvious and which have not been defined elsewhere in an International Standard, or which have been defined in various ways in different standards. In preparing these definitions, ISO and IEC standards on terminology have been consulted; see the references in parentheses. However, most of the definitions in those standards were prepared by different technical committees within a restricted scope. This means that many terms so defined have to be given more general or neutral definitions when applied in the context of graphical symbols.

NOTE 2 In those cases where the same term has substantially different meanings in ISO and IEC, this is indicated beside the term by [ISO] or [IEC] and elsewhere in this part of ISO 14617 by a superscript, for example “port[ISO]”.

3.1
connection
general term for functional connection, mechanical link, pipeline, electric conductor, etc.

3.2
functional connection
connection between functions

NOTE A functional connection is used to represent the interrelations between functions represented, for example, by symbols according to ISO 14617-6.

3.3
electric connection
conductor or circuit for joining terminals or other conductors

[IEC 60050-151, IEC 60050-531, IEC 60050-581]

3.4
connection [ISO]
threaded port, flange, or similar means for connecting a pipeline to a component

[ISO 5598]

c.f. port (3.13) and terminal.

3.5
internal connection
connection in the form of one or more pipelines or conductors that is an integral part of a component

NOTE An internal connection need not be located inside a component.

3.6
line [ISO]
abbreviation of the term “pipeline”

3.7
line [IEC]
multi-pole or multi-phase electric connection

EXAMPLE Power line, telecommunication line, transmission line.

3.8
cable
insulated conductor or several insulated conductors with a common covering

3.9
pipe unit
pipeline or, more often, several pipelines in a common covering pipe with insulation

3.10
information bus
bus with conductors conveying information

3.11
unidirectional
having the property to move, transmit, etc. in one direction only

3.12
bidirectional
having the property to move, transmit, etc. in two alternative, opposite directions

[ISO 5598]

3.13
port [ISO]
terminus of a fluid passage in a component to which can be connected pipelines for the transmission of fluid to or from the component

[ISO 5598]

cf. connection (3.4) and terminal.

3.14
connector
component which terminates conductors, flexible pipes, or hoses in order to provide connection and disconnection to a mating component

[IEC 60050-441, IEC 60050-581]

cf. connector pair (3.16).

3.15
quick-release coupling
connection (3.4) which may be joined or separated without the use of tools

[ISO 5598]

3.16
connector pair
combination of mating connectors

[IEC 60050-581]

3.17
bundle
group of conductors or pipelines that mainly follow the same path

NOTE The bundle may be a real (product) bundle or a line on a diagram representing a number of conductors or pipelines (single-line representation) even if these do not form a real bundle.

3.18
single-line representation
representation where two or more connections or components are represented by a single symbol

[IEC 61082-1]

4 Connections

4.1 Symbols of a basic nature

NOTE For the application of the symbols, see R401 (4.2.1) and R402 (4.2.2).

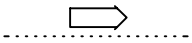
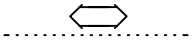
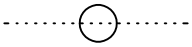
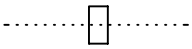
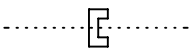
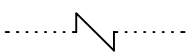
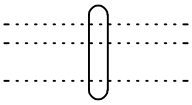
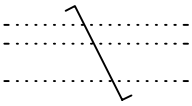
4.1.1	**401**		Functional connection
4.1.2	**402**	Form 1	Mechanical link, shaft
4.1.3	**403**	Form 2	Mechanical link, shaft, wire
4.1.4	**404**		Electrically insulating mechanical link, shaft, wire See R403 (4.2.3).
4.1.5	**405**		Pipeline, duct
4.1.6	**406**		Group of pipelines, ducts in single-line representation
4.1.7	**411**		Non-guided electromagnetic beam
4.1.8	**412**		Planned pipeline, duct
4.1.9	**413**		Group of planned pipelines, ducts in single-line representation
4.1.10	**422**		Pilot (control), drain, purge, or bleed line in fluid power systems

4.2 Application rules for the symbols in 4.1

4.2.1	**R401**	Symbols for connections may cross each other. For an example, see X401 (4.5.1).
4.2.2	**R402**	When confusion between symbols 401 (4.1.1) and 405 (4.1.5) or 406 (4.1.6) is likely, symbols giving supplementary information according to clause 4.3 shall be used. For an example, see X401 (4.5.1).
4.2.3	**R403**	In simplified representation, the symbol may also represent any type of linkage system between an actuator and the affected item, for example, a combination of mechanical links and hydraulic pipelines. For an example, see X405 (4.5.5).

