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2003-08-01

Graphical symbols for diagrams —

Part 5: Measurement and control devices

Symboles graphiques pour schémas —

Partie 5: Dispositifs de mesure et appareils de commande

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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 14617-5 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.

This corrected version of ISO 14617-5:2002 incorporates the correction of the descriptions of symbols 832, 833 and 834 from “Indicator”, “Recorder” and “Integrator” to Indicating (measuring) instrument, Recording (measuring) instrument and Integrating (measuring) instrument.

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.

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Graphical symbols for diagrams —

Part 5: Measurement and control devices

1 Scope

This part of ISO 14617 specifies graphical symbols for components and devices used in measurement and control systems, represented 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 31 (all parts), *Quantities and units*

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

ISO 14617-2:2002, *Graphical symbols for diagrams — Part 2: Symbols having general application*

ISO 14617-4:2002, *Graphical symbols for diagrams — Part 4: Actuators and related devices*

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

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60617-6:1996, *Graphical symbols for diagrams — Part 6: Production and conversion of electrical energy*

IEC 60617-12:1997, *Graphical symbols for diagrams — Part 12: Binary logic elements*

IEC 60617-13:1993, *Graphical symbols for diagrams — Part 13: Analogue elements*

3 Terms and definitions

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

NOTE 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.

3.1
sensor
primary element of a measuring chain which converts the input variable into a signal suitable for measurement

[ISO 5598, IEC 60050-351]

3.2
signal converter
device which changes a signal into a different signal, the physical nature of the output being the same as that of the input

[IEC 60050-351]

3.3
measuring transducer
transmitter
device which accepts information in the form of a physical or chemical variable and converts it to an output variable of the same or another nature, according to a definite law

[IEC 60050-351]

3.4
detector
device which accepts information in the form of a physical or chemical variable and transmits a binary signal at a specified condition.

cf. measuring transducer (3.3)

3.5
indicator
device which shows the presence or absence of a phenomenon such as pressure, flow, and position or state, but which does not measure it

[ISO 5598]

3.6
dead band
threshold
finite range of values within which a variation of the input variable does not produce any noticeable change in the output variable

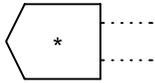
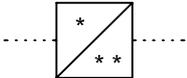
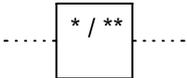
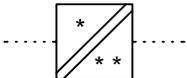
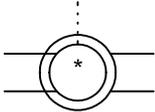
[IEC 60050-351]

3.7
bias
function giving an output corresponding to that portion of an input signal exceeding a predetermined threshold value

[IEC 60050-393]

4 Sensors, signal converters and measuring transducers

4.1 Symbols of a basic nature

4.1.1	751	Form 1 	Sensor The apex represents the sensing or incoming side. See R751 (4.2.1).
4.1.2	752	Form 2 	
4.1.3	753	Form 1 	Signal converter, measuring transducer See R752 (4.2.2).
4.1.4	754	Form 2 	
4.1.5	755	Form 1 	Signal converter, measuring transducer without connection between input and output circuits See R752 (4.2.2).
4.1.6	756	Form 2 	
4.1.7	757		Thermocouple
4.1.8	759		Tachometer generator
4.1.9	760		Measuring transducer utilizing the synchro effect See R753 (4.2.3).

4.2 Application rules for the symbols in 4.1

4.2.1	R751	The asterisk shall be replaced with a letter symbol in accordance with ISO 31 or IEC 60027, or a graphical symbol for the quantity being measured, or else shall be omitted. The asterisk in the form 1 symbol may also be replaced with an appropriate symbol, for example, according to 4.3.1, indicating the working principle.
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4.2.2	R752	The asterisk shall be replaced with the letter symbol for the input quantity according to ISO 31 or IEC 60027, or by a graphical symbol, and the double asterisk shall be replaced with that of the output quantity.
4.2.3	R753	The asterisk shall be replaced with a letter code according to 4.3.2.

