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STANDARD

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ANSI/ISA-75.19.01-2024

Hydrostatic Testing of Control Valves

Approved: 16 APRIL 2024

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ISA
3252 S. Miami Blvd., Suite 102
Durham, NC 27703 USA

Preface

Since the release of ANSI/ISA-75.19.01-2013, American Society of Mechanical Engineers (ASME) has released the 2013 edition and then the 2017 edition of B16.34, *Valves – Flanged, Threaded, and Welding End*. ANSI/ISA-75.19.01-2013 was revised in 2024 to reflect any relevant changes that have been made to ASME B16.34 since the 2009 edition. Changes include correction of some material lists and material groups. The 2024 edition of ISA-75.19.01 continues to use metric units as the primary reference units while maintaining US customary units in reference tables. This follows the lead of ASME B16.34-2017 that states its goal is to delete the US customary units in future revisions.

This preface is included for informational purposes and is not part of ISA-75.19.01-2024.

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NAME	AFFILIATION
Fabian C. Gonzalez, <i>Co-chair</i>	Flowserve Corporation
Vince Mezzano, <i>Co-chair</i>	Fluor Corp.
Isthaiq Ahmed	Bartem Instruments
Bayard Bosserman	Boyle Engineering Corp.
Foungnigue Coulibaly	Nexen Inc.
Dave Goode	Emerson
Lisa Miller	Emerson
Rasidi Mohamed	Petronas
Brett Pollock	Emerson
Sathish Sundarakumar	Consultant
Warren Weidman	Retired
Laren Winkel	Flowserve Corporation
Ramakrishnan Viswanathan	L&T Valves Limited
Sekhar Samy	IMI Critical Engineering
Sunil Vora	McDermott Middle East Inc.
James Young	The Dow Chemical Co.

The following people served as voting members of ISA75 for this 2024 revision of ANSI/ISA-75.19.01:

NAME	AFFILIATION
Vincent Mezzano, <i>Managing Director</i>	Fluor Corp
James Young, <i>Chair</i>	The Dow Chemical Co.
Hans Baumann	H B Services Partners LLC
James Beall	Enero Solutions
Stephen Boyle	Retired
Jack Broyles	Control Valve Science
Joseph Dufresne	Samson Controls Inc.
Jamshid Faramarzi	Celeros Flow Technology
Craig Hergert	Kellogg Brown & Root (KBR)
Jörg Kiesbauer	University of Applied Sciences Darmstadt

Albert Libke
Gerald Liu
Todd Loudin
Lisa Miller
Alireza Sahraei
Sekhar Samy
Joseph Scalise

DeZURIK
Retired
Valmet Flow Control
Emerson
Nutrien
IMI Critical Engineering
Bechtel

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NAME	AFFILIATION
D. Lee, <i>Chair</i>	UCDS
D. Brandl, <i>Chair-Elect</i>	BR&L Consulting
D. Bartusiak	Collaborative Systems Integration
P. Brett	Honeywell
E. Cosman	OIT Concepts
J. Federlein	Federlein & Associates
S. Fluchs	admeritia GmbH
J.-P. Hauet	KB Intelligence
G. Lehmann	NextEra Energy
T. McAviney	Consultant
V. Mezzano	Fluor
C. Monchinski	Automated Control Concepts
D. Reed	Rockwell Automation
H. Sasajima	FieldComm Group
I. Verhappen	Willowglen Systems
D. Visnich	Burns & McDonnell
W. Weidman	Consultant
J. Weiss	Applied Control Solutions
M. Wilkins	Yokogawa
D. Zetterberg	Consultant

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1 Scope

1.1 This document applies to control valves having bodies, bonnets, cover plates, and bottom flanges made of carbon steel, low alloy and high alloy (stainless) steel, nickel-base alloy, cast iron, and ductile iron.

1.2 This document establishes requirements and definitions for standard hydrostatic shell testing of control valves by the valve manufacturer to prove the structural integrity and leak tightness of the valves' pressure-retaining parts, including any closure parts such as the valve body to bonnet joint, but excluding packings, bellows, or other moving seals, and packing leakoff/purge/vent port connections. Bellows or similar moving stem seals may be pressure tested after assembly at a pressure to be agreed upon by the valve manufacturer and the purchaser. The requirements of this document do not cover pneumatic and hydraulic actuators and regulators.

1.3 This document describes and specifies the specific circumstances of hydrostatic shell testing of control valves and is in accordance with the hydrostatic testing requirements of ASME B16.1, ASME B16.34, and ASME B16.42, with the exception that the test requirements of paragraph 4.8 are not allowed by ASME B16.34.

1.4 **WARNING — SERIOUS BODILY HARM CAN BE CAUSED BY HIGH VELOCITY LEAKS THROUGH THE SHELL OR SEALS, RESULTING FROM THE ENERGY STORED IN THE PRESSURIZED FLUID AND CONTAINMENT EQUIPMENT. CARE SHOULD BE EXERCISED TO ENSURE THE SAFETY OF TEST AND INSPECTION PERSONNEL. SPECIFIC SAFETY REQUIREMENTS FOR CONDUCTING HYDROSTATIC TESTING AND INSPECTION ARE NOT WITHIN THE SCOPE OF THIS STANDARD.**

2 Terms and definitions

2.1

control valve

refer to ANSI/ISA-75.05.01, *Control Valve Terminology*

2.2

test fixture

device to close off the end connections and/or stem seal areas of the control valve to allow pressurization for hydrostatic shell testing

3 Test fixture and instrumentation

3.1 Test fixtures include, but are not limited to, the following: plugs with tie-bars and tie-rods, hydraulic presses, plugs or flanges attached to the pipe connections, bosses or lugs on the valve, and expandable rubber plugs. For butt welding end valves when end plugs are used, the seal point shall be as close to the weld end as practical without overstressing the weld preparation.

