

ANSI/ISA-S75.05-1983

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American National Standard

Control Valve Terminology



The International Society for Measurement and Control



ANSI/ISA-S75.05 — Control Valve Terminology

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Preface

This Preface is included for informational purposes and is not part of ANSI/ISA-S75.05.

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The ISA Standards and Practices Department is aware of the growing need for attention to the metric system of units in general, and the International System of Units (SI) in particular, in the preparation of instrumentation standards. The Department is further aware of the benefits to USA users of ISA Standards of incorporating suitable references to the SI (and the metric system) in their business and professional dealings with other countries. Towards this end this Department will endeavor to introduce SI-acceptable metric units in all new, and revised standards to the greatest extent possible. The Metric Practice Guide, which has been published by the Institute of Electrical and Electronics Engineers, Inc. as ANSI/IEEE 268-1982, and future revisions, will be the reference guide for definitions, symbols, abbreviations, and conversion factors.

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Prior to the issue of this standard, there had been no standard which provided terminology for control valve functions, types of valves and parts of valves used for control of fluid flow. This standard provides terminology for control valves of seven different types and also for common types of actuators used with these valves. This standard names individual valve parts, defines assemblies of parts, and provides terminology for part and assembly functions. Terminology is provided for differently shaped parts performing the same function. Operating terminology is furnished for the complete valve-actuator unit as well as limited terminology for the function of auxiliary equipment used with control valves. Type of construction terminology is provided where there may be a reason to specify a particular construction.

This standard is provided with a subject index for cross-reference and a glossary to define commonly used control valve terms. Defined terms, where used as a part of other definitions, are set in italics to provide a ready cross reference.

Valve classification charts are provided to show the control valve function within the entire grouping of valves and the charts are extended to show the relationship of control valves by type.

This standard replaces ASME Standard 112, issued in 1961, "Diaphragm Actuated Control Valve Standard," which is now inactive and is to be withdrawn. For additional information see the ISA Handbook of Control Valves.

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Draft Revision in Committee

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1 Scope and purpose

1.1 To provide terminology and classification for the following types of *control valves*.

1.1.1 *Linear motion type control valves* covered are: (Section 5)

Globe (Subsection 5.1)

Gate (Subsection 5.2)

Diaphragm (Subsection 5.3)

Pinch or Clamp (Subsection 5.4)

1.1.2 *Rotary motion type control valves* covered are: (Section 6)

Ball (Subsection 6.1)

Butterfly, (Subsection 6.2)

Plug (Subsection 6.3)

1.2 To provide terminology and classification for the following types of control valve actuators.

1.2.1 *Actuator types* covered are: (Section 7)

Diaphragm (Subsection 7.1.1.1)

Piston (Subsection 7.1.1.2)

Vane (Subsection 7.1.1.3)

Bellows (Subsection 7.1.1.4)

Fluid Motor (Subsection 7.1.1.5)

Electro Mechanical Type (Subsection 7.1.2.1)

Electro Hydraulic Type (Subsection 7.1.2.2)

Hydraulic (Subsection 7.1.3)

1.3 To provide the description and classification of *auxiliary equipment* which may be used with *control valves*. (Section 8)

1.4 To provide a glossary to define other terms commonly used in the control valve industry.

2 Basic definitions

2.1 Control valve*: A power operated device which modifies the fluid flow rate in a process control system. It consists of a *valve* connected to an *actuator* mechanism that is capable of changing the position of a flow controlling element in the valve in response to a signal from the controlling system.

2.1.1 Valve: A *valve* is a device used for the control of fluid flow. It consists of a fluid retaining assembly, one or more ports between end openings and a movable *closure member* which opens, restricts or closes the *port(s)*.

2.1.2 Actuator: An *actuator* is a fluid powered or electrically powered device which supplies force and motion to a *valve closure member*.

2.1.3 Motion conversion mechanism: A mechanism between the *valve* and the power unit of the *actuator* to convert between linear and rotary motion. The conversion can be from *linear actuator* action to *rotary valve* operation or from *rotary actuator* action to *linear valve* operation.

