ASME B16.21-2005

(Revision of ASME B16.21-1992)

Nonmetallic Flat Gaskets for Pipe Flanges

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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FOREWORD

Before this standard was issued, the individual sizes of gaskets were made to many different sets of dimensions, based on different concepts of adaptation and functional use on the part of consumers as well as manufacturers. In some cases dimensions were shown in American Standards. To standardize gasket sizes, the Standards and Specifications Committee of the Mechanical Packing Association started work on a standard for nonmetallic or cut gaskets for bronze, iron, and steel pipe flanges.

Dimensions of gaskets being used were collected, and a basic design philosophy for sizing was formulated by the committee. This was the result of extensive field research experience and accepted standard user requirements. The procedure followed was to dimension the gasket for each type and size of flange so as to prevent the gasket from projecting into the line of flow. Dimensional tolerances of standard pipe flanges and fittings as to I.D., O.D., and bolting were all considered.

Suggested dimensional standards were tabulated and distributed for industry comment. After several revisions, a final draft, dated September 15, 1948, was approved by the Mechanical Packing Association for submission as an American Standard.

Sectional Committee (B16) on the Standardization of Pipe Flanges and Fittings was organized in 1921 under the procedure of the American Standards Association, with the Heating, Piping, and Air Conditioning Contractors' National Association, Manufacturers' Standardization Society of the Valve and Fittings Industry, and the American Society of Mechanical Engineers as joint sponsors.

Sectional Committee B16 received the proposal on May 9, 1949, and assigned it to a joint group of Subcommittees 1 and 3. The Manufacturers' Standardization Society was also consulted as the proposal included gaskets for bronze flanges made to their Standard Practice SP-2. This joint group offered a revision of the original design concept for sizing, which was acceptable to the Mechanical Packing Association's Committee (now the Fluid Sealing Association). The Standard was approved as an American Standard on December 5, 1951, with the designation ASA B16.21-1951.

In 1961, the Standard was reviewed by the members of Subcommittee No. 7 on Gaskets and proposals for revision and updating the Standard were agreed upon. The American Standards Association granted approval of the revision on March 20, 1962 following sectional committee and sponsor approval.

In the mid-1960s, work had begun on a revision. The revision became a complete rewrite and included gaskets for API Std 605, MSS SP-44 and SP-51, as well as complete metric equivalents for all dimensions. Following its approval by the B16 Standards Committee and Co-Secretariat organizations, this Standard was approved as an American National Standard by ANSI on May 2, 1978.

In 1982, American National Standards Committee B16 was reorganized as an ASME Committee operating under procedures accredited by ANSI.

In 1989, general revisions had begun to reflect the current size ranges covered by the corresponding flange standard. Gasket dimensions for tongue and groove, male and female Rating Classes above 900 were deleted because a survey indicated these nonmetallic gaskets were almost never used for these joints. Tolerances to the dimensions were added.

Following approval by the Standards Committee and ASME, approval as an American National Standard was given by ANSI on March 16, 1992, with the new designation ASME B16.21-1992.

In 2005, the Standard adopted metric (SI) dimensions. Following approval by the B16 Subcommittee G, the B16 Standards Committee, and ASME, ANSI approved this American National Standard on March 16, 2005.

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

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Standardization of Valves, Flanges, Fittings, and Gaskets

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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
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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.

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NONMETALLIC FLAT GASKETS FOR PIPE FLANGES

1 SCOPE

1.1 General

This Standard covers types, sizes, materials, dimensions, tolerances, and markings for nonmetallic flat gaskets. These gaskets are dimensionally suitable for use with flanges described in the referenced flange standards.

1.2 Relevant Units

This Standard states values both in metric and U.S. customary units. As an exception, diameter of bolts and flange bolt holes are expressed in inch units only. These systems of units are to be regarded separately as standard. Within the text, the U.S. customary units are shown in parentheses or 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. Except for diameter of bolts and flange bolt holes, combining values from the two systems constitutes nonconformance with the Standard.

1.3 Quality Systems

Requirements relating to the product manufacturers' quality system programs are described in Nonmandatory Appendix A.

1.4 References

Standards and specifications adopted by reference in this Standard are shown in Mandatory Appendix II.

