STD.ASME B16.39-ENGL 1998 ■ 0759670 0608226 877 ■

ASME B16.39-1998
(Revision of ASME/ANSI B16.39-1986)

MALLEABLE IRON THREADED PIPE UNIONS

Classes 150, 250, and 300

AN AMERICAN NATIONAL STANDARD



The American Society of
Mechanical Engineers

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FOREWORD

(This Foreword is not part of ASME B16.39-1998.)

In 1921, the American Engineering Standards Committee, later the American Standards Association (ASA), now the American National Standards Institute (ANSI), authorized the organization of a Sectional Committee on the Standardization of Pipe Flanges and Flanged Fittings, with the following organizations as joint sponsors: Heating, Piping, and Air Conditioning Contractors National Association, later the Mechanical Contractors Association of America (MCAA); Manufacturers Standardization Society of the Valve and Fittings Industry (MSS); and the American Society of Mechanical Engineers (ASME).

Threaded fittings were added to the scope of the B16 Committee, and Subcommittee No. 2 (now Subcommittee B) was made responsible for threaded fittings other than steel. Standards for cast and malleable iron fittings were approved by ASA as early as 1927.

For many years, the need for standardization of threaded malleable iron unions was met by Federal Specifications (published by the General Services Administration) and other documents published by the Association of American Railroads (AAR) and the Underwriters Laboratories (UL). As these standards continued to diverge, however, manufacturers concluded that a common practice would be desirable. Accordingly, beginning in 1967, MSS developed a standard practice embodying features of the existing standards and published it as MSS SP-76-1970.

During the next few years, ANSI recognition of the AAR and UL standards was withdrawn in favor of SP-76, and in 1975 MSS submitted its standards to Subcommittee B of American National Standards Committee B16 for consideration as an American National Standard. After several modifications and the addition of metric equivalents, the Standard was approved by the Committee, cosecretariat organizations, and ANSI. It was then published with the designation ANSI B16.39-1977.

In 1982 American National Standards Committee B16 was reorganized as an ASME Committee operating under procedures accredited by ANSI. The 1986 edition of B16.39 updated the referenced standards and specifications, established U.S. customary units as the standard, and provided for electrodeposition as an alternative to hot dipping for any application of zinc coating. Following approval by the Standards Committee and ASME, approval as an American National Standard was given by ANSI on December 31, 1986, with the new designation ASME/ANSI B16.39-1986.

In the 1998 edition of ASME B16.39, reference standards are updated, a quality system program annex is added, and several editorial revisions are made. Following approval by ASME B16 Subcommittee B and the B16 Main Committee, ANSI approved this American National Standard on November 20, 1998.

Requests for interpretation or suggestions for revision 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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Standardization of Valves, Flanges, Fittings, Gaskets, and Valve Actuators

(The following is the roster of the Committee at the time of approval of this Standard.)

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MALLEABLE IRON THREADED PIPE UNIONS

Classes 150, 250, and 300

1 SCOPE

1.1 General

This Standard for threaded malleable iron unions, classes 150, 250, and 300, provides requirements for the following:

(a) design
(b) pressure–temperature ratings
(c) size
(d) marking
(e) materials
(f) joints and seats
(g) threads
(h) hydrostatic strength
(i) tensile strength
(j) air pressure test
(k) sampling
(l) coatings
(m) dimensions

1.2 Standard Units

U.S. customary units are the standard. Metric units are shown for information and reference only. (See Annex A.)

1.3 Quality Systems

Requirements relating to the product manufacturers' quality system programs are described in Annex B.

1.4 References

Standards and specifications adopted by reference in this Standard are shown in Annex I, which is part of this Standard.

2 DESIGN

The complete union shall consist of a tail or male part, a head or female part, and a union nut. The type of joint may be ball-to-cone, ball-to-ball, or ball-and-socket with metal-to-metal seating surfaces of iron, copper, or copper alloy. The threaded ends shall be male or female pipe threads. The head or female part may be furnished as a coupling, an elbow, or a tee.

3 PRESSURE–TEMPERATURE RATINGS

Pressure–temperature ratings for these unions are shown in Table 1. Unions with copper or copper alloy seats are not intended for use where temperature exceeds 450°F (232°C). Metric units (bar) are shown in Table A1.

4 SIZE

The sizes of unions shown in the tables are identified by the corresponding nominal pipe sizes (NPS) defined in ASME B36.10M.

5 MARKING

Unions shall be marked on the nut with the manufacturer's name or trademark and nominal pressure class except on bar stock unions, where marking is impractical. Additional markings permitted by MSS SP-25 may be used.

6 MATERIALS

(a) The mechanical properties of the malleable iron castings shall be at least equal to those specified in ASTM A 197. Insert rings may be of suitable copper or copper alloy.

