

STANDARD

**ISA-75.19.01-2001**  
(Formerly ANSI/ISA-75.19-1995)



**Hydrostatic Testing  
of Control Valves**



**ISA—The Instrumentation,  
Systems, and  
Automation Society**

**Approved 04 April 2001**

ISA-75.19.01-2001  
Hydrostatic Testing of Control Valves

ISBN: 1-55617-753-4

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## 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 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 Definitions

### 2.1 control valve:

refer to ANSI/ISA-75.05.01-2000, "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

- a) new gaskets or seals used to reassemble the 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 pre-test bolt loads result; and
- d) 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 (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.
- 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 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 (d). 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. Assembled valves having bodies and bonnets or cover plates that have been separately tested in accordance with sections 5 through 7 prior to having been painted or coated, may be painted or coated prior to final testing in accordance with sections 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 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 test pressure.

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

- a) all the pressure retaining parts in the valve assembly are hydrostatically tested at the pressures in accordance with section 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 paragraph 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 table 2 or table A.1, except as covered in clause 7.4.

**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 start of inspection shall be as follows:

**Table 1 — Minimum test duration (minutes)**

Nominal Valve Size	Class 150 & Lower	Class 250 thru 600	Class 900 thru 1500	Class 2500 & Higher
2" & Smaller	1	1	2	3
2-1/2 " thru 4"	2	2	4	5
5 " thru 8"	2	3	5	8
10" & Larger	3	5	8	10
For classes not shown, use next higher class.				

**5.3** The temperature of the test liquid shall not exceed 52 °C (125°F).

## 6 Acceptance standards

**6.1** Any visually detected weeping or leaking through the pressure boundary walls that are part of the valve body assembly shall be cause for rejection. Leakage through the static seals and gasketed joints is also cause for rejection unless specifically allowed by the design specifications.

**6.2** Distortion due to hydrostatic shell testing that impairs satisfactory functional operation of the valve shall be cause for rejection.

## 7 Test pressures

**7.1** Hydrostatic shell test pressures for steel and nickel-base alloy, and other alloy valves are calculated by multiplying the 38°C (100°F) working pressures by 1,5 and rounding off to the next higher 25 psig (pounds per square inch gage) increment in accordance with ASME B16.34. For other materials within the scope of this standard but not listed in table 1, and for Intermediate and Limited Classes, the above method shall be used to determine the test pressure.

**7.2** Hydrostatic shell test pressures for cast iron valves shall be in accordance with ASME B16.1.

**7.3** Hydrostatic shell test pressures for nodular (ductile) iron valves shall be in accordance with ASME B16.42.

**7.4** For other materials within the scope of this standard but not included in tables 1, 2, or A.1 and whose pressure ratings are given in a published standard or are determined by the manufacturer, the hydrostatic shell test pressures shall be calculated as in paragraph 7.1 or paragraph 7.5, as applicable.

**7.5** The metric equivalents of all test pressures in table 2 are given in table A.1 (annex A) and are calculated by converting 1,5 times the 38°C (100°F) working pressure in psig to bar and then rounding off to the next higher bar increment except for values below 10 bar which are rounded off to the next higher 0,1 bar increment<sup>1</sup>.

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<sup>1</sup> 1 bar = 100 kPa = 100 000 Pa = 0,1 MPa = 14,5038 psi.