2 TYPES AND SIZES

2.1 Types

Dimensions are provided for the following types of gaskets, which are suitable for use with the flange faces indicated:

Gasket Type	Flange Facing
Full face	Flat face
Flat ring	Raised face

2.2 Size

NPS, followed by a dimensionless number, is the designation for normal pipe size, NPS, as described in ASME B36.10M; and is related to the reference nominal diameter, DN, used in international standards. The relationship is as follows:

NPS	DN
$^1/_2$	15
$^3/_4$	20
1	25
$1^1/_4$	32
$1^1/_2$	40
2	50
$2^1/_2$	65
3	80
$3^1/_2$	90
4	100

GENERAL NOTE: For NPS $\geq$ 4, the related DN is DN = 25 $\times$ NPS

2.3 Pressure Class Designation

Class, followed by a dimensionless number, is the designation for common flange pressure-temperature ratings as given by the referenced flange standards.

3 MATERIALS

3.1 Composition

Gaskets shall be made of resilient or pliable materials. Metal or nonmetal composites may be incorporated as reinforcement or filler material.

3.2 Service Requirements

Selection of a material suitable for a given service application is the responsibility of the user subject to the requirements of any applicable code or government regulation. The material selected shall be compatible with the fluid and suitable for the pressure-temperature conditions of the service.

4 DIMENSIONS AND TOLERANCES

4.1 Dimensions

Gasket dimensions shall be in accordance with Tables 1 through 9 (Tables I-1 through I-9 of Appendix I) for the flanges standards, sizes, and classes indicated. Selection of gasket thickness is the responsibility of the

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user, considering the properties of the gasket material as well as the intended service application.

4.2 Tolerances

(*a*) *Outside Diameter*
(*1*) NPS 12 and smaller:
+0.0, −1.5 mm (+0.0, −0.06 in.)
(*2*) NPS 14 and larger:
+0.0, −3.0 mm (+0.0, −0.12 in.)
(*b*) *Inside Diameter*
(*1*) NPS 12 and smaller: ±1.5 mm (±0.06 in.)
(*2*) NPS 14 and larger: ±3.0 mm (±0.12 in.)
(*3*) Bolt Circle Diameter: ±1.5 mm (±0.06 in.)
(*4*) Center to center of adjacent bolt holes: ±1.0 mm (±0.03 in.)

5 MARKINGS

5.1 Material Marking

Unless otherwise specified by the purchaser, gasket material shall be marked with the material manufacturer's name or trademark and material designation.

5.2 Gasket Marking

Gaskets shall be packaged with NPS, Class, gasket manufacturer's name, material designation, thickness, and ASME B16.21 marked or tagged on the package or gasket. At the option of the manufacturer, the DN designation may be included.

Table 1 Gasket Dimensions for ASME B16.1 Class 25, Cast Iron Pipe Flanges and Flanged Fittings

			Full Face Gasket			
Nominal Pipe Size, NPS	Gasket I.D.	Flat Ring O.D.	O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter
4	114	175	229	8	3/4	190.5
5	141	200	254	8	3/4	215.9
6	168	225	279	8	3/4	241.3
8	219	283	343	8	3/4	298.5
10	273	346	406	12	3/4	362.0
12	324	416	483	12	3/4	431.8
14	356	457	533	12	7/8	476.3
16	406	521	597	16	7/8	539.8
18	457	559	635	16	7/8	577.9
20	508	616	699	20	7/8	635.0
24	610	730	813	20	7/8	749.3
30	762	892	984	28	1	914.4
36	914	1 064	1 168	32	1	1 085.9
42	1 067	1 232	1 346	36	1 1/8	1 257.3
48	1 219	1 397	1 511	44	1 1/8	1 422.4
54	1 372	1 568	1 683	44	1 1/8	1 593.9
60	1 524	1 730	1 854	52	1 1/4	1 759.0
72	1 829	2 067	2 197	60	1 1/4	2 095.5
84	2 134	2 394	2 534	64	1 3/8	2 425.7
96	2 438	2 724	2 877	68	1 3/8	2 755.9

GENERAL NOTE: Dimensions are in millimeters, except for hole diameter dimensions, which are in inches.