(b) Steel bar stock having a yield strength of not less than 30 ksi (207 MPa) may be used in producing NPS $\frac{1}{8}$ unions.

(c) Where copper alloy seats are furnished, either the head or tail part of unions produced from bar stock may be solid copper alloy. Such parts must meet the tensile strength requirements listed in Table 2.

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TABLE 1 PRESSURE–TEMPERATURE RATINGS

Temperature, °F	Pressure, psig Class 150	Class 250	Class 300
−20 to 150	300	500	600
200	265	455	550
250	225	405	505
300	185	360	460
350	150	315	415
400	110	270	370
450	75	225	325
500	...	180	280
550	...	130	230

7 JOINTS AND SEATS

Inserts shall be secured into the ends to become a permanent part of them with no signs of cracking. Inserted seat rings shall be of sufficient width to allow ample bearing for the seating of the male end.

8 THREADING OF PIPE ENDS

8.1 Types of Threads

Pipe ends of head and tail parts shall be threaded with taper pipe threads (ASME B1.20.1), except that NPS $\frac{1}{8}$ unions made from bar stock may have NPSC internal straight pipe threads.

8.2 Tolerances

The variation in taper threading shall be limited to one turn large and one turn small from the gaging face of the ring and gaging notch on the plug when using working gages.

When gaging internal threads, the notch should be flush with the bottom of the chamfer, which shall be considered the intersection of the chamfer cone and the pitch cone of the thread. This depth is approximately equal to one-half thread from the end of the head or tail part.

9 HYDROSTATIC STRENGTH

Assembled unions shall be capable of withstanding, without rupture or leakage through the shell or at the union joint, an internal hydrostatic pressure of five times the cold (150°F, 66°C) pressure rating for 1 min.

TABLE 2 TENSILE STRENGTH OF UNIONS

Nominal Pipe Size	Ultimate Load, lbf Class 150	Class 250	Class 300
$\frac{1}{8}$	2500	2500	4000
$\frac{1}{4}$	3800	3800	6000
$\frac{3}{8}$	5300	5300	8000
$\frac{1}{2}$	7700	7700	10,000
$\frac{3}{4}$	10,600	10,600	14,000
1	15,500	15,500	18,000
$1\frac{1}{4}$	21,300	21,300	23,000
$1\frac{1}{2}$	25,800	25,800	28,000
2	30,000	30,000	40,000
$2\frac{1}{2}$	35,000	35,000	55,000
3	40,000	40,000	75,000
4	50,000	50,000	110,000

GENERAL NOTE: Ultimate loads in metric (SI) units are shown in Table A2.

10 TENSILE STRENGTH

(a) Assembled unions shall be capable of withstanding, without rupture, the ultimate loads shown in Table 2 when tested as described in Sections 11 and 12.

(b) Tests shall be conducted by attaching threaded steel bars or tubing to each end of the union using the pipe threads provided. Bars or tubing are to be secured in a tensile testing machine. Load shall be increased at a uniform rate until the ultimate load is attained.

11 AIR PRESSURE TEST

Assembled unions selected in accordance with Section 12 shall be tested with air at a minimum pressure of 40 psig (2.8 bar).

12 SAMPLING FOR AIR PRESSURE TEST

A random sample of unions representative of the production lot shall be presented for testing in accordance with Section 11. The average outgoing quality limit (AOQL) of the established acceptable sampling plans used shall not exceed 2%. A *lot* for purposes of this Standard is defined as the number of unions of the same size, design, and pressure rating submitted for testing at any one time.

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13 COATINGS

13.1 Malleable Iron Unions

Galvanized unions shall be either hot dipped in accordance with ASTM A 153 prior to machining or electroplated in accordance with ASTM B 633, Type 1, Service Condition 4, after machining. Hot dipped coatings shall be a minimum thickness of 0.0034 in. Electroplating shall be a minimum thickness of 0.001 in.

13.2 Steel Unions

Galvanized unions made from steel bar stock shall have either electroplated zinc coatings conforming to ASTM B 633, Type 1, Service Condition 4, or cadmium coatings conforming to ASTM A 165, Type NS. The electrodeposited coatings shall be applied after machining.

14 DIMENSIONS

Dimensions in inches are given in Tables 3 through 5. Dimensions in millimeters are given in Tables A3 through A5 in Annex A.

