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ENGINEERING REFERENCE BOOK · TG-DS-100

Complete Piping Dimension Catalogue

Every Teshi dimensional chart in one book — pipe schedules, flanges, butt weld and forged fittings, branch outlets, bolting, gaskets, plates and structurals — with pressure-temperature ratings, material grade data sheets and the chemistry and mechanical properties of all alloy families.

Teshi Group — OEM manufacturer of flanges, fittings, fasteners, valves and fabrications; stockist of pipes, plates and structurals. ISO 9001:2015 · IBR approved · Manufacturing in India since 1971.

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How to use this book

Each chapter reproduces one Teshi Group dimensional chart: a dimension drawing with a key, the full data tables, and notes. All dimensions are in millimetres unless stated; NPS is nominal pipe size in inches and DN the metric equivalent. Click any line in the **contents** to jump to that chart or table, and use **Contents** ↑ at the top of each chapter to return. The PDF bookmarks panel gives the same navigation.

The book is formatted for A4 portrait so it prints double-sided and binds as a desk reference. Data are compiled from the published standards for convenience; the current edition of the governing standard takes precedence. Verify critical dimensions before design, purchase or fabrication.

Need these parts? Teshi Group manufactures every flange and fitting in this book in carbon, low-temperature, chrome-moly, stainless, duplex, super duplex, 904L / 254 SMO, nickel alloys, titanium and copper-nickel — with EN 10204 3.1 certificates and third-party inspection on request. Send your bill of materials to info@teshigroup.com (or sales@teshigroup.com), message **WhatsApp +91 78900 09110** or request a quote at teshigroup.com/rfq.

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PART 1

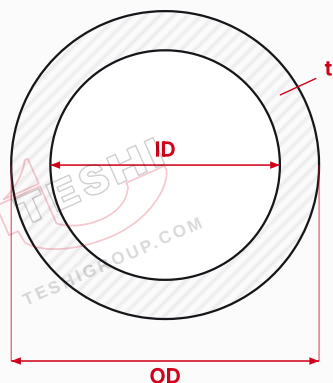
Pipe — wall thickness & weight

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Pipe Schedule Chart — ASME B36.10M

Wall thickness (mm) — ASME B36.10M

Pipe schedule chart for welded and seamless wrought steel pipe to ASME B36.10M: outside diameter, wall thickness in millimetres and plain-end weight in kilograms per metre, from NPS ½" to 48".



Pipe cross-section (not to scale)

KEY TO DIMENSIONS

OD Outside diameter

t Nominal wall thickness for the schedule

ID Inside diameter = $OD - 2t$

kg/m Plain-end mass = $(OD - t) \times t \times 0.0246615$ for carbon steel

Wall thickness (mm) — ASME B36.10M

NPS in	DN	OD mm	Sch 10	Sch 20	Sch 30	STD	Sch 40	Sch 60	XS	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XXS
½"	6	10.3	1.24	—	1.45	1.73	1.73	—	2.41	2.41	—	—	—	—	—
¾"	8	13.7	1.65	—	1.85	2.24	2.24	—	3.02	3.02	—	—	—	—	—
1"	10	17.1	1.65	—	1.85	2.31	2.31	—	3.20	3.20	—	—	—	—	—
1½"	15	21.3	2.11	—	2.41	2.77	2.77	—	3.73	3.73	—	—	—	4.78	7.47
2"	20	26.7	2.11	—	2.41	2.87	2.87	—	3.91	3.91	—	—	—	5.56	7.82
2½"	25	33.4	2.77	—	2.90	3.38	3.38	—	4.55	4.55	—	—	—	6.35	9.09
3"	32	42.2	2.77	—	2.97	3.56	3.56	—	4.85	4.85	—	—	—	6.35	9.70
3½"	40	48.3	2.77	—	3.18	3.68	3.68	—	5.08	5.08	—	—	—	7.14	10.15
4"	50	60.3	2.77	—	3.18	3.91	3.91	—	5.54	5.54	—	—	—	8.74	11.07
5"	65	73.0	3.05	—	4.78	5.16	5.16	—	7.01	7.01	—	—	—	9.53	14.02
6"	80	88.9	3.05	—	4.78	5.49	5.49	—	7.62	7.62	—	—	—	11.13	15.24
8"	90	101.6	3.05	—	4.78	5.74	5.74	—	8.08	8.08	—	—	—	—	16.15
10"	100	114.3	3.05	—	4.78	6.02	6.02	—	8.56	8.56	—	11.13	—	13.49	17.12
12"	125	141.3	3.40	—	—	6.55	6.55	—	9.53	9.53	—	12.70	—	15.88	19.05
14"	150	168.3	3.40	—	—	7.11	7.11	—	10.97	10.97	—	14.27	—	18.26	21.95
16"	200	219.1	3.76	6.35	7.04	8.18	8.18	10.31	12.70	12.70	15.09	18.26	20.62	23.01	22.23
18"	250	273.0	4.19	6.35	7.80	9.27	9.27	12.70	12.70	15.09	18.26	21.44	25.40	28.58	25.40
20"	300	323.8	4.57	6.35	8.38	9.53	10.31	14.27	12.70	17.48	21.44	25.40	28.58	33.32	25.40
22"	350	355.6	6.35	7.92	9.53	9.53	11.13	15.09	12.70	19.05	23.83	27.79	31.75	35.71	—
24"	400	406.4	6.35	7.92	9.53	9.53	12.70	16.66	12.70	21.44	26.19	30.96	36.53	40.49	—
26"	450	457.0	6.35	7.92	11.13	9.53	14.27	19.05	12.70	23.83	29.36	34.93	39.67	45.24	—
28"	500	508.0	6.35	9.53	12.70	9.53	15.09	20.62	12.70	26.19	32.54	38.10	44.45	50.01	—
30"	550	559.0	6.35	9.53	12.70	9.53	—	22.23	12.70	28.58	34.93	41.28	47.63	53.98	—
32"	600	610.0	6.35	9.53	14.27	9.53	17.48	24.61	12.70	30.96	38.89	46.02	52.37	59.54	—
34"	650	660.0	7.92	12.70	—	9.53	—	—	12.70	—	—	—	—	—	—
36"	700	711.0	7.92	12.70	15.88	9.53	—	—	12.70	—	—	—	—	—	—
38"	750	762.0	7.92	12.70	15.88	9.53	—	—	12.70	—	—	—	—	—	—
40"	800	813.0	7.92	12.70	15.88	9.53	17.48	—	12.70	—	—	—	—	—	—
42"	850	864.0	7.92	12.70	15.88	9.53	17.48	—	12.70	—	—	—	—	—	—
44"	900	914.0	7.92	12.70	15.88	9.53	19.05	—	12.70	—	—	—	—	—	—
46"	1050	1067.0	—	—	—	9.53	—	—	12.70	—	—	—	—	—	—
48"	1200	1219.0	—	—	—	9.53	—	—	12.70	—	—	—	—	—	—

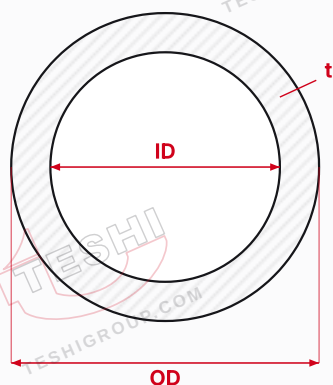
Notes

- Weights are calculated for carbon steel at 7.85 g/cm^3 from the formula in ASME B36.10M.
- A dash means the schedule is not tabulated here for that size.
- Manufacturing tolerance on wall thickness for seamless pipe to ASTM A106 is $\pm 12.5\%$.

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Pipe Schedule Chart — ASME B36.10M

Weight (kg/m), plain end — ASME B36.10M



Pipe cross-section (not to scale)

KEY TO DIMENSIONS

OD Outside diameter**t** Nominal wall thickness for the schedule**ID** Inside diameter = $OD - 2t$ **kg/m** Plain-end mass = $(OD - t) \times t \times 0.0246615$ for carbon steel

Weight (kg/m), plain end — ASME B36.10M

NPS in	DN	OD mm	Sch 10	Sch 20	Sch 30	STD	Sch 40	Sch 60	XS	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XXS
1/8"	6	10.3	0.28	—	0.32	0.37	0.37	—	0.47	0.47	—	—	—	—	—
1/4"	8	13.7	0.49	—	0.54	0.63	0.63	—	0.80	0.80	—	—	—	—	—
3/8"	10	17.1	0.63	—	0.70	0.84	0.84	—	1.10	1.10	—	—	—	—	—
1/2"	15	21.3	1.00	—	1.12	1.27	1.27	—	1.62	1.62	—	—	—	1.95	2.55
3/4"	20	26.7	1.28	—	1.44	1.69	1.69	—	2.20	2.20	—	—	—	2.90	3.64
1"	25	33.4	2.09	—	2.18	2.50	2.50	—	3.24	3.24	—	—	—	4.24	5.45
1 1/4"	32	42.2	2.69	—	2.87	3.39	3.39	—	4.47	4.47	—	—	—	5.61	7.77
1 1/2"	40	48.3	3.11	—	3.54	4.05	4.05	—	5.41	5.41	—	—	—	7.25	9.55
2"	50	60.3	3.93	—	4.48	5.44	5.44	—	7.48	7.48	—	—	—	11.11	13.44
2 1/2"	65	73.0	5.26	—	8.04	8.63	8.63	—	11.41	11.41	—	—	—	14.92	20.39
3"	80	88.9	6.46	—	9.92	11.29	11.29	—	15.27	15.27	—	—	—	21.35	27.68
3 1/2"	90	101.6	7.41	—	11.41	13.57	13.57	—	18.64	18.64	—	—	—	—	34.03
4"	100	114.3	8.37	—	12.91	16.08	16.08	—	22.32	22.32	—	28.32	—	33.54	41.03
5"	125	141.3	11.56	—	—	21.77	21.77	—	30.97	30.97	—	40.28	—	49.12	57.43
6"	150	168.3	13.83	—	—	28.26	28.26	—	42.56	42.56	—	54.21	—	67.57	79.22
8"	200	219.1	19.97	33.32	36.82	42.55	42.55	53.09	64.64	64.64	75.92	90.44	100.93	111.27	107.93
10"	250	273.0	27.78	41.76	51.01	60.29	60.29	81.53	81.53	95.98	114.71	133.01	155.10	172.27	155.10
12"	300	323.8	35.98	49.71	65.19	73.86	79.71	108.93	97.44	132.05	159.87	186.92	208.08	238.69	186.92
14"	350	355.6	54.69	67.91	81.33	81.33	94.55	126.72	107.40	158.11	194.98	224.66	253.58	281.72	—
16"	400	406.4	62.65	77.83	93.27	93.27	123.31	160.13	123.31	203.54	245.57	286.66	333.21	365.38	—
18"	450	457.0	70.57	87.71	122.38	105.17	155.81	205.75	139.16	254.57	309.64	363.58	408.28	459.39	—
20"	500	508.0	78.56	117.15	155.13	117.15	183.43	247.84	155.13	311.19	381.55	441.52	508.15	564.85	—
22"	550	559.0	86.55	129.14	171.10	129.14	—	294.27	171.10	373.85	451.45	527.05	600.67	672.30	—
24"	600	610.0	94.53	141.12	209.65	141.12	255.43	355.28	187.07	442.11	547.74	640.07	720.19	808.27	—
26"	650	660.0	127.36	202.74	—	152.88	—	—	202.74	—	—	—	—	—	—
28"	700	711.0	137.32	218.71	272.23	164.86	—	—	218.71	—	—	—	—	—	—
30"	750	762.0	147.29	234.68	292.20	176.85	—	—	234.68	—	—	—	—	—	—
32"	800	813.0	157.25	250.65	312.17	188.83	342.94	—	250.65	—	—	—	—	—	—
34"	850	864.0	167.21	266.63	332.14	200.82	364.92	—	266.63	—	—	—	—	—	—
36"	900	914.0	176.97	282.29	351.73	212.57	420.45	—	282.29	—	—	—	—	—	—
42"	1050	1067.0	—	—	—	248.53	—	—	330.21	—	—	—	—	—	—
48"	1200	1219.0	—	—	—	284.25	—	—	377.81	—	—	—	—	—	—

Notes

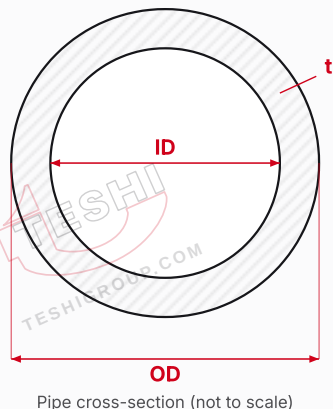
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- A dash means the schedule is not tabulated here for that size.
- Manufacturing tolerance on wall thickness for seamless pipe to ASTM A106 is -12.5%.

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Stainless Steel Pipe Schedule Chart — ASME B36.19M

Wall thickness (mm) — ASME B36.19M

Stainless steel pipe schedule chart to ASME B36.19M: outside diameter, wall thickness and weight for schedules 5S, 10S, 40S and 80S.



KEY TO DIMENSIONS

- OD** Outside diameter
- t** Nominal wall thickness for the schedule
- ID** Inside diameter = OD - 2t

Wall thickness (mm) — ASME B36.19M

NPS in	DN	METRIC					IMPERIAL				
		OD mm	Sch 5S mm	Sch 10S mm	Sch 40S mm	Sch 80S mm	OD in	Sch 5S in	Sch 10S in	Sch 40S in	Sch 80S in
1/8"	6	10.3	—	1.24	1.73	2.41	0.406	—	0.049	0.068	0.095
1/4"	8	13.7	—	1.65	2.24	3.02	0.539	—	0.065	0.088	0.119
3/8"	10	17.1	—	1.65	2.31	3.20	0.673	—	0.065	0.091	0.126
1/2"	15	21.3	1.65	2.11	2.77	3.73	0.839	0.065	0.083	0.109	0.147
3/4"	20	26.7	1.65	2.11	2.87	3.91	1.05	0.065	0.083	0.113	0.154
1"	25	33.4	1.65	2.77	3.38	4.55	1.31	0.065	0.109	0.133	0.179
1 1/4"	32	42.2	1.65	2.77	3.56	4.85	1.66	0.065	0.109	0.140	0.191
1 1/2"	40	48.3	1.65	2.77	3.68	5.08	1.90	0.065	0.109	0.145	0.200
2"	50	60.3	1.65	2.77	3.91	5.54	2.37	0.065	0.109	0.154	0.218
2 1/2"	65	73.0	2.11	3.05	5.16	7.01	2.87	0.083	0.120	0.203	0.276
3"	80	88.9	2.11	3.05	5.49	7.62	3.50	0.083	0.120	0.216	0.300
3 1/2"	90	101.6	2.11	3.05	5.74	8.08	4.00	0.083	0.120	0.226	0.318
4"	100	114.3	2.11	3.05	6.02	8.56	4.50	0.083	0.120	0.237	0.337
5"	125	141.3	2.77	3.40	6.55	9.53	5.56	0.109	0.134	0.258	0.375
6"	150	168.3	2.77	3.40	7.11	10.97	6.63	0.109	0.134	0.280	0.432
8"	200	219.1	2.77	3.76	8.18	12.70	8.63	0.109	0.148	0.322	0.500
10"	250	273.1	3.40	4.19	9.27	12.70	10.75	0.134	0.165	0.365	0.500
12"	300	323.9	3.96	4.57	9.53	12.70	12.75	0.156	0.180	0.375	0.500
14"	350	355.6	3.96	4.78	9.53	12.70	14.00	0.156	0.188	0.375	0.500
16"	400	406.4	4.19	4.78	9.53	12.70	16.00	0.165	0.188	0.375	0.500
18"	450	457.0	4.19	4.78	9.53	12.70	17.99	0.165	0.188	0.375	0.500
20"	500	508.0	4.78	5.54	9.53	12.70	20.00	0.188	0.218	0.375	0.500
22"	550	559.0	4.78	5.54	—	—	22.01	0.188	0.218	—	—
24"	600	610.0	5.54	6.35	9.53	12.70	24.02	0.218	0.250	0.375	0.500
30"	750	762.0	6.35	7.92	—	—	30.00	0.250	0.312	—	—

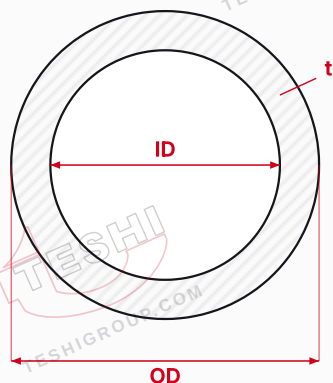
Notes

- Weights are calculated on a density of 7.85 g/cm³. For austenitic stainless steel multiply by 1.010 (grade 304) or 1.017 (grade 316).
- A dash means the schedule is not listed for that size.

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Stainless Steel Pipe Schedule Chart — ASME B36.19M

Weight (kg/m), plain end — ASME B36.19M



Pipe cross-section (not to scale)

KEY TO DIMENSIONS

- OD** Outside diameter
t Nominal wall thickness for the schedule
ID Inside diameter = OD - 2t

Weight (kg/m), plain end — ASME B36.19M

NPS in	DN	METRIC				IMPERIAL					
		OD mm	Sch 5S kg/m	Sch 10S kg/m	Sch 40S kg/m	Sch 80S kg/m	OD in	Sch 5S lb/ft	Sch 10S lb/ft	Sch 40S lb/ft	Sch 80S lb/ft
⅜"	6	10.3	—	0.28	0.37	0.47	0.406	—	0.19	0.25	0.32
½"	8	13.7	—	0.49	0.63	0.80	0.539	—	0.33	0.42	0.54
¾"	10	17.1	—	0.63	0.84	1.10	0.673	—	0.42	0.56	0.74
⅞"	15	21.3	0.80	1.00	1.27	1.62	0.839	0.54	0.67	0.85	1.09
1"	20	26.7	1.02	1.28	1.69	2.20	1.05	0.69	0.86	1.14	1.48
1 1/8"	25	33.4	1.29	2.09	2.50	3.24	1.31	0.87	1.40	1.68	2.18
1 1/4"	32	42.2	1.65	2.69	3.39	4.47	1.66	1.11	1.81	2.28	3.00
1 1/2"	40	48.3	1.90	3.11	4.05	5.41	1.90	1.28	2.09	2.72	3.64
1 3/4"	50	60.3	2.39	3.93	5.44	7.48	2.37	1.61	2.64	3.66	5.03
2"	65	73.0	3.69	5.26	8.63	11.41	2.87	2.48	3.53	5.80	7.67
2 1/4"	80	88.9	4.52	6.46	11.29	15.27	3.50	3.04	4.34	7.59	10.26
2 1/2"	90	101.6	5.18	7.41	13.57	18.64	4.00	3.48	4.98	9.12	12.53
2 3/4"	100	114.3	5.84	8.37	16.08	22.32	4.50	3.92	5.62	10.81	15.00
3"	125	141.3	9.46	11.56	21.77	30.97	5.56	6.36	7.77	14.63	20.81
3 1/2"	150	168.3	11.31	13.83	28.26	42.56	6.63	7.60	9.29	18.99	28.60
4"	200	219.1	14.78	19.97	42.55	64.64	8.63	9.93	13.42	28.59	43.44
4 1/2"	250	273.1	22.61	27.79	60.31	81.56	10.75	15.19	18.67	40.53	54.81
5"	300	323.9	31.25	35.99	73.88	97.47	12.75	21.00	24.18	49.65	65.50
5 1/2"	350	355.6	34.34	41.36	81.33	107.40	14.00	23.08	27.79	54.65	72.17
6"	400	406.4	41.56	47.34	93.27	123.31	16.00	27.93	31.81	62.67	82.86
6 1/2"	450	457.0	46.79	53.31	105.17	139.16	17.99	31.44	35.82	70.67	93.51
7"	500	508.0	59.32	68.65	117.15	155.13	20.00	39.86	46.13	78.72	104.24
7 1/2"	550	559.0	65.33	75.62	—	—	22.01	43.90	50.81	—	—
8"	600	610.0	82.58	94.53	141.12	187.07	24.02	55.49	63.52	94.83	125.71
8 1/2"	750	762.0	118.34	147.29	—	—	30.00	79.52	98.97	—	—

Notes

- Weights are calculated on a density of 7.85 g/cm³. For austenitic stainless steel multiply by 1.010 (grade 304) or 1.017 (grade 316).
- A dash means the schedule is not listed for that size.

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PART 2

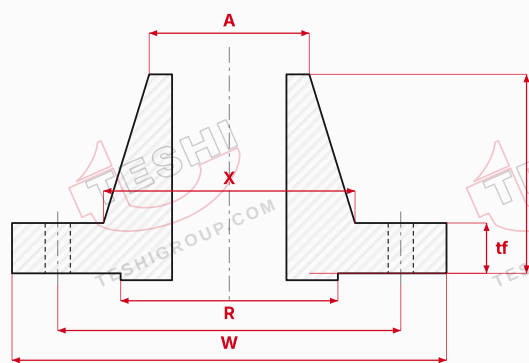
ASME B16.5 pipe flanges

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ASME B16.5 Class 150 Flange Dimensions

Class 150 flange dimensions (mm)

This chart gives the dimensions of **ASME B16.5 Class 150** pipe flanges in millimetres for NPS ½" to 24". It covers weld neck, slip-on, blind, socket weld, threaded and lap joint flanges, with drilling, stud bolt lengths and approximate weights.



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 150 flange dimensions (mm)

NPS in	DN	O Outside dia	tf Min thickness	R Raised face dia	X Hub dia	A Hub at weld	Y Weld neck	Y Slip-on / Thr / SW	Y Lap joint	W Bolt circle	Holes No.	Hole dia mm	Bolt in
½"	15	90	9.6	34.9	30	21.3	46	14	16	60.3	4	15.9	½"
¾"	20	100	11.2	42.9	38	26.7	51	14	16	69.9	4	15.9	½"
1"	25	110	12.7	50.8	49	33.4	54	16	17	79.4	4	15.9	½"
1¼"	32	115	14.3	63.5	59	42.2	56	19	21	88.9	4	15.9	½"
1½"	40	125	15.9	73.0	65	48.3	60	21	22	98.4	4	15.9	½"
2"	50	150	17.5	92.1	78	60.3	62	24	25	120.7	4	19.1	¾"
2½"	65	180	20.7	104.8	90	73.0	68	27	29	139.7	4	19.1	¾"
3"	80	190	22.3	127.0	108	88.9	68	29	30	152.4	4	19.1	¾"
3½"	90	215	22.3	139.7	122	101.6	70	30	32	177.8	8	19.1	¾"
4"	100	230	22.3	157.2	135	114.3	75	32	33	190.5	8	19.1	¾"
5"	125	255	22.3	185.7	164	141.3	87	35	36	215.9	8	22.2	¾"
6"	150	280	23.9	215.9	192	168.3	87	38	40	241.3	8	22.2	¾"
8"	200	345	27.0	269.9	246	219.1	100	43	44	298.5	8	22.2	¾"
10"	250	405	28.6	323.8	305	273.0	100	48	49	362.0	12	25.4	¾"
12"	300	485	30.2	381.0	365	323.8	113	54	56	431.8	12	25.4	¾"
14"	350	535	33.4	412.8	400	355.6	125	56	79	476.3	12	28.6	1"
16"	400	595	35.0	469.9	457	406.4	125	62	87	539.8	16	28.6	1"
18"	450	635	38.1	533.4	505	457.0	138	67	97	577.9	16	31.8	1½"
20"	500	700	41.3	584.2	559	508.0	143	71	103	635.0	20	31.8	1½"
24"	600	815	46.1	692.2	663	610.0	151	81	111	749.3	20	34.9	1½"

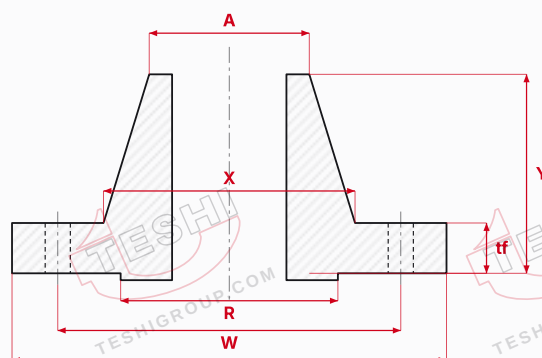
Notes

- Dimensions are in millimetres unless stated otherwise.
- Flange thickness **tf** and length through hub **Y** do not include the 2 mm raised face.
- Blind flanges have the same outside diameter, thickness **tf** and drilling as the other flange types of the same size and class.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ½").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

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ASME B16.5 Class 150 Flange Dimensions

Class 150 bolting and approximate weights



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 150 bolting and approximate weights

NPS in	Studs No.	Stud dia in	Stud length Raised face	Stud length Ring joint	Weld neck kg, approx.	Slip-on kg, approx.	Blind kg, approx.
½"	4	½"	55	—	—	0.5	0.5
¾"	4	½"	65	—	—	—	—
1"	4	½"	65	75	1.1	0.9	0.9
1¼"	4	½"	70	85	1.4	1.1	1.2
1½"	4	½"	70	85	1.8	1.4	1.6
2"	4	⅝"	85	95	2.6	2.3	2.6
2½"	4	⅝"	90	100	4.3	3.4	—
3"	4	⅝"	90	100	5.2	3.9	—
3½"	8	⅝"	90	100	5.5	5.0	5.9
4"	8	⅝"	90	100	7.3	5.8	7.4
5"	8	¾"	95	110	8.9	6.2	8.8
6"	8	¾"	100	115	11.3	7.4	11.3
8"	8	¾"	110	120	17.7	12.4	19.9
10"	12	⅞"	115	125	24.8	17.1	29.4
12"	12	⅞"	120	135	39.0	27.7	43.7
14"	12	1"	135	145	51.7	35.2	59.4
16"	16	1"	135	145	64.4	42.2	77.1
18"	16	1½"	145	160	74.8	49.7	94.8
20"	20	1½"	160	170	89.4	65.5	123
24"	20	1½"	170	185	120	90.5	188

Notes

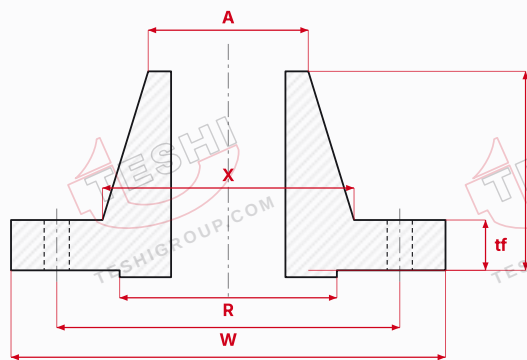
- Dimensions are in millimetres unless stated otherwise.
- Flange thickness *tf* and length through hub *Y* do not include the 2 mm raised face.
- Blind flanges have the same outside diameter, thickness *tf* and drilling as the other flange types of the same size and class.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ⅛").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

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ASME B16.5 Class 300 Flange Dimensions

Class 300 flange dimensions (mm)

This chart gives the dimensions of **ASME B16.5 Class 300** pipe flanges in millimetres for NPS ½" to 24". It covers weld neck, slip-on, blind, socket weld, threaded and lap joint flanges, with drilling, stud bolt lengths and approximate weights.