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Table 2 Gasket Dimensions for ASME B16.1 Class 125, Cast Iron Pipe Flanges and Flanged Fittings

			Full Face Gasket			
Nominal Pipe Size, NPS	Gasket I.D.	Flat Ring O.D.	O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter
1	33	67	108	4	5/8	79.4
1 1/4	42	76	117	4	5/8	88.9
1 1/2	49	86	127	4	5/8	98.4
2	60	105	152	4	3/4	120.7
2 1/2	73	124	178	4	3/4	139.7
3	89	137	191	4	3/4	152.4
3 1/2	102	162	216	8	3/4	177.8
4	114	175	229	8	3/4	190.5
5	141	197	254	8	7/8	215.9
6	168	222	279	8	7/8	241.3
8	219	279	343	8	7/8	298.5
10	273	352	406	12	1	362.0
12	324	410	483	12	1	431.8
14	356	451	533	12	1 1/8	476.3
16	406	514	597	16	1 1/8	539.8
18	457	549	635	16	1 1/4	577.9
20	508	606	699	20	1 1/4	635.0
24	610	718	813	20	1 3/8	749.3
30	762	883	984	28	1 3/8	914.4
36	914	1 048	1 168	32	1 5/8	1 085.9
42	1 067	1 219	1 346	36	1 5/8	1 257.3
48	1 219	1 384	1 511	44	1 5/8	1 422.4

GENERAL NOTE: Dimensions are in millimeters, except for hole diameter dimensions, which are in inches.

Table 3 Flat Ring Gasket Dimensions for ASME B16.1 Class 250, Cast Iron Pipe Flanges and Flanged Fittings

Nominal Pipe Size, NPS	Gasket I.D.	Flat Ring O.D.
1	33	73
1 1/4	42	83
1 1/2	49	95
2	60	111
2 1/2	73	130
3	89	149
3 1/2	102	165
4	114	181
5	141	216
6	168	251
8	219	308
10	273	362
12	324	422
14	356	486
16	406	540
18	457	597
20	508	654
24	610	775
30	762	953
36	914	1 118
42	1 067	1 289
48	1 219	1 492

GENERAL NOTE: Dimensions are in millimeters.

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Table 4 Gasket Dimensions for ASME B16.5 Class 150, Pipe Flanges and Flanged Fittings

Nominal Pipe Size, NPS	Gasket I.D.	Flat Ring O.D.	Full Face Gasket			
			O.D.	No. of Holes	Hole Diameter	Bolt Circle Diameter
1/2	21	48	89	4	5/8	60.3
3/4	27	57	98	4	5/8	69.9
1	33	67	108	4	5/8	79.4
1 1/4	42	76	117	4	5/8	88.9
1 1/2	48	86	127	4	5/8	98.4
2	60	105	152	4	3/4	120.7
2 1/2	73	124	178	4	3/4	139.7
3	89	137	191	4	3/4	152.4
3 1/2	102	162	216	8	3/4	177.8
4	114	175	229	8	3/4	190.5
5	141	197	254	8	7/8	215.9
6	168	222	279	8	7/8	241.3
8	219	279	343	8	7/8	298.5
10	273	340	406	12	1	362.0
12	324	410	483	12	1	431.8
14	356	451	533	12	1 1/8	476.3
16	406	514	597	16	1 1/8	539.8
18	457	549	635	16	1 1/4	577.9
20	508	606	699	20	1 1/4	635.0
24	610	718	813	20	1 1/8	749.3

GENERAL NOTE: Dimensions are in millimeters, except for hole diameter dimensions, which are in inches.

Table 5 Flat Ring Gasket Dimensions for ASME B16.5 Pipe Flanges and Flanged Fittings, Classes 300, 400, 600, and 900

Nominal Pipe Size, NPS	Gasket O.D				
	Gasket I.D.	Class 300	Class 400	Class 600	Class 900
1/2	21	54	54	54	64
3/4	27	67	67	67	70
1	33	73	73	73	79
1 1/4	42	83	83	83	89
1 1/2	48	95	95	95	98
2	60	111	111	111	143
2 1/2	73	130	130	130	165
3	89	149	149	149	168
3 1/2	102	165	162	162	. . .
4	114	181	178	194	206
5	141	216	213	241	248
6	168	251	248	267	289
8	219	308	305	321	359
10	273	362	359	400	435
12	324	422	419	457	498
14	356	486	483	492	521
16	406	540	537	565	575
18	457	597	594	613	638
20	508	654	648	683	699
24	610	775	768	791	838

GENERAL NOTE: Dimensions are in millimeters.