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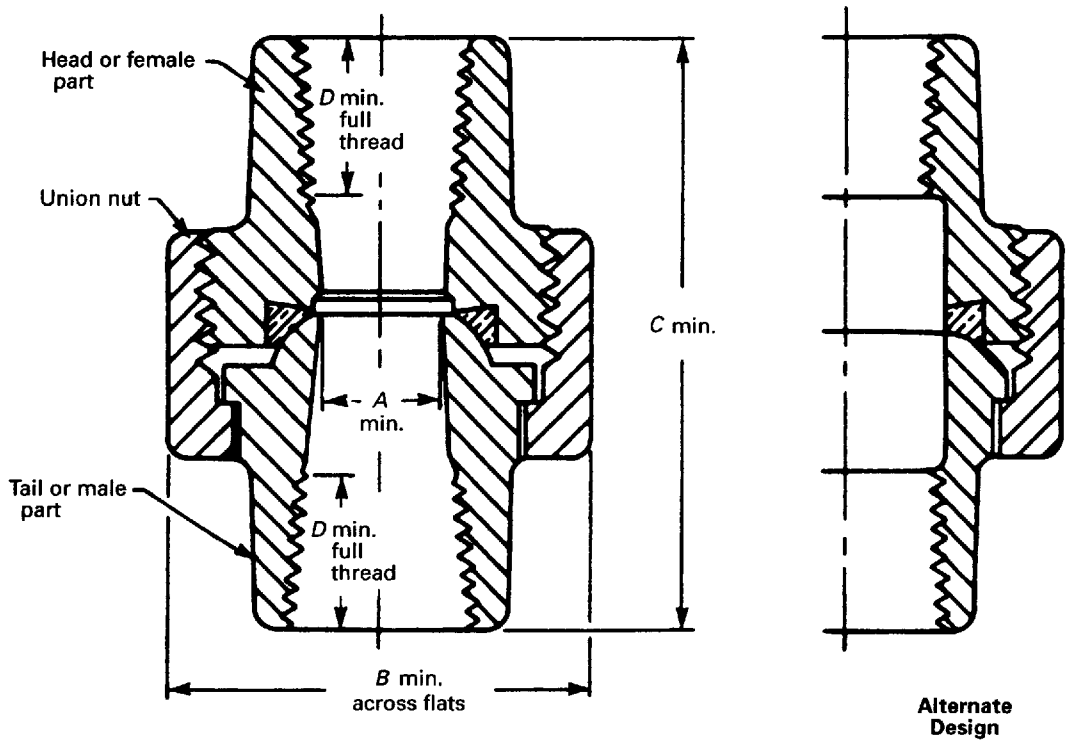


TABLE 3 DIMENSIONS OF CLASS 150 MALLEABLE IRON THREADED UNIONS

Nominal Pipe Size	*A*, Min.	*B*, Min.	*C*, Min.	*D*, Min.
1/8	0.21	0.93	1.26	0.30
1/4	0.36	1.10	1.44	0.32
3/8	0.52	1.26	1.61	0.36
1/2	0.61	1.45	1.72	0.43
3/4	0.80	1.71	1.94	0.50
1	1.00	2.07	2.06	0.58
1 1/4	1.31	2.50	2.26	0.67
1 1/2	1.55	2.82	2.41	0.70
2	2.03	3.41	2.75	0.75
2 1/2	2.38	4.12	3.22	0.92
3	3.00	4.75	3.50	0.98
4	4.03	6.00	3.85	1.08

GENERAL NOTE: Dimensions are in inches.

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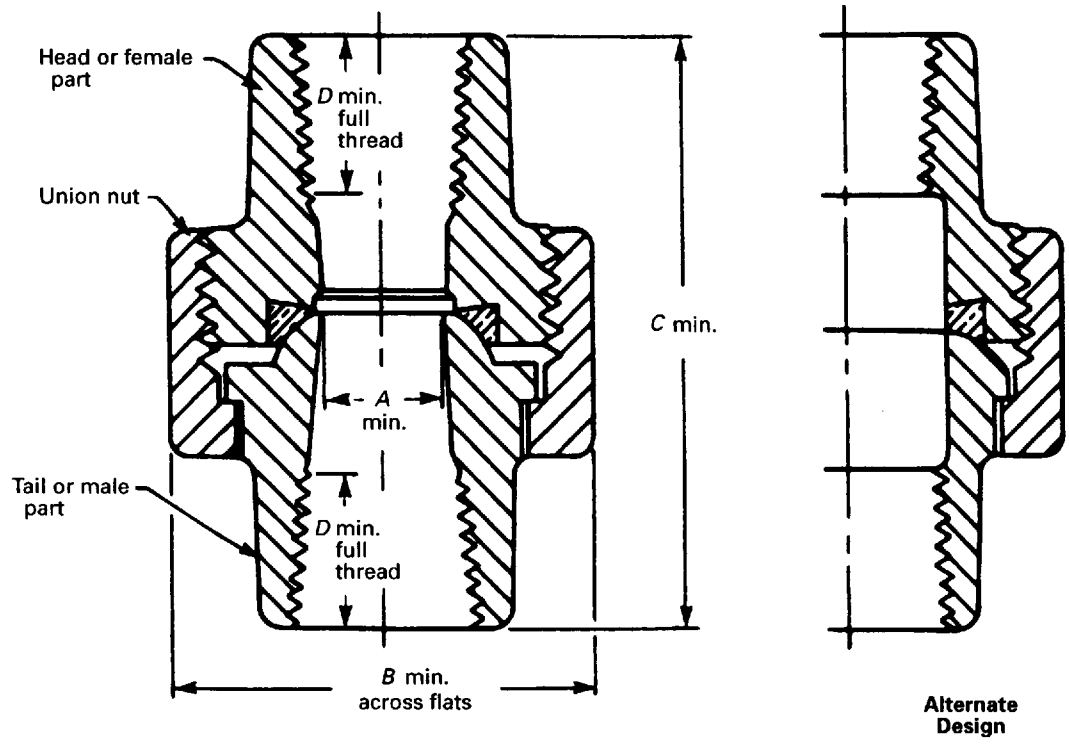