4.3 Symbols giving supplementary information

4.3.1 General symbols

4.3.1.1	715		Float type
4.3.1.2	771		Displacer type
4.3.1.3	2003		Membrane type; diaphragm type
4.3.1.4	772		Orifice plate type
4.3.1.5	773		Flow nozzle type
4.3.1.6	774		Critical flow nozzle type
4.3.1.7	775		Venturi tube type
4.3.1.8	776		Flow elbow type
4.3.1.9	777		Variable area flow type
4.3.1.10	778		Pitot tube type
4.3.1.11	2405		Rotary type, for example, turbine type
4.3.1.12	IEC		Strain gauge type
4.3.1.13	IEC		Capacitive type
4.3.1.14	IEC		Conductive electrode type
4.3.1.15	IEC		Transmitting ultrasonic type
4.3.1.16	IEC		Receiving ultrasonic type

4.3.1.17	IEC		Transmitting and receiving ultrasonic type
4.3.1.18	IEC		Radioactive type
4.3.1.19	IEC		Optical type
4.3.1.20	IEC		Semiconductor type

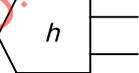
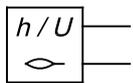
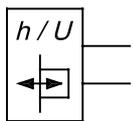
4.3.2 Letter symbols in graphical symbols for measuring transducers utilizing the synchro effect

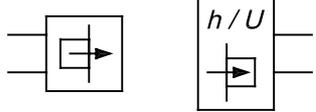
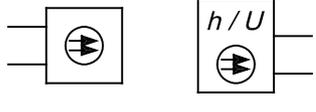
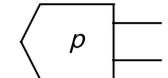
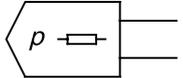
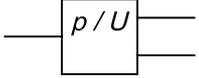
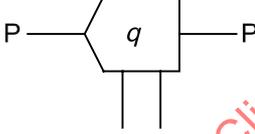
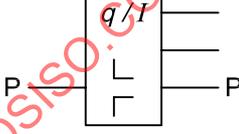
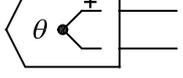
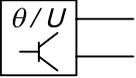
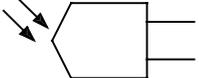
4.3.2.1	791	B	Rotatable stator (succeeding letter)
4.3.2.2	792	C	Controlling (first letter)
4.3.2.3	793	D	Differential type (succeeding letter)
4.3.2.4	794	R	Resolving (first letter) Receiver (succeeding letter)
4.3.2.5	795	T	Torque measurement (first letter) Transformer (succeeding letter)
4.3.2.6	796	X	Measuring transducer/transmitter (succeeding letter)

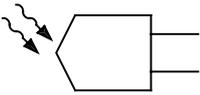
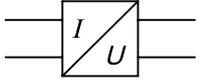
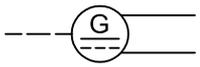
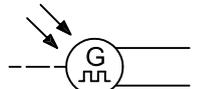
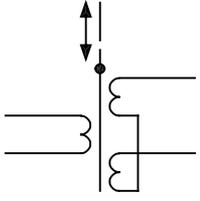
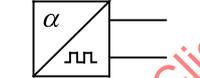
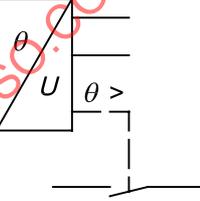
4.4 Application rule for the symbols in 4.3

None.

4.5 Application examples

4.5.1	X751	 751	Level sensor
4.5.2	X752	 101, 112, 715	Level measuring transducer with voltage as output signal, float type
4.5.3	X753	 101, 112, IEC	Level measuring transducer, sonic type with integral source

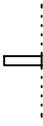
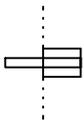
4.5.4	X754	 <p>101, 112, IEC, IEC</p>	Level measuring transducer, sonic type with separate source
4.5.5	X755	 <p>101, 112, IEC</p>	Level measuring transducer, optical type with separate source
4.5.6	X756	 <p>751</p>	Pressure sensor
4.5.7	X757	 <p>751, IEC</p>	Pressure sensor, strain gauge type
4.5.8	X758	 <p>101, 112</p>	Pressure measuring transducer with voltage as output signal
4.5.9	X759	 <p>751</p>	Flow rate sensor NOTE The lines marked P represent the pipeline.
4.5.10	X760	 <p>101, 112, 773</p>	Flow rate measuring transducer with built-in sensor of flow nozzle type with current as output signal NOTE The lines marked P represent the pipeline.
4.5.11	X761	 <p>751, 757</p>	Temperature sensor, thermocouple type
4.5.12	X762	 <p>101, 112, IEC</p>	Temperature measuring transducer with built-in sensor of semi-conductor type with voltage as output signal
4.5.13	X763	 <p>751, IEC</p>	Sensor for non-ionizing radiation