**Table 2 — List of material specifications – Group 1 materials**

Material		Applicable ASTM Specifications											
		Product Form											
		Group No.	Nominal Designation	Forgings		Castings		Plates		Bars		Tubular	
Spec No.	Grade			Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade		
1.1	C C-Si C-Mn-Si C-Mn-Si-V	A 105 A 350 A 350	LF2 LF6 Cl.1	A 216	WCB	A 515 A 516 A 537	70 70 Cl. 1	A 675 A 105 A 350 A 696	70 LF2 C	A 672 A 672	B 70 C 70		
1.2	C-Si 2 1/2 Ni 3 1/2 Ni C-Mn-Si C-Mn-Si-V	A 350 A 350	LF3 LF6 Cl.2	A 352 A 352 A 216 A 352	LC2 LC3 WCC LCC	A 203 A 203	B E	A 350	LF3	A 106	C		
1.3	C C-Si 2 1/2 Ni 3 1/2 Ni C-Mn-Si			A 352	LCB	A 515 A 203 A 203 A 516	65 A D 65	A 675	65	A 672	B 65		
1.4	C C-Si C-Mn-Si	A 350	LF1			A 515 A 516	60 60	A 675 A 350 A 696	60 LF1 B	A 106 A 672 A 672	B B 60 C 60		
1.5	C-1/2 Mo	A 182	F1	A 217 A 352	WC1 LC1	A 204 A 204	A B	A 182	F1	A 691	CM-70		
1.6	C-1/2 Mo 1/2 Cr-1/2 Mo 1Cr-1/2 Mo					A 387 A 387 A 387	2 Cl.1 2 Cl.2 12 Cl.1			A 335 A 369 A 691	P1 FP1 1/2 CR		
1.7	C-1/2 Mo 1/2 Cr-1/2 Mo Ni-1/2 Cr-1/2 Mo 3/4 Ni Cr-3/4 Mo	A 182	F2	A 217 A 217	WC4 WC5	A 204	C	A 182	F2	A 691	CM-75		

**Table 2 — List of material specifications – Group 1 materials (cont'd)**

Material		Applicable ASTM Specifications											
		Group No.	Nominal Designation	Product Form									
				Forgings		Castings		Plates		Bars		Tubular	
Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade		
1.8	1 Cr- 1/2 Mo					A 387	12 Cl.2					A 691 A 335 A 369 A 691 A 335 A 369 A 691 A 355 A 369	1 CR P12 FP 12 1 1/4 CR P11 FP11 2 1/4 CR P22 FP22
	1 1/4 Cr-1/2 Mo-Si					A 387	11 Cl.1						
	2 1/4 Cr-1 Mo					A 387	22 Cl.1						
1.9	1 Cr-1/2 Mo	A 182	F12 Cl.2			A 387	11 Cl.2					A 182 A 182 A 739	F12 Cl. 2 F11 Cl. 2 B11
	1 1/4 Cr-1/2 Mo-Si 1 1/4 Cr-1/2 Mo	A 182	F11 Cl. 2		A 217	WC6							
1.10	2 1/4 Cr-1 Mo	A 182	F22 Cl. 3		A 217	WC9						A 182 A 739	F22 Cl. 3 B22
1.11	3 Cr-1Mo					A 387	21 Cl.2						
	Mn- 1/2Mo	A 182	F21			A 302	A & B					A 182	F 21
	Mn-1/2Mo-1/2Ni					A 302	C						
	Mn-1/2Mo-3/4Ni C-Mn-Si					A 302 A 537	D Cl.2						
1.12	5 Cr-1/2 Mo					A 387	5 Cl.1					A 691 A 335 A 335 A 369	5 CR P5 FP5 F5b
	5Cr-1/2 Mo-Si					A 387	5 Cl.2						
1.13	5 Cr-1/2 Mo	A 182 A 182	F5a F5		A 217	C5						A 182 A 182	F5a F5
1.14	9 Cr-1 Mo	A 182	F9		A 217	C12						A 182	F9
1.15	9 Cr-1 Mo-V	A 182	F91		A 217	C12A						A 182	F91

**Table 3 — List of material specifications – Group 2 materials**

		Applicable ASTM Specifications											
		Product Form											
Group No.	Material	Nominal Designation	Forgings		Castings		Plates		Bars		Tubular		
			Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	
2.1	18 Cr-8 Ni		A 182	F 304	A 351	CF3	A 240	304	A 182	F 304	A 312	TP304	
			A 182	F 304H	A 351	CF8	A 240	304H	A 182	F 304H	A 312	TP304H	
2.2	16 Cr-12 Ni-2 Mo						A 240	316			A 312	TP316	
							A 240	316H			A 312	TP316H	
			A 182	F316	A 351	CF3A			A 182	F316	A 358	316	
			A 182	F316H	A 351	CF8A			A 182	F316H	A 376	TP316	
					A 351	CF3M	A 240	317			A 376	TP316H	
2.3	18 Cr-8 Ni 16 Cr-12 Ni-2 Mo										A 312	TP316H	
			A 182	F304L			A 240	304L	A 182	F304L	A 312	TP304L	
			A 182	F316L			A 240	316L	A 182	F316L	A 312	TP316L	
2.4	18 Cr-10 Ni-Ti										A 312	TP321	
			A 182	F321			A 240	321	A 182	F321	A 312	TP321H	
			A 182	F321H			A 240	321H	A 182	F321H	A 358	321	
			A 182	F321H			A 240	321H	A 182	F321H	A 376	TP321	
											A 376	TP321H	
											A 430	FP321	
											A 430	FP321H	