4.3 Symbols giving supplementary information

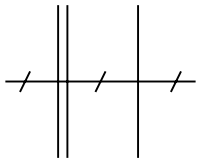
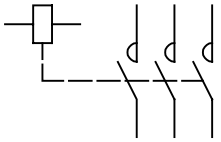
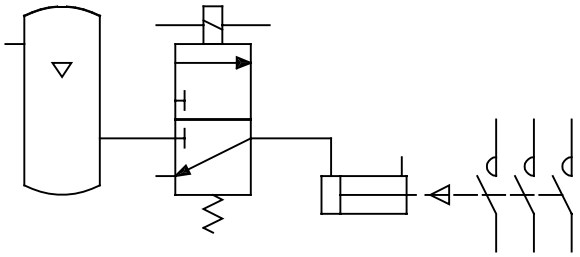
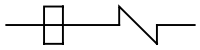
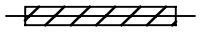
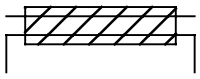
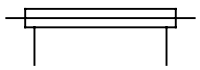
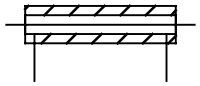
4.3.1	**431**		Pure functional type
4.3.2	**432**		Capillary type
4.3.3	**433**		Pneumatic type
4.3.4	**434**		Hydraulic type
4.3.5	**435**		Electric type

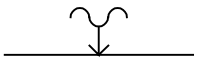
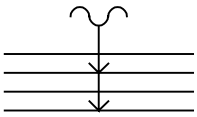
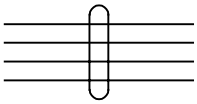
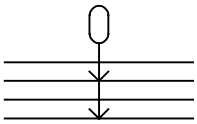
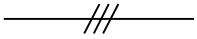
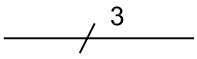
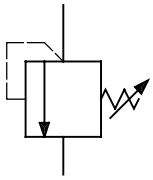
4.3.6	**442**		Unidirectional information bus type
4.3.7	**443**		Bidirectional information bus type
4.3.8	**444**	Form 1 	Flexible type For form 1, see R412 (4.4.1).
4.3.9	**452**	Form 2 	
4.3.10	**445**		Circular shape
4.3.11	**446**		Rectangular shape
4.3.12	**447**		Ridged shape
4.3.13	**448**		Twisted pipeline or duct
4.3.14	**449**		Cable, pipe unit See R412 (4.4.1).
4.3.15	**450**		Twisting of pipelines See R412 (4.4.1).
4.3.16	**451**	INT INT	Internal connection See R413 (4.4.2).

4.4 Application rules for the symbols in 4.3

4.4.1	**R412**	The symbol may instead be located beside the line or lines, provided with a leader line terminated by an arrowhead. For examples, see X411 (4.5.11) to X413 (4.5.13), X421 (4.5.14) and X422 (4.5.15).
4.4.2	**R413**	The symbol shall be used when it is necessary to indicate that a certain connection is internal, i.e. an integral part of the component or device represented. The symbol shall be placed at both ends of the internal connection or, with a short connecting line, between the two ends. If the internal connection is also connected to a terminal or port[ISO], the symbol may be omitted, provided that the terminal or port[ISO] is represented by symbol 561 (8.1.1) or indicated by a terminal designation. In diagrams for fluid power systems, an internal connection may instead be indicated by bending at least one of the ends of the connecting line by 45° to 60°. For an example, see X435 (4.5.18).