3 Classification

The classification of *valves*, *actuators*, and *valve positioners* is illustrated in the following charts:

3.1 Valves

3.2 Control valves

3.3 Actuators

3.4 Valve positioners

*The following types of valves are excluded from this standard:

- 1) **Regulator** — A regulator, whether for flow, level, pressure or temperature is a valve with a positioning actuator using a self-generated power signal for moving the closure member relative to the valve port or ports in response and in proportion to the changes in energy of the controlled variable. The force to position the closure member is derived from the same fluid. Source: "Standard Classification and Terminology for Power Actuated Valves", (Fluid Controls Institute) FCI 55-1 (1962).
- 2) **Relief Valve** — A generic term applying to relief valves, safety valves or safety relief valves. Source: ANSI B95.1 or API RP520.
- 3) **Hand Valve** — A generic term applying to valves used in process piping to provide shut off or isolation.

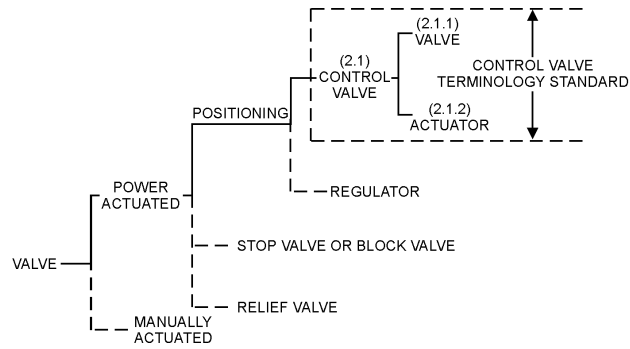


Chart 3.1 — Valves (taken in part from FCI 55-1, 1962 Std.)

