

ASME B16.34-2004
(Revision of ASME B16.34-1996)

Valves—Flanged, Threaded, and Welding End

AN AMERICAN NATIONAL STANDARD



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Mechanical Engineers**

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FOREWORD

In December 1969, American National Standards Committee B16 changed its name from Standardization of Pipe Flanges and Fittings to Standardization of Valves, Fittings, and Gaskets, reflecting American National Standards Institute approval of a broadened scope for the B16 Committee. At the same meeting, the committee approved a plan for the organization of a subcommittee to develop a new standard for steel valves with other than flanged ends. Subsequently, B16 Subcommittee 15 was appointed and held its first meeting in December 1970.

Historically, in the development of standards and pressure-temperature ratings for steel valves, the various rating classes for flanges provided an obviously logical basis for valve ratings. Steel valves with flanges of standard dimensions, many also offered in buttwelding-end versions, were given the same pressure-temperature ratings as the flanges. In 1949, a new edition of the standard, then designated B16e 1949, was published, in which a table covering wall thickness requirements for weld end valves had been added. In 1964, the Manufacturer's Standardization Society of the Valve and Fittings Industry developed and published Standard Practice SP 66, covering pressure-temperature ratings of steel buttwelding-end valves. SP 66 introduced a new method for establishing ratings by making ratings a function of the mechanical strength properties of the body material at all temperatures. Following the publication of SP 66, B16 activated Subcommittee 4 for the purpose of studying the general subject of pressure-temperature ratings and developing rational criteria for such ratings.

In the B16 charge to Subcommittee 15, it was established that the new standard would replace SP 66 and also remove the reference to buttwelding-end valves from B16.5. Flanged-end valves would continue to be covered in B16.5 but on a fully specified basis, rather than as an add-on.

As the work of the subcommittee got underway, concurrent action was initiated in Subcommittee 3 for revision of B16.5. Subsequent operations of Subcommittees 3 and 15 were closely coordinated to provide assurance that the new standard and the revised B16.5 would be compatible.

A key and basic issue of mutual concern in this coordination was the matter of pressure-temperature ratings. It was necessary to incorporate the SP 66-type ratings in the new standard, but at the same time also to provide ratings equivalent to those in B16.5 covering the buttwelding equivalents of flanged-end valves. Subcommittee 4 had made definitive recommendations for revisions in the flange ratings and it was obviously desirable to rationalize the two types of ratings as they would appear side-by-side in the new standard.

The results of these efforts appear herein in the form of pressure-temperature ratings tables. The method of computing the ratings is detailed in Nonmandatory Appendix B. The ratings differ from the pre-1968 B16.5 ratings because they are now calculated as a function of the mechanical properties of the pressure boundary materials, in contrast to the empirical basis used previously. A change in the SP 66-type rating (herein designated Special Class) discontinues the application of a plasticity factor at elevated temperatures which, in the opinion of the committee, could not be justified in dimension-sensitive valves.

Other innovations include the coverage of forged or fabricated body valves and an increase in detailed coverage by pressure-temperature ratings from 17 materials in B16.5 to 24 material groups in the new standard and in the revised B16.5. Dimensional requirements have been refined and augmented to give the designer more latitude and the user more assurance of adequacy. A number of the innovations have had trial use and at least some degree of acceptance, as they have been taken from the section on valve requirements developed and published by the ASME Boiler and Pressure Vessel Code to cover valves used in nuclear power plants. A section on valve testing eliminates uncertainties on such points as seat test requirements and stem seal testing.

Approval for the 1973 edition of the Standard by the American National Standards Institute was granted in October 1973.