**Table 3 — List of material specifications – Group 2 materials (cont'd)**

Material		Applicable ASTM Specifications											
		Product Form											
		Group No.	Nominal Designation	Forgings		Castings		Plates		Bars		Tubular	
Spec No.	Grade			Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade		
2.5	18 Cr-10 Ni-Cb	A 182	F347	A 351	CF8C	A 240	347	A 182	F347	A 312	TP347		
		A 182	F347H			A 240	347H	A 182	F347H	A 312	TP347H		
		A 182	F348			A 240	348	A 182	F348H	A 358	TP347H		
		A 182	F348H			A 240	348H	A 376	TP347	A 376	TP347H		
2.6	25 Cr-12 Ni 23 Cr-12 Ni	A 351	CH8	A 351	CH20	A 240	309S	A 182	F347	A 312	TP347		
		A 351	CH20			A 240	309H	A 358	TP347H	A 358	TP347H		
2.7	25 Cr-20 Ni	A 182	F310H	A 351	CK20	A 240	310S 310H	A 182	F310H 310H 310S	A 312	TP310H		
2.8	20Cr-18Ni-6Mo 22Cr-5Ni-3Mo-N 25Cr-7Ni-4Mo-N 24Cr-10Ni-4Mo-V 25Cr-5Ni-2Mo-2Cu 25Cr-7Ni-3.5Mo-W-Cb 25Cr-7Ni-3.5Mo-N-Cu-W	A 182	F44	A 351	CK3MCuN	A 240	S31254	A 182	F310H	A 312	TP310H		
		A 182	F51			A 240	S31803	A 358	TP309H 309H				
		A 182	F53			A 240	S32750	A 789	TP309H 309H				
		A 351	Gr. CE8MN			A 479	S31254	A 789	TP310H				
		A 351	Gr. CD4MCu			A 479	S31803	A 790	TP310H				
A 351	Gr. CD3MWCuN	A 479	S32750	A 790	TP310H								
A 182	Gr. F55	A 240	Gr. S32760	A 789	S32760	A 790	S32760						

**Table 4 — List of material specifications – Group 3 materials**

Material		Applicable ASTM Specifications											
		Product Form											
Group No.	Nominal Designation	Forgings		Castings		Plates		Bars		Tubular			
		Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade		
3.1	35Ni-35Fe-20Cr-Cb	B 462	N08020			B 463	N08020	B 473	N08020	B 464 B 468	N08020 N08020		
3.2	99Ni	B 160	N02200			B 162	N02200	B 160	N02200	B 161 B 163	N02200 N02200		
3.3	99Ni-Low C	B 160	N02201			B 162	N02201	B 160	N02201				
3.4	67Ni-30Cu	B 564	N04400			B 127	N04400	B 164	N04400	B 165 B 163	N04400 N04400		
	67Ni-30Cu-S	B 564	N04405					B 164	N04405				
3.5	72Ni-15Cr-8Fe	B 564	N06600			B 168	N06600	B 166	N06600	B 167 B 163	N06600 N06600		
3.6	33Ni-42Fe-21Cr	B 564	N08800			B 409	N08800	B 408	N08800	B 163	N00880		
3.7	65Ni-28Mo 2Fe	B 335	N10665			B333	N10665	B335	N10665	B 622	N10665		
3.8	54Ni-16Mo-15Cr	B 564	N10276			B 575	N10276	B 574	N10276	B 622	N10276		
	60Ni-22Cr-9Mo-3.5Cb	B 564	N06625			B 443	N06625	B 446	N06625	B 622	N10001		
	62Ni-28Mo-5Fe	B 335	N10001			B 333	N10001	B 335	N10001	B 622	N10001		
	70Ni-16Mo-7Cr-5Fe	B 573	N10003			B 434	N10003	B 573	N10003	B 622	N06455		
	61Ni-16Mo-16Cr	B 574	N06455			B 575	N06455	B 574	N06455	B 423	N08825		
	42Ni-21.5Cr-3Mo-2.3Cu	B 425	N08825			B 424	N08825	B 425	N08825				