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 300 flange dimensions (mm)

NPS in	DN	O Outside dia	tf Min thickness	R Raised face dia	X Hub dia	A Hub at weld	Y Weld neck	Y Slip-on / Thr / SW	Y Lap joint	W Bolt circle	Holes No.	Hole dia mm	Bolt in
½"	15	95	12.7	34.9	38	21.3	51	21	22	66.7	4	15.9	½"
¾"	20	115	14.3	42.9	48	26.7	56	24	25	82.6	4	19.1	¾"
1"	25	125	15.9	50.8	54	33.4	60	25	27	88.9	4	19.1	¾"
1¼"	32	135	17.5	63.5	64	42.2	64	25	27	98.4	4	19.1	¾"
1½"	40	155	19.1	73.0	70	48.3	67	29	30	114.3	4	22.2	¾"
2"	50	165	20.7	92.1	84	60.3	68	32	33	127.0	8	19.1	¾"
2½"	65	190	23.9	104.8	100	73.0	75	37	38	149.2	8	22.2	¾"
3"	80	210	27.0	127.0	117	88.9	78	41	43	168.3	8	22.2	¾"
3½"	90	230	28.6	139.7	133	101.6	79	43	44	184.2	8	22.2	¾"
4"	100	255	30.2	157.2	146	114.3	84	46	48	200.0	8	22.2	¾"
5"	125	280	33.4	185.7	178	141.3	97	49	51	235.0	8	22.2	¾"
6"	150	320	35.0	215.9	206	168.3	97	51	52	269.9	12	22.2	¾"
8"	200	380	39.7	269.9	260	219.1	110	60	62	330.2	12	25.4	¾"
10"	250	445	46.1	323.8	321	273.0	116	65	95	387.4	16	28.6	1"
12"	300	520	49.3	381.0	375	323.8	129	71	102	450.8	16	31.8	1½"
14"	350	585	52.4	412.8	425	355.6	141	75	111	514.4	20	31.8	1½"
16"	400	650	55.6	469.9	483	406.4	144	81	121	571.5	20	34.9	1½"
18"	450	710	58.8	533.4	533	457.0	157	87	130	628.6	24	34.9	1½"
20"	500	775	62.0	584.2	587	508.0	160	94	140	685.8	24	34.9	1½"
24"	600	915	68.3	692.2	702	610.0	167	105	152	812.8	24	41.3	1½"

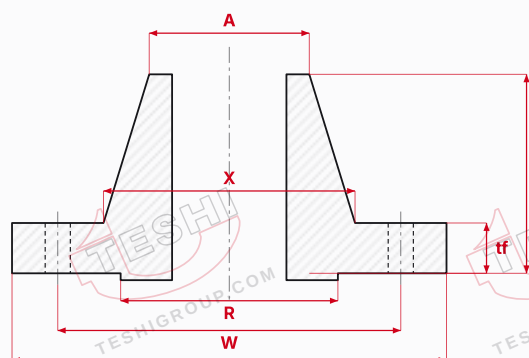
Notes

- Dimensions are in millimetres unless stated otherwise.
- Flange thickness *tf* and length through hub *Y* do not include the 2 mm raised face.
- Blind flanges have the same outside diameter, thickness *tf* and drilling as the other flange types of the same size and class.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ½").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

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ASME B16.5 Class 300 Flange Dimensions

Class 300 bolting and approximate weights



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 300 bolting and approximate weights

NPS in	Studs No.	Stud dia in	Stud length Raised face	Stud length Ring joint	Weld neck kg, approx.	Slip-on kg, approx.	Blind kg, approx.
½"	4	½"	65	75	—	0.6	—
¾"	4	⅝"	75	90	1.3	1.1	—
1"	4	⅝"	75	90	1.6	1.4	1.4
1¼"	4	⅝"	85	95	2.1	—	—
1½"	4	¾"	90	100	3.1	—	—
2"	8	⅝"	90	100	3.4	2.8	—
2½"	8	¾"	100	115	5.3	4.2	4.8
3"	8	¾"	110	120	7.3	5.8	6.8
3½"	8	¾"	110	125	8.2	7.7	9.5
4"	8	¾"	115	125	11.3	10.1	12.0
5"	8	¾"	120	135	15.1	12.6	16.0
6"	12	¾"	120	140	19.7	16.0	21.2
8"	12	⅞"	140	150	30.5	24.5	34.6
10"	16	1"	160	170	43.7	34.2	55.3
12"	16	1½"	170	185	64.4	51.3	78.9
14"	20	1½"	180	190	88.3	72.1	107
16"	20	1¼"	190	205	113	90.4	139
18"	24	1¼"	195	210	138	109	177
20"	24	1¼"	205	220	167	136	223
24"	24	1½"	230	255	235	204	342

Notes

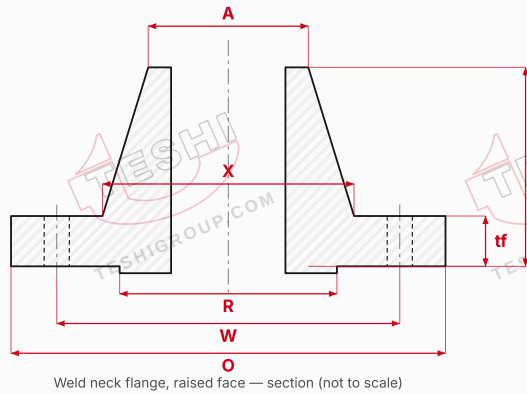
- Dimensions are in millimetres unless stated otherwise.
- Flange thickness *tf* and length through hub *Y* do not include the 2 mm raised face.
- Blind flanges have the same outside diameter, thickness *tf* and drilling as the other flange types of the same size and class.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ⅛").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

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ASME B16.5 Class 600 Flange Dimensions

Class 600 flange dimensions (mm)

This chart gives the dimensions of **ASME B16.5 Class 600** pipe flanges in millimetres for NPS ½" to 24". It covers weld neck, slip-on, blind, socket weld, threaded and lap joint flanges, with drilling, stud bolt lengths and approximate weights.



KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 600 flange dimensions (mm)

NPS in	DN	O Outside dia	tf Min thickness	R Raised face dia	X Hub dia	A Hub at weld	Y Weld neck	Y Slip-on / Thr / SW	Y Lap joint	W Bolt circle	Holes No.	Hole dia mm	Bolt in
½"	15	95	14.3	34.9	38	21.3	52	22	22	66.7	4	15.9	½"
¾"	20	115	15.9	42.9	48	26.7	57	25	25	82.6	4	19.1	¾"
1"	25	125	17.5	50.8	54	33.4	62	27	27	88.9	4	19.1	¾"
1¼"	32	135	20.7	63.5	64	42.2	67	29	29	98.4	4	19.1	¾"
1½"	40	155	22.3	73.0	70	48.3	70	32	32	114.3	4	22.2	¾"
2"	50	165	25.4	92.1	84	60.3	73	37	37	127.0	8	19.1	¾"
2½"	65	190	28.6	104.8	100	73.0	79	41	41	149.2	8	22.2	¾"
3"	80	210	31.8	127.0	117	88.9	83	46	46	168.3	8	22.2	¾"
3½"	90	230	35.0	139.7	133	101.6	86	49	49	184.2	8	25.4	¾"
4"	100	275	38.1	157.2	152	114.3	102	54	54	215.9	8	25.4	¾"
5"	125	330	44.5	185.7	189	141.3	114	60	60	266.7	8	28.6	1"
6"	150	355	47.7	215.9	222	168.3	117	67	67	292.1	12	28.6	1"
8"	200	420	55.6	269.9	273	219.1	133	76	76	349.2	12	31.8	1½"
10"	250	510	63.5	323.8	343	273.0	152	86	111	431.8	16	34.9	1½"
12"	300	560	66.7	381.0	400	323.8	156	92	117	489.0	20	34.9	1½"
14"	350	605	69.9	412.8	432	355.6	165	94	127	527.0	20	38.1	1¾"
16"	400	685	76.2	469.9	495	406.4	178	106	140	603.2	20	41.3	1½"
18"	450	745	82.6	533.4	546	457.0	184	117	152	654.0	20	44.5	1¾"
20"	500	815	88.9	584.2	610	508.0	190	127	165	723.9	24	44.5	1¾"
24"	600	940	101.6	692.2	718	610.0	203	140	184	838.2	24	50.8	1¾"

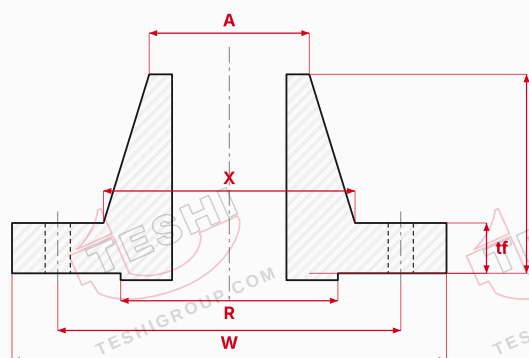
Notes

- Dimensions are in millimetres unless stated otherwise.
- Flange thickness **tf** and length through hub **Y** do not include the 7 mm raised face.
- Blind flanges have the same outside diameter, thickness **tf** and drilling as the other flange types of the same size and class.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ½").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

TG-DS-003 · Online: teshigroup.com/dimensional-standards/asme-b16-5-class-600-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Class 600 Flange Dimensions

Class 600 bolting and approximate weights



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 600 bolting and approximate weights

NPS in	Studs No.	Stud dia in	Stud length Raised face	Stud length Ring joint	Weld neck kg, approx.	Slip-on kg, approx.	Blind kg, approx.
½"	4	½"	75	75	0.9	0.9	—
¾"	4	⅝"	90	90	1.8	1.4	1.4
1"	4	⅝"	90	90	1.8	1.8	1.8
1¼"	4	⅝"	95	95	2.7	2.3	2.3
1½"	4	¾"	110	110	3.6	3.2	3.6
2"	8	⅝"	110	110	5.4	4.1	4.5
2½"	8	¾"	120	120	8.1	5.9	6.8
3"	8	¾"	125	125	10.4	7.3	9.1
3½"	8	⅞"	140	140	11.8	9.5	13.2
4"	8	⅞"	145	145	19.0	16.8	18.6
5"	8	1"	165	165	31.0	29.0	31.0
6"	12	1"	170	170	37.0	36.0	39.0
8"	12	1½"	190	195	52.0	52.0	63.0
10"	16	1¼"	215	215	86.0	77.0	104
12"	20	1¼"	220	220	102	97.0	134
14"	20	1⅝"	235	235	—	111	166
16"	20	1½"	255	255	—	157	231
18"	20	1⅝"	275	275	—	—	293
20"	24	1⅝"	285	290	—	—	376
24"	24	1⅞"	330	335	—	—	565

Notes

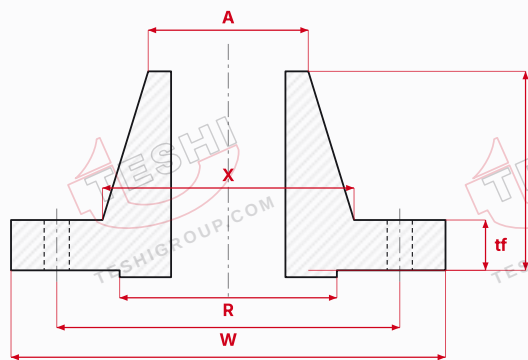
- Dimensions are in millimetres unless stated otherwise.
- Flange thickness *tf* and length through hub *Y* do not include the 7 mm raised face.
- Blind flanges have the same outside diameter, thickness *tf* and drilling as the other flange types of the same size and class.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ⅛").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

TG-DS-003 · Online: teshigroup.com/dimensional-standards/asme-b16-5-class-600-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Class 900 Flange Dimensions

Class 900 flange dimensions (mm)

This chart gives the dimensions of **ASME B16.5 Class 900** pipe flanges in millimetres for NPS ½" to 24". It covers weld neck, slip-on, blind, socket weld, threaded and lap joint flanges, with drilling, stud bolt lengths and approximate weights.



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 900 flange dimensions (mm)

NPS in	DN	O Outside dia	tf Min thickness	R Raised face dia	X Hub dia	A Hub at weld	Y Weld neck	Y Slip-on / Thr / SW	Y Lap joint	W Bolt circle	Holes No.	Hole dia mm	Bolt in
½"	15	120	22.3	34.9	38	21.3	60	32	32	82.6	4	22.2	¾"
¾"	20	130	25.4	42.9	44	26.7	70	35	35	88.9	4	22.2	¾"
1"	25	150	28.6	50.8	52	33.4	73	41	41	101.6	4	25.4	¾"
1½"	32	160	28.6	63.5	64	42.2	73	41	41	111.1	4	25.4	¾"
1½"	40	180	31.8	73.0	70	48.3	83	44	44	123.8	4	28.6	1"
2"	50	215	38.1	92.1	105	60.3	102	57	57	165.1	8	25.4	¾"
2½"	65	245	41.3	104.8	124	73.0	105	64	64	190.5	8	28.6	1"
3"	80	240	38.1	127.0	127	88.9	102	54	54	190.5	8	25.4	¾"
4"	100	290	44.5	157.2	159	114.3	114	70	70	235.0	8	31.8	1½"
5"	125	350	50.8	185.7	190	141.3	127	79	79	279.4	8	34.9	1½"
6"	150	380	55.6	215.9	235	168.3	140	86	86	317.5	12	31.8	1½"
8"	200	470	63.5	269.9	298	219.1	162	102	114	393.7	12	38.1	1½"
10"	250	545	69.9	323.8	368	273.0	184	108	127	469.9	16	38.1	1½"
12"	300	610	79.4	381.0	419	323.8	200	117	143	533.4	20	38.1	1½"
14"	350	640	85.8	412.8	451	355.6	213	130	156	558.8	20	41.3	1½"
16"	400	705	88.9	469.9	508	406.4	216	133	165	616.0	20	44.5	1½"
18"	450	785	101.6	533.4	565	457.0	229	152	190	685.8	20	50.8	1½"
20"	500	855	108.0	584.2	622	508.0	248	159	210	749.3	20	54.0	2"
24"	600	1040	139.7	692.2	749	610.0	292	203	267	901.7	20	66.7	2½"

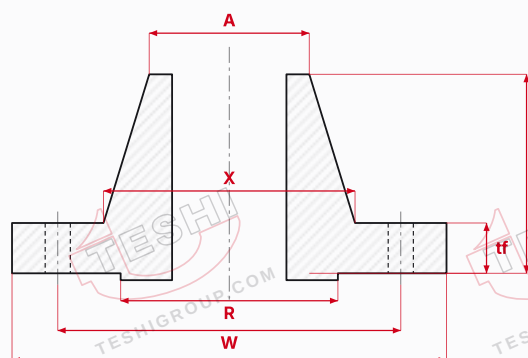
Notes

- Dimensions are in millimetres unless stated otherwise.
- Flange thickness **tf** and length through hub **Y** do not include the 7 mm raised face.
- Blind flanges have the same outside diameter, thickness **tf** and drilling as the other flange types of the same size and class.
- In ASME B16.5, Class 900 flanges NPS ½" to 2½" use Class 1500 dimensions.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ½").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

TG-DS-004 · Online: teshigroup.com/dimensional-standards/asme-b16-5-class-900-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Class 900 Flange Dimensions

Class 900 bolting and approximate weights



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 900 bolting and approximate weights

NPS in	Studs No.	Stud dia in	Stud length Raised face	Stud length Ring joint	Weld neck kg, approx.	Slip-on kg, approx.	Blind kg, approx.
½"	4	¾"	110	110	—	1.8	1.8
¾"	4	¾"	115	115	—	2.3	2.7
1"	4	¾"	125	125	4.1	3.4	3.7
1¼"	4	¾"	125	125	4.5	4.3	4.1
1½"	4	1"	140	140	6.4	5.5	5.9
2"	8	¾"	145	145	11.3	10.0	10.1
2½"	8	1"	160	160	16.3	16.3	15.9
3"	8	¾"	145	145	13.6	—	13.2
4"	8	1½"	170	170	24.0	24.0	24.0
5"	8	1¼"	190	190	39.0	38.0	39.0
6"	12	1½"	190	195	50.0	50.0	52.0
8"	12	1¾"	220	220	84.0	78.0	90.0
10"	16	1¾"	235	235	121	111	132
12"	20	1¾"	255	255	—	148	188
14"	20	1½"	275	280	—	181	235
16"	20	1½"	285	290	—	200	276
18"	20	1¾"	325	335	—	282	391
20"	20	2"	350	360	—	344	493
24"	20	2½"	440	455	—	651	932

Notes

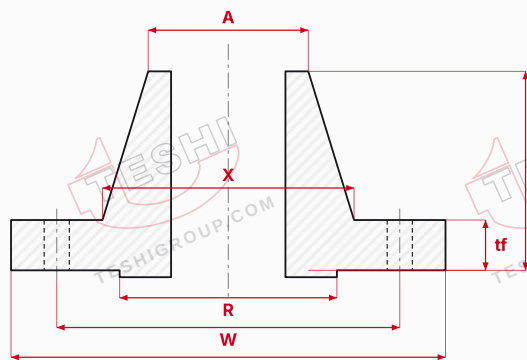
- Dimensions are in millimetres unless stated otherwise.
- Flange thickness *tf* and length through hub *Y* do not include the 7 mm raised face.
- Blind flanges have the same outside diameter, thickness *tf* and drilling as the other flange types of the same size and class.
- In ASME B16.5, Class 900 flanges NPS ½" to 2½" use Class 1500 dimensions.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ¼").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

TG-DS-004 · Online: teshigroup.com/dimensional-standards/asme-b16-5-class-900-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Class 1500 Flange Dimensions

Class 1500 flange dimensions (mm)

This chart gives the dimensions of **ASME B16.5 Class 1500** pipe flanges in millimetres for NPS ½" to 24". It covers weld neck, slip-on, blind, socket weld, threaded and lap joint flanges, with drilling, stud bolt lengths and approximate weights.



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 1500 flange dimensions (mm)

NPS in	DN	O Outside dia	tf Min thickness	R Raised face dia	X Hub dia	A Hub at weld	Y Weld neck	Y Slip-on / Thr / SW	Y Lap joint	W Bolt circle	Holes No.	Hole dia mm	Bolt in
½"	15	120	22.3	34.9	38	21.3	60	32	32	82.6	4	22.2	¾"
¾"	20	130	25.4	42.9	44	26.7	70	35	35	88.9	4	22.2	¾"
1"	25	150	28.6	50.8	52	33.4	73	41	41	101.6	4	25.4	¾"
1½"	32	160	28.6	63.5	64	42.2	73	41	41	111.1	4	25.4	¾"
1½"	40	180	31.8	73.0	70	48.3	83	44	44	123.8	4	28.6	1"
2"	50	215	38.1	92.1	105	60.3	102	57	57	165.1	8	25.4	¾"
2½"	65	245	41.3	104.8	124	73.0	105	64	64	190.5	8	28.6	1"
3"	80	265	47.7	127.0	133	88.9	117	73	73	203.2	8	31.8	1½"
4"	100	310	54.0	157.2	162	114.3	124	90	90	241.3	8	34.9	1½"
5"	125	375	73.1	185.7	197	141.3	155	105	105	292.1	8	41.3	1½"
6"	150	395	82.6	215.9	229	168.3	171	119	119	317.5	12	38.1	1½"
8"	200	485	92.1	269.9	292	219.1	213	143	143	393.7	12	44.5	1½"
10"	250	585	108.0	323.8	368	273.0	254	159	178	482.6	12	50.8	1½"
12"	300	675	123.9	381.0	451	323.8	283	181	219	571.5	16	54.0	2"
14"	350	750	133.4	412.8	495	355.6	298	—	241	635.0	16	60.3	2½"
16"	400	825	146.1	469.9	552	406.4	311	—	260	704.8	16	66.7	2½"
18"	450	915	162.0	533.4	597	457.0	327	—	276	774.7	16	73.0	2½"
20"	500	985	177.8	584.2	641	508.0	356	—	292	831.8	16	79.4	3"
24"	600	1170	203.2	692.2	762	610.0	406	—	330	990.6	16	92.1	3½"

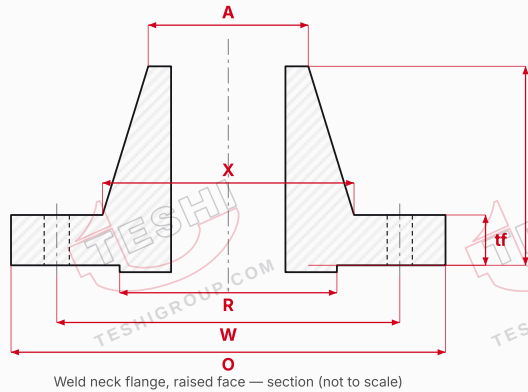
Notes

- Dimensions are in millimetres unless stated otherwise.
- Flange thickness **tf** and length through hub **Y** do not include the 7 mm raised face.
- Blind flanges have the same outside diameter, thickness **tf** and drilling as the other flange types of the same size and class.
- Slip-on and socket weld flanges are not listed in Class 1500 above NPS 2½"; the slip-on column then applies to threaded flanges only.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ½").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

TG-DS-005 · Online: teshigroup.com/dimensional-standards/asme-b16-5-class-1500-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Class 1500 Flange Dimensions

Class 1500 bolting and approximate weights



KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 1500 bolting and approximate weights

NPS in	Studs No.	Stud dia in	Stud length Raised face	Stud length Ring joint	METRIC		IMPERIAL	
					Weld neck kg, approx.	Blind kg, approx.	Weld neck lb, approx.	Blind lb, approx.
½"	4	¾"	110	110	—	1.8	—	4.0
¾"	4	¾"	115	115	—	2.7	—	6.0
1"	4	⅞"	125	125	4.1	3.7	9.0	8.2
1¼"	4	⅞"	125	125	4.5	4.1	9.9	9.0
1½"	4	1"	140	140	6.4	5.9	14.1	13.0
2"	8	⅞"	145	145	11.3	10.1	24.9	22.3
2½"	8	1"	160	160	16.3	15.9	35.9	35.1
3"	8	1⅝"	180	180	21.8	21.8	48.1	48.1
4"	8	1¼"	195	195	33.1	33	73.0	72.8
5"	8	1½"	250	250	59.9	64	132.1	141.1
6"	12	1⅝"	260	265	74.8	75	164.9	165.3
8"	12	1⅝"	290	300	125	136	275.6	299.8
10"	12	1⅝"	335	345	206	232	454.2	511.5
12"	16	2"	375	385	313	314	690.0	692.3
14"	16	2¼"	405	425	426	443	939.2	976.6
16"	16	2½"	445	470	567	591	1250.0	1302.9
18"	16	2¾"	495	525	737	795	1624.8	1752.7
20"	16	3"	540	565	930	1022	2050.3	2253.1
24"	16	3½"	615	650	1508	1648	3324.6	3633.2

Notes

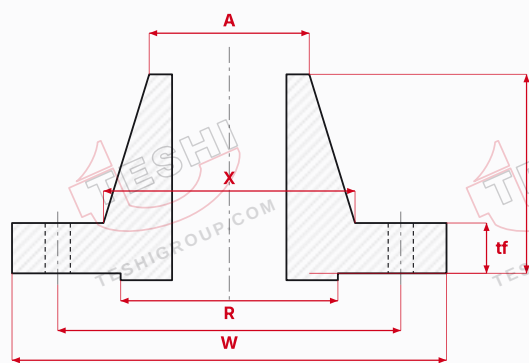
- Dimensions are in millimetres unless stated otherwise.
- Flange thickness *tf* and length through hub *Y* do not include the 7 mm raised face.
- Blind flanges have the same outside diameter, thickness *tf* and drilling as the other flange types of the same size and class.
- Slip-on and socket weld flanges are not listed in Class 1500 above NPS 2½"; the slip-on column then applies to threaded flanges only.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ⅛").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

TG-DS-005 · Online: teshigroup.com/dimensional-standards/asme-b16-5-class-1500-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Class 2500 Flange Dimensions

Class 2500 flange dimensions (mm)

This chart gives the dimensions of **ASME B16.5 Class 2500** pipe flanges in millimetres for NPS ½" to 12". It covers weld neck, slip-on, blind, socket weld, threaded and lap joint flanges, with drilling, stud bolt lengths and approximate weights.



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

O	Outside diameter of flange
tf	Minimum flange thickness (also the blind flange thickness), excluding the raised face
R	Diameter of raised face
X	Hub diameter at base
A	Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
Y	Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
W	Bolt circle diameter
Holes	Number and diameter of bolt holes
Bolt	Nominal bolt diameter in inches

Class 2500 flange dimensions (mm)

NPS in	DN	O Outside dia	tf Min thickness	R Raised face dia	X Hub dia	A Hub at weld	Y Weld neck	Y Slip-on / Thr / SW	Y Lap joint	W Bolt circle	Holes No.	Hole dia mm	Bolt in
½"	15	135	30.2	34.9	43	21.3	73	40	40	88.9	4	22.2	¾"
¾"	20	140	31.8	42.9	51	26.7	79	43	43	95.2	4	22.2	¾"
1"	25	160	35.0	50.8	57	33.4	89	48	48	108.0	4	25.4	¾"
1½"	32	185	38.1	63.5	73	42.2	95	52	52	130.2	4	28.6	1"
1½"	40	205	44.5	73.0	79	48.3	111	60	60	146.0	4	31.8	1½"
2"	50	235	50.9	92.1	95	60.3	127	70	70	171.4	8	28.6	1"
2½"	65	265	57.2	104.8	114	73.0	143	79	79	196.8	8	31.8	1½"
3"	80	305	66.7	127.0	133	88.9	168	92	92	228.6	8	34.9	1½"
4"	100	355	76.2	157.2	165	114.3	190	108	108	273.0	8	41.3	1½"
5"	125	420	92.1	185.7	203	141.3	229	130	130	323.8	8	47.6	1¾"
6"	150	485	108.0	215.9	235	168.3	273	152	152	368.3	8	54.0	2"
8"	200	550	127.0	269.9	305	219.1	318	178	178	438.2	12	54.0	2"
10"	250	675	165.1	323.8	375	273.0	419	229	229	539.8	12	66.7	2½"
12"	300	760	184.2	381.0	441	323.8	464	254	254	619.1	12	73.0	2¾"

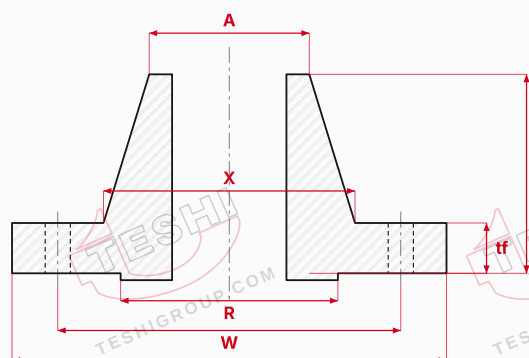
Notes

- Dimensions are in millimetres unless stated otherwise.
- Flange thickness **tf** and length through hub **Y** do not include the 7 mm raised face.
- Blind flanges have the same outside diameter, thickness **tf** and drilling as the other flange types of the same size and class.
- ASME B16.5 has no Class 2500 slip-on or socket weld flange; the slip-on column applies to threaded flanges only.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ½").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

TG-DS-006 · Online: [teshigroup.com/dimensional-standards/asm-b16-5-class-2500-flange-dimensions/](https://www.teshigroup.com/dimensional-standards/asm-b16-5-class-2500-flange-dimensions/) · Verify against the current edition of the standard.

ASME B16.5 Class 2500 Flange Dimensions

Class 2500 bolting and approximate weights



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum flange thickness (also the blind flange thickness), excluding the raised face
- R** Diameter of raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end of a weld neck flange (pipe outside diameter)
- Y** Length through hub — given separately for weld neck, slip-on / threaded / socket weld and lap joint flanges
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes
- Bolt** Nominal bolt diameter in inches

Class 2500 bolting and approximate weights

NPS in	Studs No.	Stud dia in	Stud length Raised face	Stud length Ring joint	METRIC		IMPERIAL	
					Weld neck kg, approx.	Blind kg, approx.	Weld neck lb, approx.	Blind lb, approx.
½"	4	¾"	120	120	3.6	3.2	7.9	7.1
¾"	4	¾"	125	125	4.1	—	9.0	—
1"	4	⅞"	140	140	5.9	5.0	13.0	11.0
1¼"	4	1"	150	150	9.1	7.8	20.1	17.2
1½"	4	1⅝"	170	170	12.7	10.5	28.0	23.1
2"	8	1"	180	180	19.1	18	42.1	39.7
2½"	8	1⅝"	195	205	23.6	25.5	52.0	56.2
3"	8	1¾"	220	230	42.6	39	93.9	86.0
4"	8	1½"	255	260	66.2	61.5	145.9	135.6
5"	8	1¾"	300	310	111	102	244.7	224.9
6"	8	2"	345	355	171	157	377.0	346.1
8"	12	2"	380	395	261	241	575.4	531.3
10"	12	2½"	490	510	484	470	1067.0	1036.2
12"	12	2¾"	540	560	729	—	1607.2	—

Notes

- Dimensions are in millimetres unless stated otherwise.
- Flange thickness *tf* and length through hub *Y* do not include the 7 mm raised face.
- Blind flanges have the same outside diameter, thickness *tf* and drilling as the other flange types of the same size and class.
- ASME B16.5 has no Class 2500 slip-on or socket weld flange; the slip-on column applies to threaded flanges only.
- The bore of a weld neck or socket weld flange is machined to match the inside diameter of the pipe schedule stated in the order.
- Bolt holes are tabulated in inches in ASME B16.5; the millimetre values shown are direct conversions (bolt diameter plus ⅛").
- Stud bolt lengths do not include the height of the points. Weights are approximate catalogue values and vary with bore and manufacturer.