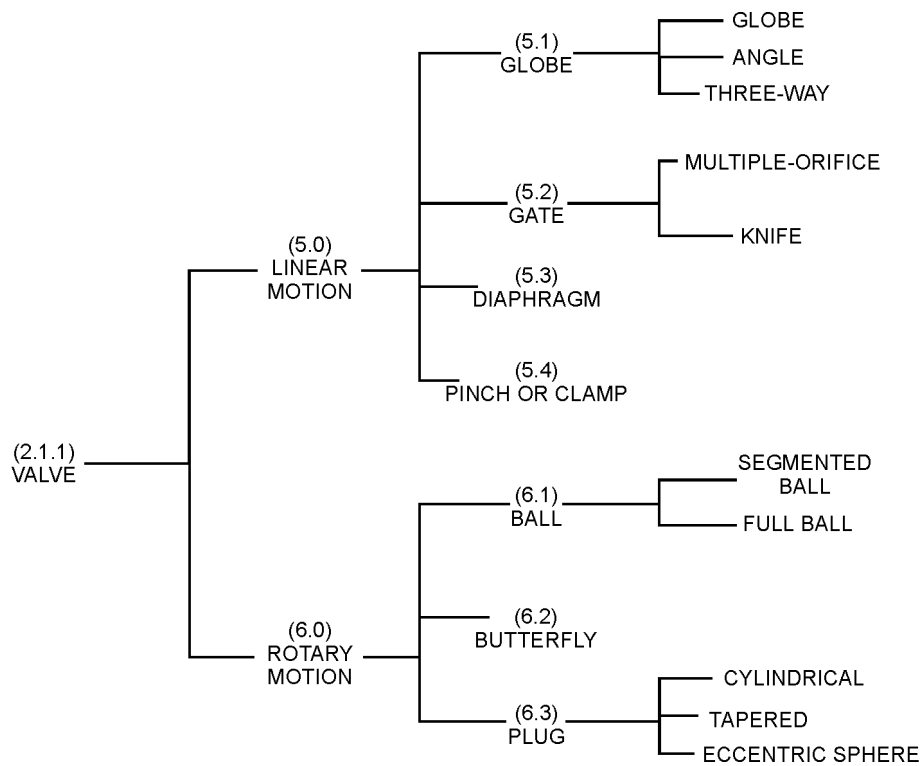


Chart 3.2 — Control valves

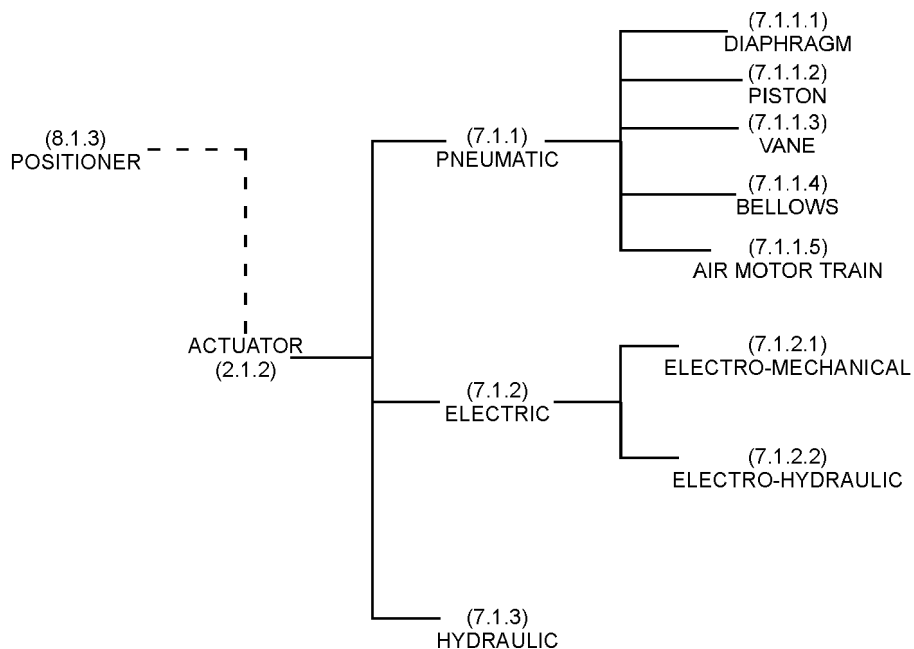


Chart 3.3 — Actuators

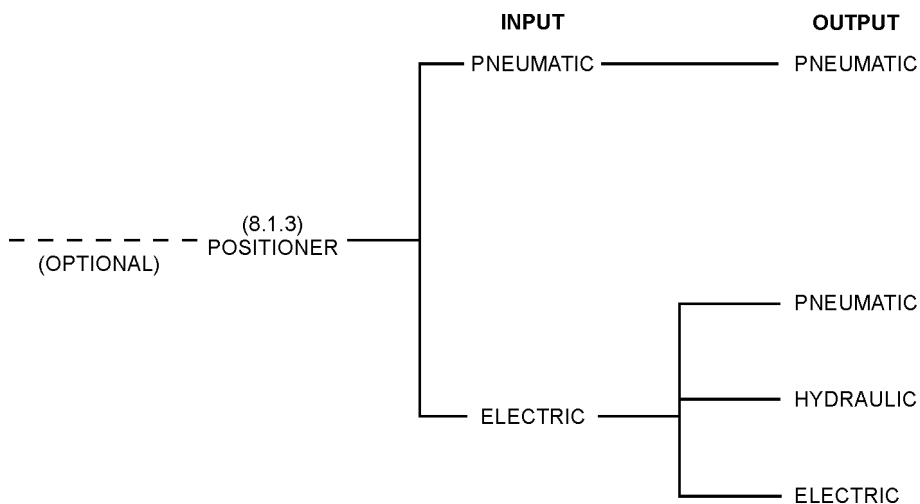


Chart 3.4 — Valve positioners

4 Definitions of parts common to many types of valves

4.1 Body: The part of the *valve* which is the main pressure boundary. The *body* also provides the pipe connecting ends, the fluid flow passageway, and may support the seating surfaces and the *valve closure member*.

4.2 Bonnet: That portion of the valve pressure retaining boundary which may guide the *stem* and contains the *packing box* and *stem seal*. It may also provide the principal opening to the *body* cavity for assembly of internal parts or be an integral part of the *valve body*. It may also provide for the attachment of the actuator to the valve body.

4.2.1 Bonnet types: Typical bonnets are bolted, threaded, or welded to or integral with the *body*. Other types sometimes used are defined below.