TABLE 4 DIMENSIONS OF CLASS 250 MALLEABLE IRON THREADED UNIONS

Nominal Pipe Size	*A*, Min.	*B*, Min.	*C*, Min.	*D*, Min.
1/8	0.21	0.93	1.26	0.30
1/4	0.30	1.11	1.55	0.43
3/8	0.42	1.26	1.71	0.47
1/2	0.54	1.45	1.81	0.57
3/4	0.74	1.71	2.07	0.64
1	0.95	2.07	2.31	0.75
1 1/4	1.27	2.57	2.62	0.84
1 1/2	1.50	2.89	2.78	0.87
2	1.93	3.48	3.13	1.00
2 1/2	2.32	4.15	3.52	1.17
3	2.90	4.96	3.84	1.23
4	3.82	6.47	4.39	1.33

GENERAL NOTE: Dimensions are in inches.

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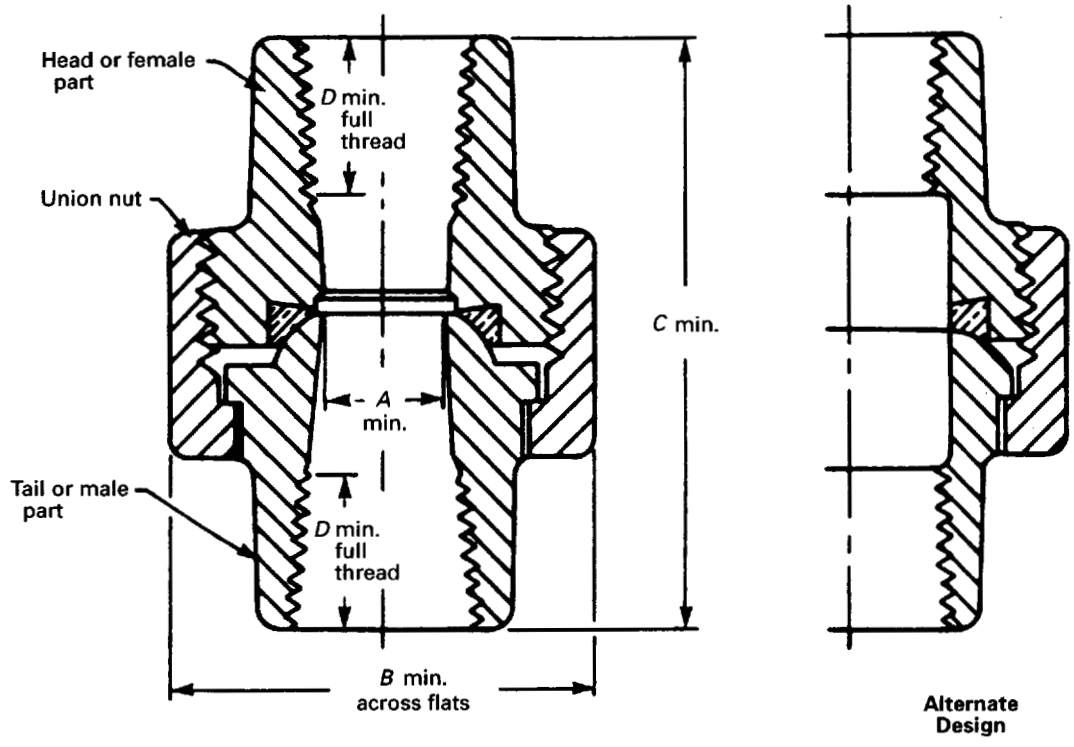


TABLE 5 DIMENSIONS OF CLASS 300 MALLEABLE IRON THREADED UNIONS

Nominal Pipe Size	*A*, Min.	*B*, Min.	*C*, Min.	*D*, Min.
1/8	0.21	0.93	1.26	0.30
1/4	0.30	1.33	1.55	0.43
3/8	0.42	1.50	1.71	0.47
1/2	0.54	1.76	1.81	0.57
3/4	0.74	2.15	2.12	0.64
1	0.95	2.48	2.31	0.75
1 1/4	1.27	3.02	2.66	0.84
1 1/2	1.50	3.28	2.85	0.87
2	1.93	3.96	3.23	1.00
2 1/2	2.32	4.72	3.33	1.17
3	2.90	5.37	4.09	1.23
4	3.82	7.00	4.47	1.33

GENERAL NOTE: Dimensions are in inches.