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Table 6 Full Face Gasket Dimensions for ASME B16.24 Cast Copper Alloy Pipe Flanges and Flanged Fittings, Classes 150 and 300

Nominal Pipe Size, NPS	Gasket I.D.	Class 150 Gaskets				Class 300 Gaskets			
		O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter	O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter
1/2	21	89	4	5/8	60.3	95	4	5/8	66.7
3/4	27	98	4	5/8	69.9	117	4	3/4	82.6
1	33	108	4	5/8	79.4	124	4	3/4	88.9
1 1/4	42	117	4	5/8	88.9	133	4	3/4	98.4
1 1/2	48	127	4	5/8	98.4	156	4	7/8	114.3
2	60	152	4	3/4	120.7	165	8	3/4	127.0
2 1/2	73	178	4	3/4	139.7	191	8	7/8	149.2
3	89	191	4	3/4	152.4	210	8	7/8	168.3
3 1/2	102	216	8	3/4	177.8	229	8	7/8	184.2
4	114	229	8	3/4	190.5	254	8	7/8	200.0
5	141	254	8	7/8	215.9	279	8	7/8	235.0
6	168	279	8	7/8	241.3	318	12	7/8	269.9
8	219	343	8	7/8	298.5	381	12	1	330.2
10	273	406	12	1	362.0	...	...	...	...
12	324	483	12	1	431.8	...	...	...	...

GENERAL NOTE: Dimensions are in millimeters, except for hole diameter dimensions, which are in inches.

Table 7 Flat Ring Gasket Dimensions for ASME B16.47 Series A, Large Diameter Steel Flanges, Classes 150, 300, 400, and 600

Nominal Pipe Size, NPS	O.D.				
	I.D.	Class 150	Class 300	Class 400	Class 600
22 [Note (1)]	559	660	705	702	733
26	660	775	835	832	867
28	711	832	899	892	914
30	762	883	953	946	972
32	813	940	1 006	1 003	1 022
34	864	991	1 057	1 054	1 073
36	914	1 048	1 118	1 118	1 130
38	965	1 111	1 054	1 073	1 105
40	1 016	1 162	1 114	1 127	1 156
42	1 067	1 219	1 165	1 178	1 219
44	1 118	1 276	1 219	1 232	1 270
46	1 168	1 327	1 273	1 289	1 327
48	1 219	1 384	1 324	1 346	1 391
50	1 270	1 435	1 378	1 403	1 448
52	1 321	1 492	1 429	1 454	1 499
54	1 372	1 549	1 492	1 518	1 556
56	1 422	1 607	1 543	1 568	1 613
58	1 473	1 664	1 594	1 619	1 664
60	1 524	1 715	1 645	1 683	1 721

GENERAL NOTE: Dimensions are in millimeters.

NOTE:

(1) NPS 22 for reference only. Size not listed in ASME B16.47.

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Table 8 Flat Ring Gasket Dimensions for ASME B16.47 Series B, Large Diameter Steel Flanges, Classes 75, 150, 300, 400, and 600

Nominal Pipe Size, NPS	Gasket I.D.	Gasket O.D.				
		Class 75	Class 150	Class 300	Class 400	Class 600
26	660	708	725	772	746	765
28	711	759	776	826	800	819
30	762	810	827	886	857	879
32	813	860	881	940	911	933
34	864	911	935	994	962	997
36	914	973	987	1 048	1 022	1 048
38	965	1 024	1 045	1 099	...	...
40	1 016	1 075	1 095	1 149	...	...
42	1 067	1 126	1 146	1 200	...	...
44	1 118	1 181	1 197	1 251	...	...
46	1 168	1 232	1 256	1 318	...	...
48	1 219	1 283	1 307	1 368	...	...
50	1 270	1 334	1 357	1 419	...	...
52	1 321	1 387	1 408	1 470	...	...
54	1 372	1 438	1 464	1 530	...	...
56	1 422	1 495	1 514	1 594	...	...
58	1 473	1 546	1 580	1 656	...	...
60	1 524	1 597	1 630	1 705	...	...

GENERAL NOTE: Dimensions are in millimeters.

Table 9 Full Face Gasket Dimensions for MSS SP-51 Class 150LW, Corrosion-Resistant Cast Flanges and Flanged Fittings

Nominal Pipe Size, NPS	Gasket I.D.	Gasket O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter
1/4	14	64	4	7/16	42.9
3/8	17	64	4	7/16	42.9
1/2	21	89	4	5/8	60.3
3/4	27	98	4	5/8	69.9
1	33	108	4	5/8	79.4
1 1/4	42	117	4	5/8	88.9
1 1/2	48	127	4	5/8	98.4
2	60	152	4	3/4	120.7
2 1/2	73	178	4	3/4	139.7
3	89	191	4	3/4	152.4
4	114	229	8	3/4	190.5
5	141	254	8	7/8	215.9
6	168	279	8	7/8	241.3
8	219	343	8	7/8	298.5
10	273	406	12	1	362.0
12	324	483	12	1	431.8

GENERAL NOTE: Dimensions are in millimeters, except for hole diameter dimensions, which are in inches.