4.5.14	X764	 751, IEC	Sensor for ionizing radiation
4.5.15	X765	 101, 111	Signal converter or measuring transducer with current as input and voltage as output
4.5.16	X766	 221, 759, IEC	Tachometer generator, DC type
4.5.17	X767	 225, 759, IEC	Tachometer generator, optical type
4.5.18	X768	 245, 404, 501, IEC, IEC	Position measuring transducer, differential transformer type
4.5.19	X769	 101, 111, 225	Measuring transducer for angle with pulse train as output variable
4.5.20	X770	 101, 111, 171, 404, IEC	Measuring transducer for temperature with voltage as output signal and contact closing when the temperature is greater than a set value

5 Fittings for sensors and measuring transducers

5.1 Symbols of a basic nature

5.1.1	801		Boss with well
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5.1.2	802		Insertion pipe
5.1.3	803		Boss with insertion pipe

5.2 Application rule for the symbols in 5.1

None.

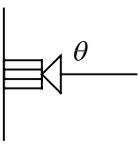
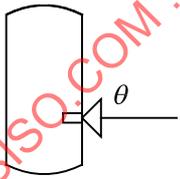
5.3 Symbol giving supplementary information

None.

5.4 Application rule for the symbol in 5.3

None.

5.5 Application examples

5.5.1	X801	 <p>405, 752, 801</p>	Temperature sensor in boss with well on pipeline
5.5.2	X802	 <p>752, 802, 2062</p>	Temperature sensor in insertion pipe on tank

6 Measuring transducers of transformer type

See IEC 60617-6.

7 Measuring and related instruments

7.1 Symbols of a basic nature

7.1.1	831		Thermometer
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7.1.2	832		Indicating (measuring) instrument See R831 (7.2.1).
7.1.3	833		Recording (measuring) instrument See R831 (7.2.1).
7.1.4	834		Integrating (measuring) instrument See R831 (7.2.1) and R832 (7.2.2).

7.2 Application rules for the symbols in 7.1

7.2.1	R831	<p>The arrow may, but the asterisk shall, be replaced with one of the following:</p> <ul style="list-style-type: none"> — the letter symbol for the unit of the quantity indicated/recorded; — the letter symbol for the quantity indicated/recorded; — a chemical formula; — a graphical symbol. <p>The symbol or formula used shall be related to the information displayed by the measuring or related instrument regardless of the means used to obtain the information.</p> <p>Letter symbols for units and quantities shall be selected from ISO 31 or IEC 60027. Non-standardized graphical symbols or letter symbols may be used provided they are explained on the diagram or in a supporting document.</p> <p>If the letter symbol for the unit of a quantity indicated or recorded is used, it may be necessary to show the letter symbol for the quantity as supplementary information. It should be placed below the unit letter symbol.</p> <p>Supplementary information concerning the quantity indicated or recorded and any necessary qualifying symbol may be shown below the quantity letter symbol.</p> <p>To make it possible to distinguish between letter symbols for units and those for quantities, inclined lettering should be used for the quantity letter symbols in accordance with ISO 31 and IEC 60027.</p>
7.2.2	R832	<p>The number of rectangles at the top indicates the number of different summations by a multi-rate meter. If this is impractical, only one rectangle may be shown supplemented with [nx] inside — see symbol 345 (2-11.1.5) — where n shall be replaced with the number of summations.</p>

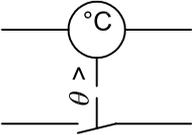
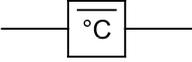
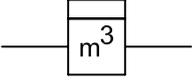
7.3 Symbol giving supplementary information

See 7.2.1.

7.4 Application rule for the symbols in 7.3

None.

7.5 Application examples

7.5.1	X842	 832	Temperature meter, thermometer with dial-in degrees Celsius
7.5.2	X843	 171, 404, 832, IEC	Temperature meter, thermometer with contact closed at temperature higher than a predetermined value
7.5.3	X846	 832	Salinity meter
7.5.4	X851	 833	Recording temperature meter
7.5.5	X855	 834	Volume meter based on time integration of flow rate EXAMPLE Water meter.