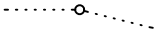
4.5 Application examples

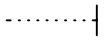
4.5.1	**X401**	 401, 402, 405, 431	Crossing of symbols for connections A functional connection, a mechanical link and a pipeline is shown.
4.5.2	**X402**	 402, 444	Flexible mechanical link
4.5.3	**X403**	 403, 444	
4.5.4	**X404**	 404, 444	Flexible, electrically insulating mechanical link, shaft
4.5.5	**X405**	 404, IEC, IEC	Electropneumatically operated contactor, simplified representation Explanation: 
4.5.6	**X406**	 405, 446, 448	Twisted rectangular pipeline
4.5.7	**X322**	 325, 405	Pipeline or duct with thermal insulation
4.5.8	**X408**	 325, 405	Pipeline with thermal insulation, heated or cooled by a separate circuit
4.5.9	**X409**	 301, 405	Jacketed (sleeved) pipeline
4.5.10	**X410**	 301, 325, 405	Jacketed (sleeved) pipeline with thermal insulation

4.5.11	**X411**	 405, 444	Flexible pipeline, hose Two methods are shown.
4.5.12	**X412**	 405, 444	
4.5.13	**X413**	 405, 444	Four pipelines, two of flexible type
4.5.14	**X421**	 405, 449	Four pipelines forming a unit
4.5.15	**X422**	 405, 449	Four pipelines, two forming a unit
4.5.16	**X431**	 343, 406	Three pipelines in single-line representation Two methods are shown.
4.5.17	**X432**	 344, 406	
4.5.18	**X435**	 201, 242, 422, 2002, 2161, 2171	Internal pilot (control) connection in a pressure relief valve

5 Connection joints and pipeline ends

5.1 Symbols of a basic nature

5.1.1	**501**	 200 %	Joint of connections (functional connections, mechanical links, pipelines, ducts, etc.) See R501 (5.2.1).
5.1.2	**2005**		Joint of two mechanical parts permitting motion of the parts in two or more dimensions, for example, a cardan joint

5.1.3	**503**		Closed end of pipeline or duct

5.2 Application rules for the symbols in 5.1

5.2.1	**R501**	The diameter of the dot should be five times the width of the widest line, except when symbol 402 (4.1.2) is used. The symbol may be omitted in a T-joint. For examples, see X502 (5.5.2), X505 (5.5.5), and X508 (5.5.8).

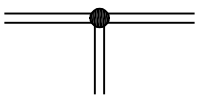
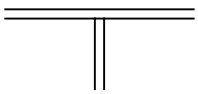
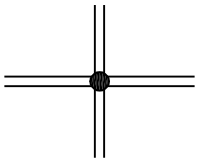
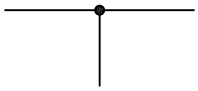
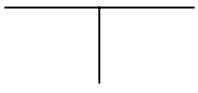
5.3 Symbol giving supplementary information

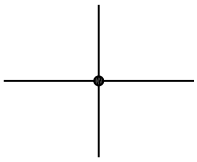
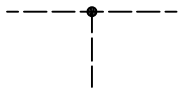
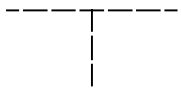
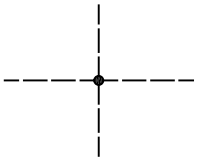
None.

5.4 Application rule for the symbol in 5.3

None.

5.5 Application examples

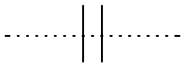
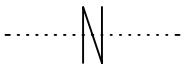
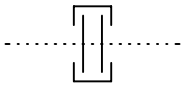
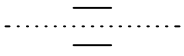
5.5.1	**X501**	 402, 501	T-joint of mechanical links Two methods are shown.
5.5.2	**X502**	 402	
5.5.3	**X503**	 402, 501	Joint of multiple mechanical links
5.5.4	**X504**	 401, 403/405, 501	T-joint of functional connections, mechanical links, or pipelines Two methods are shown.
5.5.5	**X505**	 401, 403/405	

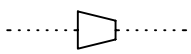
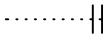
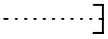
5.5.6	**X506**	 401, 403/405, 501	Joint of multiple functional connections, mechanical links, or pipelines
5.5.7	**X507**	 404, 501	T-joint of electrically insulating mechanical links Two methods are shown.
5.5.8	**X508**	 404	
5.5.9	**X509**	 404, 501	Joint of multiple electrically insulating mechanical links

6 Connection joints, junctions, and related devices of specified design

6.1 Symbols of a basic nature

NOTE For the application, see R521 (6.2.1).