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MANDATORY APPENDIX I
DIMENSIONS OF GASKETS IN U.S. CUSTOMARY UNITS

This Appendix provides tables of the standard inch dimensions for gaskets.

Table I-1 Gasket Dimensions for ASME/ANSI B16.1 Class 25, Cast Iron Pipe Flanges and Flanged Fittings

			Full Face Gasket			
Nominal Pipe Size	Gasket I.D.	Flat Ring O.D.	O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter
4	4.50	6.88	9.00	8	0.75	7.50
5	5.56	7.88	10.00	8	0.75	8.50
6	6.62	8.88	11.00	8	0.75	9.50
8	8.62	11.12	13.50	8	0.75	11.75
10	10.75	13.62	16.00	12	0.75	14.25
12	12.75	16.38	19.00	12	0.75	17.00
14	14.00	18.00	21.00	12	0.88	18.75
16	16.00	20.50	23.50	16	0.88	21.25
18	18.00	22.00	25.00	16	0.88	22.75
20	20.00	24.25	27.50	20	0.88	25.00
24	24.00	28.75	32.00	20	0.88	29.50
30	30.00	35.12	38.75	28	1.00	36.00
36	36.00	41.88	46.00	32	1.00	42.75
42	42.00	48.50	53.00	36	1.12	49.50
48	48.00	55.00	59.50	44	1.12	56.00
54	54.00	61.75	66.25	44	1.12	62.75
60	60.00	68.12	73.00	52	1.25	69.25
72	72.00	81.38	86.50	60	1.25	82.50
84	84.00	94.25	99.75	64	1.38	95.50
96	96.00	107.25	113.25	68	1.38	108.50

GENERAL NOTE: Dimensions are in inches.

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Table I-2 Gasket Dimensions for ASME B16.1 Class 125, Cast Iron Pipe Flanges and Flanged Fittings

			Full Face Gasket			
Nominal Pipe Size	Gasket I.D.	Flat Ring O.D.	O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter
1	1.31	2.62	4.25	4	0.62	3.12
$1^1/_4$	1.66	3.00	4.62	4	0.62	3.50
$1^1/_2$	1.91	3.38	5.00	4	0.62	3.88
2	2.38	4.12	6.00	4	0.75	4.75
$2^1/_2$	2.88	4.88	7.00	4	0.75	5.50
3	3.50	5.38	7.50	4	0.75	6.00
$3^1/_2$	4.00	6.38	8.50	8	0.75	7.00
4	4.50	6.88	9.00	8	0.75	7.50
5	5.56	7.75	10.00	8	0.88	8.50
6	6.62	8.75	11.00	8	0.88	9.50
8	8.62	11.00	13.50	8	0.88	11.75
10	10.75	13.88	16.00	12	1.00	14.25
12	12.75	16.12	19.00	12	1.00	17.00
14	14.00	17.75	21.00	12	1.12	18.75
16	16.00	20.25	23.50	16	1.12	21.25
18	18.00	21.62	25.00	16	1.25	22.75
20	20.00	23.88	27.50	20	1.25	25.00
24	24.00	28.25	32.00	20	1.38	29.50
30	30.00	34.75	38.75	28	1.38	36.00
36	36.00	41.25	46.00	32	1.62	42.75
42	42.00	48.00	53.00	36	1.62	49.50
48	48.00	54.50	59.50	44	1.62	56.00

GENERAL NOTE: Dimensions are in inches.

Table I-3 Flat Ring Gasket Dimensions for ASME B16.1 Class 250, Cast Iron Pipe Flanges and Flanged Fittings

Nominal Pipe Size	Gasket I.D.	Flat Ring O.D.	Nominal Pipe Size	Gasket I.D.	Flat Ring O.D.
1	1.31	2.88	12	12.75	16.62
$1^1/_4$	1.66	3.25	14	14.00	19.12
$1^1/_2$	1.91	3.75	16	16.00	21.25
2	2.38	4.38	18	18.00	23.50
$2^1/_2$	2.88	5.12	20	20.00	25.75
3	3.50	5.88	24	24.00	30.50
$3^1/_2$	4.00	6.50	30	30.00	37.50
4	4.50	7.12	36	36.00	44.00
5	5.56	8.50	42	42.00	50.75
6	6.62	9.88	48	48.00	58.75
8	8.62	12.12			
10	10.75	14.25			

GENERAL NOTE: Dimensions are in inches.

