

**ASME Y14.40.7-2002**

**(Identical to ISO 14617-7: 2002)**

# **GRAPHICAL SYMBOLS FOR DIAGRAMS, PART 7: BASIC MECHANICAL COMPONENTS**

**An American National Standard**



**The American Society of  
Mechanical Engineers**

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# GRAPHICAL SYMBOLS FOR DIAGRAMMS, PART 7: BASIC MECHANICAL COMPONENTS

**ASME Y14.40.7-2002**  
(Identical to ISO 14617-7: 2002)

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# FOREWORD

This Standard is the adoption as an American National Standard of ISO 14617-7: 2002. The ASME Standards Committee Y14, Engineering Drawing Practices and Related Documentation, is responsible for this Standard and supervises U.S. participation in the ISO Technical Committee 10 activity responsible for the development and maintenance of its counterpart ISO 14617-7 through the U.S. Technical Advisory Group for ISO/TC 10.

This Standard is *identical* to ISO 14617-7: 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.

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# GRAPHICAL SYMBOLS FOR DIAGRAMS, PART 7: BASIC MECHANICAL COMPONENTS

## 1 SCOPE

This Standard specifies graphical symbols in diagrams for

- (a) mechanical elements such as weights, springs, clutches and brakes
- (b) pipe and duct elements such as restrictors, nozzles and air vents
- (c) devices for storage such as tanks, pressure vessels and gas bottles

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

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## 3 TERMS AND DEFINITIONS

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

### 3.1

*orifice plate*: flow sensor element producing a differential pressure by means of a plate with a specified hole.

### 3.2

*flow nozzle*: flow sensor element producing a differential pressure by means of a convergent device being inserted in a fluid flow.

### 3.3

*critical flow nozzle*: nozzle of which the geometrical configuration is such that the flow rate remains constant irrespective of the fluid condition downstream of the nozzle.

### 3.4

*venturi element*: flow sensor element producing a differential pressure by means of a profiled tube generating a change in the velocity of the fluid flowing through it.

NOTE: The tube consists of a cylindrical entrance part, a convergent part, a cylindrical throat, and a divergent part.

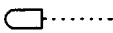
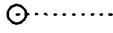








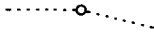
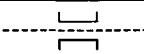







### 3.5



*pitot tube*: flow sensor element producing a differential pressure by means of two straight tubes mounted in line with the direction of the fluid movement.

NOTE: The two tubes may be mounted coaxially as a unit.



**4 MECHANICAL ELEMENTS****4.1 Symbols of a Basic Nature**

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.1.1	711		Plunger; tracer.
4.1.2	712		Roller.
4.1.3	713		Cam profile. See R711 (4.2.1).
4.1.4	715		Fluid-level-operated actuator, for example, in the form of a float.
4.1.5	716		Flow-target-operated actuator, for example, in the form of a mechanical flag.
4.1.6	771		Displacer.
4.1.7	2001		Weight.
4.1.8	2002		Spring. See R2001 (4.2.2).
4.1.9	2003	Form 1 	Membrane; diaphragm.
4.1.10	2004	Form 2 	
4.1.11	2005		Joint of two mechanical parts permitting motion of the parts in two or more dimensions. EXAMPLE: Cardan joint.
4.1.12	2006		Bearing.
4.1.13	2007		Buffer head.
4.1.14	2008		Mechanical gear pair.
4.1.15	2009		Clutch, disengaged in unactuated state.
4.1.16	2010		Clutch, engaged in unactuated state.
4.1.17	2011		Brake, disengaged in unactuated state.
4.1.18	2012		Brake, applied in unactuated state.
4.1.19	2013		Wheel. See R2002 (4.2.3).

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.1.20	2014	Form 1 	Ball.
4.1.21	2015	Form 2 	

#### 4.2 Application Rules for the Symbols in Para. 4.1

Reference Number	Registration Number	Application Rules
4.2.1	R711	The shape of the symbol shall correspond to that of the cam itself. For an example, see X711 (4-6.5.1). A cam of circular form may be shown developed as in the symbol shown.
4.2.2	R2001	<p>The symbol may be used for springs that are used for the following:</p> <p>(a) To exert a counter-force, for example, in spring-loaded safety valves. For an example, see X2002 (4.5.2).</p> <p>(b) To perform an automatic return function, for example, in directional control valves. The symbol shall be located and interpreted as stated in R653 (4-4.2.3). For an example, see X2003 (4.5.3), in which the left-hand/right-hand spring symbol indicates automatic return to the right/left.</p> <p>The use of the symbol to indicate automatic return shall be confined to applications on symbols for valves for fluid power.</p> <p>(c) To store energy, for example, in quick-acting valves and in actuating devices for circuit breakers. For examples, see X2004 (4.5.4) and X2005 (4.5.5).</p> <p>(d) To perform a function combining (a) to (c). For an example, see X2006 (4.5.6).</p>
4.2.3	R2002	The indication of the center may be omitted if confusion is unlikely.

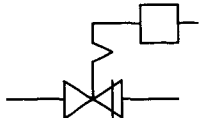
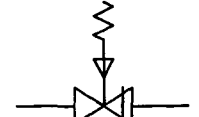
#### 4.3 Symbol Giving Supplementary Information

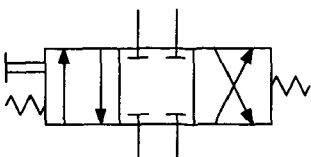
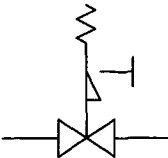
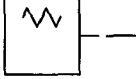


None.

#### 4.4 Application Rule for the Symbol in Para. 4.3

None.