In December 1973, a reorganization of the subcommittee structure for B16 was approved. Subcommittee 15 was redesignated as Subcommittee N and was assigned responsibility for all steel valves. Work began to include coverage for flanged-end valves in ANSI B16.34. The 1977

edition contained flanged-end valve requirements formerly in ANSI B16.5. The rating procedures of B16.5 were adopted and made applicable to Standard Class butt-welding-end valves. The method of deriving ratings was revised. Major changes were made in the method for determining ratings for austenitic stainless steel valves and ratings for Class 150 valves for all materials. The pressure-temperature tables and materials groups were rearranged and revised using data from the reference Sections of the ASME Boiler and Pressure Vessel Code through the Summer 1975 Addenda. A number of clarifying and editorial revisions were also made in order to improve the text. It was also resolved that frequent minor changes in pressure-temperature ratings because of revisions to the reference material strength property tables should be avoided and that, as a general guide, such changes should not be considered unless resulting ratings would be changed by an amount in excess of 10%.

Approval for the 1977 edition of the Standard by the American National Standards Institute was granted on June 16, 1977.

During 1979, work began on the 1981 edition. Materials coverage was expanded. Nickel alloys and other alloys were added. Bolting rules were revised to accommodate special alloy bolting for the new materials. Revisions were included to clarify requirements for rotary motion valves, e.g., ball valves and butterfly valves. Wafer-type valves were specifically identified. Other clarifying and editorial revisions were made in order to improve the text.

Following approvals by the Standards Committee and Secretariat, approval for the 1981 edition was granted by the American National Standards Institute on August 14, 1981.

During 1985, revisions were proposed that added requirements for socket welding-end and threaded-end valves. The inclusion of requirements for these valves increased the scope of the Standard. Also, the listings for nickel alloy and other alloy valves materials were expanded. Rules for threaded body joints were added, and wafer-type valve body rules improved.

Following approvals by the Standards Committee and ASME, approval for the 1988 edition was granted by the American National Standards Institute on February 24, 1988.

During 1993 and carrying over into 1994, revisions offered included multiple material marking and an improved interpolation procedure. New materials were added and the pressure-temperature rating tables were recalculated in accordance with Nonmandatory Appendix B using the latest data available from the reference ASME Boiler and Pressure Vessel Code sources. An appendix was added covering nonmandatory requirements for a quality system program.

Following the approvals the Standards Committee and ASME, approval for the new edition was granted by the American National Standards Institute on October 3, 1996.

Work was started during 1999 to revise the standard to include metric units as the primary reference units while maintaining U.S. customary units in either parenthetical or separate forms. The goal is to delete the U.S. customary units when the standard is next issued. All pressure-temperature ratings have been recalculated using data from the latest edition of the ASME Boiler and Pressure Vessel Code, Section II, Part D. As a result, some materials have been shifted to other material groups and some changes have been made to some valve ratings within material groups. Because of diminished interest for flanged end valves conforming to ASME Class 400, they are not specifically listed in this revision. Flanges for Class 400 will continue to be listed in B16 flange standards. Provision has been made to allow Class 400 valves to be furnished as intermediate rated valves. Numerous requirement clarifications and editorial revisions have also been made.

Following the approvals of the Standards Committee and ASME, approval for the new edition was granted by the American National Standards Institute on February 20, 2004.

All requests for interpretation or suggestions for revisions should be sent to the Secretary, B16 Committee, The American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B16 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
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Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, the B16 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B16 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject: Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.
Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B16 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B16 Standards Committee.

INTRODUCTION

An American National Standard is intended as a basis for common practice by the manufacturer, the user, and the general public. The existence of an American National Standard does not in itself preclude the manufacture, sale, or use of products not conforming to the standard. Mandatory conformance is established, for example, by reference to the standard in a code, specification, sales contract, or public law.

It should be noted, specifically regarding this Standard, that certain requirements reflecting the general application of valves in a wide variety of services may not be considered to be appropriate for some valves whose application is known and which may incorporate certain features found by successful experience to be satisfactory. A specific case in point is that involving valves developed and used in gas and petroleum product pipelines. Conformance of such valves to the existing API 6D may by itself be sufficient to satisfy requirements of federal rules and regulations established by the Department of Transportation, Office of Pipeline Safety Operations. Another specific case is that involving valves used in instrument systems under an applicable piping code. Conformance of such valves to the requirements of an existing piping code may by itself be sufficient to satisfy jurisdictional rules and regulations.

