

ASME Y14.40.5-2002

(Identical to ISO 14617-5: 2002)

GRAPHICAL SYMBOLS FOR DIAGRAMS, PART 5: MEASUREMENT AND CONTROL DEVICES

An American National Standard



**The American Society of
Mechanical Engineers**

ADOPTION NOTICE

ASME Y14.40.5, Graphical Symbols for Diagrams, Part 5: Measurement and Control Devices, was adopted on 19 December 2002 for use by the Department of Defense, DoD. Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: Commander, U.S. Army TACOM-ARDEC, ATTN: AMSTA-AR-QAW-E, Picatinny Arsenal, NJ 07806-5000. Copies of this document may be purchased from The American Society of Mechanical Engineers (ASME), 22 Law Drive, PO Box 2900, Fairfield, NJ 07007-2900; <http://www.asme.org>.

Custodians:

Army — AR
Navy — SA
Air Force — 16
DLA — DH

Adopting Activity:

Army — AR

(Project DRPR — 0373)

Review Activities:

Army — AT, AV, CE, CR, EA, MI, SM, TE
Navy — AS, CH, EC, MC, OS, SH, TD, YD
Air Force — 11, 13, 19, 68, 70, 71, 84, 99
DLA — CC, GS, IS
NSA — NS

AMSC N/A

AREA DRPR

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



The American Society of
Mechanical Engineers

A N A M E R I C A N N A T I O N A L S T A N D A R D

GRAPHICAL SYMBOLS FOR DIAGRAMS, PART 5: MEASUREMENT AND CONTROL DEVICES

ASME Y14.40.5-2002
(Identical to ISO 14617-5: 2002)

Date of Issuance: June 25, 2003

The next edition of this Standard is scheduled for publication in 2007. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

ASME is the registered trademark of The American Society of Mechanical Engineers.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The *proposed code or standard* was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not "approve," "rate," or "endorse" any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor assumes any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the *risk of infringement of such rights*, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

No part of this document may be reproduced in any form,
in an electronic retrieval system or otherwise,
without the prior written permission of the publisher.

The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

Copyright © 2003 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All rights reserved
Printed in U.S.A.

CONTENTS

Foreword	iv
Committee Roster	v
1 Scope	1
2 References	1
3 Terms and Definitions	1
4 Sensors, Signal Converters, and Measuring Transducers	2
5 Fittings for Sensors and Measuring Transducers	6
6 Measuring Transducers of Transformer Type	7
7 Measuring and Related Instruments	7
8 Counting Devices and Clocks	9
9 Displays	10
10 Signalling Devices	11
11 Binary Logic Elements	12
12 Devices for Analog Signal Processing	12

FOREWORD

This Standard is the adoption as an American National Standard of ISO 14617-5: 2002. The ASME Standards Committee Y14, Engineering Drawing Practices and Related Documentation, is responsible for this Standard and supervises the U.S. participation in the ISO Technical Committee 10 activity responsible for the development and maintenance of its counterpart ISO 14617-5 through the U.S. Technical Advisory Group for ISO/TC 10.

This Standard is *identical* to ISO 14617-5: 2002 as that term is defined in ISO/IEC Guide 21: 1999 and part of a series of standards providing graphical symbols for diagrams in a variety of technical disciplines. The titles in this series are:

- 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.

Suggestions for improvement of this Standard are welcome. They should be sent to: The American Society of Mechanical Engineers, Attention: Secretary, Y14 Standards Committee, Three Park Avenue, New York, NY 10016.

This Standard was approved as an American National Standard on December 19, 2002.

ASME Y14 STANDARDS COMMITTEE

Engineering Drawing and Related Documentation Practices

(The following is the roster of the Committee at the time of approval of this Standard.)

OFFICERS

F. Bakos, *Chair*
K. E. Wiegandt, *Vice Chair*
C. J. Gomez, *Secretary*

COMMITTEE PERSONNEL

A. R. Anderson, Dimensional Control Systems, Inc.
J. B. Baker, Consultant
F. Bakos, Consultant
J. V. Burleigh, The Boeing Co.
R. A. Chadderdon, Southwest Consultants
M. E. Curtis, Jr., Rexnord Corp.
D. E. Day, Monroe Community College
B. Dinardo, U.S. Department of the Army, ARDEC
C. W. Ferguson, WM Education Services
L. W. Foster, L. W. Foster Associates, Inc.
C. J. Gomez, The American Society of Mechanical Engineers
B. A. Harding, Purdue University
K. S. King, Naval Surface Warfare Center, Dahlgren Division
A. Krulikowski, General Motors Powertrain
H. S. Lachut, Alstom Power Inc.
P. J. McCuiston, Ohio University
E. Niemiec, MTD Products, Inc.
K. E. Wiegandt, Sandia National Laboratory
B. A. Wilson, The Boeing Co.
P. Wreede, Consultant

