

ASME Y14.40.9-2002

(Identical to ISO 14617-9: 2002)

GRAPHICAL SYMBOLS FOR DIAGRAMS, PART 9: PUMPS, COMPRESSORS, AND FANS

An American National Standard



**The American Society of
Mechanical Engineers**

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(Identical to ISO 14617-9: 2002)

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FOREWORD

This Standard is the adoption as an American National Standard of ISO 14617-9: 2002. The ASME Y14 Standards Committee, Engineering Drawing Practices and Related Documentation, is responsible for this Standard and supervises United States participation in the ISO Technical Committee 10 activity responsible for the development and maintenance of its counterpart, ISO 14617-9, through the U.S. Technical Advisory Group for ISO/TC 10.

This Standard is *identical* to ISO 14617-9: 2002 as that term is defined in ISO/IEC Guide 21: 1999 and the first in 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 9: Pumps, Compressors, and Fans

1 SCOPE

This Standard specifies graphical symbols for pumps, compressors, and fans, used mainly for transportation, in diagrams (for pumps and compressors used mainly for energy conversion, such as those in fluid power systems, see ASME Y14.40.10).

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

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

ISO 5598: 1985, Fluid power systems and components — Vocabulary¹

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

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

3 TERMS AND DEFINITIONS

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

3.1

(positive) displacement pump: pump in which the fluid energy is increased in a working chamber that increases and decreases in volume.

3.2

rotodynamic pump: pump in which the fluid energy is increased by a rotating impeller.

NOTE: The term "centrifugal pump" is sometimes used instead, but that term corresponds to a rotodynamic pump with radial liquid flow.

3.3

turbo-molecular pump: rotodynamic vacuum pump in which the rotor is provided with discs provided with slots or blades rotating between corresponding discs in the stator.

3.4

capacity displacement swept volume: volume absorbed or displaced per stroke or cycle.

3.5

over-center pump: pump in which the direction of flow may be reversed without changing the direction of rotation of the drive shaft.

3.6

uni-flow pump: pump in which the direction of flow is independent of the direction of rotation of the drive shaft.

3.7

entrainment pump: vacuum pump in which a momentum is imparted to the gas molecules in such a way that the molecules are transferred continuously from the inlet to the outlet.

3.8

entrapment pump: vacuum pump in which the gas molecules are retained by sorption or condensation on internal surfaces.

3.9

ejector pump: entrainment pump that uses the pressure decrease due to a Venturi effect and in which the fluid is entrained in a high-speed liquid stream towards the outlet.

3.10

diffusion pump: entrainment pump in which a low-pressure, high-speed vapor stream provides the entrainment fluid.

3.11

adsorption pump: entrapment pump in which the gas is retained mainly by physical adsorption of a material of large real area (for example, a porous substance).

3.12

getter pump: entrapment pump in which the gas is retained principally by chemical combination with a getter.

3.13

getter ion pump: entrapment pump in which the gas molecules are ionized and then transferred towards a surface of the pump on which they are retained by a getter, by means of electric fields, combined or not with a magnetic field.

3.14

cryopump: entrapment pump consisting of surfaces refrigerated to a low temperature (normally less than 120 K) sufficient to condense residual gases.

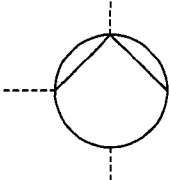
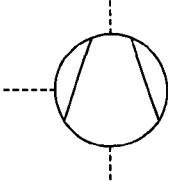
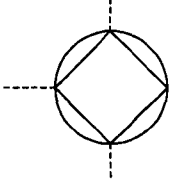
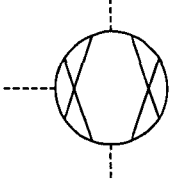
3.15

electric pump: pump working by feeding electric power directly into the pump.

3.16

induction pump: pump without rotating parts, in which electromagnetic fields exert the necessary force on the pumped medium (normally metals in liquid form).