**Table 4 — List of material specifications – Group 3 materials (cont'd)**

Material		Applicable ASTM Specifications											
		Group No.	Nominal Designation	Product Form									
				Forgings		Castings		Plates		Bars		Tubular	
Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade	Spec No.	Grade		
3.9	47Ni-22Cr-9Mo-18Fe	B 572	N06002			B 435	N06002	B 572	N06002	B 622	N06002		
3.10	25Ni-47Fe-21Cr-5Mo	B 672	N08700			B 599	N08700	B 672	N08700				
3.11	44Fe-25Ni-21Cr-Mo	B 649	N08904			B 625	N08904	B 649	N08904	B 677	N08904		
3.12	26Ni-43Fe-22Cr-5Mo 47Ni-22Cr-20Fe-7Mo	B 621 B 581	N08320 N06985			B 620 B 582	N08320 N06985	B 621 B 581	N08320 N06985	B 622 B 622	N08320 N06985		
3.13	49Ni-25Cr-18Fe-6Mo Ni-Fe-Cr-Mo-Cu-Low C	B 581 B 564	N06975 N08031			B 582 B 625	N06975 N08031	B 581 B 649	N06975 N08031	B 622 B 622	N06975 N08031		
3.14	47Ni-22Cr-19Fe-6Mo	B 581	N06007			B 582	N06007	B 581	N06007	B 622	N06007		
3.15	33Ni-2Fe-21Cr Ni-Mo Ni-Mo-Cr	B 564	N08810	A 494 A 494	N-12MV CW-12MW	B 409	N08810	B 408	N08810	B 407	N08810		
3.16	35Ni-19Cr-1 1/4 Si	B 511	N08330			B 536	N08330	B 511	N08330	B 535	N08330		
3.17	29Ni-20.5Cr-3.5Cu-2.5Mo			A 351	CN-7M								

**Table 5 — Hydrostatic shell test pressures (psig) (3) – steel, nickel-base and other alloys per ASME B16.34**

Material Group (2)	Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500		Class 2500		Class 4500	
	Std (1)	Spcl (1)	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl
1.1	450	450	1125	1125	1500	1500	2250	2250	3350	3375	5575	5625	9275	9375	16675	16875
1.2	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.3	400	400	1050	1050	1400	1400	2100	2100	3150	3150	5225	5225	8700	8700	15625	15625
1.4	375	375	950	975	1250	1300	1875	1950	2775	2900	4650	4825	7725	8050	13900	14475
1.5	400	400	1050	1050	1400	1400	2100	2100	3150	3150	5225	5225	8700	8700	15625	15625
1.6	350	350	900	900	1200	1200	1775	1775	2650	2650	4425	4425	7350	7350	13225	13225
1.7	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.8	375	375	950	975	1250	1300	1875	1950	2775	2900	4650	4825	7725	8050	13900	14475
1.9	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.10	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.11	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.12	375	375	950	975	1250	1300	1875	1950	2775	2900	4650	4825	7725	8050	13900	14475
1.13	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.14	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.15	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
2.1	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
2.2	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
2.3	350	400	900	1025	1200	1350	1800	2025	2700	3025	4500	5025	7500	8375	13500	15450
2.4	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
2.5	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
2.6	400	400	1025	1050	1350	1400	2025	2100	3025	3150	5050	5225	8400	8700	15125	15625
2.7	400	400	1025	1050	1350	1400	2025	2100	3025	3150	5050	5225	8400	8700	15125	15625
2.8	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875