SUBCOMMITTEE 40 — GRAPHIC SYMBOLS

B. A. Harding, *Chair*, Purdue University
K. Boehme, National Fluid Power Association
V. Charles, U.S. Department of the Army, ARDEC
M. D. Hartick, Boeing Commercial Airplanes
H. S. Lachut, Alstom Power Inc.
F. L. Shell, Jr., Consultant
B. S. Wood, Consultant

GRAPHICAL SYMBOLS FOR DIAGRAMS, PART 5: MEASUREMENT AND CONTROL DEVICES

1 SCOPE

This Standard 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 ASME Y14.40.0.

For an overview of the ASME Y14.40 series, 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 ASME Y14.40.1.

2 REFERENCES

The following references contain provisions which, through reference in this text, constitute provisions of this Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the references indicated below. For undated references, the latest edition applies.

ASME Y14.40.0, Basic Rules for the Design of Graphical Symbols for Use in the Technical Documentation of Products

ASME Y14.40.1, Graphical Symbols for Diagrams, Part 1: General Information and Indexes

ASME Y14.40.2, Graphical Symbols for Diagrams, Part 2: Symbols Having General Application

ASME Y14.40.4, Graphical Symbols for Diagrams, Part 4: Actuators and Related Devices

Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

IEC 60027 (all parts), Letter Symbols to Be Used in Electrical Technology¹

IEC 60617-6: 1996, Graphical Symbols for Diagrams — Part 6: Production and Conversion of Electrical Energy¹

¹ Copies may be obtained from the American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036.

IEC 60617-12: 1997, Graphical Symbols for Diagrams — Part 12: Binary Logic Elements¹

IEC 60617-13: 1993, Graphical Symbols for Diagrams — Part 13: Analogue Elements¹

Publisher: International Electrotechnical Commission (IEC), 3 rue de Varembe, Case Postale 131, CH 1211, Genève 20, Switzerland/Suisse

ISO 31 (all parts), Quantities and Units¹

Publisher: International Organization for Standardization (ISO), 1 rue de Varembe, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse

3 TERMS AND DEFINITIONS

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

3.1

sensor: primary element of a measuring chain that converts the input variable into a signal suitable for measurement.

3.2

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

3.3

measuring transducer transmitter: device that 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.

3.4

detector: device that 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 that shows the presence or absence of a phenomenon such as pressure, flow, and position or state, but which does not measure it.




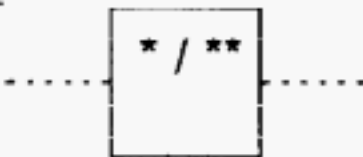


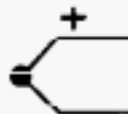
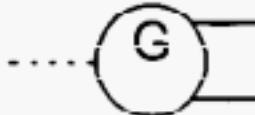
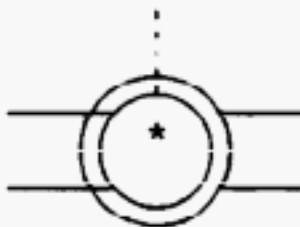
3.6

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.

3.7

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

4 SENSORS, SIGNAL CONVERTERS, AND MEASURING TRANSDUCERS**4.1 Symbols of a Basic Nature**

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
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).




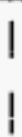

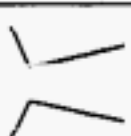
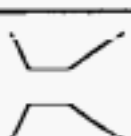
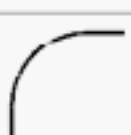
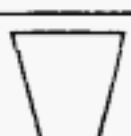


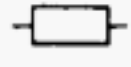

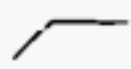

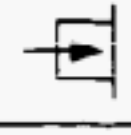
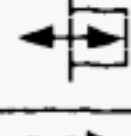


4.2 Application Rules for the Symbols in Para. 4.1


Reference Number	Registration Number	Application Rules
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.

Reference Number	Registration Number	Application Rules
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

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
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.

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.3.1.20	IEC		Semiconductor type.