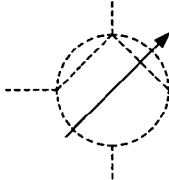



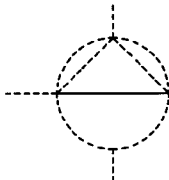
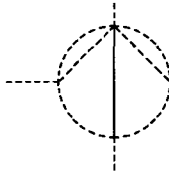
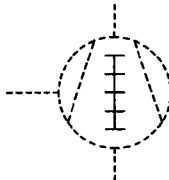
4 MECHANICALLY DRIVEN PUMPS, COMPRESSORS, AND FANS**4.1 Symbols of a Basic Nature**

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.1.1	2301		Liquid pump.
4.1.2	2302		Gas pump (including vacuum pump), compressor, fan.
4.1.3	2303		Liquid pump with alternative directions of flow.
4.1.4	2304		Gas pump, compressor, fan with alternative directions of flow.

4.2 Application Rule for the Symbols in Para. 4.1

None.

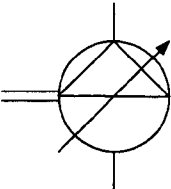
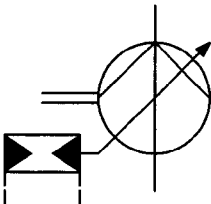
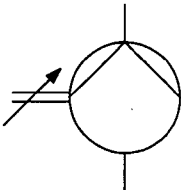
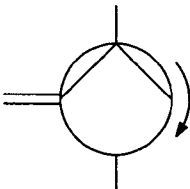
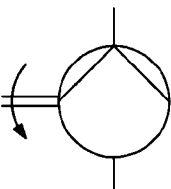
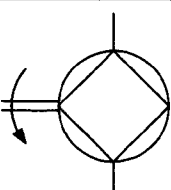
4.3 Symbols Giving Supplementary Information

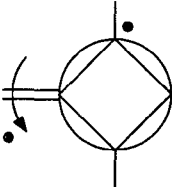
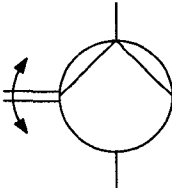
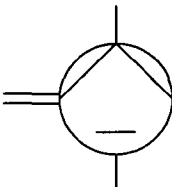
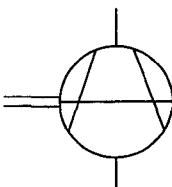
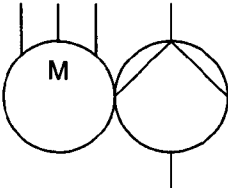
Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.3.1	201		Adjustability. See R201 (4.4.1) and R2311 (4.4.3).
4.3.2	221	Form 1 	Constant force, motion, or flow. See R221 (4.4.2).
4.3.3	222	Form 2 	
4.3.4	225		Pulse-shaped force, motion, or flow.
4.3.5	2321		Positive-displacement type.
4.3.6	2322		Rotodynamic type.
4.3.7	2323		Turbo-molecular type.

4.4 Application Rules for the Symbols in Para. 4.3

Reference Number	Registration Number	Application Rule
4.4.1	R201	The symbol should cross the center of the symbol to which it is added. For examples, see X201 (2-5.5.1) to X206 (2-2.5.6) and X2301 (4.5.1) to X2303 (4.5.3). If this symbol consists of an outline in the form of a square, rectangle, or circle and a symbol inside indicating the function, another location could be more appropriate. For an example, see X207 (2-5.5.7).
4.4.2	R221	Form 2 may be used if confusion is unlikely.
4.4.3	R2311	Applied to symbols for pumps, compressors, and fans, the symbol indicates adjustability of the capacity as defined in ISO 5598, if not otherwise indicated.