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Table I-4 Gasket Dimensions for ASME B16.5 Class 150, Pipe Flanges and Flanged Fittings

Nominal Pipe Size	Gasket I.D.	Flat Ring O.D.	Full Face Gasket				Nominal Pipe Size	Gasket I.D.	Flat Ring O.D.	Full Face Gasket			
			O.D.	No. of Holes	Hole Diameter	Bolt Circle Diameter				O.D.	No. of Holes	Hole Diameter	Bolt Circle Diameter
1/2	0.84	1.88	3.50	4	0.62	2.38	8	8.62	11.00	13.50	8	0.88	11.75
3/4	1.06	2.25	3.88	4	0.62	2.75	10	10.75	13.38	16.00	12	1.00	14.25
1	1.31	2.62	4.25	4	0.62	3.12	12	12.75	16.13	19.00	12	1.00	17.00
1 1/4	1.66	3.00	4.63	4	0.62	3.50	14	14.00	17.75	21.00	12	1.12	18.75
1 1/2	1.91	3.38	5.00	4	0.62	3.88	16	16.00	20.25	23.50	16	1.12	21.25
2	2.38	4.12	6.00	4	0.75	4.75	18	18.00	21.62	25.00	16	1.25	22.75
2 1/2	2.88	4.88	7.00	4	0.75	5.50	20	20.00	23.88	27.50	20	1.25	25.00
3	3.50	5.38	7.50	4	0.75	6.00	24	24.00	28.25	32.00	20	1.38	29.50
3 1/2	4.00	6.38	8.50	8	0.75	7.00							
4	4.50	6.88	9.00	8	0.75	7.50							
5	5.56	7.75	10.00	8	0.88	8.50							
6	6.62	8.75	11.00	8	0.88	9.50							

GENERAL NOTE: Dimensions are in inches.

Table I-5 Flat Ring Gasket Dimensions for ASME B16.5 Pipe Flanges and Flanged Fittings, Classes 300, 400, 600, and 900

Nominal Pipe Size	Gasket I.D.	Gasket O.D.			
		Class 300	Class 400	Class 600	Class 900
1/2	0.84	2.12	2.12	2.12	2.50
3/4	1.06	2.62	2.62	2.62	2.75
1	1.31	2.88	2.88	2.88	3.12
1 1/4	1.66	3.25	3.25	3.25	3.50
1 1/2	1.91	3.75	3.75	3.75	3.88
2	2.38	4.38	4.38	4.38	5.62
2 1/2	2.88	5.12	5.12	5.12	6.50
3	3.50	5.88	5.88	5.88	6.62
3 1/2	4.00	6.50	6.38	6.38	. . .
4	4.50	7.12	7.00	7.62	8.12
5	5.56	8.50	8.38	9.50	9.75
6	6.62	9.88	9.75	10.50	11.38
8	8.62	12.12	12.00	12.62	14.12
10	10.75	14.25	14.12	15.75	17.12
12	12.75	16.62	16.50	18.00	19.62
14	14.00	19.12	19.00	19.38	20.50
16	16.00	21.25	21.12	22.25	22.62
18	18.00	23.50	23.38	24.12	25.12
20	20.00	25.75	25.50	26.88	27.50
24	24.00	30.50	30.25	31.12	33.00

GENERAL NOTE: Dimensions are in inches.

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Table I-6 Full Face Gasket Dimensions for ASME B16.24 Cast Copper Alloy Pipe Flanges and Flanged Fittings, Classes 150 and 300

		Class 150 Gaskets				Class 300 Gaskets			
Nominal Pipe Size	Gasket I.D.	O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter	O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter
1/2	0.84	3.50	4	0.62	2.38	3.75	4	0.62	2.62
3/4	1.06	3.88	4	0.62	2.75	4.62	4	0.75	3.25
1	1.31	4.25	4	0.62	3.12	4.88	4	0.75	3.50
1 1/4	1.66	4.62	4	0.62	3.50	5.25	4	0.75	3.88
1 1/2	1.91	5.00	4	0.62	3.88	6.12	4	0.88	4.50
2	2.38	6.00	4	0.75	4.75	6.50	8	0.75	5.00
2 1/2	2.88	7.00	4	0.75	5.50	7.50	8	0.88	5.88
3	3.50	7.50	4	0.75	6.00	8.25	8	0.88	6.62
3 1/2	4.00	8.50	8	0.75	7.00	9.00	8	0.88	7.25
4	4.50	9.00	8	0.75	7.50	10.00	8	0.88	7.88
5	5.56	10.00	8	0.88	8.50	11.00	8	0.88	9.25
6	6.62	11.00	8	0.88	9.50	12.50	12	0.88	10.63
8	8.62	13.50	8	0.88	11.75	15.00	12	1.00	13.00
10	10.75	16.00	12	1.00	14.25	. . .	. . .	. . .	. . .
12	12.75	19.00	12	1.00	17.00	. . .	. . .	. . .	. . .