This edition of ASME B16.34 states values in both metric SI and U.S. customary units of measurement. These systems of units are to be regarded separately. The values stated in each system are not exact equivalents; therefore each system shall be used independently of the other. Combining values from the two systems constitutes nonconformance with this Standard.

VALVES — FLANGED, THREADED, AND WELDING END

1 SCOPE

1.1 General

This Standard applies to new construction and covers pressure-temperature ratings, dimensions, tolerances, materials, nondestructive examination requirements, testing, and marking for cast, forged, and fabricated flanged, threaded, and welding end and wafer or flangeless valves of steel, nickel-base alloys, and other alloys shown in Table 1. Wafer or flangeless valves, bolted or through-bolt types, that are installed between flanges or against a flange are treated as flanged-end valves. Alternative rules for NPS 2½ and smaller valves are given in Mandatory Appendix V.

1.2 Applicability

1.2.1 Standards and Specifications. Standards and specifications adopted by reference in this Standard and the names and addresses of the sponsoring organizations are shown in Mandatory Appendix VIII. It is not considered practical to refer to a specific edition of each of the standards and specifications in the individual clause references. Instead, the specific edition references are included in Mandatory Appendix VIII. A product made in conformance with a prior edition of reference standards and in all other respects conforming to this Standard shall be considered to be in conformance even though the edition reference may have been changed in a subsequent revision of this Standard.

1.2.2 Time of Purchase, Manufacture, or Installation. The pressure-temperature ratings included in this Standard are applicable, upon publication, to all valves covered within its scope that meet its requirements. For unused valves, valves which have been maintained in inventory, the manufacturer may certify conformance to this edition provided that it can be demonstrated that all requirements of this edition have been met. However, where such components were installed under the pressure-temperature ratings of an earlier edition of ASME B16.34, those ratings shall apply except as may be governed by an applicable Code or regulation.

1.2.3 User Accountability. This Standard cites duties and responsibilities that are to be assumed by the valve user in the areas of, for example, application, installation, system hydrostatic testing, operation, and material selection.

1.2.4 Quality Systems. Requirements relating to a valve manufacturer's Quality System Program are described in Nonmandatory Appendix C.

1.2.5 Relevant Units. This Standard states valves in both metric and U.S. customary units. These systems of units are to be regarded separately. The U.S. customary units are shown in parentheses or are listed in separate tables. The values stated in each system are not exact equivalents; therefore it is required that each system of units be used independently of the other. Combining values from the two systems constitutes nonconformance with the Standard.

1.3 Service Conditions

Criteria for selection of valve types and materials suitable for particular fluid service are not within the scope of this Standard.

1.4 Convention

For the purpose of determining conformance with this Standard, the convention for fixing significant digits where limits, maximum and minimum values, are specified shall be "rounding off" as defined in ASTM Practice E 29. This requires that an observed or calculated value shall be rounded off to the nearest unit in the last right-hand digit used for expressing the limit. Decimal values and tolerance do not imply a particular method of measurement.

1.5 Denotation

1.5.1 Pressure Rating Designation. Class, followed by a dimensionless number, is the designation for pressure-temperature ratings. Standardized designations are as follows:

Class	150	300	600	900	1500	2500	4500
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Class 400, an infrequently used flanged-end valve designation, is regarded as an intermediate class designation.

1.5.2 Size. NPS, followed by a dimensionless number, is the designation for nominal valve size. NPS is related to the reference *nominal diameter*, DN, used in international standards. The relationship is, typically, as follows:

NPS	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4
DN	8	10	15	20	25	32	40	50	65	80	100

For $NPS \geq 4$, the related DN is: $DN = 25$ multiplied by the NPS number.

1.6 References

Codes, standards, and specifications, containing provisions to the extent referenced herein, constitute requirements of this Standard. These reference documents are listed in Mandatory Appendix VIII.

2 PRESSURE-TEMPERATURE RATINGS

2.1 General

Pressure-temperature ratings are designated by class numbers. Each class number is further identified as Standard, Special, or Limited Class.