4.2.1.1 Extension bonnet: A *bonnet* with a *packing box* that is extended above the *bonnet* joint of the *valve body* so as to maintain the temperature of the packing above or below the temperature of the process fluid. The length of the extension *bonnet* is dependent upon the difference between the fluid temperature and the packing design temperature limit as well as upon the *valve body* design.

4.2.1.2 Seal welded bonnet: A *bonnet* welded to a *body*, at assembly, to provide a zero leakage joint. This construction consists of a low-strength weld with the bonnet retained to the *body* by other means to withstand the body pressure load acting on the *bonnet* area.

4.2.2 Bonnet gasket: A deformable sealing element between the mating surfaces of the *body* and *bonnet*. It may be deformed by compressive stress or energized by fluid pressure within the *valve body*.

4.2.3 Bonnet bolting: A means of fastening the *bonnet* to the *body*. It may consist of studs with nuts for a flanged *bonnet* joint, studs threaded into the *bonnet* neck of the *body*, or bolts through the *bonnet* flange.

4.3 Closure member: A movable part of the *valve* which is positioned in the flow path to modify the rate of flow through the *valve*.

4.3.1 Closure member types

4.3.1.1 Ball: A spherically shaped part which uses a portion of a spherical surface or an internal path to modify flow rate with rotary motion.

4.3.1.2 Disk: An essentially flat, circular shaped part which modifies the flow rate with either linear or rotary motion.

4.3.1.3 Gate: A flat or wedge-shaped sliding element that modifies flow rate with linear motion across the flow path.

4.3.1.4 Plug: A cylindrical part which moves in the flow stream with linear motion to modify the flow rate and which may or may not have a contoured portion to provide flow characterization. It may also be a cylindrical or conically tapered part, which may have an internal flow path, that modifies the flow rate with rotary motion.

4.4 Flow control orifice: The part of the flow passageway that, with the *closure member*, modifies the rate of flow through the *valve*. The orifice may be provided with a seating surface, to be contacted by or closely fitted to the *closure member*, to provide tight shutoff or limited leakage.

4.4.1 Seat ring: A part that is assembled in the *valve body* and may provide part of the flow control orifice. The *seat ring* may have special material properties and may provide the contact surface for the *closure member*. Typical *seat ring* hard facing is shown in Appendix A.

4.4.2 Cage: A part in a *globe valve* surrounding the *closure member* to provide alignment and facilitate assembly of other parts of the *valve trim*. The *cage* may also provide flow characterization and/or a seating surface for *globe valves* and flow characterization for some *plug valves*.

4.4.3 Integral seat: A *flow control orifice* and seat that is an integral part of the *body* or *cage* material or may be constructed from material added to the *body* or *cage*.

4.5 Stem: The rod, shaft or spindle which connects the valve *actuator* with the *closure member*.

4.6 Stem seals: The part or parts needed to effect a pressure-tight seal around the *stem* while allowing movement of the *stem*.

4.6.1 Packing: A sealing system consisting of deformable material of one or more mating and deformable elements contained in a packing box which may have an adjustable compression means to obtain or maintain an effective pressure seal.

4.6.1.1 Packing box: The chamber, in the *bonnet*, surrounding the stem and containing *packing* and other *stem* sealing parts.

4.6.1.2 Packing follower: A part which transfers mechanical load to the *packing* from the packing flange or nut.

4.6.1.3 Lantern ring: A rigid spacer assembled in the *packing box* with packing normally above and below it and designed to allow lubrication of the *packing* or access to a leak-off connection.

4.6.2 Pressure energized stem seal: A part and/or *packing* material deformable by fluid pressure that bears against the *stem* to make a tight seal.

4.6.3 Bellows stem seal: A thin wall, convoluted, flexible member which makes a seal between the *stem* and *bonnet* or *body* and allows *stem* motion while maintaining a positive seal.

4.6.4 Back seat: A seating surface in the bonnet area that mates with the *closure member* or *valve stem* in the extreme open position to provide pressure isolation of the *stem* seal.

4.7 Bushing: A fixed member which supports and/or guides the *closure member*, *valve stem* and/or *actuator stem*. The bushing supports the nonaxial loads on these parts and is subject to relative motion of the parts.

5 Linear motion control valve types

Types of *valves* with a *closure member* that moves with a linear motion to modify the rate of flow through the *valve*.