TG-DS-006 · Online: teshigroup.com/dimensional-standards/asme-b16-5-class-2500-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Flange Facing Dimensions

Raised face height by pressure class

This chart gives the **raised face (RF)** dimensions of **ASME B16.5** flanges: the face height for each pressure class and the raised face diameter for NPS ½" to 24". The raised face diameter is the same for every class of a given size.

KEY TO DIMENSIONS

RF height	Height of the raised face above the flange face
R	Outside diameter of the raised face
FF	Flat face — no raised face; the gasket covers the full face
RTJ	Ring-type joint — a machined groove for a metal ring gasket

Raised face height by pressure class

Class	RF height in	RF height mm (inch tables)	RF height mm (metric tables)
150 and 300	0.06"	1.6	2
400, 600, 900, 1500 and 2500	0.25"	6.4	7

Notes

- Inch tables give the raised face height as 0.06" (1.6 mm) for Class 150 and 300 and 0.25" (6.4 mm) for Class 400 and above; metric tables round these to 2 mm and 7 mm.
- Check against the edition of ASME B16.5 you are working to whether the tabulated flange thickness includes the raised face for Class 150 and 300.
- Raised face finish is typically 125–250 µin Ra (3.2–6.3 µm) serrated, unless the purchaser specifies otherwise.
- Flat-face flanges are used against cast-iron or non-metallic flanges; the raised face is machined off and a full-face gasket is used.

TG-DS-035 · Online: teshigroup.com/dimensional-standards/asme-b16-5-flange-facing-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Flange Facing Dimensions

Raised face diameter R (all classes)

KEY TO DIMENSIONS

RF height	Height of the raised face above the flange face
R	Outside diameter of the raised face
FF	Flat face — no raised face; the gasket covers the full face
RTJ	Ring-type joint — a machined groove for a metal ring gasket

Raised face diameter R (all classes)

NPS in	DN	METRIC		IMPERIAL	
		R Raised face dia, mm		R Raised face dia, in	
½"	15	34.9		1.37	
¾"	20	42.9		1.69	
1"	25	50.8		2.00	
1¼"	32	63.5		2.50	
1½"	40	73.0		2.87	
2"	50	92.1		3.63	
2½"	65	104.8		4.13	
3"	80	127.0		5.00	
3½"	90	139.7		5.50	
4"	100	157.2		6.19	
5"	125	185.7		7.31	
6"	150	215.9		8.50	
8"	200	269.9		10.63	
10"	250	323.8		12.75	
12"	300	381.0		15.00	
14"	350	412.8		16.25	
16"	400	469.9		18.50	
18"	450	533.4		21.00	
20"	500	584.2		23.00	
24"	600	692.2		27.25	

Notes

- Inch tables give the raised face height as 0.06" (1.6 mm) for Class 150 and 300 and 0.25" (6.4 mm) for Class 400 and above; metric tables round these to 2 mm and 7 mm.
- Check against the edition of ASME B16.5 you are working to whether the tabulated flange thickness includes the raised face for Class 150 and 300.
- Raised face finish is typically 125–250 µin Ra (3.2–6.3 µm) serrated, unless the purchaser specifies otherwise.
- Flat-face flanges are used against cast-iron or non-metallic flanges; the raised face is machined off and a full-face gasket is used.

TG-DS-035 · Online: teshigroup.com/dimensional-standards/asme-b16-5-flange-facing-dimensions/ · Verify against the current edition of the standard.

ASME B16.5 Flange Weight Chart

Weld neck flange weight (kg, approximate)

Approximate weights of **ASME B16.5 weld neck, slip-on and blind flanges** in kilograms, by nominal pipe size and pressure class. Use them for freight estimates, lifting plans and material take-offs.

Weld neck flange weight (kg, approximate)

NPS in	METRIC						IMPERIAL					
	Class 150 kg	Class 300 kg	Class 600 kg	Class 900 kg	Class 1500 kg	Class 2500 kg	Class 150 lb	Class 300 lb	Class 600 lb	Class 900 lb	Class 1500 lb	Class 2500 lb
½"	—	—	0.9	—	—	3.6	—	—	2.0	—	—	7.9
¾"	—	1.3	1.8	—	—	4.1	—	2.9	4.0	—	—	9.0
1"	1.1	1.6	1.8	4.1	4.1	5.9	2.4	3.5	4.0	9.0	9.0	13.0
1½"	1.4	2.1	2.7	4.5	4.5	9.1	3.1	4.6	6.0	9.9	9.9	20.1
2"	1.8	3.1	3.6	6.4	6.4	12.7	4.0	6.8	7.9	14.1	14.1	28.0
2½"	2.6	3.4	5.4	11.3	11.3	19.1	5.7	7.5	11.9	24.9	24.9	42.1
3"	4.3	5.3	8.1	16.3	16.3	23.6	9.5	11.7	17.9	35.9	35.9	52.0
3½"	5.2	7.3	10.4	13.6	21.8	42.6	11.5	16.1	22.9	30.0	48.1	93.9
4"	5.5	8.2	11.8	—	—	—	12.1	18.1	26.0	—	—	—
4"	7.3	11.3	19.0	24.0	33.1	66.2	16.1	24.9	41.9	52.9	73.0	145.9
5"	8.9	15.1	31.0	39.0	59.9	111	19.6	33.3	68.3	86.0	132.1	244.7
6"	11.3	19.7	37.0	50.0	74.8	171	24.9	43.4	81.6	110.2	164.9	377.0
8"	17.7	30.5	52.0	84.0	125	261	39.0	67.2	114.6	185.2	275.6	575.4
10"	24.8	43.7	86.0	121	206	484	54.7	96.3	189.6	266.8	454.2	1067.0
12"	39.0	64.4	102	—	313	729	86.0	142.0	224.9	—	690.0	1607.2
14"	51.7	88.3	—	—	426	—	114.0	194.7	—	—	939.2	—
16"	64.4	113	—	—	567	—	142.0	249.1	—	—	1250.0	—
18"	74.8	138	—	—	737	—	164.9	304.2	—	—	1624.8	—
20"	89.4	167	—	—	930	—	197.1	368.2	—	—	2050.3	—
24"	120	235	—	—	1508	—	264.6	518.1	—	—	3324.6	—

Notes

- Weights are approximate catalogue values for carbon steel and are for estimation only.
- A dash means no reliable published value was available for that size and class.

TG-DS-009 · Online: [teshigroup.com/dimensional-standards/asm-b16-5-flange-weight-chart/](https://www.teshigroup.com/dimensional-standards/asm-b16-5-flange-weight-chart/) · Verify against the current edition of the standard.

ASME B16.5 Flange Weight Chart

Slip-on flange weight (kg, approximate)

Slip-on flange weight (kg, approximate)

NPS in	METRIC						IMPERIAL					
	Class 150 kg	Class 300 kg	Class 600 kg	Class 900 kg	Class 1500 kg	Class 2500 kg	Class 150 lb	Class 300 lb	Class 600 lb	Class 900 lb	Class 1500 lb	Class 2500 lb
½"	0.5	0.6	0.9	1.8	—	—	1.1	1.3	2.0	4.0	—	—
¾"	—	1.1	1.4	2.3	—	—	—	2.4	3.1	5.1	—	—
1"	0.9	1.4	1.8	3.4	—	—	2.0	3.1	4.0	7.5	—	—
1¼"	1.1	—	2.3	4.3	—	—	2.4	—	5.1	9.5	—	—
1½"	1.4	—	3.2	5.5	—	—	3.1	—	7.1	12.1	—	—
2"	2.3	2.8	4.1	10.0	—	—	5.1	6.2	9.0	22.0	—	—
2½"	3.4	4.2	5.9	16.3	—	—	7.5	9.3	13.0	35.9	—	—
3"	3.9	5.8	7.3	—	—	—	8.6	12.8	16.1	—	—	—
3½"	5.0	7.7	9.5	—	—	—	11.0	17.0	20.9	—	—	—
4"	5.8	10.1	16.8	24.0	—	—	12.8	22.3	37.0	52.9	—	—
5"	6.2	12.6	29.0	38.0	—	—	13.7	27.8	63.9	83.8	—	—
6"	7.4	16.0	36.0	50.0	—	—	16.3	35.3	79.4	110.2	—	—
8"	12.4	24.5	52.0	78.0	—	—	27.3	54.0	114.6	172.0	—	—
10"	17.1	34.2	77.0	111	—	—	37.7	75.4	169.8	244.7	—	—
12"	27.7	51.3	97.0	148	—	—	61.1	113.1	213.8	326.3	—	—
14"	35.2	72.1	111	181	—	—	77.6	159.0	244.7	399.0	—	—
16"	42.2	90.4	157	200	—	—	93.0	199.3	346.1	440.9	—	—
18"	49.7	109	—	282	—	—	109.6	240.3	—	621.7	—	—
20"	65.5	136	—	344	—	—	144.4	299.8	—	758.4	—	—
24"	90.5	204	—	651	—	—	199.5	449.7	—	1435.2	—	—

Notes

- Weights are approximate catalogue values for carbon steel and are for estimation only.
- A dash means no reliable published value was available for that size and class.

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ASME B16.5 Flange Weight Chart

Blind flange weight (kg, approximate)

Blind flange weight (kg, approximate)

NPS in	METRIC						IMPERIAL					
	Class 150 kg	Class 300 kg	Class 600 kg	Class 900 kg	Class 1500 kg	Class 2500 kg	Class 150 lb	Class 300 lb	Class 600 lb	Class 900 lb	Class 1500 lb	Class 2500 lb
½"	0.5	—	—	1.8	1.8	3.2	1.1	—	—	4.0	4.0	7.1
¾"	—	—	1.4	2.7	2.7	—	—	—	3.1	6.0	6.0	—
1"	0.9	1.4	1.8	3.7	3.7	5.0	2.0	3.1	4.0	8.2	8.2	11.0
1¼"	1.2	—	2.3	4.1	4.1	7.8	2.6	—	5.1	9.0	9.0	17.2
1½"	1.6	—	3.6	5.9	5.9	10.5	3.5	—	7.9	13.0	13.0	23.1
2"	2.6	—	4.5	10.1	10.1	18	5.7	—	9.9	22.3	22.3	39.7
2½"	—	4.8	6.8	15.9	15.9	25.5	—	10.6	15.0	35.1	35.1	56.2
3"	—	6.8	9.1	13.2	21.8	39	—	15.0	20.1	29.1	48.1	86.0
3½"	5.9	9.5	13.2	—	—	—	13.0	20.9	29.1	—	—	—
4"	7.4	12.0	18.6	24.0	33	61.5	16.3	26.5	41.0	52.9	72.8	135.6
5"	8.8	16.0	31.0	39.0	64	102	19.4	35.3	68.3	86.0	141.1	224.9
6"	11.3	21.2	39.0	52.0	75	157	24.9	46.7	86.0	114.6	165.3	346.1
8"	19.9	34.6	63.0	90.0	136	241	43.9	76.3	138.9	198.4	299.8	531.3
10"	29.4	55.3	104	132	232	470	64.8	121.9	229.3	291.0	511.5	1036.2
12"	43.7	78.9	134	188	314	—	96.3	173.9	295.4	414.5	692.3	—
14"	59.4	107	166	235	443	—	131.0	235.9	366.0	518.1	976.6	—
16"	77.1	139	231	276	591	—	170.0	306.4	509.3	608.5	1302.9	—
18"	94.8	177	293	391	795	—	209.0	390.2	646.0	862.0	1752.7	—
20"	123	223	376	493	1022	—	271.2	491.6	828.9	1086.9	2253.1	—
24"	188	342	565	932	1648	—	414.5	754.0	1245.6	2054.7	3633.2	—

Notes

- Weights are approximate catalogue values for carbon steel and are for estimation only.
- A dash means no reliable published value was available for that size and class.

TG-DS-009 · Online: [teshigroup.com/dimensional-standards/asm-b16-5-flange-weight-chart/](https://www.teshigroup.com/dimensional-standards/asm-b16-5-flange-weight-chart/) · Verify against the current edition of the standard.

PART 3

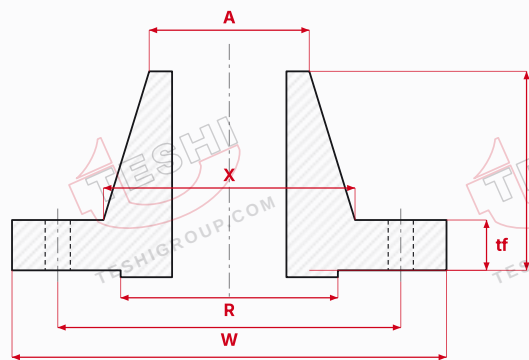
Large-diameter & orifice flanges

ASME B16.47 Series A Flange Dimensions	30
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ASME B16.47 Series A Flange Dimensions

Series A Class 150 (mm)

ASME B16.47 Series A (formerly MSS SP-44) covers large-diameter weld neck and blind flanges from NPS 26" to 60". This chart gives the dimensions in millimetres for Class 150, 300 and 600.



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum thickness of weld neck and of blind flange, excluding the raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end
- Y** Length through hub, excluding the raised face
- R** Diameter of raised face
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes

Series A Class 150 (mm)

NPS in	DN	O Outside dia	tf Weld neck	tf Blind	X Hub dia	A Hub at weld	Y Length thru hub	R Raised face dia	W Bolt circle	Holes No.	Hole dia mm	Bolt in
26"	650	870	66.7	66.7	676	660.4	119	749	806.4	24	34.9	1¼"
28"	700	925	69.9	69.9	727	711.2	124	800	863.6	28	34.9	1¼"
30"	750	985	73.1	73.1	781	762.0	135	857	914.4	28	34.9	1¼"
32"	800	1060	79.4	79.4	832	812.8	143	914	977.9	28	41.3	1½"
34"	850	1110	81.0	81.0	883	863.6	148	965	1028.7	32	41.3	1½"
36"	900	1170	88.9	88.9	933	914.4	156	1022	1085.8	32	41.3	1½"
38"	950	1240	85.8	85.8	991	965.2	156	1073	1149.4	32	41.3	1½"
40"	1000	1290	88.9	88.9	1041	1016.0	162	1124	1200.2	36	41.3	1½"
42"	1050	1345	95.3	95.3	1092	1066.8	170	1194	1257.3	36	41.3	1½"
44"	1100	1405	100.1	100.1	1143	1117.6	176	1245	1314.4	40	41.3	1½"
46"	1150	1455	101.6	101.6	1197	1168.4	184	1295	1365.2	40	41.3	1½"
48"	1200	1510	106.4	106.4	1248	1219.2	191	1359	1422.4	44	41.3	1½"
50"	1250	1570	109.6	109.6	1302	1270.0	202	1410	1479.6	44	47.6	1¾"
52"	1300	1625	114.3	114.3	1353	1320.8	208	1461	1536.7	44	47.6	1¾"
54"	1350	1685	119.1	119.1	1403	1371.6	214	1511	1593.8	44	47.6	1¾"
56"	1400	1745	122.3	122.3	1457	1422.4	227	1575	1651.0	48	47.6	1¾"
58"	1450	1805	127.0	127.0	1508	1473.2	233	1626	1708.2	48	47.6	1¾"
60"	1500	1855	130.2	130.2	1559	1524.0	238	1676	1759.0	52	47.6	1¾"

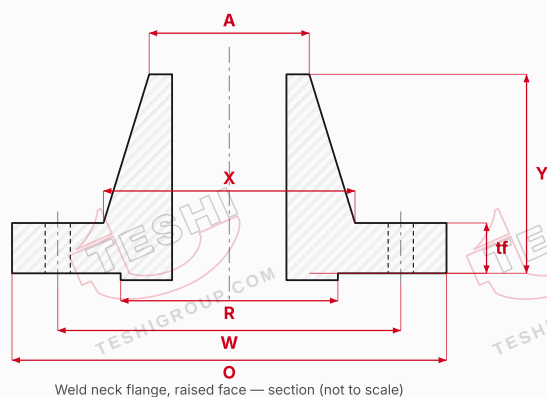
Notes

- Dimensions are in millimetres unless stated otherwise.
- Thickness and hub length exclude the raised face: 2 mm for Class 150 and 300, 7 mm for Class 600.
- Bolt holes are tabulated in inches in the standard; millimetre values are direct conversions.
- Some dimensions do not increase uniformly with size (Class 300 and 600 become more compact from NPS 38"). This follows the standard.

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ASME B16.47 Series A Flange Dimensions

Series A Class 300 (mm)



KEY TO DIMENSIONS

- O** Outside diameter of flange
tf Minimum thickness of weld neck and of blind flange, excluding the raised face
X Hub diameter at base
A Hub diameter at the welding end
Y Length through hub, excluding the raised face
R Diameter of raised face
W Bolt circle diameter
Holes Number and diameter of bolt holes

Series A Class 300 (mm)

NPS in	DN	O Outside dia	tf Weld neck	tf Blind	X Hub dia	A Hub at weld	Y Length thru hub	R Raised face dia	W Bolt circle	Holes No.	Hole dia mm	Bolt in
26"	650	970	77.8	82.6	721	660.4	183	749	876.3	28	44.5	1½"
28"	700	1035	84.2	88.9	775	711.2	195	800	939.8	28	44.5	1½"
30"	750	1090	90.5	93.7	827	762.0	208	857	997.0	28	47.6	1¾"
32"	800	1150	96.9	98.5	881	812.8	221	914	1054.1	28	50.8	1¾"
34"	850	1205	100.1	103.2	937	863.6	230	965	1104.9	28	50.8	1¾"
36"	900	1270	103.2	109.6	991	914.4	240	1022	1168.4	32	54.0	2"
38"	950	1170	106.4	106.4	994	965.2	179	1029	1092.2	32	41.3	1½"
40"	1000	1240	112.8	112.8	1048	1016.0	192	1086	1155.7	32	44.5	1½"
42"	1050	1290	117.5	117.5	1099	1066.8	198	1137	1206.5	32	44.5	1½"
44"	1100	1355	122.3	122.3	1149	1117.6	205	1194	1263.6	32	47.6	1¾"
46"	1150	1415	127.0	127.0	1203	1168.4	214	1245	1320.8	28	50.8	1¾"
48"	1200	1465	131.8	131.8	1254	1219.2	222	1302	1371.6	32	50.8	1¾"
50"	1250	1530	138.2	138.2	1305	1270.0	230	1359	1428.8	32	54.0	2"
52"	1300	1580	142.9	142.9	1356	1320.8	237	1410	1479.6	32	54.0	2"
54"	1350	1660	150.9	150.9	1410	1371.6	251	1467	1549.4	28	60.3	2¼"
56"	1400	1710	152.4	152.4	1464	1422.4	259	1518	1600.2	28	60.3	2¼"
58"	1450	1760	157.2	157.2	1514	1473.2	265	1575	1651.0	32	60.3	2¼"
60"	1500	1810	162.0	162.0	1564	1524.0	271	1626	1701.8	32	60.3	2¼"

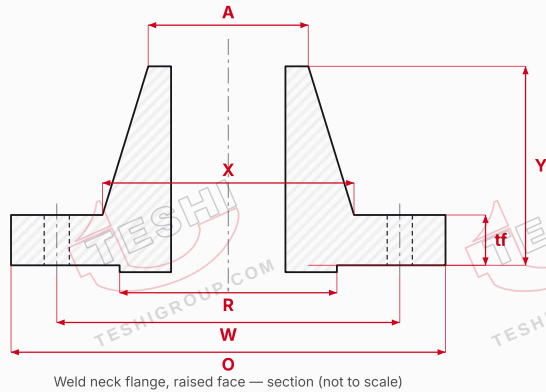
Notes

- Dimensions are in millimetres unless stated otherwise.
- Thickness and hub length exclude the raised face: 2 mm for Class 150 and 300, 7 mm for Class 600.
- Bolt holes are tabulated in inches in the standard; millimetre values are direct conversions.
- Some dimensions do not increase uniformly with size (Class 300 and 600 become more compact from NPS 38"). This follows the standard.

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ASME B16.47 Series A Flange Dimensions

Series A Class 600 (mm)



KEY TO DIMENSIONS

- O** Outside diameter of flange
tf Minimum thickness of weld neck and of blind flange, excluding the raised face
X Hub diameter at base
A Hub diameter at the welding end
Y Length through hub, excluding the raised face
R Diameter of raised face
W Bolt circle diameter
Holes Number and diameter of bolt holes

Series A Class 600 (mm)

NPS in	DN	O Outside dia	tf Weld neck	tf Blind	X Hub dia	A Hub at weld	Y Length thru hub	R Raised face dia	W Bolt circle	Holes No.	Hole dia mm	Bolt in
26"	650	1015	108.0	125.5	748	660.4	222	749	914.4	28	50.8	1½"
28"	700	1075	111.2	131.8	803	711.2	235	800	965.2	28	54.0	2"
30"	750	1130	114.3	139.7	862	762.0	248	857	1022.4	28	54.0	2"
32"	800	1195	117.5	147.7	918	812.8	260	914	1079.5	28	60.3	2¼"
34"	850	1245	120.7	154.0	973	863.6	270	965	1130.3	28	60.3	2¼"
36"	900	1315	123.9	162.0	1032	914.4	283	1022	1193.8	28	66.7	2½"
38"	950	1270	152.4	155.0	1022	965.2	254	1054	1162.0	28	60.3	2¼"
40"	1000	1320	158.8	162.0	1073	1016.0	264	1111	1212.8	32	60.3	2¼"
42"	1050	1405	168.3	171.5	1127	1066.8	279	1168	1282.7	28	66.7	2½"
44"	1100	1455	173.1	177.8	1181	1117.6	289	1226	1333.5	32	66.7	2½"
46"	1150	1510	179.4	185.8	1235	1168.4	300	1276	1390.6	32	66.7	2½"
48"	1200	1595	189.0	195.3	1289	1219.2	316	1334	1460.5	32	73.0	2¾"
50"	1250	1670	196.9	203.2	1343	1270.0	329	1384	1524.0	28	79.4	3"
52"	1300	1720	203.2	209.6	1394	1320.8	337	1435	1574.8	32	79.4	3"
54"	1350	1780	209.6	217.5	1448	1371.6	349	1492	1632.0	32	79.4	3"
56"	1400	1855	217.4	225.5	1502	1422.4	362	1543	1695.4	32	85.7	3¼"
58"	1450	1905	222.3	231.8	1553	1473.2	370	1600	1746.2	32	85.7	3¼"
60"	1500	1995	233.4	242.9	1610	1524.0	389	1657	1822.4	28	92.1	3½"

Notes

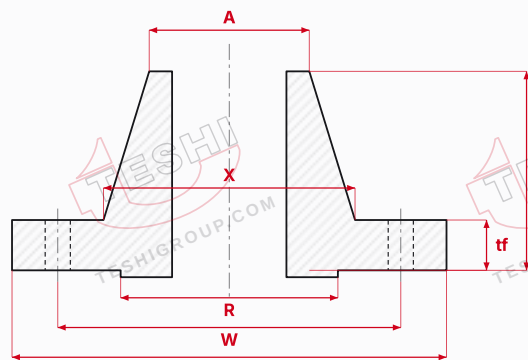
- Dimensions are in millimetres unless stated otherwise.
- Thickness and hub length exclude the raised face: 2 mm for Class 150 and 300, 7 mm for Class 600.
- Bolt holes are tabulated in inches in the standard; millimetre values are direct conversions.
- Some dimensions do not increase uniformly with size (Class 300 and 600 become more compact from NPS 38"). This follows the standard.

TG-DS-007 · Online: teshigroup.com/dimensional-standards/asme-b16-47-series-a-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.47 Series B Flange Dimensions

Series B Class 150 (mm)

ASME B16.47 Series B (formerly API 605) covers large-diameter weld neck and blind flanges from NPS 26" to 60". This chart gives the dimensions in millimetres for Class 150 and 300.



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
- tf** Minimum thickness of weld neck and of blind flange, excluding the raised face
- X** Hub diameter at base
- A** Hub diameter at the welding end
- Y** Length through hub, excluding the raised face
- R** Diameter of raised face
- W** Bolt circle diameter
- Holes** Number and diameter of bolt holes

Series B Class 150 (mm)

NPS in	DN	O Outside dia	tf Weld neck	tf Blind	X Hub dia	A Hub at weld	Y Length thru hub	R Raised face dia	W Bolt circle	Holes No.	Hole dia mm	Bolt in
26"	650	785	39.8	43.0	684	661.9	87	711	744.5	36	22.2	¾"
28"	700	835	43.0	46.2	735	712.7	94	762	795.3	40	22.2	¾"
30"	750	885	43.0	49.3	787	763.5	98	813	846.1	44	22.2	¾"
32"	800	940	44.6	52.5	840	814.3	106	864	900.1	48	22.2	¾"
34"	850	1005	47.7	55.7	892	865.1	109	921	957.3	40	25.4	⅞"
36"	900	1055	50.9	57.3	945	915.9	116	972	1009.6	44	25.4	⅞"
38"	950	1125	52.5	62.0	997	968.2	122	1022	1070.0	40	28.6	1"
40"	1000	1175	54.1	65.2	1049	1019.0	127	1080	1120.8	44	28.6	1"
42"	1050	1225	57.3	66.8	1102	1069.8	132	1130	1171.6	48	28.6	1"
44"	1100	1275	58.9	70.0	1153	1120.6	135	1181	1222.4	52	28.6	1"
46"	1150	1340	60.4	73.1	1205	1171.4	143	1235	1284.3	40	31.8	1½"
48"	1200	1390	63.6	76.3	1257	1222.2	148	1289	1335.1	44	31.8	1½"
50"	1250	1445	66.8	79.5	1308	1273.0	152	1340	1385.9	48	31.8	1½"
52"	1300	1495	68.4	82.7	1360	1323.8	156	1391	1436.7	52	31.8	1½"
54"	1350	1550	70.0	85.8	1413	1374.6	160	1441	1492.2	56	31.8	1½"
56"	1400	1600	71.6	89.0	1465	1425.4	165	1492	1543.0	60	31.8	1½"
58"	1450	1675	73.1	91.9	1516	1476.2	173	1543	1611.3	48	34.9	1¾"
60"	1500	1725	74.7	95.4	1570	1527.0	178	1600	1662.1	52	34.9	1¾"

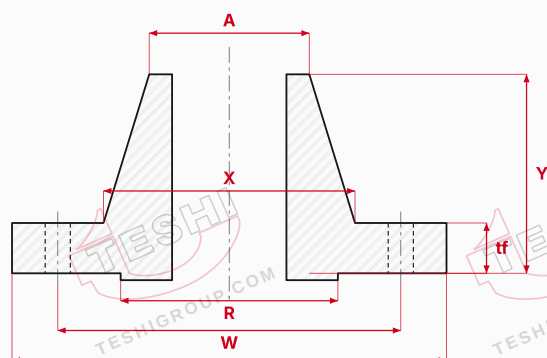
Notes

- Dimensions are in millimetres unless stated otherwise.
- Thickness and hub length exclude the raised face: 2 mm for Class 150 and 300.
- Bolt holes are tabulated in inches in the standard; millimetre values are direct conversions.
- Some dimensions do not increase uniformly with size (for example Class 300 thickness at NPS 54" and 60"). This follows the standard.