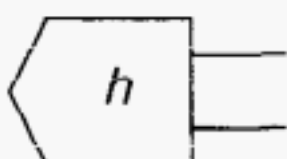
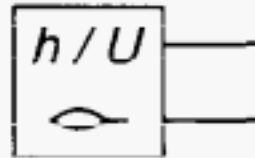
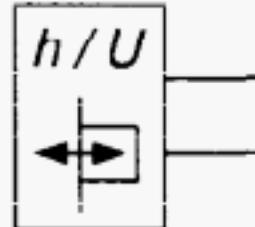
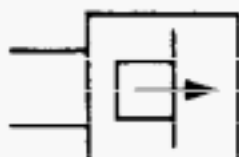
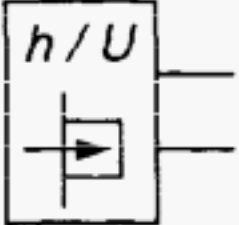
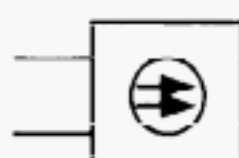
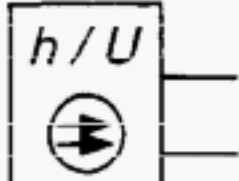
4.3.2 Letter Symbols in Graphical Symbols for Measuring Transducers Utilizing the Synchro Effect

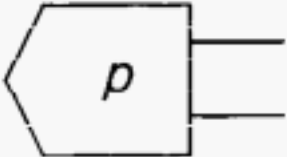
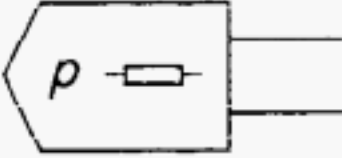
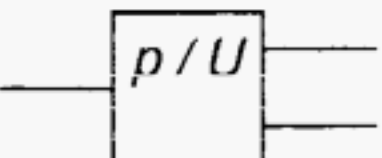
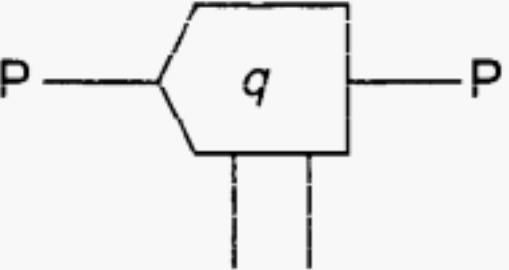
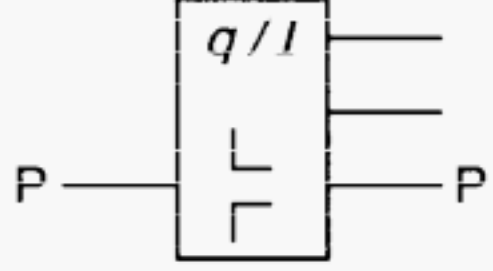
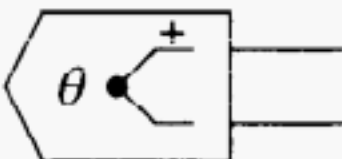
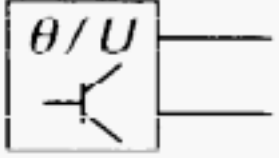


Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.3.2.1	791	<i>B</i>	Rotatable stator (succeeding letter).
4.3.2.2	792	<i>C</i>	Controlling (first letter).
4.3.2.3	793	<i>D</i>	Differential type (succeeding letter).
4.3.2.4	794	<i>R</i>	Resolving (first letter). Receiver (succeeding letter).
4.3.2.5	795	<i>T</i>	Torque measurement (first letter). Transformer (succeeding letter).
4.3.2.6	796	<i>X</i>	Measuring transducer/transmitter (succeeding letter).




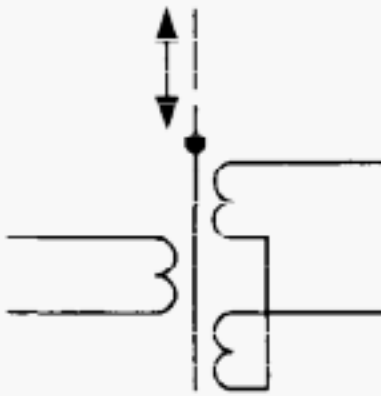
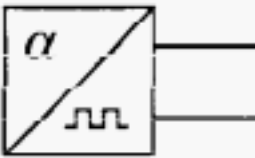
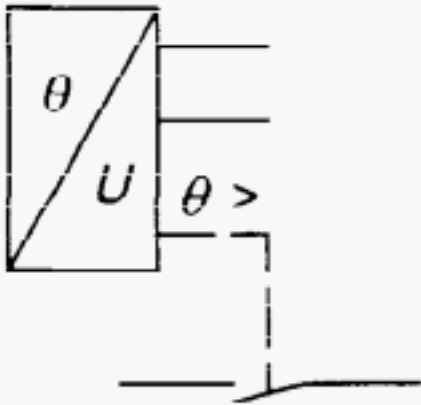
4.4 Application Rule for the Symbols in Para. 4.3

None.