**Table 5 — Hydrostatic shell test pressures (psig) (3) — steel, nickel-base and other alloys per ASME B16.34 (cont'd)**

Material Group (2)	Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500		Class 2500		Class 4500	
	Std (1)	Spcl (1)	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl
3.1	350	400	900	1025	1200	1350	1800	2025	2700	3025	4500	5025	7500	8375	13500	15050
3.2	225	250	550	600	725	825	1100	1225	1625	1825	2700	3025	4500	5025	8100	9050
3.3	150	175	375	425	500	550	725	825	1100	1225	1800	2025	3000	3350	5400	6050
3.4	350	400	900	1025	1200	1350	1800	2025	2700	3025	4500	5025	7500	8375	13500	15075
3.5	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
3.6	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
3.7	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
3.8	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
3.9	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
3.10	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
3.11	375	425	975	1075	1300	1450	1925	2150	2900	3225	4825	5375	8025	8950	14425	16100
3.12	400	450	1025	1125	1350	1500	2025	2250	3025	3375	5050	5625	8400	9375	15125	16875
3.13	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
3.14	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
3.15	350	400	900	1025	1200	1350	1800	2025	2700	3025	4500	5025	7500	8375	13500	15075
3.16	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
3.17	350	400	900	1000	1200	1350	1800	2000	2700	3000	4500	5000	7500	8325	13500	14950

**NOTE 1** — For definition of "Std" and "Spcl," see ASME B16.34.

**NOTE 2** — The material groups are defined in table 1.

**NOTE 3** — Values are listed for reference only. Source is ASME B16.34.

**Table 6 — Hydrostatic shell test pressures (psig) — cast iron valves  
per ASME B16.1 (1)**

Sizes (NPS)	Class 25		Class 125				Class 250			Class 800
	Class A		Class B		Class A		Class B			Class B
	4-36	42-96	1-12	14-24	1-12	30-48	1-12	14-24	30-48	2-12
70	40	270	300	230	230	600	750	450	450	1200

**NOTE 1** — Body and bonnet material to be per ASTM A126.

**Table 7 — Hydrostatic shell test pressures (psig) — ductile iron valves  
per ASME B16.42 (1)**

Class 150	Class 300
400	975

**NOTE 1** — Body and bonnet material to be per ASTM A395.

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**Annex A — Test Pressures (Bar)**

**Table A.1 — Hydrostatic shell test pressures (bar gauge) (3) – steel, nickel-base and other alloys per ASME B16.34**

This annex, which is placed after the main text for convenience, is an integral part of ISA-75.19.01-2001.

Material Group (2)	Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500		Class 2500		Class 4500	
	Std (1)	Spcl (1)	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl
1.1	30	30	77	78	103	104	154	156	230	233	384	388	639	647	1150	1164
1.2	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.3	28	28	72	72	96	96	144	144	216	216	359	359	599	599	1078	1078
1.4	25	26	65	67	86	89	128	133	192	200	320	333	533	555	958	998
1.5	28	28	72	72	96	96	144	144	216	216	359	359	599	599	1078	1078
1.6	24	24	62	62	82	82	122	122	183	183	304	304	507	507	912	912
1.7	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.8	25	26	65	67	86	89	128	133	192	200	320	333	533	555	958	998
1.9	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.10	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.11	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.12	25	26	65	67	86	89	128	133	192	200	320	333	533	555	958	998
1.13	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.14	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.15	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
2.1	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
2.2	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
2.3	24	27	63	70	83	93	125	139	187	208	311	346	518	577	931	1066
2.4	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
2.5	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
2.6	27	28	70	72	93	96	140	144	209	216	348	359	580	599	1043	1078
2.7	27	28	70	72	93	96	140	144	209	216	348	359	580	599	1043	1078
2.8	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164



**Table A.1 — Hydrostatic shell test pressures (bar gauge) (3) — steel, nickel-base and other alloys per AMSE B16.34 (cont'd)**

This annex, which is placed after the main text for convenience, is an integral part of ISA-75.19.01-2001.

