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## History

The history of the B16 Standard can be traced back to 1920 when ASME co-sponsored Sectional Committee B16 with what was the American Standards Association (ASA) for the purpose of unifying and developing standards for pipe flanges and fittings (and later for valves and gaskets). The first B16 standard was approved and published in 1927.

Today, ASME offers a series of 32 different B16 Standards that cover pressure-temperature ratings, materials, dimensions, tolerances, markings and the testing of the following: valves, flanges, fittings and gaskets. And certain B16 Standards are used in conjunction with equipment described in other ASME B16 Standards, as well as with other ASME standards, such as the Boiler and Pressure Vessel Code and the B31 Piping Codes.

## About ASME

ASME, founded in 1880, is one of the oldest standards-developing organizations in the world. Starting with the first issuance of its legendary Boiler & Pressure Vessel Code in 1914, ASME has pioneered much of the mechanical engineering standards development and best practices used today. Its codes and standards have grown to nearly 600 offerings – covering a breadth of topics, including piping and pressure technology, nuclear plants, elevators/escalators, construction, engineering design, standardization, and performance testing. ASME standards are used in more than 100 countries and have been translated into numerous languages.

To learn more, visit [www.asme.org/Codes](http://www.asme.org/Codes)

## *Who Can Benefit From B16?*

B16 is intended for manufacturers, owners, employers, users and others concerned with the specification, buying, maintenance, training and safe use of valves, flanges, fittings and gaskets with pressure equipment, plus all potential governing entities. Careful application of certain B16 standards can help users comply with important regulations within their jurisdictions, while achieving operational, cost and safety benefits gained from the many industry best-practices covered in these B16 Standards.



### ASME B16.10

#### Face-to-Face and End-to-End Dimensions of Valves

This Standard covers face-to-face and end-to-end dimensions of straightway valves, and center-to-face and center-to-end dimensions of angle valves. Its purpose is to ensure installation interchangeability for valves of a given material, type, size, rating class, and end connection.

### ASME B16.33

#### Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 175 psi (Sizes NPS 1/2 through NPS 2)

This Standard covers requirements for manually operated metallic valves sizes NPS 1/2 through NPS 2, for outdoor installation as gas shut-off valves at the end of the gas service line and before the gas regulator and meter where the designated gauge pressure of the gas piping system does not exceed 175 psi (12.1 bar). The Standard applies to valves operated in a temperature environment between -20°F and 150°F (-29°C and 66°C).

### ASME B16.34

#### Valves Flanged, Threaded, and Welding End

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 throughbolt types, that are installed between flanges or against a flange are treated as flanged-end valves. Alternative rules for NPS 2 1/2 and smaller valves are given in Mandatory Appendix V.

### ASME B16.38

#### Large Metallic Valves for Gas Distribution: Manually Operated, NPS 2 1/2 (DN 65) to NPS 12 (DN 300), 125 psig (8.6 bar) Maximum

This Standard covers requirements for manually operated metallic valves in nominal sizes 2 1/2 (DN 65) through 12 (DN 300) having the inlet and outlet on a common centerline. These valves are intended for controlling the flow of gas from open to fully closed positions, for use in distribution and service lines where the maximum gage pressure does not exceed 125 psig (8.6 bar).





## ASME B16.40

### Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems

This Standard covers manually operated thermoplastic valves in nominal valve sizes 1/2 through 12. These valves are intended for use below ground in thermoplastic fuel gas distribution mains and service lines. The maximum operating pressure (MOP) at which such distribution piping systems may be operated is in accordance with the Code of Federal Regulation (CFR) Title 49, Part 192, Transportation of Natural and Other Gas by Pipeline; Minimum Safety Standards, for temperature ranges of -20°F to 140°F (-29°C to 60°C).

## ASME B16.44

### Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems up to 5 psi

This Standard applies to new valve construction and covers quarter-turn manually operated metallic valves in sizes NPS 4 1/4 and tubing sizes 1 1/4 O.D. These valves are intended for indoor installation as gas shutoff valves when installed in aboveground fuel gas piping downstream of the gas meter outlet and upstream of the inlet connection to a gas appliance. The valves covered by this Standard are limited to application temperatures between 32°F (0°C) and 125°F (52°C) at pressures not to exceed 5 psig. When so designated by the manufacturer, these valves may be installed for service outdoors and/or at temperatures below 32°F (0°C) and/or above 125°F (52°C).