4.5 Application Examples

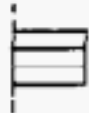
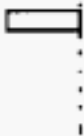
Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.5.1	X751	 751	Level sensor.
4.5.2	X752	 101, 112, 715	Level measuring transducer with voltage as output signal, float type.
4.5.3	X753	 101, 112, IEC	Level measuring transducer, sonic type with integral source.
4.5.4	X754	  101, 112, IEC, IEC	Level measuring transducer, sonic type with separate source.
4.5.5	X755	  101, 112, IEC	Level measuring transducer, optical type with separate source.


Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.5.6	X756	 751	Pressure sensor.
4.5.7	X757	 751, IEC	Pressure sensor, strain gauge type.
4.5.8	X758	 101, 112	Pressure measuring transducer with voltage as output signal.
4.5.9	X759	 751	Flow rate sensor. NOTE: The lines marked <i>P</i> represent the pipeline.
4.5.10	X760	 101, 112, 773	Flow rate measuring transducer with built-in sensor of flow nozzle type with current as output signal. NOTE: The lines marked <i>P</i> represent the pipeline.
4.5.11	X761	 751, 757	Temperature sensor, thermocouple type.
4.5.12	X762	 101, 112, IEC	Temperature measuring transducer with built-in sensor of semi-conductor type with voltage as output signal.
4.5.13	X763	 751, IEC	Sensor for nonionizing radiation.
4.5.14	X764	 751, IEC	Sensor for ionizing radiation.

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

5 FITTINGS FOR SENSORS AND MEASURING TRANSDUCERS

5.1 Symbols of a Basic Nature

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
5.1.1	801		Boss with well.
5.1.2	802		Insertion pipe.

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
5.1.3	803		Boss with insertion pipe.

5.2 Application Rule for the Symbols in Para. 5.1

None.

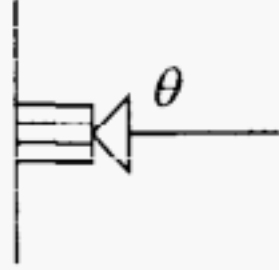
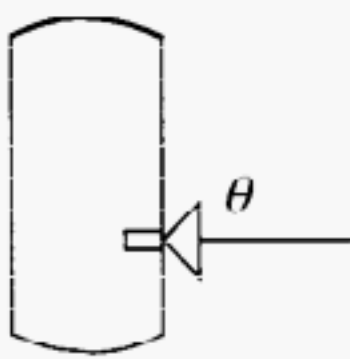
5.3 Symbol Giving Supplementary Information

None.

5.4 Application Rule for the Symbol in Para. 5.3

None.

5.5 Application Examples



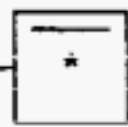
Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
5.5.1	X801	 405, 752, 801	Temperature sensor in boss with well on pipeline.
5.5.2	X802	 752, 802, 2062	Temperature sensor in insertion pipe on tank.

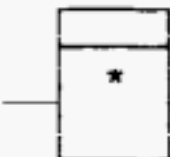
6 MEASURING TRANSDUCERS OF TRANSFORMER TYPE

See IEC 60617-6.

7 MEASURING AND RELATED INSTRUMENTS

7.1 Symbols of a Basic Nature

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
7.1.1	831		Thermometer.
7.1.2	832		Indicator. See R831 (7.2.1).
7.1.3	833		Recorder. See R831 (7.2.1).

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
7.1.4	834		Integrator. See R831 (7.2.1) and R832 (7.2.2).

7.2 Application Rules for the Symbols in Para. 7.1

Reference Number	Registration Number	Application Rules
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"> (a) the letter symbol for the unit of the quantity indicated/recorded; (b) the letter symbol for the quantity indicated/recorded; (c) a chemical formula; (d) 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. Nonstandardized 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 <i>n</i> shall be replaced with the number of summations.</p>


7.3 Symbol Giving Supplementary Information

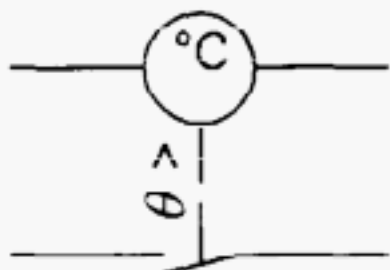
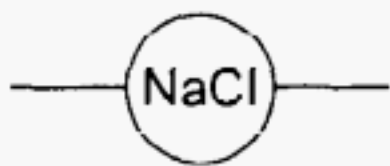
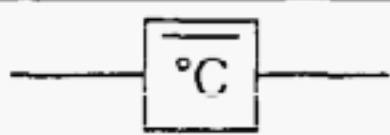
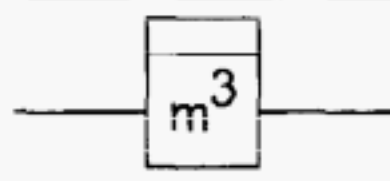
See para. 7.2.1.