GENERAL NOTE: Dimensions are in inches.

Table I-7 Flat Ring Gasket Dimensions for ASME B16.47 Series A, Large Diameter Steel Flanges, Classes 150, 300, 400, and 600

		O.D.			
Nominal Pipe Size	I.D.	Class 150	Class 300	Class 400	Class 600
22 [Note (1)]	22.00	26.00	27.75	27.63	28.88
26	26.00	30.50	32.88	32.75	34.12
28	28.00	32.75	35.38	35.12	36.00
30	30.00	34.75	37.50	37.25	38.25
32	32.00	37.00	39.62	39.50	40.25
34	34.00	39.00	41.62	41.50	42.25
36	36.00	41.25	44.00	44.00	44.50
38	38.00	43.75	41.50	42.26	43.50
40	40.00	45.75	43.88	44.58	45.50
42	42.00	48.00	45.88	46.38	48.00
44	44.00	50.25	48.00	48.50	50.00
46	46.00	52.25	50.12	50.75	52.26
48	48.00	54.50	52.12	53.00	54.75
50	50.00	56.50	54.25	55.25	57.00
52	52.00	58.75	56.25	57.26	59.00
54	54.00	61.00	58.75	59.75	61.25
56	56.00	63.25	60.75	61.75	63.50
58	58.00	65.50	62.75	63.75	65.50
60	60.00	67.50	64.75	66.25	67.75

GENERAL NOTE: Dimensions are in inches.

NOTE:

(1) NPS 22 for reference only. Size not listed in ASME B16.47.

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Table I-8 Flat Ring Gasket Dimensions for ASME B16.47 Series B, Large Diameter Steel Flanges, Classes 75, 150, 300, 400, and 600

Nominal Pipe Size	Gasket I.D.	Gasket O.D.				
		Class 75	Class 150	Class 300	Class 400	Class 600
26	26.00	27.88	28.56	30.38	29.38	30.12
28	28.00	29.88	30.56	32.50	31.50	32.25
30	30.00	31.88	32.56	34.88	33.75	34.62
32	32.00	33.88	34.69	37.00	35.88	36.75
34	34.00	35.88	36.81	39.12	37.88	39.25
36	36.00	38.31	38.88	41.25	40.25	41.25
38	38.00	40.31	41.12	43.25	...	...
40	40.00	42.31	43.12	45.25	...	...
42	42.00	44.31	45.12	47.25	...	...
44	44.00	46.50	47.12	49.25	...	...
46	46.00	48.50	49.44	51.88	...	...
48	48.00	50.50	51.44	53.88	...	...
50	50.00	52.50	53.44	55.88	...	...
52	52.00	54.62	55.44	57.88	...	...
54	54.00	56.62	57.62	61.25	...	...
56	56.00	58.88	59.62	62.75	...	...
58	58.00	60.88	62.19	65.19	...	...
60	60.00	62.88	64.19	67.12	...	...

GENERAL NOTE: Dimensions are in inches.

Table I-9 Full Face Gasket Dimensions for MSS SP-51 Class 150LW, Corrosion-Resistant Cast Flanges and Flanged Fittings

Nominal Pipe Size	Gasket I.D.	Gasket O.D.	Number of Holes	Hole Diameter	Bolt Circle Diameter
1/4	0.56	2.50	4	0.44	1.69
1/8	0.69	2.50	4	0.44	1.69
1/2	0.84	3.50	4	0.62	2.38
3/4	1.06	3.88	4	0.62	2.75
1	1.31	4.25	4	0.62	3.12
1 1/4	1.66	4.62	4	0.62	3.50
1 1/2	1.91	5.00	4	0.62	3.88
2	2.38	6.00	4	0.75	4.75
2 1/2	2.88	7.00	4	0.75	5.50
3	3.50	7.50	4	0.75	6.00
4	4.50	9.00	8	0.75	7.50
5	5.56	10.00	8	0.88	8.50
6	6.62	11.00	8	0.88	9.50
8	8.62	13.60	8	0.88	11.75
10	10.75	16.00	12	1.00	14.25
12	12.75	19.00	12	1.00	17.00
14	14.00	21.00	12	1.12	18.75
16	16.00	23.50	16	1.12	21.25
18	18.00	25.00	16	1.25	22.75
20	20.00	27.50	20	1.25	25.00
24	24.00	32.00	20	1.38	29.50

GENERAL NOTE: Dimensions are in inches.