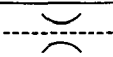





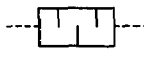

#### 4.5 Application Examples









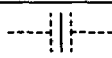


Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.5.1	X2001	 403, 655, 2001, 2101, 2112	Weight-loaded safety valve detained in open position after operation.
4.5.2	X2002	 403, 654, 2002, 2101, 2112	<p>Spring-loaded safety valve with automatic return after operation.</p> <p>[Use symbol 2002 (4.1.8) to indicate a counter-force.]</p>

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.5.3	X2003	 <p>242, 402, 681, 2002, 2161, 2171, 2172</p>	<p>Directional control valve with four ports and three distinct positions, automatic return to mid-position.</p> <p>[Use symbol 2002 (4.1.8) to indicate spring return.]</p>
4.5.4	X2004	 <p>403, 661, 681, 2002, 2101</p>	<p>Quick-acting valve, closing when spring is released.</p> <p>[Use symbol 2002 (4.1.8) to indicate storing of energy.]</p>
4.5.5	X2005	 <p>404, 741, 2002</p>	<p>Spring-loaded actuating device, for example, for a circuitbreaker.</p> <p>[Use symbol 2002 (4.1.8) to indicate storing of energy.]</p>
4.5.6	X2006	 <p>2002, 2007</p>	<p>Spring-equipped buffer.</p> <p>[Use symbol 2002 (4.1.8) to indicate an automatic return, a counter-force, and storing of energy.]</p>
4.5.7	X2007	 <p>301, 2007</p>	<p>Hydraulic buffer.</p>

## 5 PIPE AND DUCT ELEMENTS

### 5.1 Symbols of a Basic Nature

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
5.1.1	2031		Restrictor.
5.1.2	772		Orifice plate.
5.1.3	773		Flow nozzle.
5.1.4	774		Critical flow nozzle.
5.1.5	775		Venturi element.
5.1.6	2032		Flow straightener.
5.1.7	2033		Silencer.
5.1.8	2034		Viewing glass.

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
5.1.9	2035		Rupturing disc.
5.1.10	2036		Flame arrestor.
5.1.11	2037		Spray nozzle.
5.1.12	2038		Siphon, anti-siphon trap.
5.1.13	2039		Vent.
5.1.14	2040		Drain funnel.
5.1.15	2041		Stack.
5.1.16	2042		Pig receiver; launcher.
5.1.17	2043		Blind.
5.1.18	2044		Spectacle blind, shown in closed position.
5.1.19	2045		Spectacle blind, shown in open position.

## 5.2 Application Rules for the Symbols in Para. 5.1

None.

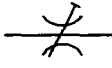
## 5.3 Symbol Giving Supplementary Information

None.









## 5.4 Application Rule for the Symbol in Para. 5.3

None.

## 5.5 Application Example

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
5.5.1	X2031	 203, 2031, 2171	Restriction with pre-set adjustability.

**6 DEVICES FOR STORAGE****6.1 Symbols of a Basic Nature**

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
6.1.1	2061		Container, tank, cistern for atmospheric pressure. See R2061 (6.2.1).
6.1.2	2062	Form 1 	Pressure or vacuum vessel. See R2061 (6.2.1).
6.1.3	2063	Form 2 	
6.1.4	2064		Bunker. See R2061 (6.2.1).
6.1.5	2065		Open store.
6.1.6	2066		Shelf store.
6.1.7	2067		Barrel.
6.1.8	2068		Bag.

**6.2 Application Rule for the Symbols in Para. 6.1**

Reference Number	Registration Number	Application Rule
6.2.1	R2061	The symbol may have another shape if the shape of the tank is significant for the function.


**6.3 Symbol Giving Supplementary Information**





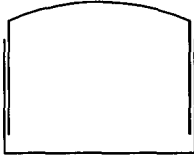
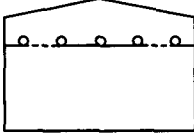



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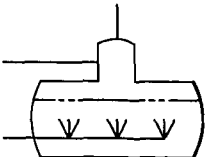
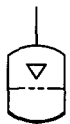
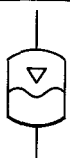
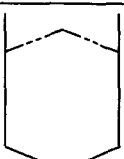
**6.4 Application Rule for the Symbol in Para. 6.3**

None.

**6.5 Application Examples**

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
6.5.1	X2061	 2061	Closed tank for atmospheric pressure.

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
6.5.2	X2062	 2061	Closed tank with conic bottom.
6.5.3	X2063	 2061	Tank with conic roof.
6.5.4	X2064	 2061/2062	Tank with torispheric roof.
6.5.5	X2065	 2061	Tank with floating roof.
6.5.6	X2066	 2062	Gas-holder.
6.5.7	X2067	 2015, 2061	Tank with conic roof and surface of liquid provided with floating balls.
6.5.8	X2068	 2061, 2501	Tank with conic roof and provided with internal heating or cooling coil.
6.5.9	X2069	 301, 2062	Pressure vessel with heating or cooling jacket.
6.5.10	X2070	 2062, IEC	Pressure vessel provided with external electric heater.

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
6.5.11	X2071	 <p>405, 2037, 2062</p>	Boiler feedwater vessel with dearator.
6.5.12	X2072	 <p>244, 2062</p>	Pressure vessel. EXAMPLE: Expansion vessel.
6.5.13	X2073	 <p>244, 2003, 2062</p>	Pressure vessel with diaphragm. EXAMPLE: Expansion vessel.
6.5.14	X2074	 <p>2064</p>	Open bunker with material indicated.

## RELATED DOCUMENTS

<b>Engineering Drawing and Related Documentation Practices</b>	
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)
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