6.1.1	**511**	 200 %	Flange coupling, flange pair
6.1.2	**512**	 200 %	Flexible coupling
6.1.3	**513**	 200 %	Clamped flange coupling
6.1.4	**514**	 200 %	Screwed joint
6.1.5	**515**		Welded, brazed, or soldered joint For further details, see ISO 2553 and ISO 4063.

6.1.6	**516**		Change of pipe dimension, pipe reducer
6.1.7	**517**		Blind flange pair
6.1.8	**518**		End cap

6.2 Application rule for the symbols in 6.1

6.2.1	**R521**	The symbols shall be used only when it is necessary to indicate the design.

6.3 Symbol giving supplementary information

None.

6.4 Application rule for the symbol in 6.3

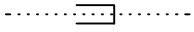
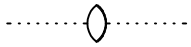
None.

6.5 Application example

None.

7 Fittings

7.1 Symbols of a basic nature

7.1.1	**531**		Expansion loop
7.1.2	**532**		Expansion sleeve
7.1.3	**533**		Expansion bellows

7.2 Application rule for the symbols in 7.1

None.

7.3 Symbol giving supplementary information

None.

7.4 Application rule for the symbol in 7.3

None.

7.5 Application example

None.

8 Ports[ISO], quick-release couplings, and connectors

8.1 Symbols of a basic nature

8.1.1	**561**	 200 %	Port[ISO] See R561 (8.2.1).
8.1.2	**563**	 200 %	Quick-release coupling element of male type
8.1.3	**564**	 200 %	Quick-release coupling element of female type
8.1.4	**565**	 200 %	Quick-release coupling element which fits into another coupling element of the same type
8.1.5	**566**	 200 %	Quick-release coupling element of male type with automatic closing when decoupled
8.1.6	**567**	 200 %	Quick-release coupling element of female type with automatic closing when decoupled
8.1.7	**568**	 200 %	Quick-release coupling element which fits into another coupling element of the same type, with automatic closing when decoupled
8.1.8	**576**		Fixed portion of a connector pair; socket
8.1.9	**577**		Movable portion of a connector pair; plug

8.2 Application rule for the symbols in 8.1

8.2.1	**R561**	If no confusion is likely, the symbol may be omitted.

8.3 Symbol giving supplementary information

None.

8.4 Application rule for the symbol in 8.3

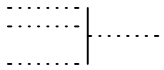
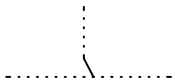
None.

8.5 Application example

8.5.1	**X563**	 405, 563, 564	Quick-release coupling

9 Additional simplifications

9.1 Symbols of a basic nature

9.1.1	**601**		Connection with *n* parallel identical branches See R601 (9.2.1).
9.1.2	**602**		Transition between multi-line and single-line representation See R602 (9.2.2).
9.1.3	**603**		Exit from, or entrance into, a bundle See R603 (9.2.3).

9.2 Application rules for the symbols in 9.1

9.2.1	**R601**	The letter *n* shall be replaced with the actual number of branches. For an example, see X601 (9.5.1).
9.2.2	**R602**	The sequence of the individual connecting lines should be the same in both ends, if practical. For an example, see X603 (9.5.3). If the sequence is the same but the order is not obvious or reversed, one of the outer connecting lines shall be identified at each end, for example, with a correlation indication, symbol 263 (2-7.3.3). For an example, see X604 (9.5.4). If the sequence at each end is different, each connecting line shall be identified. For an example, see X605 (9.5.5).
9.2.3	**R603**	The symbol may represent a physical bundle or a diagram bundle used for simplification of the diagram. The oblique part of the connecting line shall indicate the direction in which the other end or ends can be found. For examples, see X606 (9.5.6) to X608 (9.5.8).