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MANDATORY APPENDIX II
REFERENCES

The following is a list of standards and specifications references in this Standard.

ASME B16.1-1998, Cast Iron Pipe Flanges and Flanged Fittings

ASME B16.5-2003, Pipe Flanges and Flanged Fittings

ASME B16.24-2001, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500, and 2500

ASME B16.34-2002, Valves-Flanged, Threaded, and Welding End

ASME B16.47-1996, Large Diameter Steel Flanges

ASME B36.10M-2001, Welded and Seamless Wrought Steel Pipe

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

MSS SP-51-1986, Class 150 LW Corrosion Resistant Cast Flanges and Flanged Fittings

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

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 standard — Part 2: Generic guidelines for the application of ISO 9001, ISO 9002m and ISO 9003

ISO 9000–3:1997, Quality management and quality assurance standards — Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software

ISO 9000–4:1993, Quality management and quality assurance standards — Part 4: Guide to Dependability programme management

ISO 9002:1994, Quality system — 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 (ISO), 1 rue de Varembé, Case Postale 56, CH-1211 Genève 20, Switzerland/Suisse

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NONMANDATORY APPENDIX A
QUALITY SYSTEM PROGRAM

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.

[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 Mandatory Appendix II.

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

Scheme for the Identification of Piping Systems A13.1-1996 (R2002)
Pipe Threads, General Purpose (Inch) B1.20.1-1983 (R2001)
Dryseal Pipe Threads (Inch) B1.20.3-1976 (R2003)
Cast Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 . . . . . B16.1-1998
Malleable Iron Threaded Fittings: Classes 150 and 300 . . . . . B16.3-1998
Gray Iron Threaded Fittings: Classes 125 and 250 . . . . . B16.4-1998
Pipe Flanges and Flanged Fittings NPS $^1/_2$ Through NPS 24 Metric/Inch Standard B16.5-2003
Factory-Made Wrought Buttwelding Fittings B16.9-2003
Face-to-Face and End-to-End Dimensions of Valves B16.10-2000 (R2003)
Forged Fittings, Socket-Welding and Threaded B16.11-2001
Cast Iron Threaded Drainage Fittings B16.12-1998
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 B16.18-2001
Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound, and Jacketed B16.20-1998 (R2004)
Nonmetallic Flat Gaskets for Pipe Flanges B16.21-2005
Wrought Copper and Copper Alloy Solder Joint Pressure Fittings B16.22-2001
Cast Copper Alloy Solder Joint Drainage Fittings: DWV B16.23-2002
Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500, and 2500 . . . . . B16.24-2001
Buttwelding Ends B16.25-2003
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 B16.29-2001
Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 psi (Sizes NPS $^1/_2$ Through NPS 2) B16.33-2002
Valves — Flanged, Threaded, and Welding End B16.34-1996
Orifice Flanges B16.36-1996
Large Metallic Valves for Gas Distribution (Manually Operated, NPS $2^1/_2$ 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 B16.40-2002
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 . . . . . B16.42-1998
Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems Up To 5 psi B16.44-2002
Cast Iron Fittings for Sovent® Drainage Systems B16.45-1998
Large Diameter Steel Flanges (NPS 26 Through NPS 60) B16.47-1996
Steel Line Blanks B16.48-1997
Factory-Made Wrought Steel Buttwelding Induction Bends for Transportation and Distribution Systems B16.49-2000
Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings B16.50-2001
Power Piping B31.1-2004
Fuel Gas Piping (not an ANSI standard) B31.2-1968
Process Piping B31.3-2002
Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids B31.4-2002
Refrigeration Piping and Heat Transfer Components B31.5-2001
Gas Transmission and Distribution Piping Systems B31.8-2003
Building Services Piping B31.9-1996
Slurry Transportation Piping Systems B31.11-2002
Manual for Determining the Remaining Strength of Corroded Pipelines B31G-1991
Welded and Seamless Wrought Steel Pipe B36.10M-2004
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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