2.1.1 Rating Designations. Rating designations are tabulated for Standard and Special Class 150, 300, 400, 600, 900, 1500, 2500, and 4500 in Table 2 in metric units and in Mandatory Appendix VII in customary units. Ratings for Limited Class are determined by the method in Mandatory Appendix V.¹

(a) Flanged-end valves shall be rated only as Standard Class.

(b) Class 4500 applies only to welding-end valves.

(c) A class designation greater than Class 2500 or a rating temperature greater than 538°C (1000°F) applied to threaded-end valves is beyond the scope of this Standard.

(d) Threaded and socket welding-end valves larger than NPS 2½ are beyond the scope of this Standard.

(e) Except as provided in para. 2.5, the tabulated ratings are the maximum allowable working pressures, expressed as gage pressure, at the temperatures shown.

(f) Ratings intermediate to tabulated values are determined by linear interpolation between temperatures within a class number or between class numbers, except that for flanged-end valves interpolation between tabulated classes is not permitted. A further exception is that Class 400 valves having ASME B16.5 flanged ends shall use the intermediate rating method of para. 2.1.5.

(g) In all cases, valves shall be constructed so that the body, bonnet or cover, body bolting, and bonnet or cover bolting meet the 38°C (100°F) pressure rating requirements for the designated pressure class or pressure-temperature rating. However, pressure-temperature ratings for the valve may be otherwise limited by construction details or material design considerations, in which case the requirements of paras. 4.3.3 and 7.2.3 shall be met.

¹ Throughout this Standard the metric unit used for pressure is *bar* where 1 bar is equivalent to 0.1 MPa. Use of the term bar for pressure is an aid in distinguishing between values for pressure and stress where stress values are given in MPa units. This also recognizes the common usage of the term bar for pressure in International Standards for piping components such as valves and fittings.

2.1.2 Standard Class Valves. Valves conforming to the requirements of this Standard, except for those meeting the additional requirements of Section 8 for Special Class valves or of Mandatory Appendix V for Limited Class valves, shall be designated Standard Class valves. Ratings shall not exceed the values that are listed in Table 2 with an identifying suffix "A."

2.1.3 Special Class Valves. Threaded- or welding-end valves that conform to all the requirements of para. 2.1.2, and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves. Pressure-temperature ratings shall not exceed the values that are listed in Table 2 with an identifying table number suffix "B." Special Class ratings shall not be used for flanged-end valves.

2.1.4 Limited Class Valves. Welding- or threaded-end valves in sizes NPS 2½ and smaller that conform to the requirements of Mandatory Appendix V may be designated Limited Class valves. Pressure-temperature ratings shall not exceed the values calculated in accordance with Mandatory Appendix V. Limited Class ratings shall not be used for flanged-end valves.

2.1.5 Intermediate Rated Valves. A Standard Class or Special Class welding- or threaded-end valve or a Standard Class 400 flanged-end valve may be assigned an intermediate pressure-temperature rating or Class in accordance with para. 6.1.4, provided all other applicable requirements of this Standard are met. Correspondingly, an intermediate pressure rating or Class for Limited Class valves having welding ends or threaded ends may be assigned pressure-temperature ratings as determined by the method described in Mandatory Appendix V in conjunction with the interpolation procedure described in para. 6.1.4.

2.1.6 Valves Fabricated by Welding. A valve made wholly or partly from segments of castings, forging, bars, plates, or tubular product welded together will merit the applicable pressure-temperature rating only if

(a) it conforms to all applicable requirements of this Standard

(b) weld fabrication and heat treatment of welds are in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1²

(c) nondestructive examination of welds is in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, as required to warrant a joint efficiency, E, not less than

(1) 0.80 for flanged-end and Standard Class welding-end valves larger than size NPS 6

² Standard Welding Procedure Specifications published by the American Welding Society and listed in Appendix E of the ASME Boiler and Pressure Code, Section IX, are permitted within the limitations established by Article V of the ASME Boiler and Pressure Vessel Code, Section IX.