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ANNEX I
REFERENCES

(This Annex is part of ASME B16.39-1998.)

The following is a list of publications referenced in this Standard.

ASME B1.20.1-1983 (R1992), Pipe Threads, General Purpose (Inch)[1]

ASME B36.10M-1996, Welded and Seamless Wrought Steel Pipe[1]

Publisher: American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

ASTM A 153/A 153M-95, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM B 633-85 (R1994), Specification for Electrodeposited Coatings of Zinc on Iron and Steel

ASTM B 766-86 (R1993), Specification for Electrodeposited Coatings of Cadmium on Steel

ASTM A 197-87 (R1992), Specification for Cupola Malleable Iron

Publisher: American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428

ISO 9000-1: 1994, Quality management and quality assurance standards — Part 1: Guidelines for selection and use

ISO 9000-2: 1997, Quality management and quality assurance standards — Part 2: Generic guidelines for the application of ISO 9001, ISO 9002, and ISO 9003

ISO 9000-3: 1991, Quality management and quality assurance standards — Part 3: Guidelines for the application of ISO 9001 to the development, supply, and maintenance of software

ISO 9001: 1994, Quality systems — Model for quality assurance in design, development, production, installation, and servicing

ISO 9002: 1994, Quality systems — Model for quality assurance in production and servicing

ISO 9003: 1994, Quality systems — Model for quality assurance in final inspection and test

Publisher: International Organization for Standardization, 1 rue de Varembé, Case postale 56, CH-1121 Genève 20, Switzerland/Suisse

MSS SP-25-1998, Standard Marking System for Valves, Fittings, Flanges, and Unions

Publisher: Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, NE, Vienna, VA 22180

[1] May also be obtained from American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036.

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ANNEX A
METRIC (SI) TABLES

(This Annex is a nonmandatory part of ASME B16.39-1998 and is included for informational purposes only.)

Tables A1 through A5 present the metric values comparable to the customary values shown in Tables 1 through 5. The metric dimensions shown in Tables A3 through A5 are for information and reference, and are not exact equivalents of the dimensions in Tables 3 through 5. If used by agreement between the manufacturer and the purchaser, complete dimensional interchangeability with standard components cannot be assured. Use of a combination of customary and metric values is contrary to the intent of this Standard.

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TABLE A1 PRESSURE–TEMPERATURE RATINGS

Temperature, °C	Pressure, bar		
	Class 150 Unions	Class 250 Unions	Class 300 Unions
–29 to 66	20.7	34.5	41.4
100	17.5	30.6	37.5
125	15.2	27.7	34.6
150	12.9	24.8	31.7
175	10.6	22.0	28.9
200	8:2	19.1	26.0
225	5.9	16.2	23.1
232	5.2	. . .	. . .
250	. . .	13.4	20.3
275	. . .	10.5	17.4
288	. . .	9.0	15.9

GENERAL NOTES:
(a) 1 bar = 14.5 psi = 100 kPa
(b) $°C = \frac{°F - 32}{1.8}$

TABLE A2 TENSILE STRENGTH OF UNIONS

Nominal Pipe Size	Ultimate Load, kN		
	Class 150	Class 250	Class 300
1/8	11.1	11.1	17.8
1/4	16.9	16.9	26.7
3/8	23.6	23.6	35.6
1/2	34.2	34.2	44.5
3/4	47.1	47.1	62.3
1	68.9	68.9	80.1
1 1/4	94.7	94.7	102.3
1 1/2	114.8	114.8	124.5
2	133.4	133.4	177.9
2 1/2	155.7	155.7	244.6
3	177.9	177.9	333.6
4	222.4	222.4	489.3