7.4 Application Rule for the Symbols in Para. 7.3

None.




7.5 Application Examples

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
7.5.1	X842		Temperature meter, thermometer with dial-in degrees Celsius.
		832	

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
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

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
8.1.1	841		Counter.
8.1.2	842		Clock.
8.1.3	843		Master clock.

8.2 Application Rule for the Symbols in Para. 8.1

None.

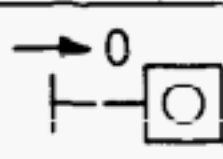
8.3 Symbol Giving Supplementary Information

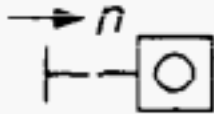
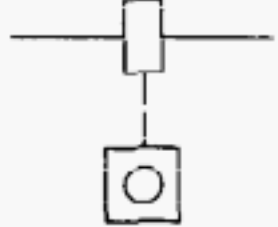
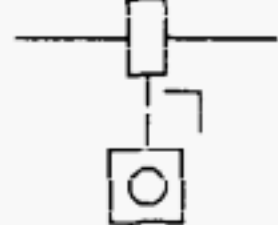
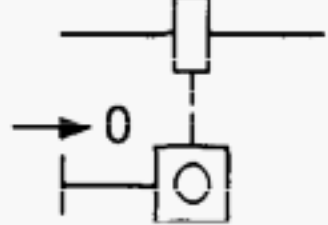
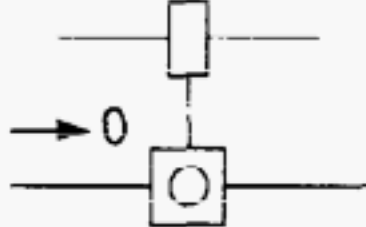
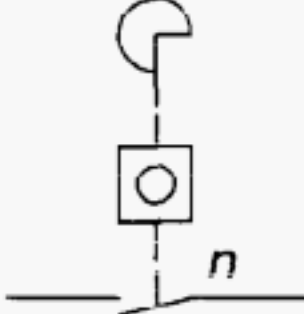
None.

8.4 Application Rule for the Symbol in Para 8.3

None.

8.5 Application Examples


Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
8.5.1	X871	 241, 404, 681, 841	Counter with reset to 0.

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

9 DISPLAYS

9.1 Symbols of a Basic Nature

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

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
9.1.1	851		Display unit.

9.2 Application Rule for the Symbols in Para. 9.1

None.

9.3 Symbol Giving Supplementary Information

None.

9.4 Application Rule for the Symbol in Para. 9.3





None.

9.5 Application Example

None.

10 SIGNALLING DEVICES

10.1 Symbols of a Basic Nature

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
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 Para. 10.1

Reference Number	Registration Number	Application Rules
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.


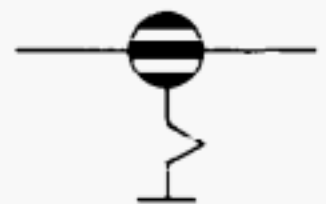
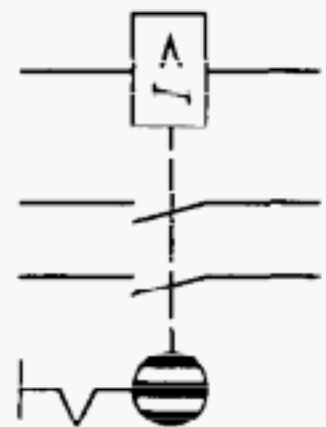
10.3 Symbol Giving Supplementary Information

None.

10.4 Application Rule for the Symbol in Para. 10.3

None.

10.5 Application Examples

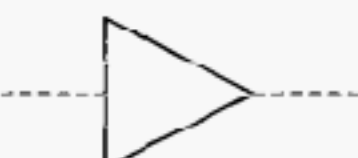


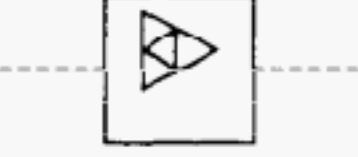
Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
10.5.1	X893	 864	Electromechanical indicator with automatic return.
10.5.2	X894	 403, 655, 681, 864	Electromechanical indicator without automatic return (manual reset).
10.5.3	X895	 171, 403, 404, 655, 681, 733, 863, IEC	Overcurrent relay with mechanical indicator without automatic return (manual reset).