TG-DS-008 · Online: teshigroup.com/dimensional-standards/asme-b16-47-series-b-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.47 Series B Flange Dimensions

Series B Class 300 (mm)



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

- O** Outside diameter of flange
tf Minimum thickness of weld neck and of blind flange, excluding the raised face
X Hub diameter at base
A Hub diameter at the welding end
Y Length through hub, excluding the raised face
R Diameter of raised face
W Bolt circle diameter
Holes Number and diameter of bolt holes

Series B Class 300 (mm)

NPS in	DN	O Outside dia	tf Weld neck	tf Blind	X Hub dia	A Hub at weld	Y Length thru hub	R Raised face dia	W Bolt circle	Holes No.	Hole dia mm	Bolt in
26"	650	865	87.4	87.4	702	665.2	143	737	803.3	32	34.9	1¼"
28"	700	920	87.4	87.4	756	716.0	148	787	857.2	36	34.9	1¼"
30"	750	990	92.1	92.1	813	768.4	156	845	920.8	36	38.1	1½"
32"	800	1055	101.6	101.6	864	819.2	167	902	977.9	32	41.3	1¼"
34"	850	1110	101.6	101.6	918	870.0	171	953	1031.9	36	41.3	1½"
36"	900	1170	101.6	101.6	965	920.8	179	1010	1089.0	32	44.5	1½"
38"	950	1220	109.6	109.6	1016	971.6	190	1060	1139.8	36	44.5	1½"
40"	1000	1275	114.3	114.3	1067	1022.4	197	1114	1190.6	40	44.5	1½"
42"	1050	1335	117.5	117.5	1118	1074.7	203	1168	1244.6	36	47.6	1¼"
44"	1100	1385	125.5	125.5	1173	1125.5	213	1219	1295.4	40	47.6	1¼"
46"	1150	1460	127.0	128.6	1229	1176.3	221	1270	1365.2	36	50.8	1½"
48"	1200	1510	127.0	133.4	1278	1227.1	222	1327	1416.0	40	50.8	1½"
50"	1250	1560	136.6	138.2	1330	1277.9	233	1378	1466.8	44	50.8	1½"
52"	1300	1615	141.3	142.6	1383	1328.7	241	1429	1517.6	48	50.8	1½"
54"	1350	1675	135.0	147.7	1435	1379.5	238	1480	1578.0	48	50.8	1½"
56"	1400	1765	152.4	155.4	1494	1430.3	267	1537	1651.0	36	60.3	2¼"
58"	1450	1825	152.4	160.4	1548	1481.1	273	1594	1712.9	40	60.3	2¼"
60"	1500	1880	149.3	165.1	1599	1531.9	270	1651	1763.7	40	60.3	2¼"

Notes

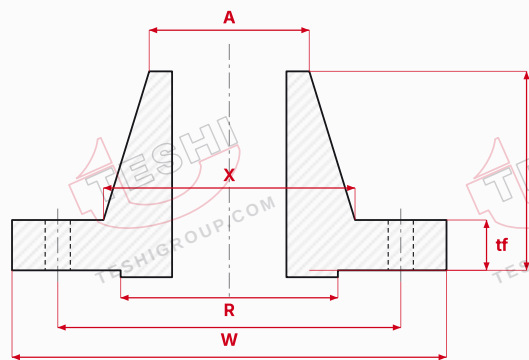
- Dimensions are in millimetres unless stated otherwise.
- Thickness and hub length exclude the raised face: 2 mm for Class 150 and 300.
- Bolt holes are tabulated in inches in the standard; millimetre values are direct conversions.
- Some dimensions do not increase uniformly with size (for example Class 300 thickness at NPS 54" and 60"). This follows the standard.

TG-DS-008 · Online: teshigroup.com/dimensional-standards/asme-b16-47-series-b-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.36 Orifice Flange Dimensions

Class 300 orifice flange dimensions (mm)

This chart gives **ASME B16.36** weld neck orifice flange dimensions in millimetres for **Class 300 and Class 600**, NPS 1" to 24". Orifice flanges are supplied in pairs to hold an orifice plate for flow measurement; each flange carries pressure taps and a jack screw.



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

O	Outside diameter of flange
T	Minimum flange thickness, excluding the raised face
R	Diameter of raised face
X	Hub diameter at base
Y	Length through hub
W	Bolt circle diameter
Holes	Number of bolt holes
Bolt	Nominal stud bolt diameter in inches
Stud	Stud bolt length for a raised-face orifice flange pair

Class 300 orifice flange dimensions (mm)

NPS in	O Outside dia	T Min thickness	R Raised face dia	X Hub dia	Y Length thru hub	W Bolt circle	Holes No.	Hole dia mm	Bolt in	Stud Length, mm
1"	125	36.6	50.8	54	81	88.9	4	19.1	5/8"	125
1½"	155	36.6	73.0	70	84	114.3	4	22.2	¾"	135
2"	165	36.6	92.1	84	84	127.0	8	19.1	5/8"	125
2½"	190	36.6	104.8	100	87	149.2	8	22.2	¾"	135
3"	210	36.6	127.0	117	87	168.3	8	22.2	¾"	135
4"	255	36.6	157.2	146	90	200.0	8	22.2	¾"	135
6"	320	36.6	215.9	206	98	269.9	12	22.2	¾"	135
8"	380	39.7	269.9	260	110	330.2	12	25.4	7/8"	145
10"	445	46.1	323.8	321	116	387.4	16	28.6	1"	165
12"	520	49.3	381.0	375	129	450.8	16	31.8	1½"	180
14"	585	52.4	412.8	425	141	514.4	20	31.8	1½"	185
16"	650	55.6	469.9	483	144	571.5	20	34.9	1¼"	195
18"	710	58.8	533.4	533	157	628.6	24	34.9	1¼"	205
20"	775	62.0	584.2	587	160	685.8	24	34.9	1¼"	215
24"	915	68.3	692.2	702	167	812.8	24	41.3	1½"	240

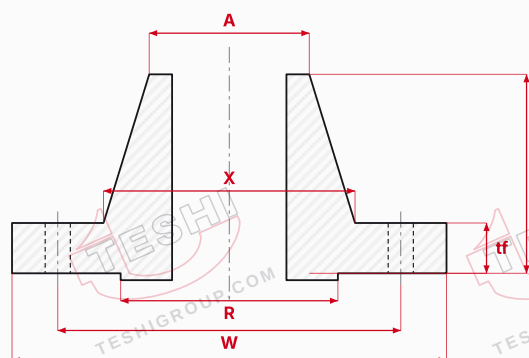
Notes

- Dimensions are in millimetres unless stated otherwise. Bolt holes and bolt diameters follow ASME B16.5 (inch); the mm values are conversions.
- The bore is machined to the pipe inside diameter specified by the purchaser.
- Each flange has two pressure taps, usually ½" NPT, on opposite sides; other tap sizes and orientations are supplied on request.
- One jack screw per flange, set 180° apart, is used to separate the flanges to change the orifice plate.
- Raised face height is 2 mm for Class 300; for Class 600 it is 2 mm at NPS 1–3 and 7 mm at NPS 4–24.
- Stud lengths include an allowance of about 6 mm for the orifice plate and gaskets (NPS 1–12).
- Class 600 orifice flanges from NPS 1 to 3 have the same dimensions as Class 300.

TG-DS-033 -- Online: teshigroup.com/dimensional-standards/asme-b16-36-orifice-flange-dimensions/ · Verify against the current edition of the standard.

ASME B16.36 Orifice Flange Dimensions

Class 600 orifice flange dimensions (mm)



Weld neck flange, raised face — section (not to scale)

KEY TO DIMENSIONS

O	Outside diameter of flange
T	Minimum flange thickness, excluding the raised face
R	Diameter of raised face
X	Hub diameter at base
Y	Length through hub
W	Bolt circle diameter
Holes	Number of bolt holes
Bolt	Nominal stud bolt diameter in inches
Stud	Stud bolt length for a raised-face orifice flange pair

Class 600 orifice flange dimensions (mm)

NPS in	O Outside dia	T Min thickness	R Raised face dia	X Hub dia	Y Length thru hub	W Bolt circle	Holes No.	Hole dia mm	Bolt in	Stud Length, mm
1"	125	36.6	50.8	54	81	88.9	4	19.1	5/8"	125
1½"	155	36.6	73.0	70	84	114.3	4	22.2	¾"	135
2"	165	36.6	92.1	84	84	127.0	8	19.1	5/8"	125
2½"	190	36.6	104.8	100	87	149.2	8	22.2	¾"	135
3"	210	36.6	127.0	117	87	168.3	8	22.2	¾"	135
4"	275	38.1	157.2	152	102	215.9	8	25.4	7/8"	150
6"	355	47.7	215.9	222	117	292.1	12	28.6	1"	180
8"	420	55.6	269.9	273	133	349.2	12	31.8	1½"	195
10"	510	63.5	323.8	343	152	431.8	16	34.9	1¼"	220
12"	560	66.7	381.0	400	156	489.0	20	34.9	1¼"	230
14"	605	69.9	412.8	432	165	527.0	20	38.1	1¾"	240
16"	685	76.2	469.9	495	178	603.2	20	41.3	1½"	260
18"	745	82.6	533.4	546	184	654.0	20	44.5	1¾"	280
20"	815	88.9	584.2	610	190	723.9	24	44.5	1¾"	300
24"	940	101.6	692.2	718	203	838.2	24	50.8	1¾"	335

Notes

- Dimensions are in millimetres unless stated otherwise. Bolt holes and bolt diameters follow ASME B16.5 (inch); the mm values are conversions.
- The bore is machined to the pipe inside diameter specified by the purchaser.
- Each flange has two pressure taps, usually ½" NPT, on opposite sides; other tap sizes and orientations are supplied on request.
- One jack screw per flange, set 180° apart, is used to separate the flanges to change the orifice plate.
- Raised face height is 2 mm for Class 300; for Class 600 it is 2 mm at NPS 1–3 and 7 mm at NPS 4–24.
- Stud lengths include an allowance of about 6 mm for the orifice plate and gaskets (NPS 1–12).
- Class 600 orifice flanges from NPS 1 to 3 have the same dimensions as Class 300.

TG-DS-033 · Online: teshigroup.com/dimensional-standards/asme-b16-36-orifice-flange-dimensions/ · Verify against the current edition of the standard.

PART 4

EN 1092-1 metric flanges

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EN 1092-1 PN10 Flange Dimensions

EN 1092-1 PN10 flange dimensions (mm)

This chart gives **EN 1092-1 PN10** flange dimensions in millimetres for DN 10 to DN 600: outside diameter, bolt circle, bolt holes and bolting and raised face diameter. EN 1092-1 PN10 is the European flange standard most often specified on export and European-design projects.

KEY TO DIMENSIONS

- A** Pipe outside diameter (EN 10220 / ISO series 1)
- D** Outside diameter of flange
- K** Bolt circle (pitch circle) diameter
- L** Bolt hole diameter
- n** Number of bolts
- d1** Raised face diameter

EN 1092-1 PN10 flange dimensions (mm)

DN	A Pipe OD	D Flange OD	K Bolt circle	L Hole dia	n Bolts	Bolt Size	d1 Raised face
10	17.2	90	60	14	4	M12	40
15	21.3	95	65	14	4	M12	45
20	26.9	105	75	14	4	M12	58
25	33.7	115	85	14	4	M12	68
32	42.4	140	100	18	4	M16	78
40	48.3	150	110	18	4	M16	88
50	60.3	165	125	18	4	M16	102
65	76.1	185	145	18	8	M16	122
80	88.9	200	160	18	8	M16	138
100	114.3	220	180	18	8	M16	158
125	139.7	250	210	18	8	M16	188
150	168.3	285	240	22	8	M20	212
200	219.1	340	295	22	8	M20	268
250	273.0	395	350	22	12	M20	320
300	323.9	445	400	22	12	M20	370
350	355.6	505	460	22	16	M20	430
400	406.4	565	515	26	16	M24	482
450	457.0	615	565	26	20	M24	532
500	508.0	670	620	26	20	M24	585
600	610.0	780	725	30	20	M27	685

Notes

- All dimensions are in millimetres.
- Flange outside diameter, bolt circle and drilling are common to all EN 1092-1 flange types of the same DN and PN, so flanges of different types mate with each other.
- Bolt sizes are metric (ISO). Bolt holes are 2–6 mm larger than the bolt, as tabulated.
- Up to DN 150, PN10 flanges use the PN16 dimensions; from DN 200 the PN10 drilling differs. Flange thickness depends on the flange type — confirm against the standard for your type.

TG-DS-030 · Online: [teshigroup.com/dimensional-standards/en-1092-1-pn10-flange-dimensions/](https://www.teshigroup.com/dimensional-standards/en-1092-1-pn10-flange-dimensions/) · Verify against the current edition of the standard.

EN 1092-1 PN16 Flange Dimensions

EN 1092-1 PN16 flange dimensions (mm)

This chart gives **EN 1092-1 PN16** flange dimensions in millimetres for DN 10 to DN 600: outside diameter, bolt circle, bolt holes and bolting, flange thickness and raised face. EN 1092-1 PN16 is the European flange standard most often specified on export and European-design projects.

KEY TO DIMENSIONS

- A** Pipe outside diameter (EN 10220 / ISO series 1)
- D** Outside diameter of flange
- K** Bolt circle (pitch circle) diameter
- L** Bolt hole diameter
- n** Number of bolts
- C1** Thickness of plate flange (Type 01)
- C2** Thickness of weld neck and blind flanges (Types 11 and 05)
- d1** Raised face diameter

EN 1092-1 PN16 flange dimensions (mm)

DN	A Pipe OD	D Flange OD	K Bolt circle	L Hole dia	n Bolts	Bolt Size	C1 Plate flange	C2 Weld neck / blind	d1 Raised face
10	17.2	90	60	14	4	M12	14	14	40
15	21.3	95	65	14	4	M12	14	14	45
20	26.9	105	75	14	4	M12	14	14	58
25	33.7	115	85	14	4	M12	16	16	68
32	42.4	140	100	18	4	M16	18	16	78
40	48.3	150	110	18	4	M16	18	16	88
50	60.3	165	125	18	4	M16	19	18	102
65	76.1	185	145	18	8	M16	20	18	122
80	88.9	200	160	18	8	M16	20	20	138
100	114.3	220	180	18	8	M16	22	20	158
125	139.7	250	210	18	8	M16	22	22	188
150	168.3	285	240	22	8	M20	24	22	212
200	219.1	340	295	22	12	M20	26	24	268
250	273.0	405	355	26	12	M24	29	26	320
300	323.9	460	410	26	12	M24	32	28	378
350	355.6	520	470	26	16	M24	35	30	438
400	406.4	580	525	30	16	M27	38	32	490
450	457.0	640	585	30	20	M27	42	40	550
500	508.0	715	650	33	20	M30	46	44	610
600	610.0	840	770	36	20	M33	52	54	725

Notes

- All dimensions are in millimetres.
- Flange outside diameter, bolt circle and drilling are common to all EN 1092-1 flange types of the same DN and PN, so flanges of different types mate with each other.
- Bolt sizes are metric (ISO). Bolt holes are 2–6 mm larger than the bolt, as tabulated.
- C1 applies to plate flanges (Type 01); C2 to weld neck (Type 11) and blind (Type 05) flanges. Thickness excludes the raised face.
- DN 65 PN16 flanges have 8 bolt holes; 4-hole drilling is permitted by agreement.

TG-DS-029 · Online: teshigroup.com/dimensional-standards/en-1092-1-pn16-flange-dimensions/ · Verify against the current edition of the standard.

EN 1092-1 PN25 Flange Dimensions

EN 1092-1 PN25 flange dimensions (mm)

This chart gives **EN 1092-1 PN25** flange dimensions in millimetres for DN 10 to DN 600: outside diameter, bolt circle, bolt holes and bolting, flange thickness, EN 1092-1 PN25 is the European flange standard most often specified on export and European-design projects.

KEY TO DIMENSIONS

- A** Pipe outside diameter (EN 10220 / ISO series 1)
- D** Outside diameter of flange
- K** Bolt circle (pitch circle) diameter
- L** Bolt hole diameter
- n** Number of bolts
- C1** Thickness of plate flange (Type 01)
- C2** Thickness of weld neck and blind flanges (Types 11 and 05)

EN 1092-1 PN25 flange dimensions (mm)

DN	A Pipe OD	D Flange OD	K Bolt circle	L Hole dia	n Bolts	Bolt Size	C1 Plate flange	C2 Weld neck / blind
10	17.2	90	60	14	4	M12	14	14
15	21.3	95	65	14	4	M12	14	14
20	26.9	105	75	14	4	M12	14	14
25	33.7	115	85	14	4	M12	16	16
32	42.4	140	100	18	4	M16	18	16
40	48.3	150	110	18	4	M16	18	16
50	60.3	165	125	18	4	M16	20	20
65	76.1	185	145	18	8	M16	22	22
80	88.9	200	160	18	8	M16	24	24
100	114.3	235	190	22	8	M20	26	24
125	139.7	270	220	26	8	M24	28	26
150	168.3	300	250	26	8	M24	30	28
200	219.1	360	310	26	12	M24	32	30
250	273.0	425	370	30	12	M27	35	32
300	323.9	485	430	30	16	M27	38	34
350	355.6	555	490	33	16	M30	42	38
400	406.4	620	550	36	16	M33	46	40
450	457.0	670	600	36	20	M33	50	46
500	508.0	730	660	36	20	M33	56	48
600	610.0	845	770	39	20	M36	68	58

Notes

- All dimensions are in millimetres.
- Flange outside diameter, bolt circle and drilling are common to all EN 1092-1 flange types of the same DN and PN, so flanges of different types mate with each other.
- Bolt sizes are metric (ISO). Bolt holes are 2–6 mm larger than the bolt, as tabulated.
- C1 applies to plate flanges (Type 01); C2 to weld neck (Type 11) and blind (Type 05) flanges. Thickness excludes the raised face.
- Up to DN 150, PN25 and PN40 flanges share the same dimensions; from DN 200 they differ.

TG-DS-031 · Online: [teshigroup.com/dimensional-standards/en-1092-1-pn25-flange-dimensions/](https://www.teshigroup.com/dimensional-standards/en-1092-1-pn25-flange-dimensions/) · Verify against the current edition of the standard.

EN 1092-1 PN40 Flange Dimensions

EN 1092-1 PN40 flange dimensions (mm)

This chart gives **EN 1092-1 PN40** flange dimensions in millimetres for DN 10 to DN 600: outside diameter, bolt circle, bolt holes and bolting, flange thickness, EN 1092-1 PN40 is the European flange standard most often specified on export and European-design projects.

KEY TO DIMENSIONS

- A** Pipe outside diameter (EN 10220 / ISO series 1)
- D** Outside diameter of flange
- K** Bolt circle (pitch circle) diameter
- L** Bolt hole diameter
- n** Number of bolts
- C1** Thickness of plate flange (Type 01)
- C2** Thickness of weld neck and blind flanges (Types 11 and 05)

EN 1092-1 PN40 flange dimensions (mm)

DN	A Pipe OD	D Flange OD	K Bolt circle	L Hole dia	n Bolts	Bolt Size	C1 Plate flange	C2 Weld neck / blind
10	17.2	90	60	14	4	M12	14	14
15	21.3	95	65	14	4	M12	14	14
20	26.9	105	75	14	4	M12	14	14
25	33.7	115	85	14	4	M12	16	16
32	42.4	140	100	18	4	M16	18	16
40	48.3	150	110	18	4	M16	18	16
50	60.3	165	125	18	4	M16	20	20
65	76.1	185	145	18	8	M16	22	22
80	88.9	200	160	18	8	M16	24	24
100	114.3	235	190	22	8	M20	26	24
125	139.7	270	220	26	8	M24	28	26
150	168.3	300	250	26	8	M24	30	28
200	219.1	375	320	30	12	M27	36	34
250	273.0	450	385	33	12	M30	42	38
300	323.9	515	450	33	16	M30	48	42
350	355.6	580	510	36	16	M33	54	46
400	406.4	660	585	39	16	M36	60	50
450	457.0	685	610	39	20	M36	66	57
500	508.0	755	670	42	20	M39	72	57
600	610.0	890	795	48	20	M45	84	72

Notes

- All dimensions are in millimetres.
- Flange outside diameter, bolt circle and drilling are common to all EN 1092-1 flange types of the same DN and PN, so flanges of different types mate with each other.
- Bolt sizes are metric (ISO). Bolt holes are 2–6 mm larger than the bolt, as tabulated.
- C1 applies to plate flanges (Type 01); C2 to weld neck (Type 11) and blind (Type 05) flanges. Thickness excludes the raised face.
- Up to DN 150, PN25 and PN40 flanges share the same dimensions; from DN 200 they differ.

TG-DS-032 · Online: [teshigroup.com/dimensional-standards/en-1092-1-pn40-flange-dimensions/](https://www.teshigroup.com/dimensional-standards/en-1092-1-pn40-flange-dimensions/) · Verify against the current edition of the standard.

PART 5

Pressure–temperature ratings

ASME B16.5 Flange Pressure–Temperature Ratings

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ASME B16.5 Flange Pressure–Temperature Ratings

Material Group 1.1: A105, A350 LF2, A216 WCB

A flange class is not a pressure. The **maximum allowable working pressure** of an ASME B16.5 flange depends on its class, its material group and the design temperature. These tables give the ratings in bar gauge for the material groups most often specified.

Material Group 1.1: A105, A350 LF2, A216 WCB

Temp. °C	Temp. °F	METRIC						IMPERIAL					
		Class 150 bar	Class 300 bar	Class 600 bar	Class 900 bar	Class 1500 bar	Class 2500 bar	Class 150 psi	Class 300 psi	Class 600 psi	Class 900 psi	Class 1500 psi	Class 2500 psi
–29 to 38	–20 to 100	19.6	51.1	102.1	153.2	255.3	425.5	284	741	1481	2222	3703	6171
50	122	19.2	50.1	100.2	150.4	250.6	417.7	278	727	1453	2181	3635	6058
100	212	17.7	46.6	93.2	139.8	233.0	388.3	257	676	1352	2028	3379	5632
150	302	15.8	45.1	90.2	135.2	225.4	375.6	229	654	1308	1961	3269	5448
200	392	13.8	43.8	87.6	131.4	219.0	365.0	200	635	1271	1906	3176	5294
250	482	12.1	41.9	83.9	125.8	209.7	349.5	175	608	1217	1825	3041	5069
300	572	10.2	39.8	79.6	119.5	199.1	331.8	148	577	1155	1733	2888	4812
325	617	9.3	38.7	77.4	116.1	193.6	322.6	135	561	1123	1684	2808	4679
350	662	8.4	37.6	75.1	112.7	187.8	313.0	122	545	1089	1635	2724	4540
375	707	7.4	36.4	72.7	109.1	181.8	303.1	107	528	1054	1582	2637	4396
400	752	6.5	34.7	69.4	104.2	173.6	289.3	94	503	1007	1511	2518	4196
425	797	5.5	28.8	57.5	86.3	143.8	239.7	80	418	834	1252	2086	3477
450	842	4.6	23.0	46.0	69.0	115.0	191.7	67	334	667	1001	1668	2780
475	887	3.7	17.4	34.9	52.3	87.2	145.3	54	252	506	759	1265	2107
500	932	2.8	11.8	23.5	35.3	58.8	97.9	41	171	341	512	853	1420
538	1000	1.4	5.9	11.8	17.7	29.5	49.2	20	86	171	257	428	714

Notes

- Working pressures are in bar gauge. Linear interpolation between temperatures is permitted by the standard.
- Group 1.1 includes ASTM A105, A350 LF2 and A216 WCB. Prolonged use of carbon steel above about 425 °C is not recommended because of graphitisation.
- Group 2.3: F304L is not to be used above 425 °C; F316L is rated to 450 °C.
- Ratings are those of the ASME B16.5 metric tables in the 2013 to 2020 editions. Confirm against the edition your project specifies.
- The Group 1.9 (F11 Cl.2) table was cross-checked against the equivalent ASME B16.34 valve ratings; confirm it against the current edition of ASME B16.5 for design.

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ASME B16.5 Flange Pressure–Temperature Ratings

Material Group 1.9: A182 F11 Cl.2 (also A217 WC6)

Material Group 1.9: A182 F11 Cl.2 (also A217 WC6)

Temp. °C	Temp. °F	METRIC						IMPERIAL					
		Class 150 bar	Class 300 bar	Class 600 bar	Class 900 bar	Class 1500 bar	Class 2500 bar	Class 150 psi	Class 300 psi	Class 600 psi	Class 900 psi	Class 1500 psi	Class 2500 psi
–29 to 38	–20 to 100	19.8	51.7	103.4	155.1	258.6	430.9	287	750	1500	2250	3751	6250
50	122	19.5	51.7	103.4	155.1	258.6	430.9	283	750	1500	2250	3751	6250
100	212	17.7	51.5	103.0	154.4	257.4	429.0	257	747	1494	2239	3733	6222
150	302	15.8	49.7	99.5	149.2	248.7	414.5	229	721	1443	2164	3607	6012
200	392	13.8	48.0	95.9	143.9	239.8	399.6	200	696	1391	2087	3478	5796
250	482	12.1	46.3	92.7	139.0	231.8	386.2	175	672	1345	2016	3362	5601
300	572	10.2	42.9	85.7	128.6	214.4	357.1	148	622	1243	1865	3110	5179
325	617	9.3	41.4	82.6	124.0	206.6	344.3	135	600	1198	1798	2996	4994
350	662	8.4	40.3	80.4	120.7	201.1	335.3	122	585	1166	1751	2917	4863
375	707	7.4	38.9	77.6	116.5	194.1	323.2	107	564	1125	1690	2815	4688
400	752	6.5	36.5	73.3	109.8	183.1	304.9	94	529	1063	1593	2656	4422
425	797	5.5	35.2	70.0	105.1	175.1	291.6	80	511	1015	1524	2540	4229
450	842	4.6	33.7	67.7	101.4	169.0	281.8	67	489	982	1471	2451	4087
475	887	3.7	31.7	63.4	95.1	158.2	263.9	54	460	920	1379	2295	3828
500	932	2.8	25.7	51.5	77.2	128.6	214.4	41	373	747	1120	1865	3110
538	1000	1.4	14.9	29.8	44.7	74.5	124.1	20	216	432	648	1081	1800

Notes

- Working pressures are in bar gauge. Linear interpolation between temperatures is permitted by the standard.
- Group 1.1 includes ASTM A105, A350 LF2 and A216 WCB. Prolonged use of carbon steel above about 425 °C is not recommended because of graphitisation.
- Group 2.3: F304L is not to be used above 425 °C; F316L is rated to 450 °C.
- Ratings are those of the ASME B16.5 metric tables in the 2013 to 2020 editions. Confirm against the edition your project specifies.
- The Group 1.9 (F11 Cl.2) table was cross-checked against the equivalent ASME B16.34 valve ratings; confirm it against the current edition of ASME B16.5 for design.