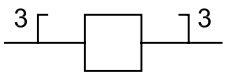
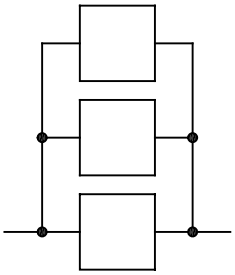
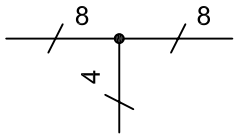
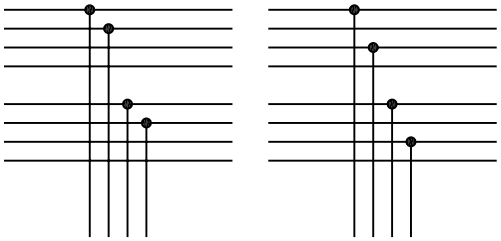
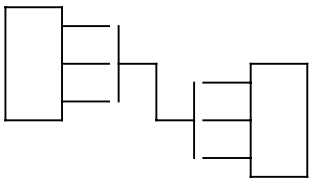
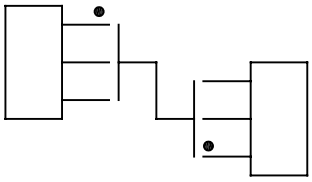
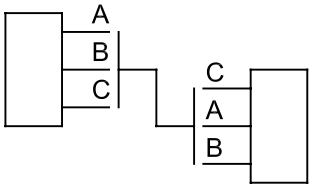
9.3 Symbol giving supplementary information

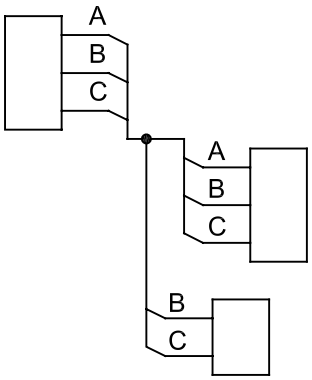
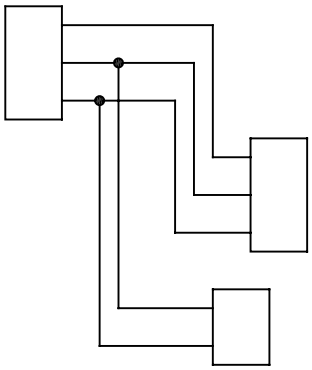
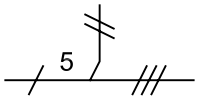
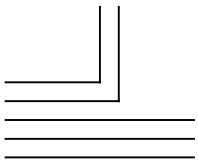
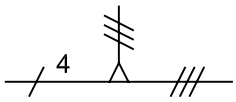
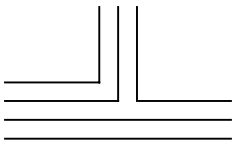
None.

9.4 Application rule for the symbol in 9.3

None.

9.5 Application examples

9.5.1	**X601**	 101, 405, 601	Three parallel identical branches Explanation: 
9.5.2	**X602**	 344, 405, 501	Eight connections, four of them branching Explanation, two possibilities are shown: 
9.5.3	**X603**	 101, 405, 406, 602	Three connections with the same sequence between two components
9.5.4	**X604**	 101, 263, 405, 406, 602	Three connections with reversed sequence between two components
9.5.5	**X605**	 101, 405, 406, 602	Three connections with changed sequence between two components

9.5.6	**X606**	 101, 405, 406, 501, 603	Connections between three components Explanation: 
9.5.7	**X607**	 342, 343, 344, 406, 603	Branching of a bundle: 5, 2 and 3 connections Explanation: 
9.5.8	**X608**	 343, 344, 406, 603	Branching of a bundle: 4, 3 and 3 connections Explanation: 

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