# 2 / Flanges

B16 Standards – Valves, Flanges, Fittings, and Gaskets

## ASME B16.5

### Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard

This Standard covers pressure-temperature ratings, materials, dimensions, tolerances, marking, testing, and methods of designating openings for pipe flanges and flanged fittings. Included are:

- (1) flanges with rating class designations 150, 300, 400, 600, 900, and 1500 in sizes NPS 1/2 through NPS 24 and flanges with rating class designation 2500 in sizes NPS 1/2 through NPS 12, with requirements given in both metric and U.S. Customary units with diameter of bolts and flange bolt holes expressed in inch units
- (2) flanged fittings with rating class designation 150 and 300 in sizes NPS 1/2 through NPS 24, with requirements given in both metric and U.S. Customary units with diameter of bolts and flange bolt holes expressed in inch units
- (3) flanged fittings with rating class designation 400, 600, 900, and 1500 in sizes NPS 1/2 through NPS 24 and flanged fittings with rating class designation 2500 in sizes 1/2 through NPS 12 that are acknowledged in Nonmandatory Appendix E in which only U.S. Customary units are provided.

This Standard is to be used in conjunction with equipment described in other volumes of the ASME B16 Series of Standards as well as with other ASME standards, such as the Boiler and Pressure Vessel Code and the B31 Piping Codes.

## ASME B16.36

### Orifice Flanges

This Standard covers pressure-temperature ratings, materials, dimensions, tolerances, testing, and making of flanges (similar to those covered in ASME B16.5) that have orifice pressure differential connections. Coverage is limited to the following:

- (a) welding neck flanges Classes 300, 600, 900, 1500, and 2500. U.S. Customary units are presented in Mandatory Appendix I.
- (b) slip-on and threaded Class 300.
- (c) welding neck flanges Class 400 in U.S. Customary units in Mandatory Appendix II.



## ASME B16.47

### Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/Inch Standard

This Standard covers pressure-temperature ratings, materials, dimensions, tolerances, marking, and testing for pipe flanges in sizes NPS 26 through NPS 60. Included are flanges with rating class designations 75, 150, 300, 400, 600, and 900 with requirements given in both SI (Metric) and U.S. Customary units, with diameter of bolts and flange bolt holes expressed in inch units.

## ASME B16.48

### Line Blanks

This Standard covers pressure-temperature ratings, materials, dimensions, tolerances, marking, and testing for operational line blanks in sizes NPS 1/2 through NPS 24 for installation between ASME B16.5 flanges in the 150, 300, 600, 900, 1500, and 2500 pressure classes.



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### ASME B16.1

#### Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250

This Standard covers Classes 25, 125, and 250 Gray Iron Pipe Flanges and Flanged Fittings. It includes pressure–temperature ratings, sizes and method of designating openings of reducing fittings, marking, materials, dimensions and tolerances, bolting and gaskets, and pressure testing.

### ASME B16.3

#### Malleable Iron Threaded Fittings: Classes 150 and 300

This Standard covers malleable iron threaded fittings, Classes 150 and 300. It also contains provisions for using steel for caps and couplings in Class 150 for NPS 3/8 and smaller. This Standard includes pressure–temperature ratings, size and method of designating openings of reducing fittings, marking, material, dimensions and tolerances, threading, and coatings.

### ASME B16.4

#### Gray Iron Threaded Fittings: Classes 125 and 250

This Standard for gray iron threaded fittings, Classes 125 and 250, covers pressure–temperature ratings, sizes and method of designating openings of reducing fittings, marking, material, dimensions and tolerances, threading, and coatings.

### ASME B16.9

#### Factory Made Wrought Butt welding Fittings

This Standard covers overall dimensions, tolerances, ratings, testing, and markings for factory-made wrought butt welding fittings in sizes NPS 1/2 through NPS 48 (DN 15 through DN 1200).

### ASME B16.11

#### Forged Fittings, Socket-Welding and Threaded

This Standard covers ratings, dimensions, tolerances, marking and material requirements for socket-welding and threaded forged fittings. These fittings are designated as Class 2000, 3000, and 6000 for threaded end fittings and Class 3000, 6000, and 9000 for socket-weld end fittings.

### ASME B16.12

#### Cast Iron Threaded Drainage Fittings

This Standard for cast iron threaded drainage fittings covers sizes and method of designating openings in reducing fittings, marking, material, dimensions and tolerances, threading, ribs, coatings, and face bevel.





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## ASME B16.14

### Ferrous Pipe Plugs, Bushings, and Locknuts with Pipe Threads

This Standard covers pressure–temperature ratings, size, marking, materials, dimensions and tolerances, threading, and pattern taper.