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ASME B16.5 Flange Pressure–Temperature Ratings

Material Group 1.10: A182 F22 Cl.3 (also A217 WC9)

Material Group 1.10: A182 F22 Cl.3 (also A217 WC9)

Temp. °C	Temp. °F	METRIC						IMPERIAL					
		Class 150 bar	Class 300 bar	Class 600 bar	Class 900 bar	Class 1500 bar	Class 2500 bar	Class 150 psi	Class 300 psi	Class 600 psi	Class 900 psi	Class 1500 psi	Class 2500 psi
–29 to 38	–20 to 100	19.8	51.7	103.4	155.1	258.6	430.9	287	750	1500	2250	3751	6250
50	122	19.5	51.7	103.4	155.1	258.6	430.9	283	750	1500	2250	3751	6250
100	212	17.7	51.5	103.0	154.6	257.6	429.4	257	747	1494	2242	3736	6228
150	302	15.8	50.3	100.3	150.6	250.8	418.2	229	730	1455	2184	3638	6065
200	392	13.8	48.6	97.2	145.8	243.4	405.4	200	705	1410	2115	3530	5880
250	482	12.1	46.3	92.7	139.0	231.8	386.2	175	672	1345	2016	3362	5601
300	572	10.2	42.9	85.7	128.6	214.4	357.1	148	622	1243	1865	3110	5179
325	617	9.3	41.4	82.6	124.0	206.6	344.3	135	600	1198	1798	2996	4994
350	662	8.4	40.3	80.4	120.7	201.1	335.3	122	585	1166	1751	2917	4863
375	707	7.4	38.9	77.6	116.5	194.1	323.2	107	564	1125	1690	2815	4688
400	752	6.5	36.5	73.3	109.8	183.1	304.9	94	529	1063	1593	2656	4422
425	797	5.5	35.2	70.0	105.1	175.1	291.6	80	511	1015	1524	2540	4229
450	842	4.6	33.7	67.7	101.4	169.0	281.8	67	489	982	1471	2451	4087
475	887	3.7	31.7	63.4	95.1	158.2	263.9	54	460	920	1379	2295	3828
500	932	2.8	28.2	56.5	84.7	140.9	235.0	41	409	819	1228	2044	3408
538	1000	1.4	18.4	36.9	55.3	92.2	153.7	20	267	535	802	1337	2229

Notes

- Working pressures are in bar gauge. Linear interpolation between temperatures is permitted by the standard.
- Group 1.1 includes ASTM A105, A350 LF2 and A216 WCB. Prolonged use of carbon steel above about 425 °C is not recommended because of graphitisation.
- Group 2.3: F304L is not to be used above 425 °C; F316L is rated to 450 °C.
- Ratings are those of the ASME B16.5 metric tables in the 2013 to 2020 editions. Confirm against the edition your project specifies.
- The Group 1.9 (F11 Cl.2) table was cross-checked against the equivalent ASME B16.34 valve ratings; confirm it against the current edition of ASME B16.5 for design.

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ASME B16.5 Flange Pressure–Temperature Ratings

Material Group 2.1: A182 F304 / F304H

Material Group 2.1: A182 F304 / F304H

Temp. °C	Temp. °F	METRIC						IMPERIAL					
		Class 150 bar	Class 300 bar	Class 600 bar	Class 900 bar	Class 1500 bar	Class 2500 bar	Class 150 psi	Class 300 psi	Class 600 psi	Class 900 psi	Class 1500 psi	Class 2500 psi
–29 to 38	–20 to 100	19.0	49.6	99.3	148.9	248.2	413.7	276	719	1440	2160	3600	6000
50	122	18.3	47.8	95.6	143.5	239.1	398.5	265	693	1387	2081	3468	5780
100	212	15.7	40.9	81.7	122.6	204.3	340.4	228	593	1185	1778	2963	4937
150	302	14.2	37.0	74.0	111.0	185.0	308.4	206	537	1073	1610	2683	4473
200	392	13.2	34.5	69.0	103.4	172.4	287.3	191	500	1001	1500	2500	4167
250	482	12.1	32.5	65.0	97.5	162.4	270.7	175	471	943	1414	2355	3926
300	572	10.2	30.9	61.8	92.7	154.6	257.6	148	448	896	1345	2242	3736
325	617	9.3	30.2	60.4	90.7	151.1	251.9	135	438	876	1315	2192	3654
350	662	8.4	29.6	59.3	88.9	148.1	246.9	122	429	860	1289	2148	3581
375	707	7.4	29.0	58.1	87.1	145.2	241.9	107	421	843	1263	2106	3508
400	752	6.5	28.4	56.9	85.3	142.2	237.0	94	412	825	1237	2062	3437
425	797	5.5	28.0	56.0	84.0	140.0	233.3	80	406	812	1218	2031	3384
450	842	4.6	27.4	54.8	82.2	137.0	228.4	67	397	795	1192	1987	3313
475	887	3.7	26.9	53.9	80.8	134.7	224.5	54	390	782	1172	1954	3256
500	932	2.8	26.5	53.0	79.5	132.4	220.7	41	384	769	1153	1920	3201
538	1000	1.4	24.4	48.9	73.3	122.1	203.6	20	354	709	1063	1771	2953

Notes

- Working pressures are in bar gauge. Linear interpolation between temperatures is permitted by the standard.
- Group 1.1 includes ASTM A105, A350 LF2 and A216 WCB. Prolonged use of carbon steel above about 425 °C is not recommended because of graphitisation.
- Group 2.3: F304L is not to be used above 425 °C; F316L is rated to 450 °C.
- Ratings are those of the ASME B16.5 metric tables in the 2013 to 2020 editions. Confirm against the edition your project specifies.
- The Group 1.9 (F11 Cl.2) table was cross-checked against the equivalent ASME B16.34 valve ratings; confirm it against the current edition of ASME B16.5 for design.

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ASME B16.5 Flange Pressure–Temperature Ratings

Material Group 2.2: A182 F316 / F316H

Material Group 2.2: A182 F316 / F316H

Temp. °C	Temp. °F	METRIC						IMPERIAL					
		Class 150 bar	Class 300 bar	Class 600 bar	Class 900 bar	Class 1500 bar	Class 2500 bar	Class 150 psi	Class 300 psi	Class 600 psi	Class 900 psi	Class 1500 psi	Class 2500 psi
–29 to 38	–20 to 100	19.0	49.6	99.3	148.9	248.2	413.7	276	719	1440	2160	3600	6000
50	122	18.4	48.1	96.2	144.3	240.6	400.9	267	698	1395	2093	3490	5815
100	212	16.2	42.2	84.4	126.6	211.0	351.6	235	612	1224	1836	3060	5100
150	302	14.8	38.5	77.0	115.5	192.5	320.8	215	558	1117	1675	2792	4653
200	392	13.7	35.7	71.3	107.0	178.3	297.2	199	518	1034	1552	2586	4311
250	482	12.1	33.4	66.8	100.1	166.9	278.1	175	484	969	1452	2421	4034
300	572	10.2	31.6	63.2	94.9	158.1	263.5	148	458	917	1376	2293	3822
325	617	9.3	30.9	61.8	92.7	154.4	257.4	135	448	896	1345	2239	3733
350	662	8.4	30.3	60.7	91.0	151.6	252.7	122	439	880	1320	2199	3665
375	707	7.4	29.9	59.8	89.6	149.4	249.0	107	434	867	1300	2167	3611
400	752	6.5	29.4	58.9	88.3	147.2	245.3	94	426	854	1281	2135	3558
425	797	5.5	29.1	58.3	87.4	145.7	242.9	80	422	846	1268	2113	3523
450	842	4.6	28.8	57.7	86.5	144.2	240.4	67	418	837	1255	2091	3487
475	887	3.7	28.7	57.3	86.0	143.4	238.9	54	416	831	1247	2080	3465
500	932	2.8	28.2	56.5	84.7	140.9	235.0	41	409	819	1228	2044	3408
538	1000	1.4	25.2	50.0	75.2	125.5	208.9	20	365	725	1091	1820	3030

Notes

- Working pressures are in bar gauge. Linear interpolation between temperatures is permitted by the standard.
- Group 1.1 includes ASTM A105, A350 LF2 and A216 WCB. Prolonged use of carbon steel above about 425 °C is not recommended because of graphitisation.
- Group 2.3: F304L is not to be used above 425 °C; F316L is rated to 450 °C.
- Ratings are those of the ASME B16.5 metric tables in the 2013 to 2020 editions. Confirm against the edition your project specifies.
- The Group 1.9 (F11 Cl.2) table was cross-checked against the equivalent ASME B16.34 valve ratings; confirm it against the current edition of ASME B16.5 for design.

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ASME B16.5 Flange Pressure–Temperature Ratings

Material Group 2.3: A182 F304L / F316L

Material Group 2.3: A182 F304L / F316L

Temp. °C	Temp. °F	METRIC						IMPERIAL					
		Class 150 bar	Class 300 bar	Class 600 bar	Class 900 bar	Class 1500 bar	Class 2500 bar	Class 150 psi	Class 300 psi	Class 600 psi	Class 900 psi	Class 1500 psi	Class 2500 psi
–29 to 38	–20 to 100	15.9	41.4	82.7	124.1	206.8	344.7	231	600	1199	1800	2999	4999
50	122	15.3	40.0	80.0	120.1	200.1	333.5	222	580	1160	1742	2902	4837
100	212	13.3	34.8	69.6	104.4	173.9	289.9	193	505	1009	1514	2522	4205
150	302	12.0	31.4	62.8	94.2	157.0	261.6	174	455	911	1366	2277	3794
200	392	11.2	29.2	58.3	87.5	145.8	243.0	162	424	846	1269	2115	3524
250	482	10.5	27.5	54.9	82.4	137.3	228.9	152	399	796	1195	1991	3320
300	572	10.0	26.1	52.1	78.2	130.3	217.2	145	379	756	1134	1890	3150
325	617	9.3	25.5	51.0	76.4	127.4	212.3	135	370	740	1108	1848	3079
350	662	8.4	25.1	50.1	75.2	125.4	208.9	122	364	727	1091	1819	3030
375	707	7.4	24.8	49.5	74.3	123.8	206.3	107	360	718	1078	1796	2992
400	752	6.5	24.3	48.6	72.9	121.5	202.5	94	352	705	1057	1762	2937
425	797	5.5	23.9	47.7	71.6	119.3	198.8	80	347	692	1038	1730	2883
450	842	4.6	23.4	46.8	70.2	117.1	195.1	67	339	679	1018	1698	2830

Notes

- Working pressures are in bar gauge. Linear interpolation between temperatures is permitted by the standard.
- Group 1.1 includes ASTM A105, A350 LF2 and A216 WCB. Prolonged use of carbon steel above about 425 °C is not recommended because of graphitisation.
- Group 2.3: F304L is not to be used above 425 °C; F316L is rated to 450 °C.
- Ratings are those of the ASME B16.5 metric tables in the 2013 to 2020 editions. Confirm against the edition your project specifies.
- The Group 1.9 (F11 Cl.2) table was cross-checked against the equivalent ASME B16.34 valve ratings; confirm it against the current edition of ASME B16.5 for design.

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PART 6

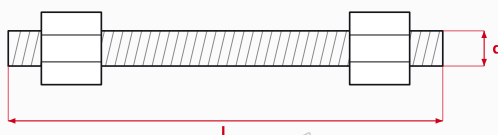
Bolting & gaskets

Stud Bolt Chart for ASME B16.5 Flanges	50
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Stud Bolt Chart for ASME B16.5 Flanges

Class 150 stud bolts

This chart lists the **number, diameter and length of stud bolts** for every ASME B16.5 flange from Class 150 to Class 2500, for raised-face and ring-joint facings. Each stud is used with two heavy hex nuts.



Stud bolt with two heavy hex nuts; L excludes the point height at each end

Class 150 stud bolts

NPS in	No. of studs	Stud dia in	METRIC		IMPERIAL	
			Length Raised face, mm	Length Ring joint, mm	Length Raised face, in	Length Ring joint, in
½"	4	½"	55	—	2.17	—
¾"	4	½"	65	—	2.56	—
1"	4	½"	65	75	2.56	2.95
1¼"	4	½"	70	85	2.76	3.35
1½"	4	½"	70	85	2.76	3.35
2"	4	⅝"	85	95	3.35	3.74
2½"	4	⅝"	90	100	3.54	3.94
3"	4	⅝"	90	100	3.54	3.94
3½"	8	⅝"	90	100	3.54	3.94
4"	8	⅝"	90	100	3.54	3.94
5"	8	¾"	95	110	3.74	4.33
6"	8	¾"	100	115	3.94	4.53
8"	8	¾"	110	120	4.33	4.72
10"	12	⅞"	115	125	4.53	4.92
12"	12	⅞"	120	135	4.72	5.31
14"	12	1"	135	145	5.31	5.71
16"	16	1"	135	145	5.31	5.71
18"	16	1⅛"	145	160	5.71	6.30
20"	20	1⅛"	160	170	6.30	6.69
24"	20	1¼"	170	185	6.69	7.28

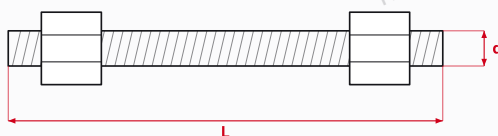
Notes

- Lengths are in millimetres for a 2 mm raised face (Class 150 and 300) or 7 mm raised face (Class 600 and above), and for ring-joint flanges with the standard ring.
- Stud lengths are those tabulated in ASME B16.5 and do not include the height of the points.
- Different lengths are needed for lap joint flanges, for spectacle blinds or orifice plates in the joint, and when bolt tensioners are used.

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Stud Bolt Chart for ASME B16.5 Flanges

Class 300 stud bolts



Stud bolt with two heavy hex nuts; L excludes the point height at each end

Class 300 stud bolts

NPS in	No. of studs	Stud dia in	METRIC		IMPERIAL	
			Length Raised face, mm	Length Ring joint, mm	Length Raised face, in	Length Ring joint, in
½"	4	½"	65	75	2.56	2.95
¾"	4	⅝"	75	90	2.95	3.54
1"	4	⅝"	75	90	2.95	3.54
1¼"	4	⅝"	85	95	3.35	3.74
1½"	4	¾"	90	100	3.54	3.94
2"	8	⅝"	90	100	3.54	3.94
2½"	8	¾"	100	115	3.94	4.53
3"	8	¾"	110	120	4.33	4.72
3½"	8	¾"	110	125	4.33	4.92
4"	8	¾"	115	125	4.53	4.92
5"	8	¾"	120	135	4.72	5.31
6"	12	¾"	120	140	4.72	5.51
8"	12	⅞"	140	150	5.51	5.91
10"	16	1"	160	170	6.30	6.69
12"	16	1⅝"	170	185	6.69	7.28
14"	20	1⅝"	180	190	7.09	7.48
16"	20	1¾"	190	205	7.48	8.07
18"	24	1¾"	195	210	7.68	8.27
20"	24	1¾"	205	220	8.07	8.66
24"	24	1½"	230	255	9.06	10.04

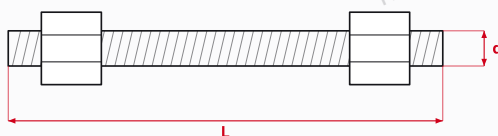
Notes

- Lengths are in millimetres for a 2 mm raised face (Class 150 and 300) or 7 mm raised face (Class 600 and above), and for ring-joint flanges with the standard ring.
- Stud lengths are those tabulated in ASME B16.5 and do not include the height of the points.
- Different lengths are needed for lap joint flanges, for spectacle blinds or orifice plates in the joint, and when bolt tensioners are used.

TG-DS-011 · Online: teshigroup.com/dimensional-standards/stud-bolt-chart-asme-b16-5-flanges/ · Verify against the current edition of the standard.

Stud Bolt Chart for ASME B16.5 Flanges

Class 600 stud bolts



Stud bolt with two heavy hex nuts; L excludes the point height at each end

Class 600 stud bolts

NPS in	No. of studs	Stud dia in	METRIC		IMPERIAL	
			Length Raised face, mm	Length Ring joint, mm	Length Raised face, in	Length Ring joint, in
½"	4	½"	75	75	2.95	2.95
¾"	4	⅝"	90	90	3.54	3.54
1"	4	⅝"	90	90	3.54	3.54
1¼"	4	⅝"	95	95	3.74	3.74
1½"	4	¾"	110	110	4.33	4.33
2"	8	⅝"	110	110	4.33	4.33
2½"	8	¾"	120	120	4.72	4.72
3"	8	¾"	125	125	4.92	4.92
3½"	8	⅞"	140	140	5.51	5.51
4"	8	⅞"	145	145	5.71	5.71
5"	8	1"	165	165	6.50	6.50
6"	12	1"	170	170	6.69	6.69
8"	12	1⅝"	190	195	7.48	7.68
10"	16	1¼"	215	215	8.46	8.46
12"	20	1¼"	220	220	8.66	8.66
14"	20	1⅝"	235	235	9.25	9.25
16"	20	1½"	255	255	10.04	10.04
18"	20	1⅝"	275	275	10.83	10.83
20"	24	1⅝"	285	290	11.22	11.42
24"	24	1⅞"	330	335	12.99	13.19

Notes

- Lengths are in millimetres for a 2 mm raised face (Class 150 and 300) or 7 mm raised face (Class 600 and above), and for ring-joint flanges with the standard ring.
- Stud lengths are those tabulated in ASME B16.5 and do not include the height of the points.
- Different lengths are needed for lap joint flanges, for spectacle blinds or orifice plates in the joint, and when bolt tensioners are used.

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Stud Bolt Chart for ASME B16.5 Flanges

Class 900 stud bolts



Stud bolt with two heavy hex nuts; L excludes the point height at each end

Class 900 stud bolts

NPS in	No. of studs	Stud dia in	METRIC		IMPERIAL	
			Length Raised face, mm	Length Ring joint, mm	Length Raised face, in	Length Ring joint, in
½"	4	¾"	110	110	4.33	4.33
¾"	4	¾"	115	115	4.53	4.53
1"	4	7⁄8"	125	125	4.92	4.92
1¼"	4	7⁄8"	125	125	4.92	4.92
1½"	4	1"	140	140	5.51	5.51
2"	8	7⁄8"	145	145	5.71	5.71
2½"	8	1"	160	160	6.30	6.30
3"	8	7⁄8"	145	145	5.71	5.71
4"	8	1½"	170	170	6.69	6.69
5"	8	1½"	190	190	7.48	7.48
6"	12	1½"	190	195	7.48	7.68
8"	12	1¾"	220	220	8.66	8.66
10"	16	1¾"	235	235	9.25	9.25
12"	20	1¾"	255	255	10.04	10.04
14"	20	1½"	275	280	10.83	11.02
16"	20	1¾"	285	290	11.22	11.42
18"	20	1¾"	325	335	12.80	13.19
20"	20	2"	350	360	13.78	14.17
24"	20	2½"	440	455	17.32	17.91

Notes

- Lengths are in millimetres for a 2 mm raised face (Class 150 and 300) or 7 mm raised face (Class 600 and above), and for ring-joint flanges with the standard ring.
- Stud lengths are those tabulated in ASME B16.5 and do not include the height of the points.
- Different lengths are needed for lap joint flanges, for spectacle blinds or orifice plates in the joint, and when bolt tensioners are used.

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Stud Bolt Chart for ASME B16.5 Flanges

Class 1500 stud bolts



Stud bolt with two heavy hex nuts; L excludes the point height at each end

Class 1500 stud bolts

NPS in	No. of studs	Stud dia in	METRIC		IMPERIAL	
			Length Raised face, mm	Length Ring joint, mm	Length Raised face, in	Length Ring joint, in
½"	4	¾"	110	110	4.33	4.33
¾"	4	¾"	115	115	4.53	4.53
1"	4	⅞"	125	125	4.92	4.92
1¼"	4	⅞"	125	125	4.92	4.92
1½"	4	1"	140	140	5.51	5.51
2"	8	⅞"	145	145	5.71	5.71
2½"	8	1"	160	160	6.30	6.30
3"	8	1⅛"	180	180	7.09	7.09
4"	8	1¼"	195	195	7.68	7.68
5"	8	1½"	250	250	9.84	9.84
6"	12	1⅜"	260	265	10.24	10.43
8"	12	1⅝"	290	300	11.42	11.81
10"	12	1⅞"	335	345	13.19	13.58
12"	16	2"	375	385	14.76	15.16
14"	16	2¼"	405	425	15.94	16.73
16"	16	2½"	445	470	17.52	18.50
18"	16	2¾"	495	525	19.49	20.67
20"	16	3"	540	565	21.26	22.24
24"	16	3½"	615	650	24.21	25.59

Notes

- Lengths are in millimetres for a 2 mm raised face (Class 150 and 300) or 7 mm raised face (Class 600 and above), and for ring-joint flanges with the standard ring.
- Stud lengths are those tabulated in ASME B16.5 and do not include the height of the points.
- Different lengths are needed for lap joint flanges, for spectacle blinds or orifice plates in the joint, and when bolt tensioners are used.

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Stud Bolt Chart for ASME B16.5 Flanges

Class 2500 stud bolts



Stud bolt with two heavy hex nuts; L excludes the point height at each end

Class 2500 stud bolts

NPS in	No. of studs	Stud dia in	METRIC		IMPERIAL	
			Length Raised face, mm	Length Ring joint, mm	Length Raised face, in	Length Ring joint, in
½"	4	¾"	120	120	4.72	4.72
¾"	4	¾"	125	125	4.92	4.92
1"	4	7/8"	140	140	5.51	5.51
1¼"	4	1"	150	150	5.91	5.91
1½"	4	1⅛"	170	170	6.69	6.69
2"	8	1"	180	180	7.09	7.09
2½"	8	1⅝"	195	205	7.68	8.07
3"	8	1¾"	220	230	8.66	9.06
4"	8	1½"	255	260	10.04	10.24
5"	8	1¾"	300	310	11.81	12.20
6"	8	2"	345	355	13.58	13.98
8"	12	2"	380	395	14.96	15.55
10"	12	2½"	490	510	19.29	20.08
12"	12	2¾"	540	560	21.26	22.05

Notes

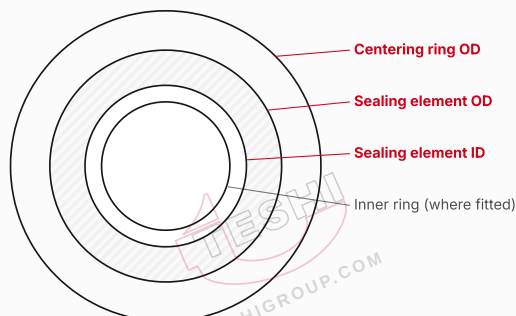
- Lengths are in millimetres for a 2 mm raised face (Class 150 and 300) or 7 mm raised face (Class 600 and above), and for ring-joint flanges with the standard ring.
- Stud lengths are those tabulated in ASME B16.5 and do not include the height of the points.
- Different lengths are needed for lap joint flanges, for spectacle blinds or orifice plates in the joint, and when bolt tensioners are used.

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ASME B16.20 Spiral Wound Gasket Dimensions

Sealing element inside diameter (mm)

Dimensions of **ASME B16.20 spiral wound gaskets** for ASME B16.5 flanges in millimetres: inside and outside diameter of the sealing element (winding) and outside diameter of the centering ring, by flange class.



Spiral wound gasket — plan view (not to scale)

Sealing element inside diameter (mm)

NPS in	DN	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
½"	15	19.1	19.1	19.1	19.1	19.1	19.1
¾"	20	25.4	25.4	25.4	25.4	25.4	25.4
1"	25	31.8	31.8	31.8	31.8	31.8	31.8
1¼"	32	47.8	47.8	47.8	39.6	39.6	39.6
1½"	40	54.1	54.1	54.1	47.8	47.8	47.8
2"	50	69.9	69.9	69.9	58.7	58.7	58.7
2½"	65	82.6	82.6	82.6	69.9	69.9	69.9
3"	80	101.6	101.6	101.6	95.3	92.2	92.2
4"	100	127.0	127.0	120.7	120.7	117.6	117.6
5"	125	155.7	155.7	147.6	147.6	143.0	143.0
6"	150	182.6	182.6	174.8	174.8	171.5	171.5
8"	200	233.4	233.4	225.6	222.3	215.9	215.9
10"	250	287.3	287.3	274.6	276.4	266.7	270.0
12"	300	339.9	339.9	327.2	323.9	323.9	317.5
14"	350	371.6	371.6	362.0	355.6	362.0	—
16"	400	422.4	422.4	412.8	412.8	406.4	—
18"	450	474.7	474.7	469.9	463.6	463.6	—
20"	500	525.5	525.5	520.7	520.7	514.4	—
24"	600	628.7	628.7	628.7	628.7	616.0	—

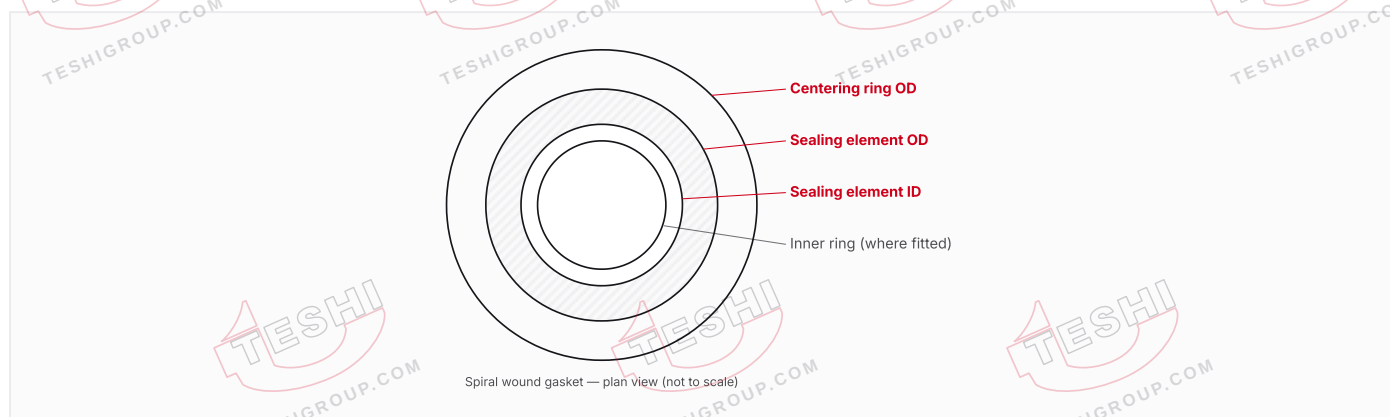
Notes

- Dimensions are in millimetres unless stated otherwise.
- For Class 900, NPS ½" to 2½", the Class 1500 gasket is used.
- Class 2500 is listed to NPS 12" only.
- Inner ring inside diameters have been revised between editions of ASME B16.20 and are not tabulated here; ask for the value to the edition your project specifies.
- Nominal sealing element thickness is 4.5 mm (0.175").

TG-DS-022 · Online: teshigroup.com/dimensional-standards/asme-b16-20-spiral-wound-gasket-dimensions/ · Verify against the current edition of the standard.