5.1 Globe valve: A *valve* with a linear motion *closure member*, one or more ports and a *body* distinguished by a globular shaped cavity around the port region. Typical *globe valve* types are illustrated below. Flow arrows shown indicate a commonly, used flow direction.

TWO-WAY BODIES

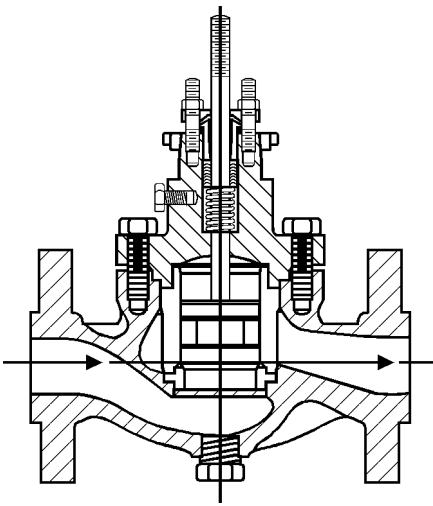


Figure 5.1a — Cage guided

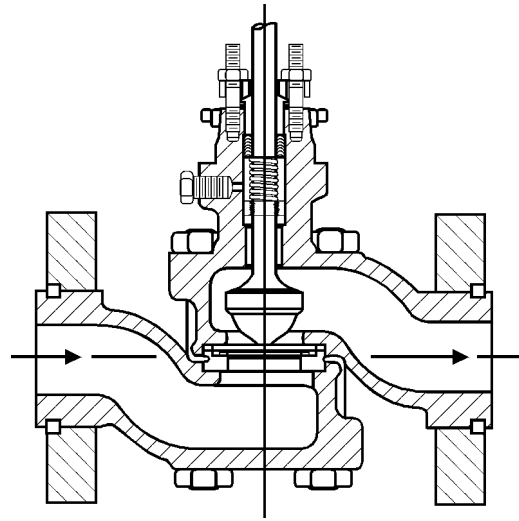


Figure 5.1b — Split body stem guided

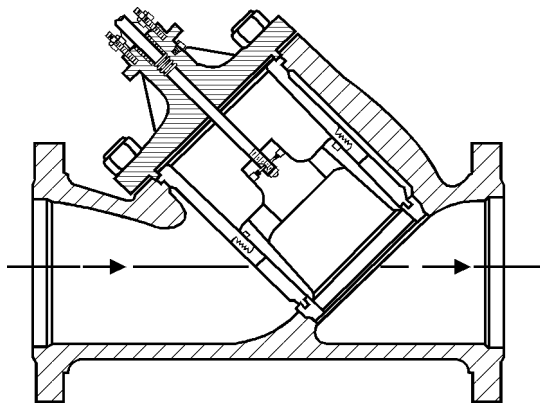


Figure 5.1c — Y-type cage guided

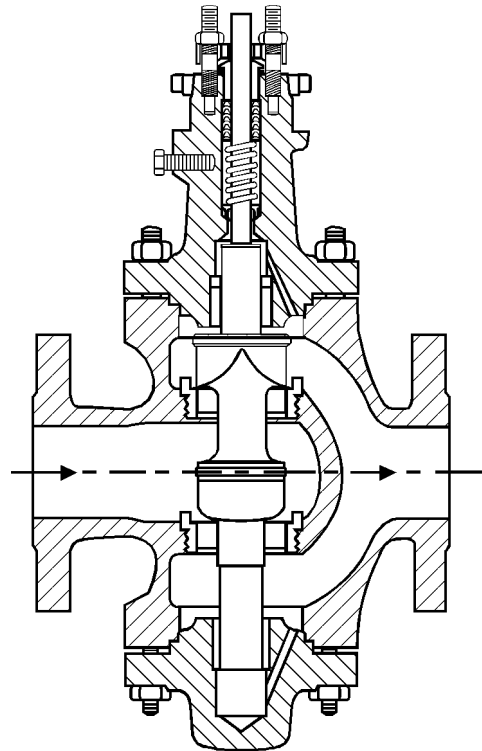


Figure 5.1d — Double ported post (or top & bottom) guided