8 Counting devices and clocks

8.1 Symbols of a basic nature

8.1.1	841		Counter
8.1.2	842		Clock
8.1.3	843		Master clock

8.2 Application rule for the symbols in 8.1

None.

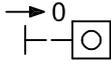
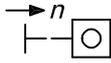
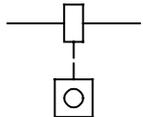
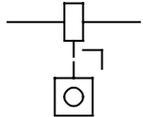
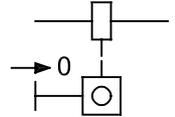
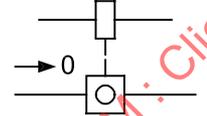
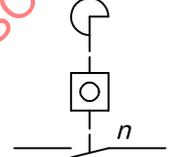
8.3 Symbol giving supplementary information

None.

8.4 Application rule for the symbol in 8.3

None.

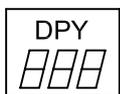
8.5 Application examples

8.5.1	X871	 <p>241, 404, 681, 841</p>	Counter with reset to 0
8.5.2	X872	 <p>241, 404, 681, 841</p>	Counter counting downwards with preset to n events
8.5.3	X873	 <p>404, 841, IEC</p>	Electromechanical counter
8.5.4	X874	 <p>129, 404, 841, IEC</p>	Electromechanical counter indicating a new event when the electrical pulse disappears (postponed action)
8.5.5	X875	 <p>241, 404, 681, 841, IEC</p>	Electromechanical counter with manual reset to 0
8.5.6	X876	 <p>241, 404, 841, IEC</p>	Electromechanical counter with electrical reset to 0
8.5.7	X877	 <p>404, 714, 841, IEC</p>	Cam-driven mechanical counter with output closing at each n events

9 Displays

9.1 Symbols of a basic nature

NOTE For binary logic display elements, see IEC 60617-12:1997, Section 52.

9.1.1	851		Display unit
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9.2 Application rule for the symbols in 9.1

None.

9.3 Symbol giving supplementary information

None.

9.4 Application rule for the symbol in 9.3

None.

9.5 Application example

None.

10 Signalling devices

10.1 Symbols of a basic nature

10.1.1	863		Mechanical indicator See R862 (10.2.1).
10.1.2	864		Electromechanical indicator See R862 (10.2.1).
10.1.3	865		Electromechanical position indicator with one de-energized and two operated positions See R863 (10.2.2).
10.1.4	866		Acoustic signalling device

10.2 Application rules for the symbols in 10.1

10.2.1	R862	The symbol represents an indicator with automatic return. If an indicator has non-automatic return, symbol 655 (4-4.1.11) shall be shown adjacent to the symbol for the indicator. For examples, see X894 (10.5.2) and X895 (10.5.3).
10.2.2	R863	The symbol may also be used for an electrical position indicator in the form of a unit with a number of signal lamps or light emitting diodes with the same indication function.

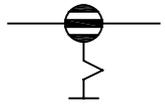
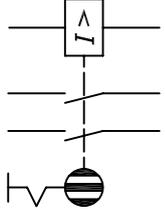
10.3 Symbol giving supplementary information

None.

10.4 Application rule for the symbol in 10.3

None.

10.5 Application examples

10.5.1	X893	 864	Electromechanical indicator with automatic return
10.5.2	X894	 403, 655, 681, 864	Electromechanical indicator without automatic return (manual reset)
10.5.3	X895	 171, 403, 404, 655, 681, 733, 863, IEC	Overcurrent relay with mechanical indicator without automatic return (manual reset)

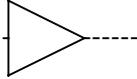
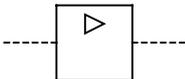
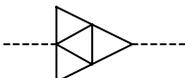
11 Binary logic elements

See IEC 60617-12.

12 Devices for analogue signal processing

12.1 Symbols of a basic nature

NOTE See also IEC 60617-13.

12.1.1	891	Form 1 	Amplifier See R891 (12.2.1).
12.1.2	892	Form 2 	
12.1.3	893	Form 1 	Amplifier with return channel See R891 (12.2.1).
12.1.4	894	Form 2 