ASME B16.20 Spiral Wound Gasket Dimensions

Sealing element outside diameter (mm)



Sealing element outside diameter (mm)

NPS in	DN	METRIC		IMPERIAL	
		Class 150–600 mm	Class 900–2500 mm	Class 150–600 in	Class 900–2500 in
½"	15	31.8	31.8	1.25	1.25
¾"	20	39.6	39.6	1.56	1.56
1"	25	47.8	47.8	1.88	1.88
1¼"	32	60.5	60.5	2.38	2.38
1½"	40	69.9	69.9	2.75	2.75
2"	50	85.9	85.9	3.38	3.38
2½"	65	98.6	98.6	3.88	3.88
3"	80	120.7	120.7	4.75	4.75
4"	100	149.4	149.4	5.88	5.88
5"	125	177.8	177.8	7.00	7.00
6"	150	209.6	209.6	8.25	8.25
8"	200	263.7	257.3	10.38	10.13
10"	250	317.5	311.2	12.50	12.25
12"	300	374.7	368.3	14.75	14.50
14"	350	406.4	400.1	16.00	15.75
16"	400	463.6	457.2	18.25	18.00
18"	450	527.1	520.7	20.75	20.50
20"	500	577.9	571.5	22.75	22.50
24"	600	685.8	679.5	27.00	26.75

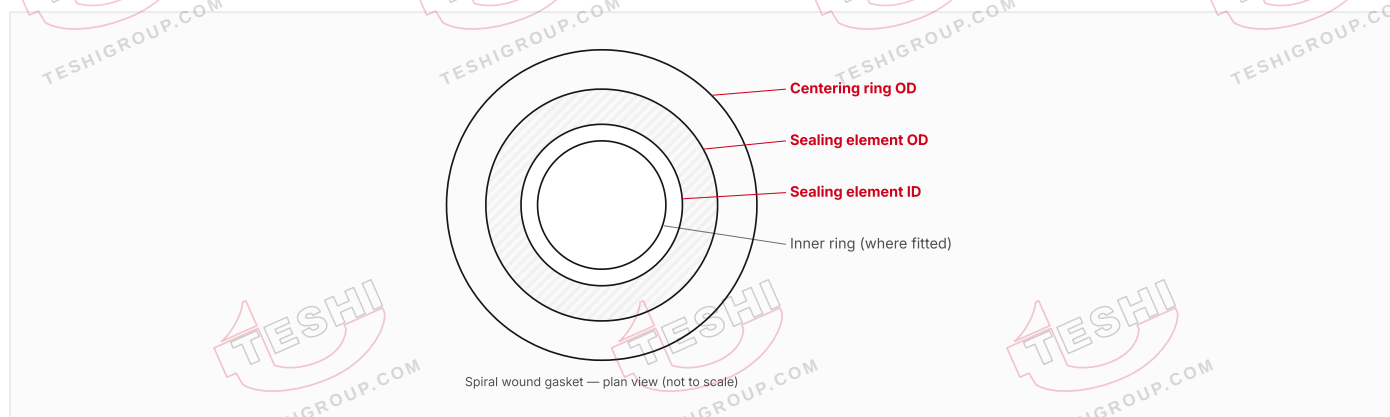
Notes

- Dimensions are in millimetres unless stated otherwise.
- For Class 900, NPS ½" to 2½", the Class 1500 gasket is used.
- Class 2500 is listed to NPS 12" only.
- Inner ring inside diameters have been revised between editions of ASME B16.20 and are not tabulated here; ask for the value to the edition your project specifies.
- Nominal sealing element thickness is 4.5 mm (0.175").

TG-DS-022 · Online: teshigroup.com/dimensional-standards/asme-b16-20-spiral-wound-gasket-dimensions/ · Verify against the current edition of the standard.

ASME B16.20 Spiral Wound Gasket Dimensions

Centering ring outside diameter (mm)



Centering ring outside diameter (mm)

NPS in	DN	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
½"	15	47.8	54.1	54.1	63.5	63.5	69.9
¾"	20	57.2	66.8	66.8	69.9	69.9	76.2
1"	25	66.8	73.2	73.2	79.5	79.5	85.9
1¼"	32	76.2	82.6	82.6	88.9	88.9	104.9
1½"	40	85.9	95.3	95.3	98.6	98.6	117.6
2"	50	104.9	111.3	111.3	143.0	143.0	146.1
2½"	65	124.0	130.3	130.3	165.1	165.1	168.4
3"	80	136.7	149.4	149.4	168.4	174.8	196.9
4"	100	174.8	181.1	193.8	206.5	209.6	235.0
5"	125	196.9	215.9	241.3	247.7	254.0	279.4
6"	150	222.3	251.0	266.7	289.1	282.7	317.5
8"	200	279.4	308.1	320.8	358.9	352.6	387.4
10"	250	339.9	362.0	400.1	435.1	435.1	476.3
12"	300	409.7	422.4	457.2	498.6	520.7	549.4
14"	350	450.9	485.9	492.3	520.7	577.9	—
16"	400	514.4	539.8	565.2	574.8	641.4	—
18"	450	549.4	596.9	612.9	638.3	704.9	—
20"	500	606.6	654.1	682.8	698.5	755.7	—
24"	600	717.6	774.7	790.7	838.2	901.7	—

Notes

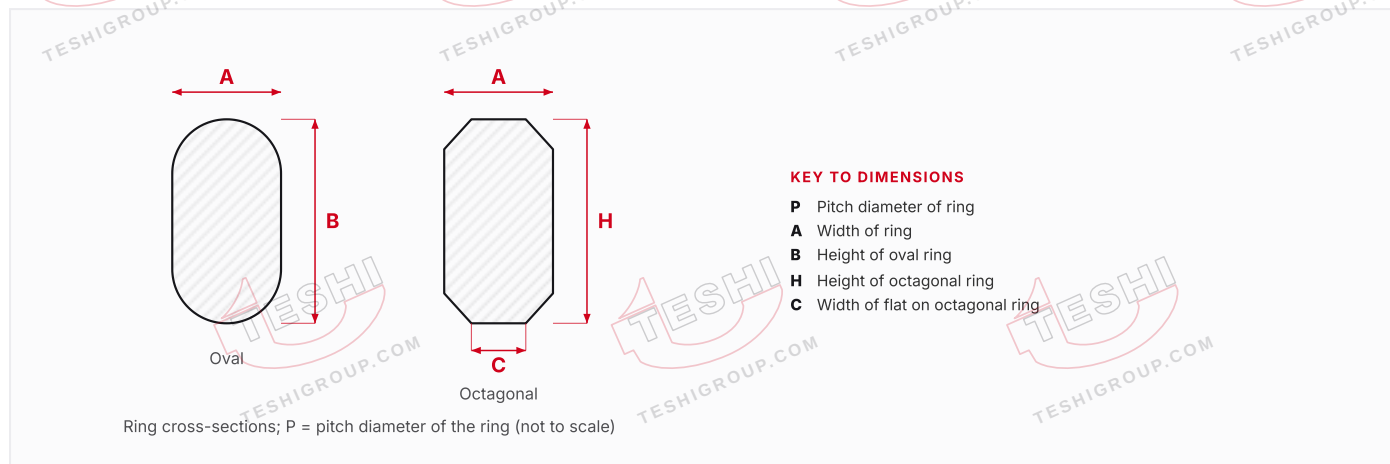
- Dimensions are in millimetres unless stated otherwise.
- For Class 900, NPS ½" to 2½", the Class 1500 gasket is used.
- Class 2500 is listed to NPS 12" only.
- Inner ring inside diameters have been revised between editions of ASME B16.20 and are not tabulated here; ask for the value to the edition your project specifies.
- Nominal sealing element thickness is 4.5 mm (0.175").

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ASME B16.20 Ring Joint Gasket Dimensions — Type R

Type R ring joint gaskets (mm) and flange size by class (part 1 of 2)

Dimensions of ASME B16.20 type R ring joint gaskets (oval and octagonal) in millimetres, with the ASME B16.5 flange size each ring number fits in each pressure class.



Type R ring joint gaskets (mm) and flange size by class (part 1 of 2)

Ring no.	P Pitch dia	A Width	B Oval height	H Octagonal height	C Flat width	Class 150 NPS	Class 300–600 NPS	Class 900 NPS	Class 1500 NPS	Class 2500 NPS
R11	34.14	6.35	11.2	9.7	4.32	—	½"	—	—	—
R12	39.70	7.95	14.2	12.7	5.23	—	—	½"	½"	—
R13	42.88	7.95	14.2	12.7	5.23	—	¾"	—	—	¾"
R14	44.45	7.95	14.2	12.7	5.23	—	—	¾"	¾"	—
R15	47.63	7.95	14.2	12.7	5.23	1"	—	—	—	—
R16	50.80	7.95	14.2	12.7	5.23	—	1"	1"	1"	¾"
R17	57.15	7.95	14.2	12.7	5.23	1¼"	—	—	—	—
R18	60.33	7.95	14.2	12.7	5.23	—	1¼"	1¼"	1¼"	1"
R19	65.10	7.95	14.2	12.7	5.23	1½"	—	—	—	—
R20	68.28	7.95	14.2	12.7	5.23	—	1½"	1½"	1½"	—
R21	72.24	11.13	17.5	16.0	7.75	—	—	—	—	1¼"
R22	82.55	7.95	14.2	12.7	5.23	2"	—	—	—	—
R23	82.55	11.13	17.5	16.0	7.75	—	2"	—	—	1½"
R24	95.25	11.13	17.5	16.0	7.75	—	—	2"	2"	—
R25	101.60	7.95	14.2	12.7	5.23	2½"	—	—	—	—
R26	101.60	11.13	17.5	16.0	7.75	—	2½"	—	—	2"
R27	107.95	11.13	17.5	16.0	7.75	—	—	2½"	2½"	—
R28	111.13	12.70	19.1	17.5	8.66	—	—	—	—	2½"
R29	114.30	7.95	14.2	12.7	5.23	3"	—	—	—	—
R30 (lapped joint)	117.48	11.13	17.5	16.0	7.75	—	3"	—	—	—
R31	123.83	11.13	17.5	16.0	7.75	—	3"	3"	—	—
R32	127.00	12.70	19.1	17.5	8.66	—	—	—	—	3"
R33	131.78	7.95	14.2	12.7	5.23	3½"	—	—	—	—
R34	131.78	11.13	17.5	16.0	7.75	—	3½"	—	—	—
R35	136.53	11.13	17.5	16.0	7.75	—	—	—	3"	—
R36	149.23	7.95	14.2	12.7	5.23	4"	—	—	—	—
R37	149.23	11.13	17.5	16.0	7.75	—	4"	4"	—	—
R38	157.18	15.88	22.4	20.6	10.49	—	—	—	—	4"
R39	161.93	11.13	17.5	16.0	7.75	—	—	—	4"	—
R40	171.45	7.95	14.2	12.7	5.23	5"	—	—	—	—
R41	180.98	11.13	17.5	16.0	7.75	—	5"	5"	—	—
R42	190.50	19.05	25.4	23.9	12.32	—	—	—	—	5"
R43	193.68	7.95	14.2	12.7	5.23	6"	—	—	—	—
R44	193.68	11.13	17.5	16.0	7.75	—	—	—	5"	—
R45	211.15	11.13	17.5	16.0	7.75	—	6"	6"	—	—

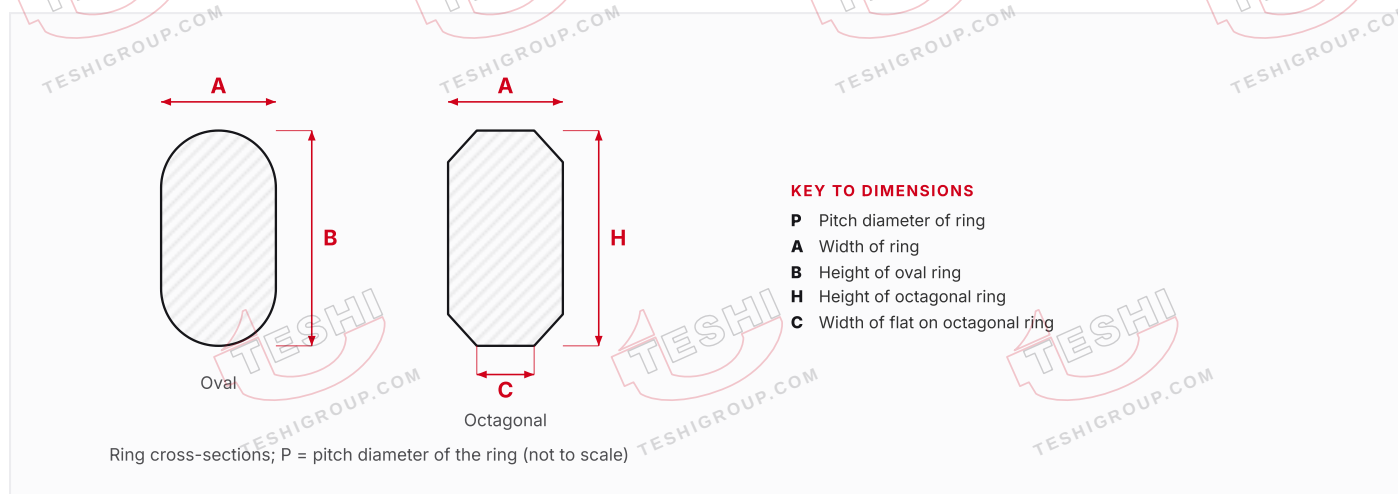
Notes

- Dimensions are in millimetres unless stated otherwise.
- Ring number R30 is for lapped joints only.
- Confirm the ring number against the flange drawing before ordering.

TG-DS-023 · Online: teshigroup.com/dimensional-standards/asme-b16-20-ring-joint-gasket-dimensions/ · Verify against the current edition of the standard.

ASME B16.20 Ring Joint Gasket Dimensions — Type R

Type R ring joint gaskets (mm) and flange size by class (part 2 of 2)



Type R ring joint gaskets (mm) and flange size by class (part 2 of 2)

Ring no.	P Pitch dia	A Width	B Oval height	H Octagonal height	C Flat width	Class 150 NPS	Class 300–600 NPS	Class 900 NPS	Class 1500 NPS	Class 2500 NPS
R46	211.15	12.70	19.1	17.5	8.66	—	—	—	6"	—
R47	228.60	19.05	25.4	23.9	12.32	—	—	—	—	6"
R48	247.65	7.95	14.2	12.7	5.23	8"	—	—	—	—
R49	269.88	11.13	17.5	16.0	7.75	—	8"	8"	—	—
R50	269.88	15.88	22.4	20.6	10.49	—	—	—	8"	—
R51	279.40	22.23	28.7	26.9	14.81	—	—	—	—	8"
R52	304.80	7.95	14.2	12.7	5.23	10"	—	—	—	—
R53	323.85	11.13	17.5	16.0	7.75	—	10"	10"	—	—
R54	323.85	15.88	22.4	20.6	10.49	—	—	—	10"	—
R55	342.90	28.58	36.6	35.1	19.81	—	—	—	—	10"
R56	381.00	7.95	14.2	12.7	5.23	12"	—	—	—	—
R57	381.00	11.13	17.5	16.0	7.75	—	12"	12"	—	—
R58	381.00	22.23	28.7	26.9	14.81	—	—	—	12"	—
R59	396.88	7.95	14.2	12.7	5.23	14"	—	—	—	—
R60	406.40	31.75	39.6	38.1	22.33	—	—	—	—	12"
R61	419.10	11.13	17.5	16.0	7.75	—	14"	—	—	—
R62	419.10	15.88	22.4	20.6	10.49	—	—	14"	—	—
R63	419.10	25.40	33.3	31.8	17.30	—	—	—	14"	—
R64	454.03	7.95	14.2	12.7	5.23	16"	—	—	—	—
R65	469.90	11.13	17.5	16.0	7.75	—	16"	—	—	—
R66	469.90	15.88	22.4	20.6	10.49	—	—	16"	—	—
R67	469.90	28.58	36.6	35.1	19.81	—	—	—	16"	—
R68	517.53	7.95	14.2	12.7	5.23	18"	—	—	—	—
R69	533.40	11.13	17.5	16.0	7.75	—	18"	—	—	—
R70	533.40	19.05	25.4	23.9	12.32	—	—	18"	—	—
R71	533.40	28.58	36.6	35.1	19.81	—	—	—	18"	—
R72	558.80	7.95	14.2	12.7	5.23	20"	—	—	—	—
R73	584.20	12.70	19.1	17.5	8.66	—	20"	—	—	—
R74	584.20	19.05	25.4	23.9	12.32	—	—	20"	—	—
R75	584.20	31.75	39.6	38.1	22.33	—	—	—	20"	—
R76	673.10	7.95	14.2	12.7	5.23	24"	—	—	—	—
R77	692.15	15.88	22.4	20.6	10.49	—	24"	—	—	—
R78	692.15	25.40	33.3	31.8	17.30	—	—	24"	—	—
R79	692.15	34.93	44.5	41.4	24.82	—	—	—	24"	—

Notes

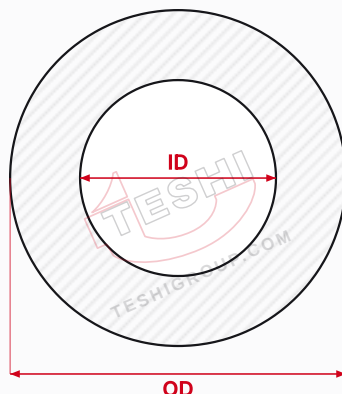
- Dimensions are in millimetres unless stated otherwise.
- Ring number R30 is for lapped joints only.
- Confirm the ring number against the flange drawing before ordering.

TG-DS-023 · Online: teshigroup.com/dimensional-standards/asm-b16-20-ring-joint-gasket-dimensions/ · Verify against the current edition of the standard.

ASME B16.21 Non-Metallic Flat Gasket Dimensions

Flat ring gaskets for raised-face flanges (mm)

Dimensions of **ASME B16.21 non-metallic flat ring gaskets** for ASME B16.5 raised-face flanges in millimetres: inside diameter and outside diameter for Class 150, 300 and 600.



Flat ring gasket (not to scale)

Flat ring gaskets for raised-face flanges (mm)

NPS in	METRIC				IMPERIAL			
	ID Inside dia	OD Class 150	OD Class 300	OD Class 600	ID Inside dia, in	OD Class 150, in	OD Class 300, in	OD Class 600, in
½"	21	48	54	54	0.827	1.89	2.13	2.13
¾"	27	57	67	67	1.06	2.24	2.64	2.64
1"	33	67	73	73	1.30	2.64	2.87	2.87
1¼"	42	76	83	83	1.65	2.99	3.27	3.27
1½"	48	86	95	95	1.89	3.39	3.74	3.74
2"	60	105	111	111	2.36	4.13	4.37	4.37
2½"	73	124	130	130	2.87	4.88	5.12	5.12
3"	89	137	149	149	3.50	5.39	5.87	5.87
3½"	102	162	165	162	4.02	6.38	6.50	6.38
4"	114	175	181	194	4.49	6.89	7.13	7.64
5"	141	197	216	241	5.55	7.76	8.50	9.49
6"	168	222	251	267	6.61	8.74	9.88	10.51
8"	219	279	308	321	8.62	10.98	12.13	12.64
10"	273	340	362	400	10.75	13.39	14.25	15.75
12"	324	410	422	457	12.76	16.14	16.61	17.99
14"	356	451	486	492	14.02	17.76	19.13	19.37
16"	406	514	540	565	15.98	20.24	21.26	22.24
18"	457	549	597	613	17.99	21.61	23.50	24.13
20"	508	606	654	683	20.00	23.86	25.75	26.89
24"	610	718	775	791	24.02	28.27	30.51	31.14

Notes

- Dimensions are in millimetres unless stated otherwise.
- Values are rounded to the nearest millimetre; some published tables differ by 1 mm.

TG-DS-024 · Online: teshigroup.com/dimensional-standards/asme-b16-21-non-metallic-gasket-dimensions/ · Verify against the current edition of the standard.

PART 7

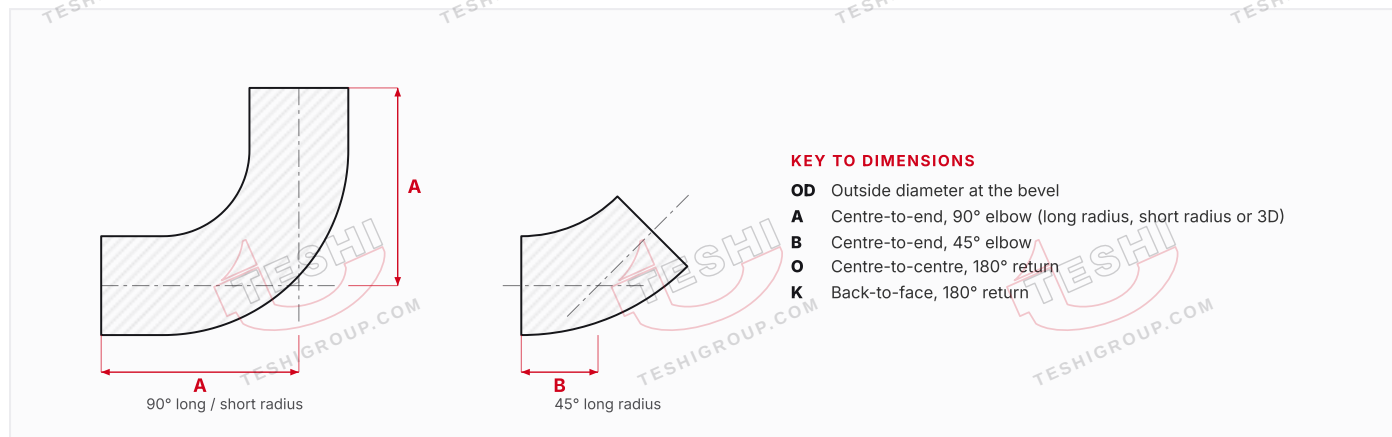
Butt weld fittings — ASME B16.9

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ASME B16.9 Butt Weld Elbow Dimensions

Elbows and 180° returns (mm)

Centre-to-end dimensions of **ASME B16.9 butt weld elbows** in millimetres: long-radius (1.5D) 90° and 45° elbows, short-radius (1D) 90° elbows, 3D elbows and 180° long-radius returns, from NPS ½" to 48".



Elbows and 180° returns (mm)

NPS in	DN	OD at bevel	A 90° long radius	B 45° long radius	A 90° short radius	O 180° LR return	K 180° LR return	A 90° 3D	B 45° 3D
½"	15	21.3	38	16	—	76	48	—	—
¾"	20	26.7	38	19	—	76	51	57	24
1"	25	33.4	38	22	25	76	56	76	31
1¼"	32	42.2	48	25	32	95	70	95	39
1½"	40	48.3	57	29	38	114	83	114	47
2"	50	60.3	76	35	51	152	106	152	63
2½"	65	73.0	95	44	64	190	132	190	79
3"	80	88.9	114	51	76	229	159	229	95
3½"	90	101.6	133	57	89	267	184	267	111
4"	100	114.3	152	64	102	305	210	305	127
5"	125	141.3	190	79	127	381	262	381	157
6"	150	168.3	229	95	152	457	313	457	189
8"	200	219.1	305	127	203	610	414	610	252
10"	250	273.0	381	159	254	762	518	762	316
12"	300	323.8	457	190	305	914	619	914	378
14"	350	355.6	533	222	356	1067	711	1067	441
16"	400	406.4	610	254	406	1219	813	1219	505
18"	450	457.0	686	286	457	1372	914	1372	568
20"	500	508.0	762	318	508	1524	1016	1524	632
22"	550	559.0	838	343	559	1676	1118	1676	694
24"	600	610.0	914	381	610	1829	1219	1829	757
26"	650	660.0	991	406	—	—	—	1981	821
28"	700	711.0	1067	438	—	—	—	2134	883
30"	750	762.0	1143	470	—	—	—	2286	946
32"	800	813.0	1219	502	—	—	—	2438	1010
34"	850	864.0	1295	533	—	—	—	2591	1073
36"	900	914.0	1372	565	—	—	—	2743	1135
38"	950	965.0	1448	600	—	—	—	2896	1200
40"	1000	1016.0	1524	632	—	—	—	3048	1264
42"	1050	1067.0	1600	660	—	—	—	3200	1326
44"	1100	1118.0	1676	695	—	—	—	3353	1389
46"	1150	1168.0	1753	727	—	—	—	3505	1453
48"	1200	1219.0	1829	759	—	—	—	3658	1516

Notes

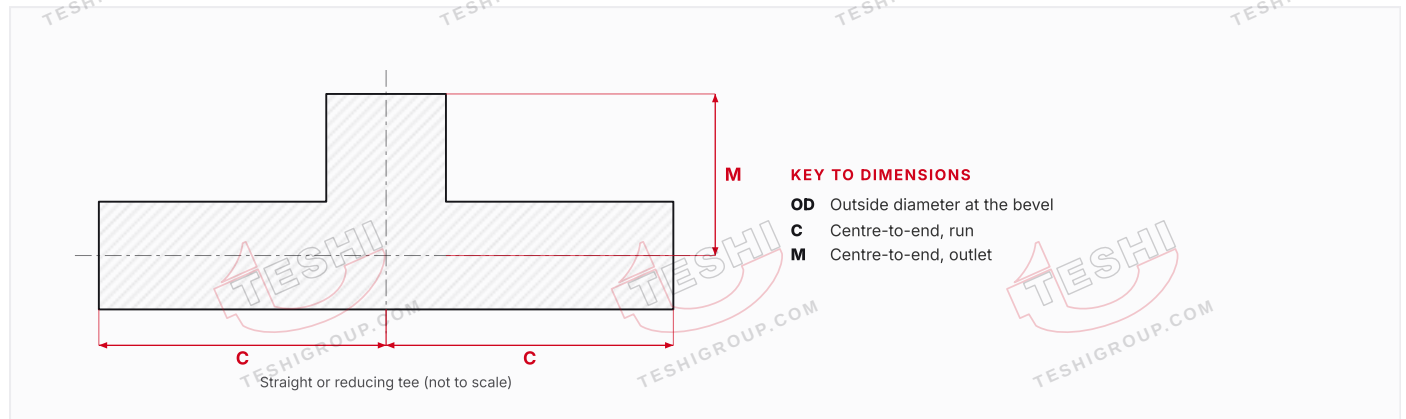
- Dimensions are in millimetres unless stated otherwise.
- Short-radius elbows and 180° returns are listed in ASME B16.9 up to NPS 24".
- Wall thickness follows the pipe schedule stated in the order; see the pipe schedule chart.
- NPS ¾" long-radius dimensions are those of the current edition (A = 38 mm).

TG-DS-012 · Online: [teshigroup.com/dimensional-standards/asme-b16-9-elbow-dimensions/](https://www.teshigroup.com/dimensional-standards/asme-b16-9-elbow-dimensions/) · Verify against the current edition of the standard.

ASME B16.9 Butt Weld Tee Dimensions

Straight (equal) tees (mm)

Centre-to-end dimensions of **ASME B16.9 butt weld tees** in millimetres. The first table covers straight (equal) tees from NPS ½" to 48"; the second covers reducing-outlet tees for run sizes up to NPS 24".