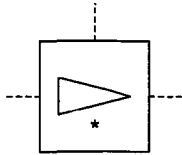
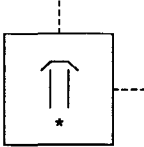
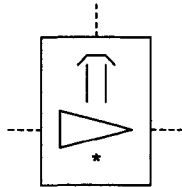
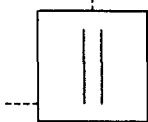
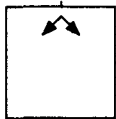
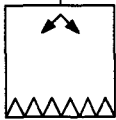
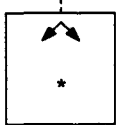
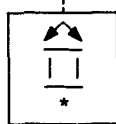
4.5 Application Examples

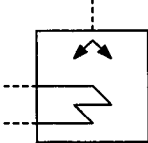
Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.5.1	X2301	 201, 402, 2301, 2321	Liquid pump of positive-displacement type with adjustable capacity.
4.5.2	X2302	 201, 402, 403, 719, 2301, 2322	Liquid pump of rotodynamic type with adjustable capacity. The actuator is shown.
4.5.3	X2303	 201, 402, 2301	Liquid pump driven by shaft with adjustable speed.
4.5.4	X2304	 255, 402, 2301	Liquid pump with clockwise rotation when seen towards shaft end. NOTE: For the interpretation of the arrow, see R249 (2-7.2.8).
4.5.5	X2305	 255, 402, 2301	
4.5.6	X2306	 255, 402, 2303	Over-center liquid pump. Clockwise rotation shown.

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
4.5.7	X2307		Reversible liquid pump. Corresponding directions of rotation and of flow indicated.
		256, 263, 402, 2303	
4.5.8	X2308		Uni-flow liquid pump.
		256, 402, 2301	
4.5.9	X2309		Liquid pump with substantially even flow.
		222, 402, 2301	
4.5.10	X2310		Gas pump, compressor of positive displacement type.
		402, 2302, 2321	
4.5.11	X2311		Liquid pump with built-in electric motor (wet rotor).
		2301, IEC	

5 ENTRAINMENT AND ENTRAPMENT PUMPS

5.1 Symbols of a Basic Nature

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
5.1.1	2331		Ejector pump. See R2331 (5.2.1).
5.1.2	2332		Diffusion pump. See R2331 (5.2.1).
5.1.3	2333		Diffusion-ejector pump. See R2331 (5.2.1).
5.1.4	2334		Gas-lift pump.
5.1.5	2335		Entrapment pump. EXAMPLE: Adsorption pump, getter pump.
5.1.6	2336		Adsorption pump.
5.1.7	2337		Getter pump. See R2332 (5.2.2).
5.1.8	2338		Getter ion pump. See R2332 (5.2.2).

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
5.1.9	2339		Cryopump.

5.2 Application Rules for the Symbols in Para. 5.1

Reference Number	Registration Number	Application Rule
5.2.1	R2331	The asterisk shall be replaced with a chemical symbol for the fluid, or else shall be omitted.
5.2.2	R2332	The asterisk shall be replaced with the chemical symbol for the sorbent concerned.

5.3 Symbol Giving Supplementary Information

None.

5.4 Application Rule for the Symbol in Para. 5.3

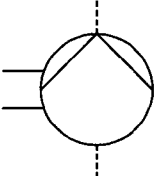
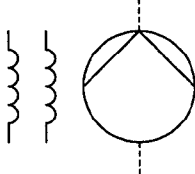

None.

5.5 Application Example

None.

6 ELECTRIC PUMPS

6.1 Symbols of a Basic Nature

Reference Number	Registration Number	Symbol Form/Shape	Symbol Description
6.1.1	2351		Electric liquid pump, for example, working by piezoelectric effect.
6.1.2	2352	Form 1 	Electric induction liquid pump. Detailed and simplified forms shown.
6.1.3	2353	Form 2 	

6.2 Application Rule for the Symbols in Para. 6.1

None.

6.3 Symbol Giving Supplementary Information

None.

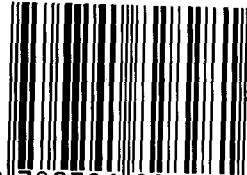
6.4 Application Rule for the Symbol in Para. 6.3

None.

6.5 Application Example

None.

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