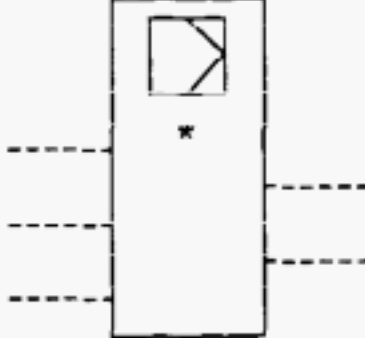
11 BINARY LOGIC ELEMENTS

See IEC 60617-12.

12 DEVICES FOR ANALOG SIGNAL PROCESSING**12.1 Symbols of a Basic Nature**

NOTE: See also IEC 60617-13.

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
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 	




Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
12.1.5	895	Form 1 	Feedback controller. See R891 (12.2.1) and R892 (12.2.2).
12.1.6	896	Form 2 	

12.2 Application Rules for the Symbols in Para. 12.1

Reference Number	Registration Number	Application Rules
12.2.1	R891	<p>The symbol may be supplemented with the mathematical signs + and – as input and output labels with the following meaning:</p> <p>An increase or decrease in a quantity at an input labelled with + or – causes an increase or decrease in both a quantity at an output labelled with the same sign and in a quantity at an output labelled with the opposite sign.</p> <p>The symbols may also be supplemented with a letter code or a graph indicating the behavior of the amplifier or controller (see IEC 60050-351).</p>
12.2.2	R892	<p>The asterisk shall be replaced with the letter symbol for the quantity being controlled, for example, θ for temperature, or a graph or mnemonic indicating the behavior of the controller, or else shall be omitted.</p>

12.3 Symbols Giving Supplementary information

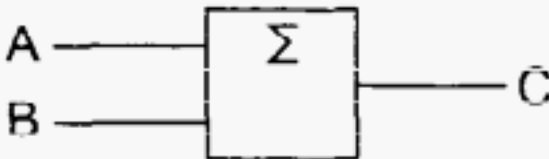
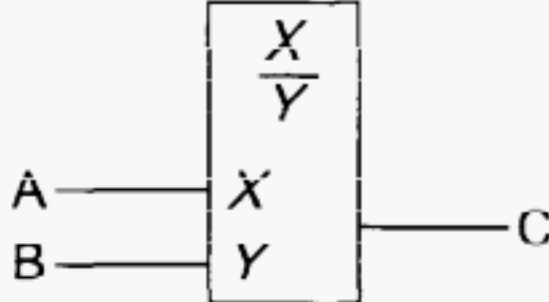
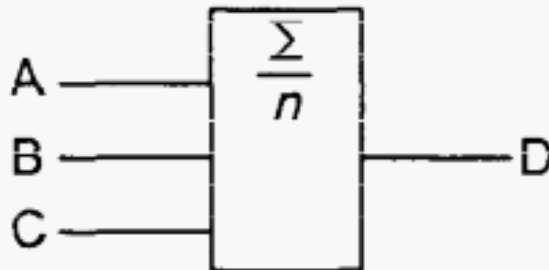
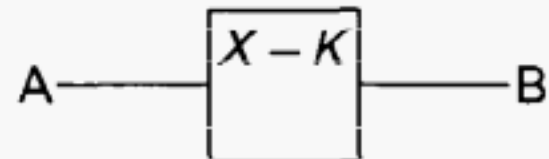
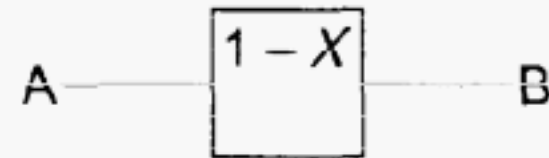
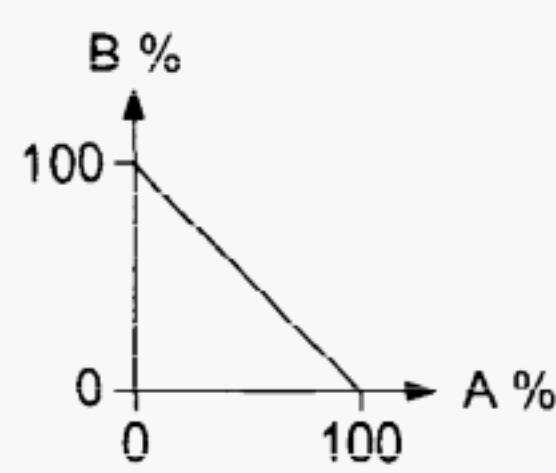

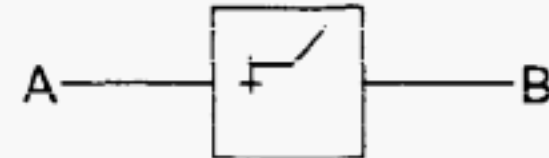
NOTE: See also ASME Y14.40.2, para. 4.3.2.