KEY TO DIMENSIONS

- OD** Outside diameter at the bevel
- C** Centre-to-end, run
- M** Centre-to-end, outlet

Straight (equal) tees (mm)

NPS in	DN	METRIC			IMPERIAL		
		OD at bevel	C Run	M Outlet	OD at bevel, in	C Run, in	M Outlet, in
½"	15	21.3	25	25	0.839	0.984	0.984
¾"	20	26.7	29	29	1.05	1.14	1.14
1"	25	33.4	38	38	1.31	1.50	1.50
1¼"	32	42.2	48	48	1.66	1.89	1.89
1½"	40	48.3	57	57	1.90	2.24	2.24
2"	50	60.3	64	64	2.37	2.52	2.52
2½"	65	73.0	76	76	2.87	2.99	2.99
3"	80	88.9	86	86	3.50	3.39	3.39
3½"	90	101.6	95	95	4.00	3.74	3.74
4"	100	114.3	105	105	4.50	4.13	4.13
5"	125	141.3	124	124	5.56	4.88	4.88
6"	150	168.3	143	143	6.63	5.63	5.63
8"	200	219.1	178	178	8.63	7.01	7.01
10"	250	273.0	216	216	10.75	8.50	8.50
12"	300	323.8	254	254	12.75	10.00	10.00
14"	350	355.6	279	279	14.00	10.98	10.98
16"	400	406.4	305	305	16.00	12.01	12.01
18"	450	457.0	343	343	17.99	13.50	13.50
20"	500	508.0	381	381	20.00	15.00	15.00
22"	550	559.0	419	419	22.01	16.50	16.50
24"	600	610.0	432	432	24.02	17.01	17.01
26"	650	660.0	495	495	25.98	19.49	19.49
28"	700	711.0	521	521	27.99	20.51	20.51
30"	750	762.0	559	559	30.00	22.01	22.01
32"	800	813.0	597	597	32.01	23.50	23.50
34"	850	864.0	635	635	34.02	25.00	25.00
36"	900	914.0	673	673	35.98	26.50	26.50
38"	950	965.0	711	711	37.99	27.99	27.99
40"	1000	1016.0	749	749	40.00	29.49	29.49
42"	1050	1067.0	762	711	42.01	30.00	27.99
44"	1100	1118.0	813	762	44.02	32.01	30.00
46"	1150	1168.0	851	800	45.98	33.50	31.50
48"	1200	1219.0	889	838	47.99	35.00	32.99

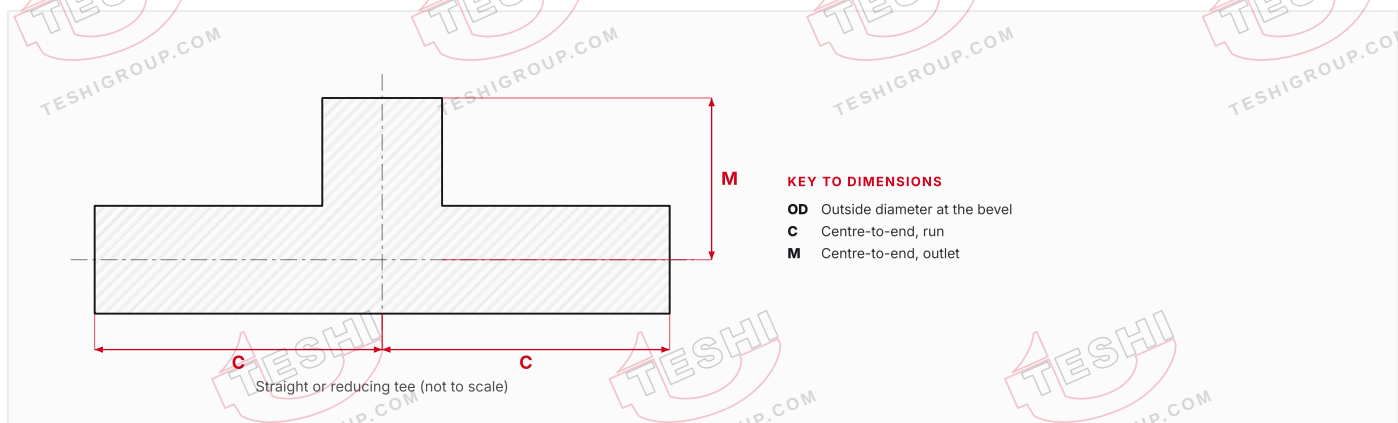
Notes

- Dimensions are in millimetres unless stated otherwise.
- For straight tees above NPS 24" the outlet dimension M is as tabulated and may be less than C.

TG-DS-013 · Online: teshigroup.com/dimensional-standards/asm-b16-9-tee-dimensions/ · Verify against the current edition of the standard.

ASME B16.9 Butt Weld Tee Dimensions

Reducing outlet tees (mm) (part 1 of 2)



Reducing outlet tees (mm) (part 1 of 2)

Run NPS in	Outlet NPS in	METRIC		IMPERIAL	
		C Run	M Outlet	C Run, in	M Outlet, in
½"	¾"	25	25	0.984	0.984
½"	½"	25	25	0.984	0.984
¾"	½"	29	29	1.14	1.14
¾"	¾"	29	29	1.14	1.14
1"	¾"	38	38	1.50	1.50
1"	½"	38	38	1.50	1.50
1¼"	1"	48	48	1.89	1.89
1¼"	¾"	48	48	1.89	1.89
1¼"	½"	48	48	1.89	1.89
1½"	1¼"	57	57	2.24	2.24
1½"	1"	57	57	2.24	2.24
1½"	¾"	57	57	2.24	2.24
1½"	½"	57	57	2.24	2.24
2"	1½"	64	60	2.52	2.36
2"	1¼"	64	57	2.52	2.24
2"	1"	64	51	2.52	2.01
2"	¾"	64	44	2.52	1.73
2½"	2"	76	70	2.99	2.76
2½"	1½"	76	67	2.99	2.64
2½"	1¼"	76	64	2.99	2.52
2½"	1"	76	57	2.99	2.24
3"	2½"	86	83	3.39	3.27
3"	2"	86	76	3.39	2.99
3"	1½"	86	73	3.39	2.87
3"	1¼"	86	70	3.39	2.76
3"	3"	95	92	3.74	3.62
3½"	2½"	95	89	3.74	3.50
3½"	2"	95	83	3.74	3.27
3½"	1½"	95	79	3.74	3.11
4"	3½"	105	102	4.13	4.02
4"	3"	105	98	4.13	3.86
4"	2½"	105	95	4.13	3.74
4"	2"	105	89	4.13	3.50
4"	1½"	105	86	4.13	3.39
5"	4"	124	117	4.88	4.61
5"	3½"	124	114	4.88	4.49
5"	3"	124	111	4.88	4.37
5"	2½"	124	108	4.88	4.25
5"	2"	124	105	4.88	4.13
6"	5"	143	137	5.63	5.39
6"	4"	143	130	5.63	5.12
6"	3½"	143	127	5.63	5.00
6"	3"	143	124	5.63	4.88
6"	2½"	143	121	5.63	4.76
8"	6"	178	168	7.01	6.61

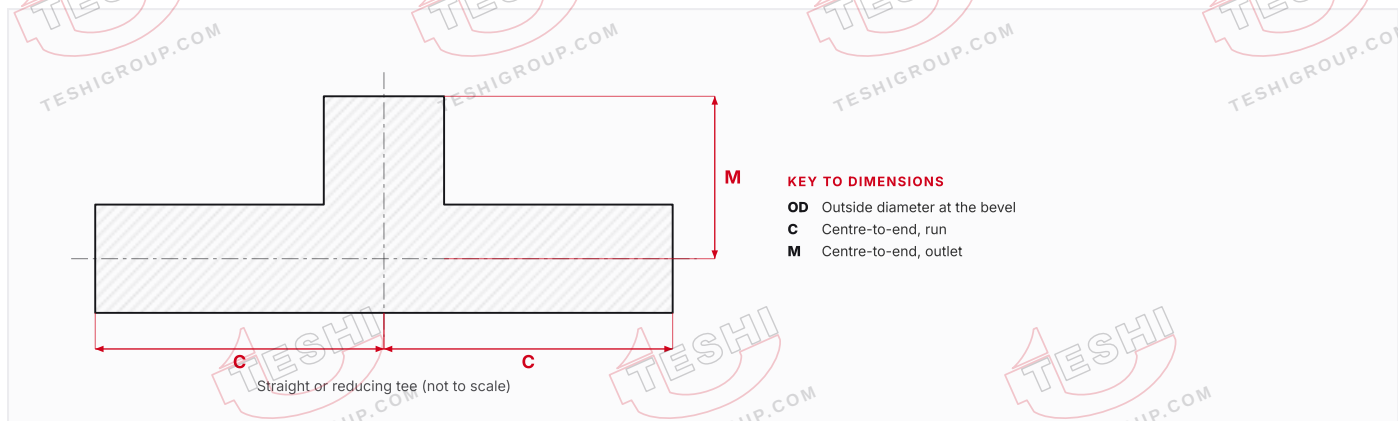
Notes

- Dimensions are in millimetres unless stated otherwise.
- For straight tees above NPS 24" the outlet dimension M is as tabulated and may be less than C.

TG-DS-013 · Online: teshigroup.com/dimensional-standards/asm-b16-9-tee-dimensions/ · Verify against the current edition of the standard.

ASME B16.9 Butt Weld Tee Dimensions

Reducing outlet tees (mm) (part 2 of 2)



Reducing outlet tees (mm) (part 2 of 2)

Run NPS in	Outlet NPS in	METRIC		IMPERIAL	
		C Run	M Outlet	C Run, in	M Outlet, in
8"	5"	178	162	7.01	6.38
8"	4"	178	156	7.01	6.14
8"	3½"	178	152	7.01	5.98
10"	8"	216	203	8.50	7.99
10"	6"	216	194	8.50	7.64
10"	5"	216	191	8.50	7.52
10"	4"	216	184	8.50	7.24
12"	10"	254	241	10.00	9.49
12"	8"	254	229	10.00	9.02
12"	6"	254	219	10.00	8.62
12"	5"	254	216	10.00	8.50
14"	12"	279	270	10.98	10.63
14"	10"	279	257	10.98	10.12
14"	8"	279	248	10.98	9.76
14"	6"	279	238	10.98	9.37
16"	14"	305	305	12.01	12.01
16"	12"	305	295	12.01	11.61
16"	10"	305	283	12.01	11.14
16"	8"	305	273	12.01	10.75
16"	6"	305	264	12.01	10.39
18"	16"	343	330	13.50	12.99
18"	14"	343	330	13.50	12.99
18"	12"	343	321	13.50	12.64
18"	10"	343	308	13.50	12.13
18"	8"	343	298	13.50	11.73
20"	18"	381	368	15.00	14.49
20"	16"	381	356	15.00	14.02
20"	14"	381	356	15.00	14.02
20"	12"	381	346	15.00	13.62
20"	10"	381	333	15.00	13.11
20"	8"	381	324	15.00	12.76
22"	20"	419	406	16.50	15.98
22"	18"	419	394	16.50	15.51
22"	16"	419	381	16.50	15.00
22"	14"	419	381	16.50	15.00
22"	12"	419	371	16.50	14.61
22"	10"	419	359	16.50	14.13
24"	22"	432	432	17.01	17.01
24"	20"	432	432	17.01	17.01
24"	18"	432	419	17.01	16.50
24"	16"	432	406	17.01	15.98
24"	14"	432	406	17.01	15.98
24"	12"	432	397	17.01	15.63
24"	10"	432	384	17.01	15.12

Notes

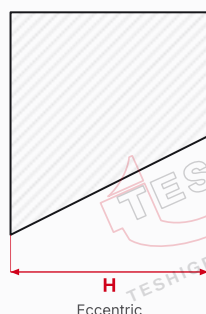
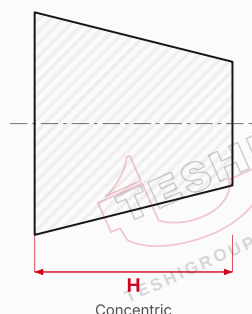
- Dimensions are in millimetres unless stated otherwise.
- For straight tees above NPS 24" the outlet dimension M is as tabulated and may be less than C.

TG-DS-013 · Online: teshigroup.com/dimensional-standards/asm-b16-9-tee-dimensions/ · Verify against the current edition of the standard.

ASME B16.9 Butt Weld Reducer Dimensions

Reducers — end-to-end length (mm)

End-to-end length of **ASME B16.9 concentric and eccentric reducers** in millimetres. The length H depends only on the large-end size; the table also lists the small-end sizes the standard covers for each large end.



KEY TO DIMENSIONS

H End-to-end length

Reducers — end-to-end length (mm)

Large end NPS in	Small end NPS covered in	METRIC	IMPERIAL
		H End to end	H End to end, in
¾"	½, ⅜	38	1.50
1"	¾, ½	51	2.01
1¼"	1, ¾, ½	51	2.01
1½"	1¼, 1, ¾, ½	64	2.52
2"	1½, 1¼, 1, ¾	76	2.99
2½"	2, 1½, 1¼, 1	89	3.50
3"	2½, 2, 1½, 1¼	89	3.50
3½"	3, 2½, 2, 1½, 1¼	102	4.02
4"	3½, 3, 2½, 2, 1½	102	4.02
5"	4, 3½, 3, 2½, 2	127	5.00
6"	5, 4, 3½, 3, 2½	140	5.51
8"	6, 5, 4, 3½	152	5.98
10"	8, 6, 5, 4	178	7.01
12"	10, 8, 6, 5	203	7.99
14"	12, 10, 8, 6	330	12.99
16"	14, 12, 10, 8	356	14.02
18"	16, 14, 12, 10	381	15.00
20"	18, 16, 14, 12	508	20.00
22"	20, 18, 16, 14	508	20.00
24"	22, 20, 18, 16	508	20.00
26"	24, 22, 20, 18	610	24.02
28"	26, 24, 20, 18	610	24.02
30"	28, 26, 24, 20	610	24.02
32"	30, 28, 26, 24	610	24.02
34"	32, 30, 26, 24	610	24.02
36"	34, 32, 30, 26, 24	610	24.02
38"	36, 34, 32, 30, 28, 26	610	24.02
40"	38, 36, 34, 32, 30	610	24.02
42"	40, 38, 36, 34, 32, 30	610	24.02
44"	42, 40, 38, 36	610	24.02
46"	44, 42, 40, 38	711	27.99
48"	46, 44, 42, 40	711	27.99

Notes

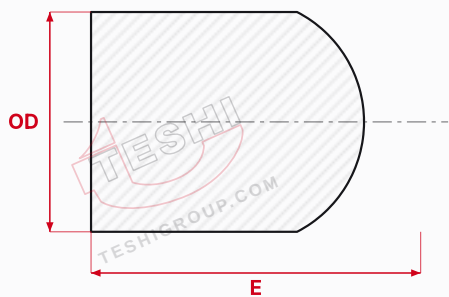
- Dimensions are in millimetres unless stated otherwise.
- Other size combinations are manufactured to order.

TG-DS-014 · Online: teshigroup.com/dimensional-standards/asme-b16-9-reducer-dimensions/ · Verify against the current edition of the standard.

ASME B16.9 Butt Weld Pipe Cap Dimensions

Butt weld caps (mm)

Length of **ASME B16.9 butt weld pipe caps** in millimetres from NPS ½" to 48". Length E applies up to the limiting wall thickness shown; for heavier walls the longer length E1 applies.



Butt weld cap (not to scale)

KEY TO DIMENSIONS

- OD** Outside diameter at the bevel
- E** Length for wall thickness up to the limiting value
- E1** Length for wall thickness above the limiting value

Butt weld caps (mm)

NPS in	DN	METRIC					IMPERIAL				
		OD at bevel	E Length	Limiting wall for length E	E1 Length, heavier wall		OD at bevel, in	E Length, in	Limiting wall for length E, in	E1 Length, heavier wall, in	
½"	15	21.3	25	4.57	25		0.839	0.984	0.180	0.984	
¾"	20	26.7	25	3.81	25		1.05	0.984	0.150	0.984	
1"	25	33.4	38	4.57	38		1.31	1.50	0.180	1.50	
1¼"	32	42.2	38	4.83	38		1.66	1.50	0.190	1.50	
1½"	40	48.3	38	5.08	38		1.90	1.50	0.200	1.50	
2"	50	60.3	38	5.59	44		2.37	1.50	0.220	1.73	
2½"	65	73.0	38	7.11	51		2.87	1.50	0.280	2.01	
3"	80	88.9	51	7.62	64		3.50	2.01	0.300	2.52	
3½"	90	101.6	64	8.13	76		4.00	2.52	0.320	2.99	
4"	100	114.3	64	8.64	76		4.50	2.52	0.340	2.99	
5"	125	141.3	76	9.65	89		5.56	2.99	0.380	3.50	
6"	150	168.3	89	10.92	102		6.63	3.50	0.430	4.02	
8"	200	219.1	102	12.70	127		8.63	4.02	0.500	5.00	
10"	250	273.0	127	12.70	152		10.75	5.00	0.500	5.98	
12"	300	323.8	152	12.70	178		12.75	5.98	0.500	7.01	
14"	350	355.6	165	12.70	191		14.00	6.50	0.500	7.52	
16"	400	406.4	178	12.70	203		16.00	7.01	0.500	7.99	
18"	450	457.0	203	12.70	229		17.99	7.99	0.500	9.02	
20"	500	508.0	229	12.70	254		20.00	9.02	0.500	10.00	
22"	550	559.0	254	12.70	254		22.01	10.00	0.500	10.00	
24"	600	610.0	267	12.70	305		24.02	10.51	0.500	12.01	
26"	650	660.0	267	—	—		25.98	10.51	—	—	
28"	700	711.0	267	—	—		27.99	10.51	—	—	
30"	750	762.0	267	—	—		30.00	10.51	—	—	
32"	800	813.0	267	—	—		32.01	10.51	—	—	
34"	850	864.0	267	—	—		34.02	10.51	—	—	
36"	900	914.0	267	—	—		35.98	10.51	—	—	
38"	950	965.0	305	—	—		37.99	12.01	—	—	
40"	1000	1016.0	305	—	—		40.00	12.01	—	—	
42"	1050	1067.0	305	—	—		42.01	12.01	—	—	
44"	1100	1118.0	343	—	—		44.02	13.50	—	—	
46"	1150	1168.0	343	—	—		45.98	13.50	—	—	
48"	1200	1219.0	343	—	—		47.99	13.50	—	—	

Notes

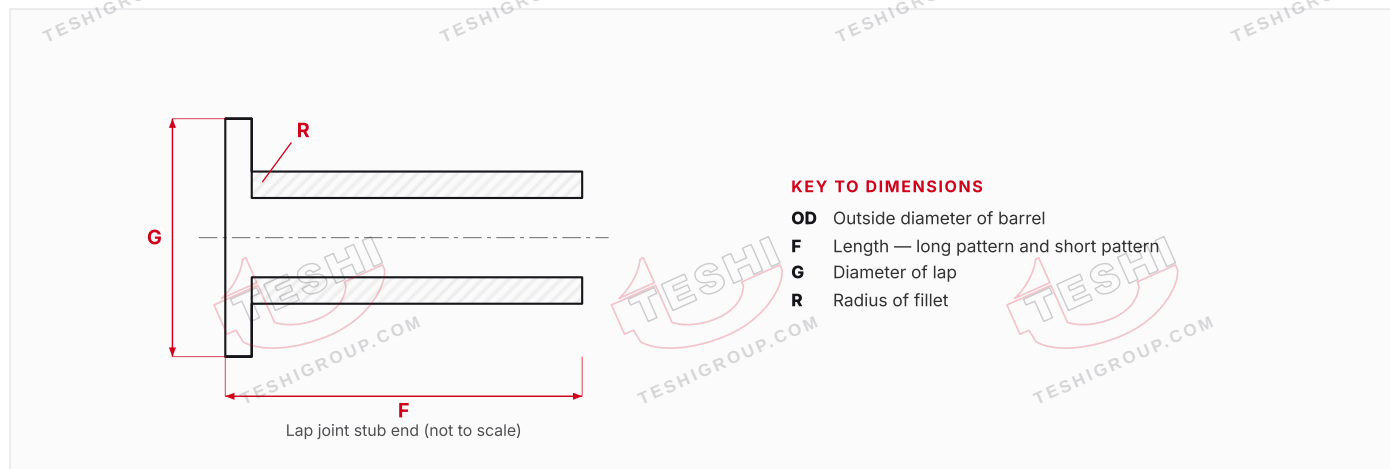
- Dimensions are in millimetres unless stated otherwise.
- Above NPS 24" the standard lists a single length E.

TG-DS-015 · Online: teshigroup.com/dimensional-standards/asme-b16-9-cap-dimensions/ · Verify against the current edition of the standard.

ASME B16.9 Lap Joint Stub End Dimensions

Lap joint stub ends (mm)

Dimensions of **lap joint stub ends** to ASME B16.9 in millimetres, in long pattern and short pattern (MSS SP-43) lengths, from NPS ½" to 24".



Lap joint stub ends (mm)

NPS in	DN	METRIC					IMPERIAL				
		OD Barrel	F Long pattern	F Short pattern	G Lap dia	R Fillet radius	OD Barrel, in	F Long pattern, in	F Short pattern, in	G Lap dia, in	R Fillet radius, in
½"	15	21.3	76	51	35	3	0.839	2.99	2.01	1.38	0.118
¾"	20	26.7	76	51	43	3	1.05	2.99	2.01	1.69	0.118
1"	25	33.4	102	51	51	3	1.31	4.02	2.01	2.01	0.118
1¼"	32	42.2	102	51	64	5	1.66	4.02	2.01	2.52	0.197
1½"	40	48.3	102	51	73	6	1.90	4.02	2.01	2.87	0.236
2"	50	60.3	152	64	92	8	2.37	5.98	2.52	3.62	0.315
2½"	65	73.0	152	64	105	8	2.87	5.98	2.52	4.13	0.315
3"	80	88.9	152	64	127	10	3.50	5.98	2.52	5.00	0.394
3½"	90	101.6	152	76	140	10	4.00	5.98	2.99	5.51	0.394
4"	100	114.3	152	76	157	11	4.50	5.98	2.99	6.18	0.433
5"	125	141.3	203	76	186	11	5.56	7.99	2.99	7.32	0.433
6"	150	168.3	203	89	216	13	6.63	7.99	3.50	8.50	0.512
8"	200	219.1	203	102	270	13	8.63	7.99	4.02	10.63	0.512
10"	250	273.0	254	127	324	13	10.75	10.00	5.00	12.76	0.512
12"	300	323.8	254	152	381	13	12.75	10.00	5.98	15.00	0.512
14"	350	355.6	305	152	413	13	14.00	12.01	5.98	16.26	0.512
16"	400	406.4	305	152	470	13	16.00	12.01	5.98	18.50	0.512
18"	450	457.0	305	152	533	13	17.99	12.01	5.98	20.98	0.512
20"	500	508.0	305	152	584	13	20.00	12.01	5.98	22.99	0.512
22"	550	559.0	305	152	641	13	22.01	12.01	5.98	25.24	0.512
24"	600	610.0	305	152	692	13	24.02	12.01	5.98	27.24	0.512

Notes

- Dimensions are in millimetres unless stated otherwise.
- The lap diameter G matches the raised-face diameter of an ASME B16.5 flange of the same size.
- Lap thickness is not less than the nominal pipe wall thickness.

TG-DS-016 · Online: teshigroup.com/dimensional-standards/asme-b16-9-stub-end-dimensions/ · Verify against the current edition of the standard.

PART 8

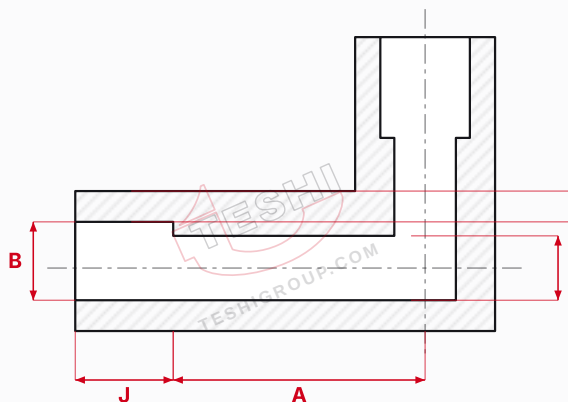
Forged fittings & branch outlets

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ASME B16.11 Socket Weld Fitting Dimensions

Socket weld elbows, tees and crosses (mm)

Dimensions of **ASME B16.11 forged socket weld fittings** in millimetres for 90° and 45° elbows, tees, crosses, couplings, half couplings and caps in Class 3000, 6000 and 9000, from NPS ½" to 4".



Socket weld 90° elbow — section (not to scale)

KEY TO DIMENSIONS

- B** Socket bore diameter (mid-point of the maximum and minimum limits)
- J** Minimum socket depth
- A** Centre to bottom of socket
- C** Minimum socket wall thickness
- D** Bore diameter of fitting (mid-point of limits)
- E** Laying length of a full coupling
- F** Laying length of a half coupling
- K** Minimum end wall thickness of a cap

Socket weld elbows, tees and crosses (mm)

NPS	DN	Socket bore B	Socket depth J	A 90° 3000	A 90° 6000	A 90° 9000	A 45° 3000	A 45° 6000	A 45° 9000	C min 3000	C min 6000	C min 9000	D 3000	D 6000	D 9000
½"	6	11.00	9.5	11	11	—	8	8	—	3.18	3.43	—	6.85	4.00	—
¼"	8	14.40	9.5	11	13.5	—	8	8	—	3.30	4.01	—	9.25	6.35	—
¾"	10	17.80	9.5	13.5	15.5	—	8	11	—	3.50	4.37	—	12.55	9.15	—
½"	15	22.00	9.5	15.5	19	25.5	11	12.5	15.5	4.09	5.18	8.18	15.80	11.75	6.40
¾"	20	27.40	12.5	19	22.5	28.5	13	14	19	4.27	6.04	8.56	20.95	15.55	11.05
1"	25	34.10	12.5	22.5	27	32	14	17.5	20.5	4.98	6.93	9.96	26.65	20.70	15.20
1¼"	32	42.90	12.5	27	32	35	17.5	20.5	22.5	5.28	6.93	10.62	35.05	29.45	22.75
1½"	40	49.00	12.5	32	38	38	20.5	25.5	25.5	5.54	7.80	11.12	40.85	33.95	27.95
2"	50	61.45	16.0	38	41	54	25.5	28.5	28.5	6.04	9.50	12.12	52.50	42.85	38.15
2½"	65	74.15	16.0	41	—	—	28.5	—	—	7.67	—	—	62.70	—	—
3"	80	90.05	16.0	57	—	—	32	—	—	8.30	—	—	77.90	—	—
4"	100	115.45	19.0	66.5	—	—	41	—	—	9.35	—	—	102.25	—	—

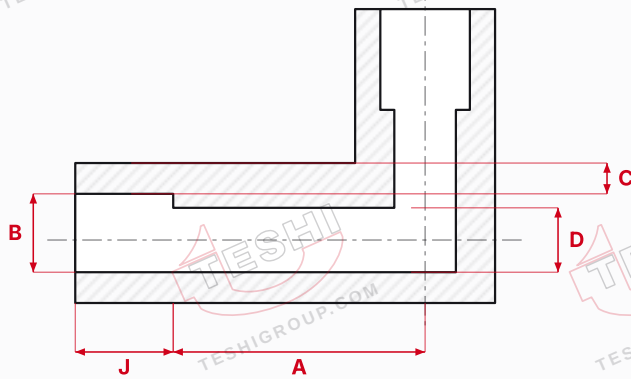
Notes

- Dimensions are in millimetres unless stated otherwise.
- Socket bore B and fitting bore D are shown as the mid-point of the maximum and minimum limits in the standard.
- A dash means the standard does not list that size in that class.
- A gap of approximately 1.6 mm is left between the pipe end and the bottom of the socket before welding.

TG-DS-017 · Online: [teshigroup.com/dimensional-standards/asme-b16-11-socket-weld-fitting-dimensions/](https://www.teshigroup.com/dimensional-standards/asme-b16-11-socket-weld-fitting-dimensions/) · Verify against the current edition of the standard.