## ASME B16.15

### Cast Copper Alloy Threaded Fittings: Classes 125 and 250

This Standard covers cast Classes 125 and 250 copper alloy threaded pipe fittings with provisions for substituting wrought copper alloys for plugs, bushings, caps, and couplings in small sizes. This Standard includes pressure–temperature ratings, size and method of designating openings of reducing pipe fittings, marking requirements, minimum requirements for casting quality and materials dimensions and tolerances in SI (metric) and U.S. Customary units, threading requirements, and pressure test requirements.

## ASME B16.18

### Cast Copper Alloy Solder Joint Pressure Fittings

This Standard for cast copper alloy solder joint pressure fittings designed for use with copper water tube establishes requirements for pressure–temperature ratings, abbreviations for end connections, sizes and method of designating openings of fittings, marking, material, dimensions and tolerances, and tests.

## ASME B16.22

### Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings

This Standard establishes specifications for wrought copper and wrought copper alloy, solder-joint, seamless fittings, designed for use with seamless copper tube conforming to ASTM B88 (water and general plumbing systems), ASTM B280 (air conditioning and refrigeration service), and ASTM B819 (medical gas systems), as well as fittings intended to be assembled with soldering materials conforming to ASTM B32, brazing materials conforming to AWS A5.8, or with tapered pipe thread conforming to ASME B1.20.1.

## ASME B16.23

### Cast Copper Alloy Solder Joint Drainage Fittings: DWV

This Standard establishes specifications for cast copper alloy solder joint drainage fittings, designed for use in drain, waste, and vent (DWV) systems. These fittings are designed for use with seamless copper tube conforming to ASTM B306, Copper Drainage Tube (DWV), as well as fittings intended to be assembled with soldering materials conforming to ASTM B32, or tapered pipe thread conforming to ASME B1.20.1.

B16.23 provides requirements for fitting ends suitable for soldering and covers description, pitch (slope), abbreviations for end connections, sizes and methods for designing openings for reducing fittings, marking, material, and dimensions and tolerances.



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**ASME B16.24****Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves: Classes 150, 300, 600, 900, 1500, and 2500**

This Standard covers cast copper alloy threaded pipe flanges and blind flanges having class designations 150, 300, 600, 900, 1500, and 2500, flanged fittings having rating class designations 150 and 300, and threaded and flanged valves having rating class designations 150, 300, 600, 1500, and 2500. To support this, requirements for pressure–temperature ratings, size and method of designating openings for reduced fittings, markings, materials, dimensions, bolting and gaskets, tolerances, nondestructive examination for valves, and tests are established within this Standard.

**ASME B16.25****Buttwelding Ends**

This Standard covers the preparation of buttwelding ends of piping components to be joined into a piping system by welding. It includes requirements for welding bevels, for external and internal shaping of heavy-wall components, and for preparation of internal ends (including dimensions and tolerances). Coverage includes preparation for joints with the no backing rings, split or noncontinuous backing rings, solid or continuous backing rings, consumable insert rings, and gas tungsten arc welding (GTAW) of the root pass.

**ASME B16.26****Cast Copper Alloy Fittings for Flared Copper Tubes**

This Standard establishes specifications for cast copper alloy fittings and nuts used with flared seamless copper tube conforming to ASTM B 88 (water and general plumbing systems). Included are requirements for pressure rating, size, marking, material, dimensions, threading, and hydrostatic testing.

**ASME B16.29****Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings-DWV**

This Standard for wrought copper and wrought copper alloy solder-joint drainage fittings, designed for use with copper drainage tube conforming to ASTM B-306, covers description, pitch (slope), abbreviations for end connections, sizes and method of designating openings for reducing fittings, marking, material, and dimensions and tolerances.

**ASME B16.39****Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300**

This Standard covers threaded malleable iron unions, Classes 150, 250, and 300. It also contains provisions for using steel for NPS 1/8 unions. This Standard includes design, pressure–temperature ratings, size, marking, materials, joints and seats, threads, hydrostatic strength, tensile strength, air pressure test, sampling, coatings, and dimensions.

**ASME B16.42****Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300**

This Standard covers minimum requirements for Classes 150 and 300 cast ductile iron pipe flanges and flanged fittings. The requirements covered are pressure–temperature ratings, sizes and method of designating openings of reducing fittings, marking, material, dimensions and tolerances, bolts, nuts, and gaskets, and tests.