GENERAL NOTE: 1 N = 0.2248 lbf

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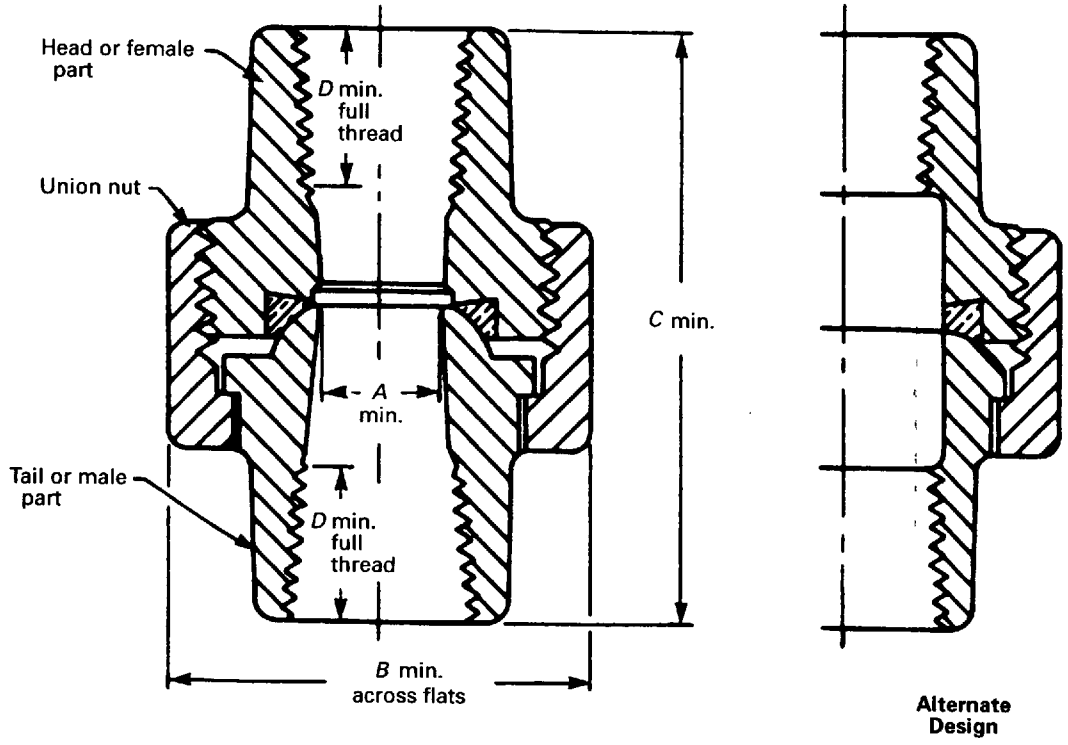


TABLE A3 SI DIMENSIONS OF CLASS 150 MALLEABLE IRON THREADED UNIONS

Nominal Pipe Size	*A*, Min.	*B*, Min.	*C*, Min.	*D*, Min.
1/8	5.5	23.5	32.0	7.5
1/4	9.0	28.0	36.5	8.0
3/8	13.0	32.0	41.0	9.0
1/2	15.5	37.0	43.5	11.0
3/4	20.5	43.5	49.5	12.5
1	25.5	52.5	52.5	14.5
1 1/4	33.5	63.5	57.5	17.0
1 1/2	39.5	71.5	61.0	18.0
2	51.5	86.5	70.0	19.0
2 1/2	60.5	104.5	82.0	23.5
3	76.0	120.5	89.0	25.0
4	102.5	152.5	98.0	27.5

GENERAL NOTE: Dimensions are in millimeters.

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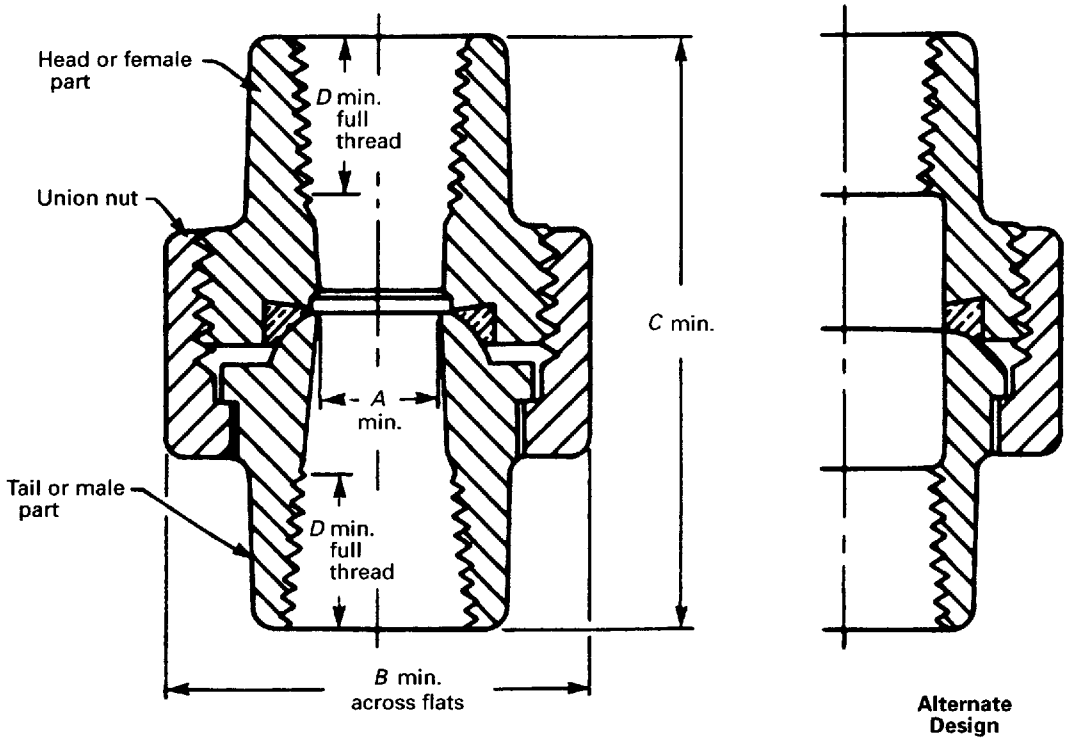