Material Group (2)	Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500		Class 2500		Class 4500	
	Std (1)	Spcl (1)	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl
3.1	24	27	63	70	83	93	125	139	187	208	311	346	518	577	931	1038
3.2	15	17	38	42	50	56	75	84	112	125	187	208	311	347	559	624
3.3	10	11	25	28	34	37	50	56	75	84	125	139	207	231	373	416
3.4	24	27	63	70	83	93	125	139	187	208	311	347	518	578	931	1039
3.5	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.6	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.7	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
3.8	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
3.9	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
3.10	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.11	26	29	67	74	89	99	133	148	199	222	332	370	553	617	994	1110
3.12	27	30	70	78	93	104	140	156	209	233	348	388	580	647	1043	1164
3.13	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
3.14	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.15	24	27	63	70	83	93	125	139	187	208	311	347	518	578	931	1039
3.16	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.17	24	27	63	69	83	92	125	138	187	207	311	344	518	573	931	1031

1 bar = 100 kPa = 100 000 Pa = 0,1 MPa = 14,5038 psi

**NOTE 1** — For definition of "Std" and "Spcl," see ASME B16.34.

**NOTE 2** — The material groups are defined in table 1.

**NOTE 3** — Values are listed for reference only. Source is ASME B16.34.

**Table A.2 — Hydrostatic shell test pressures (bar gauge) – cast iron valves per ASME B16.1 (1)**

Sizes (NPS)	Class 25		Class 125			Class 250			Class 800
	Class A		Class B		Class A	Class B		Class B	
	4-36	42-96	1-12	14-24	30-48	1-12	14-24	30-48	2-12
4.8	2,7	19	21	16	16	42	31	31	83
			1-12	14-24	30-48	1-12	1-12	1-12	

**NOTE 1** — Body and bonnet material to be per ASTM A126.

**Table A.3 — Hydrostatic shell test pressures (bar gauge) – ductile iron valves per ASME B16.42 (1)**

Class 150	Class 300
28	68

**NOTE 1** — Body and bonnet material to be per ASTM A395.

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## Annex B — References

This annex is an integral part of this standard. It is placed after the main text for convenience.

List of standards and specifications referenced in standards showing the year of approval.

### AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.1-1998	Cast Iron Flanges and Flanged Fittings, Class 25, 125, and 250
ASME B16.34-1996	Valves - Flanged, Threaded and Welding End
ASME B16.42-1998	Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300

#### Available from:

**ASME**  
345 East 47th Street  
New York, NY 10036  
Tel: (212) 705-7722

### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A105/A105M-98	Standard Specification for Carbon Steel Forgings for Piping Applications
A106-99e1	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
A126-95e1	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
A182/A182M-99	Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
A203/A203M-97	Standard Specification for Pressure Vessel Plates, Alloy Steel, Nickel
A204/A204M-93(1999)	Standard Specification for Pressure Vessel Plates, Alloy Steel, Molybdenum
A216/A216M-93(1998)	Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
A217/A217M-99	Standard Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service
A240/A240M-00	Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
A302/A302M-97e1	Standard Specification for Pressure Vessel Plates, Alloy Steel, Manganese-Molybdenum and Manganese-Molybdenum-Nickel

A312/A312M-00	Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
A335/A335M-99	Standard Specification for Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service
A350/A350M-99	Standard Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
A351/A351M-94a(1999)	Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts
A352/A352M-93(1998)	Standard Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service
A355-89(1994)e1	Standard Specification for Steel Bars, Alloys, for Nitriding
A358/A358M-98	Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Alloy Steel Pipe for High-Temperature Service
A369/A369M-92	Standard Specification for Carbon and Ferritic Alloy Steel Forged and Bored Pipe for High-Temperature Service
A376/A376M-98	Standard Specification for Seamless Austenitic Steel Pipe for High-Temperature Central-Station Service
A387/A387M-99	Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum
A395/A395M-99	Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
A430/A430M-91	Standard Specification for Austenitic Steel Forged and Bored Pipe for High-Temperature Service
A479/A479M-00	Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
A515/A515M-92(1997)	Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
A516/A516M-90(1996)e1	Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
A537/A537M-95e2	Standard Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel
A672-96	Standard Specification for Electric-Fusion-Welded Steel Pipe for High-Pressure Service at Moderate Temperatures
A675/A675M-90a(1995)e1	Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties