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## ASME B16.49

### Factory-Made, Wrought Steel, Buttwelding Induction Bends for Transportation and Distribution Systems

This Standard covers design, material, manufacturing, testing, marking, and inspection requirements for factory-made pipeline bends of carbon steel materials having controlled chemistry and mechanical properties, produced by the induction bending process, with or without tangents. This Standard covers induction bends for transportation and distribution piping applications (e.g., ASME B31.4 and ASME B31.8).

## ASME B16.50

### Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings

This Standard establishes requirements for wrought copper and wrought copper alloy braze-joint seamless fittings designed for use with seamless copper tube conforming to ASTM Standard Specification, B88 (Water and General Plumbing Systems), B280 (Air Conditioning and Refrigeration Service), and B819 (Medical Gas Systems). This Standard covers joints assembled with brazing materials conforming to ANSI/AWS A5.8. This Standard is allied to ASME standards B16.18 and B16.22. It provides requirements for fitting-ends suitable for brazing and covers pressure-temperature ratings, abbreviations for end connections, size and method of designating openings of fittings, marking, material, dimensions and tolerances, and testing.

## ASME B16.51

### Copper and Copper Alloy Press-Connect Pressure Fittings

This Standard establishes requirements for cast copper alloy, wrought copper, and wrought copper alloy, press-connect pressure fittings for use with hard drawn seamless copper water tube conforming to ASTM B88 for piping systems conveying water. The press-connect system (tube, fitting, and joint) conforming to this Standard is for use at a maximum pressure of 1 380 kPa (200 psi) over the temperature range from 0°C to 93°C (32°F to 200°F). This Standard provides requirements for fittings suitable for press-connect joining and covers size designations, pressure-temperature ratings, terminology, dimensions and tolerances, materials, design qualification, required installation instructions, and markings.





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## ASME B16.20

### Metallic Gaskets for Pipe Flanges

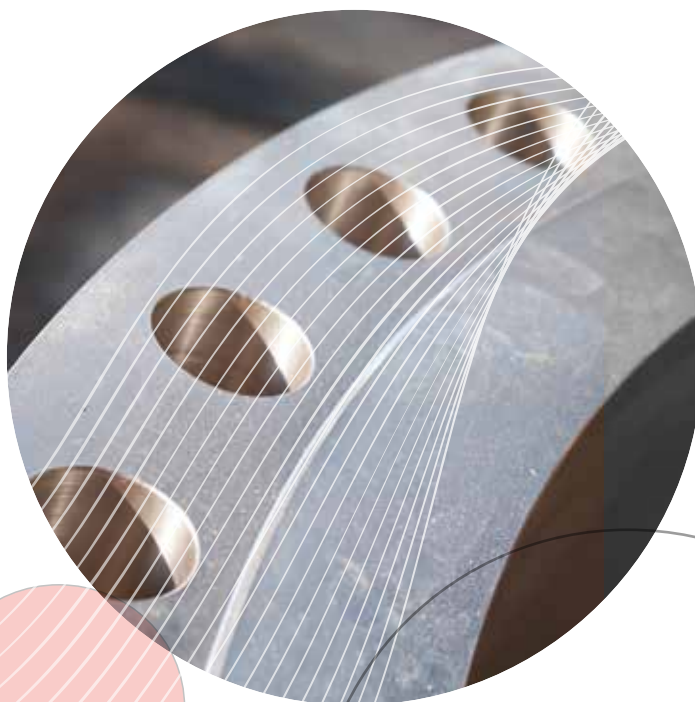
This Standard covers materials, dimensions, tolerances, and markings for metal ring-joint gaskets, spiral-wound metal gaskets, metal-jacketed gaskets, and grooved metal gaskets with covering layers. These gaskets are dimensionally suitable for use with flanges described in reference flange standards ASME B16.5, ASME B16.47, API Specification 6A, and ISO 10423.

## ASME B16.21

### Nonmetallic Flat Gaskets for Pipe Flanges

This Standard covers types, sizes, materials, dimensions, tolerances, and markings for nonmetallic flat gaskets. These

described in the referenced flange standards.





## Consider these B16– Valves, Flanges, Fittings, and Gaskets Related Courses and Training!

- EL601 – Bolting Specialist Qualification Program - Part 1
- PD386 – Design of Bolted Flange Joints
- PD601 – The Bolting Combo Course
- PD539 – Bolted Joints and Gasket Behavior
- EL512 – The Bolted Joint
- PD679 – Selection of Pumps and Valves for Optimum System Performance
- PD763 – Centrifugal Pumps: Testing, Design and Analysis

[asme.org/shop/courses](https://asme.org/shop/courses)