TABLE A4 SI DIMENSIONS OF CLASS 250 MALLEABLE IRON THREADED UNIONS

Nominal Pipe Size	*A*, Min.	*B*, Min.	*C*, Min.	*D*, Min.
1/8	5.5	23.5	32.0	7.5
1/4	7.5	28.5	39.5	11.0
3/8	10.5	32.0	43.5	12.0
1/2	13.5	37.0	46.0	14.5
3/4	19.0	43.5	52.5	16.5
1	24.0	52.5	58.5	19.0
1 1/4	32.5	65.5	66.5	21.5
1 1/2	38.0	73.5	70.5	22.0
2	49.0	88.5	79.5	25.5
2 1/2	59.0	105.5	89.5	29.5
3	73.5	126.0	97.5	31.0
4	97.0	164.5	111.5	34.0

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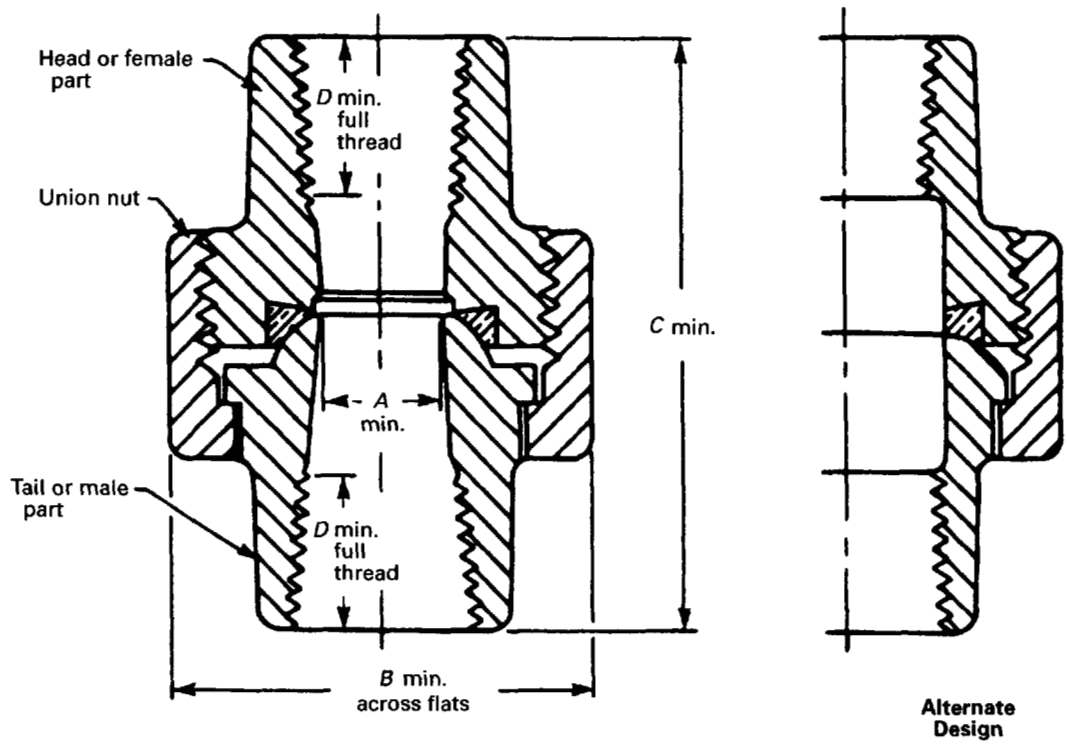


TABLE A5 SI DIMENSIONS OF CLASS 300 MALLEABLE IRON THREADED UNIONS

Nominal Pipe Size	*A*, Min.	*B*, Min.	*C*, Min.	*D*, Min.
1/8	5.5	23.5	32.0	7.5
1/4	7.5	34.0	39.5	11.0
3/8	10.5	38.0	43.5	12.0
1/2	13.5	44.5	46.0	14.5
3/4	19.0	54.5	54.0	16.5
1	24.0	63.0	58.5	19.0
1 1/4	32.5	76.5	67.5	21.5
1 1/2	38.0	83.5	72.5	22.0
2	49.0	100.5	82.0	25.5
2 1/2	59.0	120.0	84.5	29.5
3	73.5	136.5	104.0	31.0
4	97.0	178.0	113.5	34.0

GENERAL NOTE: Dimensions are in millimeters.