3.2 The analog or digital pressure measuring instruments used in testing shall be of the indicating or recording type.

3.3 The valve manufacturer shall be responsible for maintaining the accuracy of the pressure measuring instruments.

3.4 Pressure measuring instruments shall have a total uncertainty of no more than 3% of the reading, at test pressure, and analog-type shall be used between 20% and 80% of their scale range.

4 Test requirements

4.1 The control valve, with or without its actuator, must be complete before hydrostatic shell testing, except as permitted in 4.2, 4.3, 4.4, and 4.8.

4.2 It is permissible to disassemble the valve after hydrostatic shell testing, provided:

- a) new gaskets or seals used to reassemble the tested valve are of the same kind and size;
- b) equivalent studs and nuts are used;
- c) the same torquing procedure is used, or steps are taken to ensure the same pretest bolt loads result; and
- d) a gas or liquid leak test at lower than the hydrostatic shell test pressure is performed to ensure proper gasket installation.

4.3 All cavities pressurized in service shall simultaneously be subjected to the hydrostatic shell test pressure. Moving stem seals such as bellows, diaphragms, stem, and packing that may be damaged by the hydrostatic shell test pressure, or trim parts that do not affect the pressure boundary, need not be installed during testing.

4.4 Valves with welded-on nipples, flanges, reducers, and/or increasers shall be hydrostatically shell tested in accordance with paragraph 4.4 (a) or (d), at the manufacturer's option, unless paragraph 4.4 (b) or (c) is agreed to by both the valve manufacturer and the purchaser.

- a) Hydrostatically shell test the valve alone at the appropriate pressure for its class and do not retest after welding on any of the nipples, flanges, reducers, or increasers. The completed assembly shall be documented as **not tested after welding on nipples, flanges, reducers, or increasers** in the purchase order and specification.
- b) Hydrostatically shell test the valve alone at the appropriate pressure for its class and retest the valve assembly after welding on any of the nipples, flanges, reducers or increasers with the pressure in accordance with the specification applicable to the nipples, flanges, reducers, or increasers. The purchaser shall provide the design pressure and temperature and the applicable specifications to the valve manufacturer.
- c) Hydrostatically shell test the valve including all weld-on nipples, flanges, reducers, and increasers with the pressure in accordance with the specification applicable to the nipples, flanges, reducers, and increasers. The valve nameplate and required valve body marking must then indicate the pressure and temperature limit as determined by the nipples, flanges, reducers, and increasers.
- d) Hydrostatically shell test the valve including all welded-on nipples, flanges, reducers, and increasers with the pressure in accordance with this document, provided that the nipples, flanges, reducers, and increasers are designed for that pressure.

4.5 The valve shall not be painted or otherwise coated with materials capable of sealing against leakage before the shell tests are completed, except internal linings or coatings included in the design (e.g., nonmetallic butterfly valve body linings) are permitted. Chemical corrosion protection treatments are permitted. If valve parts are to be painted for storage, they shall be hydrostatically shell tested before painting, provided the fully assembled valve is again tested in accordance with paragraph 4.2 (d). If the presence of the purchaser's representative is specified for hydrostatic shell tests, painted valves may be retested without removal of the paint, unless otherwise agreed

to, by the valve manufacturer and purchaser. Assembled valves having bodies and bonnets or cover plates that have been separately tested in accordance with Clauses 5 through 7 prior to having been painted or coated may be painted or coated prior to final testing in accordance with Clauses 5 through 7.

Wrought welded-on nipples, flanges, increasers, and reducers need not have their protective coating removed for hydrostatic shell testing.

4.6 The valve shall not be seated on the main seat or on the back seat during the hydrostatic shell test.

4.7 If a valve is dual pressure rated (inlet rating higher than outlet rating from causes such as different wall thicknesses, flange rating, or materials), it may be necessary to separate the high-pressure portion of the valve from the low-pressure portion with a temporary barrier and to test each portion at its respective test pressure.

4.8 Pressure-retaining parts may be hydrostatically shell tested separately if all the following conditions are satisfied:

- a) all the pressure-retaining parts in the valve assembly are hydrostatically tested at the pressures in accordance with Clause 7, Test pressures;
- b) the hydrostatic test is performed in a manner that simulates all loadings, fasteners, and restraints present when the part is tested in a completed valve;
- c) individual part testing is agreed to by both the manufacturer and the purchaser; and
- d) the fully assembled valve is pressure tested in accordance with 4.2 (d).

5 Test procedures

5.1 After filling the valve with water, which may contain a corrosion inhibitor, or with other suitable liquid (provided such liquid has a viscosity not greater than water), and venting all air, each valve shall be pressurized to no less than the pressures given in Clause 7.

CAUTION — IF AIR IS PRESENT IN THE TEST FLUID, THERE ARE HAZARDS INVOLVED AND APPROPRIATE PRECAUTIONS SHOULD BE TAKEN.

5.2 The minimum duration of test pressure before the start of inspection shall be as follows:

Table 1 – Minimum test duration (minutes)

Nominal valve size	Class 600 and lower	Class 900 through 1500	Class 2500 and higher
2" and smaller	1	2	3
2½" through 4"	2	4	5
5" through 8"	3	5	8
10" and larger	5	8	10
For classes not shown, use next higher class. Test durations are longer than ASME 16.34 due to control valves having greater wall thickness.			