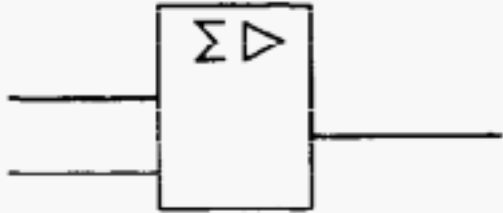

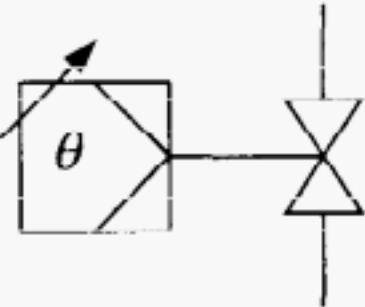

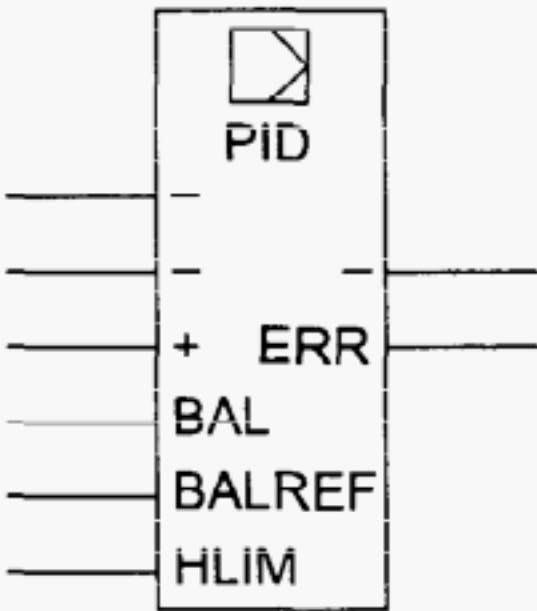
Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
12.3.1	133	Form 1 HLIM	High limitation.
12.3.2	134	Form 2 	
12.3.3	135	Form 1 LLIM	Low limitation.
12.3.4	136	Form 2 	
12.3.5	137		Dead band; threshold.

12.4 Application Rule for the Symbols in Para. 12.3

None.

12.5 Application Examples

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
12.5.1	X901	 101	Device for summing. $C = A + B$
12.5.2	X902	 101, 106, 161	Device for division. $C = \frac{A}{B}$
12.5.3	X903	 101, 161	Device for averaging. $D = \frac{A + B + C}{3}$
12.5.4	X904	 101, 162	Device for bias. $B = A - K$
12.5.5	X905	 101, 163	Device for reverse function. If $A = 0$ then $B = 100\%$. If $A = 100\%$ then $B = 0$. <div data-bbox="1323 1513 1690 1825">  </div>
12.5.6	X906	 101, 134	Device for high limitation. When A is less than or equal to a predetermined value, A_M , then $B = A$. When $A > A_M$, then $B = B_M$.
12.5.7	X907	 101, 136	Device for low limitation. When A greater than or equal to a predetermined value A_M , then $B = A$. When $A < A_M$, then $B = B_M$.

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
12.5.8	X908	<div>  <p>101, 134</p> </div>	Device for high limitation, where input value can be negative.
12.5.9	X909	<div>  <p>892</p> </div>	Summing amplifier.
12.5.10	X910	<div>  <p>106, 892</p> </div>	Differential amplifier.
12.5.11	X911	<div>  <p>201, 403, 895, 2101</p> </div>	Feedback controller with internal set point adjustability controlling ambient temperature by means of valve in pipe.
12.5.12	X912	<div>  <p>106, 895</p> </div>	Feedback controller for rotational speed.
12.5.13	X913	<div>  <p>106, 896</p> </div>	Feedback controller with PID (proportional, integral and derivative action) characteristic and many inputs.