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ANNEX B
QUALITY SYSTEM PROGRAM

(This Annex is a nonmandatory part of ASME B16.39-1998 and is included for informational purposes only.)

The products manufactured in accordance with this Standard shall be produced under a quality system program following the principles of an appropriate standard from the ISO 9000 series.[1] A determination of the need for registration and/or certification of the product manufacturer's quality system program by an independent organization shall be the responsibility of the manufacturer. Detailed documentation demonstrating program compliance shall be available to the purchaser at the manufacturer's facility. A written, summarized description of the program used by the product manufacturer shall be available to the purchaser upon request. The product manufacturer is defined as the entity whose name or trademark appears on the product in accordance with the marking or identification requirements of this Standard.

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[1] The series is also available from the American National Standards Institute (ANSI) and the American Society for Quality (ASQ) as American National Standards that are identified by a prefix "Q" replacing the prefix "ISO". Each standard of the series is listed in Annex I.

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AMERICAN NATIONAL STANDARDS FOR PIPING, PIPE FLANGES, FITTINGS, AND VALVES

Scheme for the Identification of Piping Systems A13.1-1996
Pipe Threads, General Purpose (Inch) ..... B1.20.1-1983(R1992)
Dryseal Pipe Threads (Inch) ..... B1.20.3-1976(R1991)
Cast Iron Pipe Flanges and Flanged Fittings B16.1-1989
Malleable Iron Threaded Fittings B16.3-1992
Gray Iron Threaded Fittings B16.4-1992
Pipe Flanges and Flanged Fittings (NPS ½ Through NPS 24) B16.5-1996
Factory-Made Wrought Steel Buttwelding Fittings B16.9-1993
Face-to-Face and End-to-End Dimensions of Valves B16.10-1992
Forged Fittings, Socket-Welding and Threaded B16.11-1996
Cast Iron Threaded Drainage Fittings B16.12-1991
Ferrous Pipe Plugs, Bushings, and Locknuts with Pipe Threads B16.14-1991
Cast Bronze Threaded Fittings, Classes 125 and 250 ..... B16.15-1985(R1994)
Cast Copper Alloy Solder Joint Pressure Fittings ..... B16.18-1984(R1994)
Metallic Gaskets for Pipe Flanges — Ring-Joint, Spiral-Wound, and Jacketed B16.20-1993
Nonmetallic Flat Gaskets for Pipe Flanges B16.21-1992
Wrought Copper and Copper Alloy Solder Joint Pressure Fittings B16.22-1995
Cast Copper Alloy Solder Joint Drainage Fittings — DWV B16.23-1992
Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500, and 2500 ..... B16.24-1991
Buttwelding Ends B16.25-1992
Cast Copper Alloy Fittings for Flared Copper Tubes B16.26-1988
Wrought Steel Buttwelding Short Radius Elbows and Returns B16.28-1994
Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings — DWV B16.29-1994
Cast Copper Alloy Solder Joint Fittings for Sovent Drainage Systems B16.32-1992
Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 psig (Sizes ½ Through 2) B16.33-1990
Valves — Flanged, Threaded, and Welding End B16.34-1996
Orifice Flanges B16.36-1996
Large Metallic Valves for Gas Distribution (Manually Operated, NPS 2½ to 12, 125 psig Maximum) ..... B16.38-1985(R1994)
Malleable Iron Threaded Pipe Unions B16.39-1998
Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems ..... B16.40-1985(R1994)
Functional Qualification Requirements for Power Operated Active Valve Assemblies for Nuclear Power Plants ..... B16.41-1983(R1989)
Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300 ..... B16.42-1987
Manually Operated Metallic Gas Valves for Use in House Piping Systems B16.44-1995
Cast Iron Fittings for Sovent® Drainage Systems B16.45-1987
Large Diameter Steel Flanges (NPS 26 Through NPS 60) B16.47-1996
Steel Line Blanks B16.48-1997
Power Piping B31.1-1995
Fuel Gas Piping (not an ANSI standard) B31.2-1968
Process Piping B31.3-1996
Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids B31.4-1992
Refrigeration Piping B31.5-1992
Gas Transmission and Distribution Piping Systems B31.8-1995
Building Services Piping B31.9-1988
Slurry Transportation Piping Systems B31.11-1989
Manual for Determining the Remaining Strength of Corroded Pipelines B31G-1991
Welded and Seamless Wrought Steel Pipe B36.10M-1995
Stainless Steel Pipe ..... B36.19M-1985(R1994)
Self-Operated and Power-Operated Safety-Related Valves Functional Specification Standard ..... N278.1-1975(R1992)

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