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American National Standard

Hydrostatic Testing of Control Valves



ANSI/ISA-S75.19 — Hydrostatic Testing of Control Valves

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Preface

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Contents

Section Title	Section Number
Scope	1
Definitions	2
Test fixture and instrumentation	3
Test requirements	4
Test procedures	5
Acceptance standards	6
Test pressures	7
 Annexes	
A — Hydrostatic shell test pressures	
B — References	

1 Scope

1.1 This standard 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 standard 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 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 standard do not cover pneumatic and hydraulic actuators and regulators.

1.3 This standard describes and specifies the specific circumstances of hydrostatic shell testing of control valves and is in accordance with the hydrostatic testing requirements of [ASME/ANSI B16.1](#), [ASME/ANSI B16.34](#) and [ASME/ANSI B16.42](#) with the exception that the test requirements of paragraph 4.8 are not allowed by ASME/ANSI 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 Definitions

2.1 control valve: Refer to [ISA-S75.05](#), "Control Valve Terminology."

2.2 test fixture: A test fixture is a 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 be accurate within 3% 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

- 1) new gaskets or seals used to reassemble the valve are of the same kind and size;
- 2) equivalent studs and nuts are used;
- 3) the same torquing procedure is used, or steps are taken to ensure the same pre-test bolt loads result; and
- 4) an air or water 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 (1) or (4), at the manufacturer's option, unless paragraph 4.4 (2) or (3) is agreed to by both the valve manufacturer and the purchaser.

- 1) 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.
- 2) 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.
- 3) 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.
- 4) Hydrostatically shell test the valve including all welded-on nipples, flanges, reducers, and increasers with the pressure in accordance with this standard, provided that the nipples, flanges, reducers and increasers are adequate 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 (4). If the presence of 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.

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 nor 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 test each portion at its respective pressure.

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

- 1) all the pressure retaining parts in the valve assembly are hydrostatically tested at the pressures in accordance with [section 7, "Test Pressures"](#);
- 2) 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;
- 3) individual part testing is agreed to by both the manufacturer and the purchaser; and
- 4) the fully assembled valve is pressure tested in accordance with paragraph 4.2 (4).

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 [Table 2](#) or [Table A.1](#), except as covered in paragraph 7.4.

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