RELATED DOCUMENTS

Engineering Drawing and Related Documentation Practices

Decimal Inch Drawing Sheet Size and Format	Y14.1-1995(R2002)
Metric Drawing Sheet Size and Format	Y14.1M-1995(R2002)
Line Conventions and Lettering	Y14.2M-1992(R1998)
Multiview and Sectional View Drawings	Y14.3M-1994(R1999)
Pictorial Drawings	Y14.4M-1989(R1999)
Dimensioning and Tolerancing	Y14.5M-1994(R1999)
Mathematical Definition of Dimensioning and Tolerancing Principles	Y14.5.1M-1994(R1999)
Certification of Geometric Dimensioning and Tolerancing Professionals	Y14.5.2-2000
Screw Thread Representation	Y14.6-2001
Gears and Splines	
Spur, Helical, Double Helical and Racks	Y14.7.1-1971(R1998)
Bevel and Hypoid Gears	Y14.7.2-1978(R1999)
Castings and Forgings	Y14.8M-1996(R2002)
Mechanical Spring Representation	Y14.13M-1981(R1998)
Optical Parts	Y14.18M-1986(R1998)
Types and Applications of Engineering Drawings	Y14.24-1999
Chassis Frames — Passenger Car and Light Truck — Ground Vehicle Practices	Y14.32.1M-1994(R1999)
Associated Lists	Y14.34M-1996(R2002)
Revision of Engineering Drawings and Associated Documents	Y14.35M-1997
Surface Texture Symbols	Y14.36M-1996(R2002)
Abbreviations and Acronyms	Y14.38-1999
Basic Rules for the Design of Graphical Symbols for Use in the Technical Documentation of Products	Y14.40.0-2002
Graphical Symbols for Diagrams, Part 2: Symbols Having General Applications	Y14.40.2-2002
Graphical Symbols for Diagrams, Part 3: Connections and Related Devices	Y14.40.3-2002
Graphical Symbols for Diagrams, Part 5: Measurement and Control Devices	Y14.40.5-2002
Graphical Symbols for Diagrams, Part 7: Basic Mechanical Components	Y14.40.7-2002
Digital Approval Systems	Y14.42-2002
Digital Product Definition Data Practices	Y14.41-2003
Engineering Drawing Practices	Y14.100-2000
Graphic Symbols for:	
Plumbing Fixtures for Diagrams Used in Architecture and Building Construction	Y32.4-1977(R1999)
Railroad Maps and Profiles	Y32.7-1972(R1999)
Mechanical and Acoustical Elements as Used in Schematic Diagrams	Y32.18-1972(R1998)

The ASME Publications Catalog shows a complete list of all the Standards published by the Society. For a complimentary catalog, or the latest information about our publications, call 1-800-IHE-ASME (1-800-843-2763).

ASME Services

ASME is committed to developing and delivering technical information. At ASME's Information Central, we make every effort to answer your questions and expedite your orders. Our representatives are ready to assist you in the following areas:

ASME Press
Codes & Standards
Credit Card Orders
IMEchE Publications
Meetings & Conferences
Member Dues Status

Member Services & Benefits
Other ASME Programs
Payment Inquiries
Professional Development
Short Courses
Publications

Public Information
Self-Study Courses
Shipping Information
Subscriptions/Journals/Magazines
Symposia Volumes
Technical Papers

How can you reach us? It's easier than ever!

There are four options for making inquiries* or placing orders. Simply mail, phone, fax, or E-mail us and an Information Central representative will handle your request.

Mail
ASME
22 Law Drive, Box 2900
Fairfield, New Jersey
07007-2900

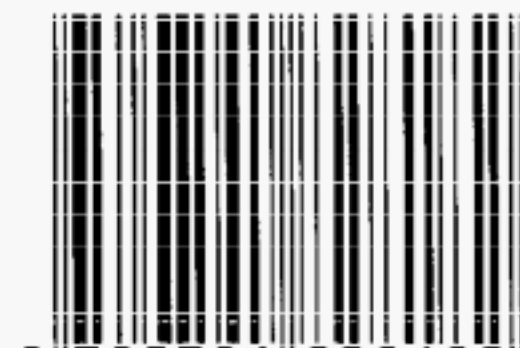
Call Toll Free
US & Canada: 800-THE-ASME
(800-843-2763)
Mexico: 95-800-THE-ASME
(95-800-843-2763)
Universal: 973-882-1167

Fax—24 hours
973-882-1717
973-882-5155

E-Mail—24 hours
infocentral@asme.org

* Information Central staff are not permitted to answer inquiries about the technical content of this code or standard. Information as to whether or not technical inquiries are issued to this code or standard is shown on the copyright page. All technical inquiries must be submitted in writing to the staff secretary. Additional procedures for inquiries may be listed within.

ISBN 0-7918-2818-2



9 780791 828182



N17602