A691-98	Standard Specification for Carbon and Alloy Steel Pipe, Electric-Fusion-Welded for High-Pressure Service at High Temperatures
A696-90a(1995)e1	Standard Specification for Steel Bars, Carbon, Hot-Wrought or Cold-Finished, Special Quality, for Pressure Piping Components
A739-90a(1995)e1	Standard Specification for Steel Bars, Alloy, Hot-Wrought, for Elevated Temperature or Pressure-Containing Parts, or Both
A789/A789M-00	Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service
A790/A790M-00	Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe
B127-98	Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
B160-99	Standard Specification for Nickel Rod and Bar
B161-93	Standard Specification for Nickel Seamless Pipe and Tube
B162-99	Standard Specification for Nickel Plate, Sheet, and Strip
B163-98a	Standard Specification for Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes
B164-98	Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire
B165-93	Standard Specification for Nickel-Copper Alloy (UNS N04400)* Seamless Pipe and Tube
B166-99	Standard Specification for Nickel-Chromium-Iron Alloys (UNSN06600, N06601, N06603, N06690, N06025, and N06045 and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Rod, Bar, and Wire
B167-98	Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06025, and N06045)* Seamless Pipe and Tube
B168-98	Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06025, and N06045) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Plate, Sheet, and Strip
B333-98	Standard Specification for Nickel-Molybdenum Alloy Plate, Sheet, and Strip
B335-98	Standard Specification for Nickel-Molybdenum Alloy Rod
B407-96	Standard Specification for Nickel-Iron-Chromium Alloy Seamless Pipe and Tube
B408-96	Standard Specification for Nickel-Iron-Chromium Alloy Rod and Bar

B409-96a	Standard Specification for Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip
B424-98a	Standard Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221)* Plate, Sheet, and Strip
B425-99	Standard Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Rod and Bar
B434-00	Standard Specification for Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, UNS N10242)* Plate, Sheet, and Strip
B435-98a	Standard Specification for UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Plate, Sheet, and Strip
B443-99	Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625)* Plate, Sheet, and Strip
B444-94	Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloys (UNS N06625)* Pipe and Tube
B446-98	Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625)* Rod and Bar
B462-97	Standard Specification for Forged or Rolled UNS N08020, UNS N08024, UNS N08026, UNS N08367, and UNS R20033 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service
B463-99	Standard Specification for UNS N08020, UNS N08026, and UNS N08024 Alloy Plate, Sheet, and Strip
B464-99	Standard Specification for Welded UNS N08020, N08024, and N08026 Alloy Pipe
B468-99	Standard Specification for Welded UNS N08020, N08024, and N08026 Alloy Tubes
B473-96	Standard Specification for UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire
B511-98a	Standard Specification for Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes
B535-99	Standard Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Seamless Pipe and Tube
B536-95	Standard Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip
B564-99a	Standard Specification for Nickel Alloy Forgings
B572-98a	Standard Specification for UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Rod

B573-00	Standard Specification for Nickel-Molybdenum-Chromium-Iron Alloy (UNS N10003, N10242)* Rod
B574-99a	Specification for Low-Carbon Nickel-Molybdenum-Chromium, Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Rod
B575-99a	Spec for Low-Carbon Nickel-Molybdenum-Chromium, Low-Carbon, Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium-Molybdenum-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Plate, Sheet and Strip
B581-97	Standard Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod
B582-97	Standard Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip
B599-92(1997)	Standard Specification for Nickel-Iron-Chromium-Molybdenum-Columbium Stabilized Alloy (UNS N08700) Plate, Sheet, and Strip
B620-98a	Standard Specification for Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Plate, Sheet, and Strip
B621-95a	Standard Specification for Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Rod
B622-99a	Standard Specification for Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
B625-99	Standard Specification for UNS N08904, UNS N08925, UNS N08031, UNS N08932, UNS N08926, and UNS R20033 Plate, Sheet, and Strip
B649-95	Standard Specification for Ni-Fe-Cr-Mo-Cu Low-Carbon Alloy (UNS N08904), Ni-Fe-Cr-Mo-Cu-N Low-Carbon Alloys (UNS N08925, UNS N08031, and UNS N08926), and Cr-Ni-Fe-N Low-Carbon Alloy (UNS R20033) Bar and Wire
B672-95	Standard Specification for Nickel-Iron-Chromium-Molybdenum-Columbium Stabilized Alloy (UNS N08700) Bar and Wire
B677-99	Standard Specification for UNS N08904, UNS N08925, and UNS N08926 Seamless Pipe and Tube

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