ASME B16.11 Socket Weld Fitting Dimensions

Socket weld couplings, half couplings and caps (mm) · Fitting class and matching pipe schedule



Socket weld 90° elbow — section (not to scale)

KEY TO DIMENSIONS

- B** Socket bore diameter (mid-point of the maximum and minimum limits)
- J** Minimum socket depth
- A** Centre to bottom of socket
- C** Minimum socket wall thickness
- D** Bore diameter of fitting (mid-point of limits)
- E** Laying length of a full coupling
- F** Laying length of a half coupling
- K** Minimum end wall thickness of a cap

Socket weld couplings, half couplings and caps (mm)

NPS in	DN	METRIC						IMPERIAL					
		E Full coupling	F Half coupling	K Cap, 3000	K Cap, 6000	K Cap, 9000		Full coupling, in	F Half coupling, in	K Cap, 3000, in	K Cap, 6000, in	K Cap, 9000, in	
3/8"	6	6.5	16	4.8	6.4	—		0.256	0.630	0.189	0.252	—	
1/4"	8	6.5	16	4.8	6.4	—		0.256	0.630	0.189	0.252	—	
3/8"	10	6.5	17.5	4.8	6.4	—		0.256	0.689	0.189	0.252	—	
1/2"	15	9.5	22.5	6.4	7.9	11.2		0.374	0.886	0.252	0.311	0.441	
3/4"	20	9.5	24	6.4	7.9	12.7		0.374	0.945	0.252	0.311	0.500	
1"	25	12.5	28.5	9.6	11.2	14.2		0.492	1.12	0.378	0.441	0.559	
1 1/4"	32	12.5	30	9.6	11.2	14.2		0.492	1.18	0.378	0.441	0.559	
1 1/2"	40	12.5	32	11.2	12.7	15.7		0.492	1.26	0.441	0.500	0.618	
2"	50	19.0	41	12.7	15.7	19.0		0.748	1.61	0.500	0.618	0.748	
2 1/2"	65	19.0	43	15.7	19.0	—		0.748	1.69	0.618	0.748	—	
3"	80	19.0	44.5	19.0	22.4	—		0.748	1.75	0.748	0.882	—	
4"	100	19.0	48	22.4	28.4	—		0.748	1.89	0.882	1.12	—	

Fitting class and matching pipe schedule

Type	Class	Pipe schedule
Threaded	2000	Sch 80 (XS)
Threaded	3000	Sch 160
Threaded	6000	XXS
Socket-welding	3000	Sch 80 (XS)
Socket-welding	6000	Sch 160
Socket-welding	9000	XXS

Notes

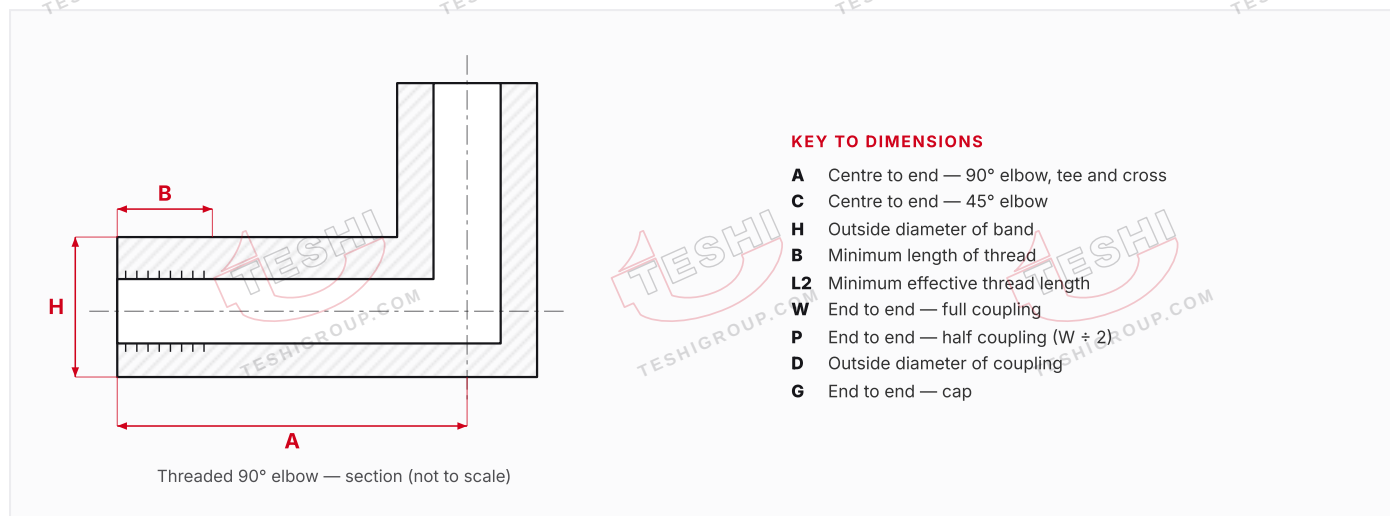
- Dimensions are in millimetres unless stated otherwise.
- Socket bore B and fitting bore D are shown as the mid-point of the maximum and minimum limits in the standard.
- A dash means the standard does not list that size in that class.
- A gap of approximately 1.6 mm is left between the pipe end and the bottom of the socket before welding.

TG-DS-017 · Online: teshigroup.com/dimensional-standards/asme-b16-11-socket-weld-fitting-dimensions/ · Verify against the current edition of the standard.

ASME B16.11 Threaded Fitting Dimensions

Threaded elbows, tees and crosses (mm)

Dimensions of **ASME B16.11 forged threaded (screwed) fittings** in millimetres for 90° and 45° elbows, tees, crosses, couplings, half couplings, caps, plugs and bushings in Class 2000, 3000 and 6000, from NPS ½" to 4".



Threaded elbows, tees and crosses (mm)

NPS in	DN	A 2000	A 3000	A 6000	C 45° 2000	C 45° 3000	C 45° 6000	H 2000	H 3000	H 6000	B Thread length	L2 Effective thread
½"	6	21	21	25	17	17	19	22	22	25	6.4	6.7
¾"	8	21	25	28	17	19	22	22	25	33	8.1	10.2
¾"	10	25	28	33	19	22	25	25	33	38	9.1	10.4
½"	15	28	33	38	22	25	28	33	38	46	10.9	13.6
¾"	20	33	38	44	25	28	33	38	46	56	12.7	13.9
1"	25	38	44	51	28	33	35	46	56	62	14.7	17.3
1¼"	32	44	51	60	33	35	43	56	62	75	17.0	18.0
1½"	40	51	60	64	35	43	44	62	75	84	17.8	18.4
2"	50	60	64	83	43	44	52	75	84	102	19.0	19.2
2½"	65	76	83	95	52	52	64	92	102	121	23.6	28.9
3"	80	86	95	106	64	64	79	109	121	146	25.9	30.5
4"	100	106	114	114	79	79	79	146	152	152	27.7	33.0

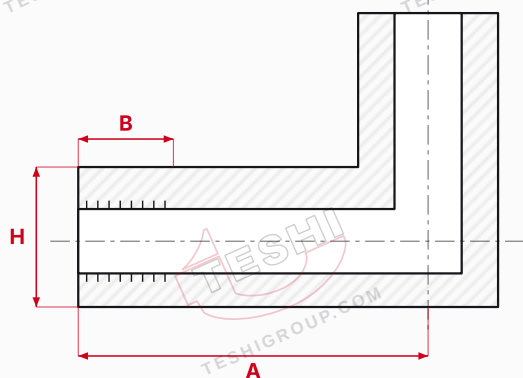
Notes

- Dimensions are in millimetres unless stated otherwise.
- The half-coupling length P is calculated as half the full-coupling length W.
- A dash means the standard does not list that size in that class.

TG-DS-018 · Online: teshigroup.com/dimensional-standards/asme-b16-11-threaded-fitting-dimensions/ · Verify against the current edition of the standard.

ASME B16.11 Threaded Fitting Dimensions

Threaded couplings, caps, plugs and bushings (mm) · Fitting class and matching pipe schedule



Threaded 90° elbow — section (not to scale)

KEY TO DIMENSIONS

- A** Centre to end — 90° elbow, tee and cross
- C** Centre to end — 45° elbow
- H** Outside diameter of band
- B** Minimum length of thread
- L2** Minimum effective thread length
- W** End to end — full coupling
- P** End to end — half coupling ($W \div 2$)
- D** Outside diameter of coupling
- G** End to end — cap

Threaded couplings, caps, plugs and bushings (mm)

NPS in	DN	W Full coupling	P Half coupling	D 3000	D 6000	G Cap, 3000	G Cap, 6000	Square head plug Min. length
1/8"	6	32	16.0	16	22	19	—	10
1/4"	8	35	17.5	19	25	25	27	11
3/8"	10	38	19.0	22	32	25	27	13
1/2"	15	48	24.0	28	38	32	33	14
3/4"	20	51	25.5	35	44	37	38	16
1"	25	60	30.0	44	57	41	43	19
1 1/4"	32	67	33.5	57	64	44	46	21
1 1/2"	40	79	39.5	64	76	44	48	21
2"	50	86	43.0	76	92	48	51	22
2 1/2"	65	92	46.0	92	108	60	64	27
3"	80	108	54.0	108	127	65	68	28
4"	100	121	60.5	140	159	68	75	32

Fitting class and matching pipe schedule

Type	Class	Pipe schedule
Threaded	2000	Sch 80 (XS)
Threaded	3000	Sch 160
Threaded	6000	XXS
Socket-welding	3000	Sch 80 (XS)
Socket-welding	6000	Sch 160
Socket-welding	9000	XXS

Notes

- Dimensions are in millimetres unless stated otherwise.
- The half-coupling length P is calculated as half the full-coupling length W.
- A dash means the standard does not list that size in that class.

TG-DS-018 · Online: [teshigroup.com/dimensional-standards/asme-b16-11-threaded-fitting-dimensions/](https://www.teshigroup.com/dimensional-standards/asme-b16-11-threaded-fitting-dimensions/) · Verify against the current edition of the standard.

NPT Thread Dimensions — ASME B1.20.1

NPT basic thread dimensions

Basic dimensions of NPT taper pipe threads to ASME B1.20.1 in millimetres. NPT threads have a 60° thread angle and a taper of 1 in 16 on diameter ($\frac{3}{4}$ " per foot).

NPT basic thread dimensions

NPS in	Threads per inch	Pitch mm	Pipe OD mm	L1 Hand-tight, mm	L2 Effective thread, mm	E0 Pitch dia at end, mm	E1 Pitch dia at hand-tight, mm	Tap drill mm, approx.
$\frac{1}{16}$ "	27	0.941	7.94	4.06	6.63	6.888	7.142	6.25
$\frac{1}{8}$ "	27	0.941	10.29	4.10	6.70	9.233	9.489	8.61
$\frac{1}{4}$ "	18	1.411	13.72	5.79	10.21	12.126	12.487	11.11
$\frac{3}{8}$ "	18	1.411	17.14	6.10	10.36	15.545	15.926	14.68
$\frac{1}{2}$ "	14	1.814	21.34	8.13	13.56	19.264	19.772	18.26
$\frac{3}{4}$ "	14	1.814	26.67	8.61	13.86	24.579	25.117	23.42
1"	11.5	2.209	33.40	10.16	17.34	30.826	31.461	29.37
1 $\frac{1}{4}$ "	11.5	2.209	42.16	10.67	17.95	39.551	40.218	38.10
1 $\frac{1}{2}$ "	11.5	2.209	48.26	10.67	18.38	45.621	46.287	44.05
2"	11.5	2.209	60.33	11.07	19.21	57.633	58.325	56.36
2 $\frac{1}{2}$ "	8	3.175	73.03	17.32	28.89	69.076	70.159	66.67
3"	8	3.175	88.90	19.46	30.48	84.852	86.068	82.55
3 $\frac{1}{2}$ "	8	3.175	101.60	20.85	31.75	97.472	98.776	95.25
4"	8	3.175	114.30	21.44	33.02	110.093	111.433	107.95
5"	8	3.175	141.30	23.80	35.72	136.925	138.412	134.14
6"	8	3.175	168.28	24.33	38.42	163.731	165.252	161.13
8"	8	3.175	219.07	27.00	43.50	214.213	215.901	—
10"	8	3.175	273.05	30.73	48.90	267.851	269.772	—
12"	8	3.175	323.85	34.54	53.98	318.333	320.492	—

Notes

- Millimetre values are conversions of the inch dimensions in ASME B1.20.1.
- Tap drill sizes are commonly recommended values and are not part of the standard; they depend on whether the hole is reamed.

TG-DS-019 · Online: teshigroup.com/dimensional-standards/npt-thread-dimensions-asme-b1-20-1/ · Verify against the current edition of the standard.

MSS SP-97 Weldolet Dimensions

Standard-weight Weldolet dimensions, size-on-size (mm)

This chart gives typical dimensions of **standard-weight (STD) Weldolets to MSS SP-97** in millimetres, for outlets from NPS ½" to 8" on a run pipe of the same size (size-on-size). A Weldolet is an integrally reinforced butt-weld branch outlet that replaces a reinforced branch or a reducing tee.

KEY TO DIMENSIONS

- A** Height of the outlet above the run pipe
- B** Width of the base across the run pipe
- C** Outside diameter of the outlet at the welding end

Standard-weight Weldolet dimensions, size-on-size (mm)

NPS Outlet	METRIC			IMPERIAL		
	A Height	B Base width	C Outlet OD	A Height, in	B Base width, in	C Outlet OD, in
½"	19.1	34.9	23.8	0.752	1.37	0.937
¾"	22.2	41.3	30.2	0.874	1.63	1.19
1"	27.0	50.8	36.5	1.06	2.00	1.44
1½"	33.3	73.0	50.8	1.31	2.87	2.00
2"	38.1	88.9	65.1	1.50	3.50	2.56
3"	44.5	122.2	93.7	1.75	4.81	3.69
4"	50.8	152.4	120.7	2.00	6.00	4.75
6"	60.3	215.9	169.9	2.37	8.50	6.69
8"	69.9	263.5	220.7	2.75	10.37	8.69

Notes

- Dimensions are in millimetres, for standard-weight (STD) Weldolets on a run pipe of the same nominal size.
- On a larger run pipe the base is contoured to that run size; the height A stays the same for a given outlet size and schedule.
- Extra-strong (XS) and Schedule 160 Weldolets are taller; their dimensions are supplied on request.
- Sockolet (socket weld) and Thredolet (NPT) outlets to MSS SP-97 are rated Class 3000 or 6000.

TG-DS-034 · Online: [teshigroup.com/dimensional-standards/mss-sp-97-weldolet-dimensions/](https://www.teshigroup.com/dimensional-standards/mss-sp-97-weldolet-dimensions/) · Verify against the current edition of the standard.

PART 9

Plates & structural sections

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ISMB Beam Sizes and Weights — IS 808	81
ISMC Channel Sizes and Weights — IS 808	82
ISA Steel Angle Sizes and Weights — IS 808	83

Steel Plate Weight Chart

Plate weight by thickness

Weight of **mild steel plate** per square metre and per standard plate size, for thicknesses from 3 mm to 100 mm. The values apply to IS 2062, ASTM A36 and ASTM A516 plates.

Plate weight by thickness

Thickness mm	Weight kg/m ²	1250 × 2500 mm kg per plate	1250 × 6300 mm kg per plate	1500 × 6300 mm kg per plate	2000 × 6300 mm kg per plate	2500 × 10000 mm kg per plate	2500 × 12000 mm kg per plate
3	23.55	74	185	223	297	589	706
4	31.40	98	247	297	396	785	942
5	39.25	123	309	371	495	981	1,178
6	47.10	147	371	445	593	1,177	1,413
8	62.80	196	495	593	791	1,570	1,884
10	78.50	245	618	742	989	1,962	2,355
12	94.20	294	742	890	1,187	2,355	2,826
14	109.90	343	865	1,039	1,385	2,748	3,297
16	125.60	392	989	1,187	1,583	3,140	3,768
18	141.30	442	1,113	1,335	1,780	3,532	4,239
20	157.00	491	1,236	1,484	1,978	3,925	4,710
22	172.70	540	1,360	1,632	2,176	4,318	5,181
25	196.25	613	1,545	1,855	2,473	4,906	5,888
28	219.80	687	1,731	2,077	2,769	5,495	6,594
30	235.50	736	1,855	2,225	2,967	5,888	7,065
32	251.20	785	1,978	2,374	3,165	6,280	7,536
36	282.60	883	2,225	2,671	3,561	7,065	8,478
40	314.00	981	2,473	2,967	3,956	7,850	9,420
45	353.25	1,104	2,782	3,338	4,451	8,831	10,598
50	392.50	1,227	3,091	3,709	4,946	9,812	11,775
56	439.60	1,374	3,462	4,154	5,539	10,990	13,188
63	494.55	1,545	3,895	4,673	6,231	12,364	14,836
70	549.50	1,717	4,327	5,193	6,924	13,738	16,485
75	588.75	1,840	4,636	5,564	7,418	14,719	17,662
80	628.00	1,962	4,946	5,935	7,913	15,700	18,840
90	706.50	2,208	5,564	6,676	8,902	17,662	21,195
100	785.00	2,453	6,182	7,418	9,891	19,625	23,550

Notes

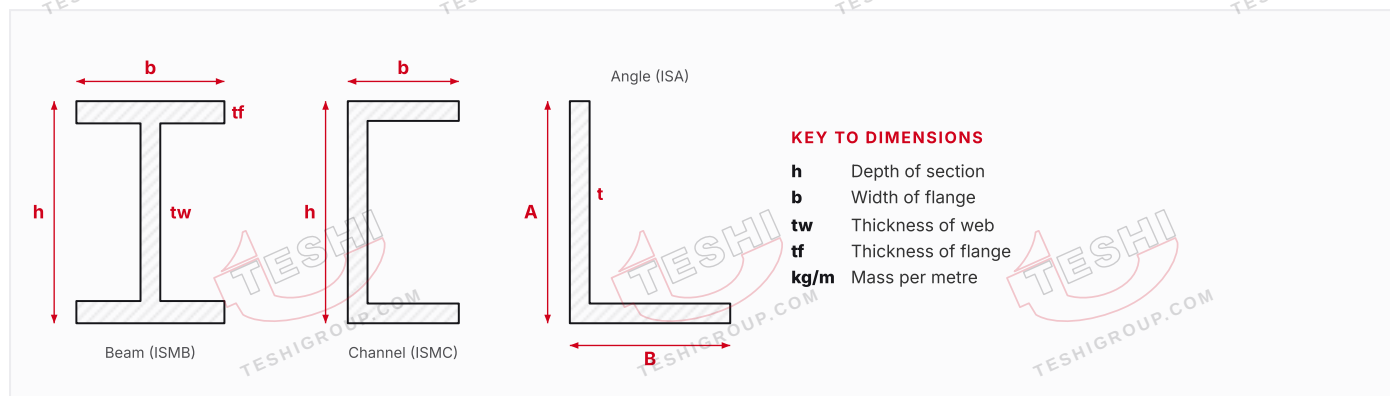
- Calculated at a density of 7.85 g/cm³ (7850 kg/m³).
- Actual plate weight varies with rolling tolerance on thickness; invoicing is normally on weighbridge weight.

TG-DS-025 · Online: [teshigroup.com/dimensional-standards/steel-plate-weight-chart/](https://www.teshigroup.com/dimensional-standards/steel-plate-weight-chart/) · Verify against the current edition of the standard.

ISMB Beam Sizes and Weights — IS 808

ISMB sections

Dimensions and mass of **ISMB sections** (Indian Standard medium-weight beams) to IS 808: depth, flange width, web and flange thickness, mass per metre and sectional area.



ISMB sections

Designation	METRIC						IMPERIAL					
	h Depth, mm	b Flange width, mm	tw Web, mm	tf Flange, mm	Mass kg/m	Area cm ²	h Depth, in	b Flange width, in	tw Web, in	tf Flange, in	Mass lb/ft	Area in ²
ISMB 100	100	50	4.7	7.0	8.9	11.4	3.94	1.97	0.185	0.276	5.98	1.77
ISMB 125	125	70	5.0	8.0	13.3	17.0	4.92	2.76	0.197	0.315	8.94	2.63
ISMB 150	150	75	5.0	8.0	15.0	19.1	5.91	2.95	0.197	0.315	10.08	2.96
ISMB 175	175	85	5.8	9.0	19.6	25.0	6.89	3.35	0.228	0.354	13.17	3.88
ISMB 200	200	100	5.7	10.0	24.2	30.8	7.87	3.94	0.224	0.394	16.26	4.77
ISMB 225	225	110	6.5	11.8	31.1	39.7	8.86	4.33	0.256	0.465	20.90	6.15
ISMB 250	250	125	6.9	12.5	37.3	47.5	9.84	4.92	0.272	0.492	25.06	7.36
ISMB 300	300	140	7.7	13.1	46.0	58.6	11.81	5.51	0.303	0.516	30.91	9.08
ISMB 350	350	140	8.1	14.2	52.4	66.7	13.78	5.51	0.319	0.559	35.21	10.34
ISMB 400	400	140	8.9	16.0	61.5	78.4	15.75	5.51	0.350	0.630	41.33	12.15
ISMB 450	450	150	9.4	17.4	72.4	92.2	17.72	5.91	0.370	0.685	48.65	14.29
ISMB 500	500	180	10.2	17.2	86.9	111	19.69	7.09	0.402	0.677	58.39	17.20
ISMB 550	550	190	11.2	19.3	104	132	21.65	7.48	0.441	0.760	69.88	20.46
ISMB 600	600	210	12.0	20.3	123	156	23.62	8.27	0.472	0.799	82.65	24.18

Notes

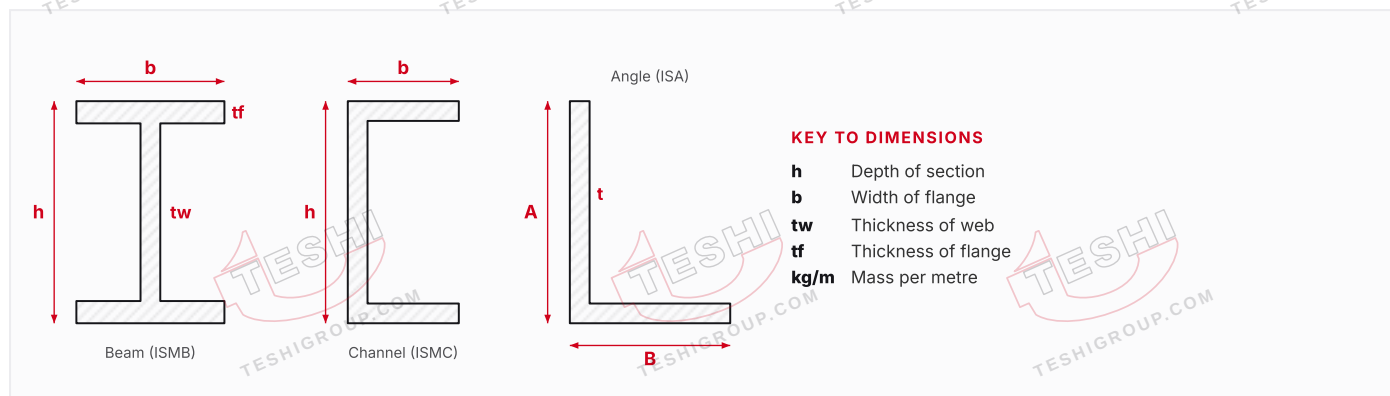
- Values are those of IS 808:1989. Check against IS 808:2021 where the order specifies the current edition.
- Rolled sections are supplied to the rolling tolerances of IS 1852.

TG-DS-026 · Online: teshigroup.com/dimensional-standards/is-808-ismb-beam-sizes-weights/ · Verify against the current edition of the standard.

ISMC Channel Sizes and Weights — IS 808

ISMC sections

Dimensions and mass of **ISMC sections** (Indian Standard medium-weight channels) to IS 808: depth, flange width, web and flange thickness, mass per metre and sectional area.



ISMC sections

Designation	METRIC						IMPERIAL					
	h Depth, mm	b Flange width, mm	tw Web, mm	tf Flange, mm	Mass kg/m	Area cm ²	h Depth, in	b Flange width, in	tw Web, in	tf Flange, in	Mass lb/ft	Area in ²
ISMC 75	75	40	4.8	7.5	7.14	9.1	2.95	1.57	0.189	0.295	4.80	1.41
ISMC 100	100	50	5.0	7.7	9.56	12.2	3.94	1.97	0.197	0.303	6.42	1.89
ISMC 125	125	65	5.3	8.2	13.1	16.7	4.92	2.56	0.209	0.323	8.80	2.59
ISMC 150	150	75	5.7	9.0	16.8	21.3	5.91	2.95	0.224	0.354	11.29	3.30
ISMC 175	175	75	6.0	10.2	19.6	24.9	6.89	2.95	0.236	0.402	13.17	3.86
ISMC 200	200	75	6.2	11.4	22.3	28.5	7.87	2.95	0.244	0.449	14.98	4.42
ISMC 225	225	80	6.5	12.4	26.1	33.3	8.86	3.15	0.256	0.488	17.54	5.16
ISMC 250	250	80	7.2	14.1	30.6	39.0	9.84	3.15	0.283	0.555	20.56	6.04
ISMC 300	300	90	7.8	13.6	36.3	46.3	11.81	3.54	0.307	0.535	24.39	7.18
ISMC 350	350	100	8.3	13.5	42.7	54.4	13.78	3.94	0.327	0.531	28.69	8.43
ISMC 400	400	100	8.8	15.3	50.1	63.8	15.75	3.94	0.346	0.602	33.67	9.89

Notes

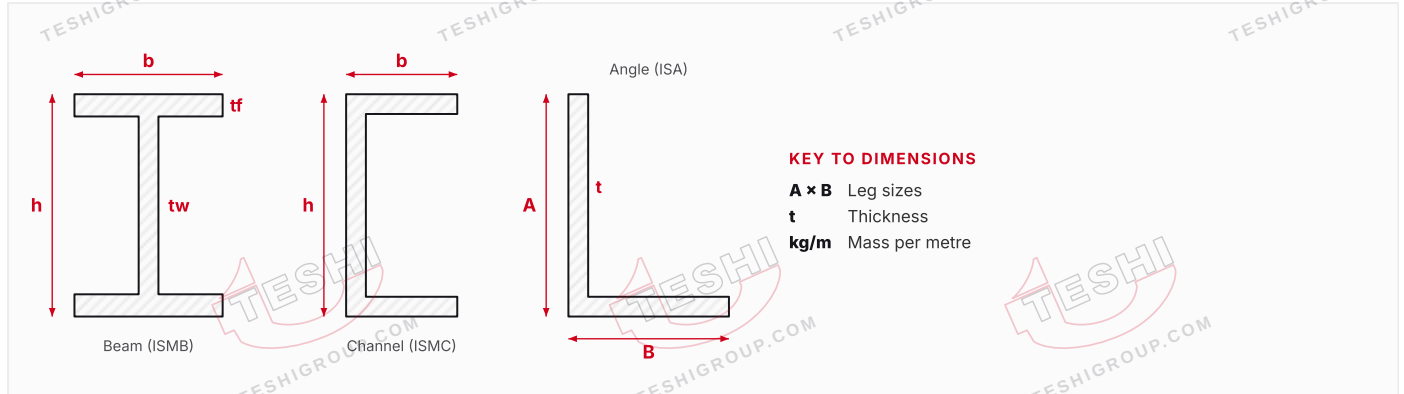
- Values are those of IS 808:1989. Check against IS 808:2021 where the order specifies the current edition.
- Rolled sections are supplied to the rolling tolerances of IS 1852.

TG-DS-027 · Online: [teshigroup.com/dimensional-standards/is-808-ismc-channel-sizes-weights/](https://www.teshigroup.com/dimensional-standards/is-808-ismc-channel-sizes-weights/) · Verify against the current edition of the standard.

ISA Steel Angle Sizes and Weights — IS 808

Equal angles (part 1 of 2)

Leg size, thickness and mass per metre of **hot-rolled steel angles** (ISA) to IS 808, for equal and unequal leg angles.



Equal angles (part 1 of 2)

Designation A × B × t	METRIC				IMPERIAL			
	A mm	B mm	t mm	Mass kg/m	A in	B in	t in	Mass lb/ft
ISA 25 × 25 × 3	25	25	3	1.1	0.984	0.984	0.118	0.74
ISA 25 × 25 × 4	25	25	4	1.4	0.984	0.984	0.157	0.94
ISA 25 × 25 × 5	25	25	5	1.8	0.984	0.984	0.197	1.21
ISA 30 × 30 × 3	30	30	3	1.4	1.18	1.18	0.118	0.94
ISA 30 × 30 × 4	30	30	4	1.8	1.18	1.18	0.157	1.21
ISA 30 × 30 × 5	30	30	5	2.2	1.18	1.18	0.197	1.48
ISA 35 × 35 × 3	35	35	3	1.6	1.38	1.38	0.118	1.08
ISA 35 × 35 × 4	35	35	4	2.1	1.38	1.38	0.157	1.41
ISA 35 × 35 × 5	35	35	5	2.6	1.38	1.38	0.197	1.75
ISA 35 × 35 × 6	35	35	6	3.0	1.38	1.38	0.236	2.02
ISA 40 × 40 × 3	40	40	3	1.8	1.57	1.57	0.118	1.21
ISA 40 × 40 × 4	40	40	4	2.4	1.57	1.57	0.157	1.61
ISA 40 × 40 × 5	40	40	5	3.0	1.57	1.57	0.197	2.02
ISA 40 × 40 × 6	40	40	6	3.5	1.57	1.57	0.236	2.35
ISA 45 × 45 × 3	45	45	3	2.1	1.77	1.77	0.118	1.41
ISA 45 × 45 × 4	45	45	4	2.7	1.77	1.77	0.157	1.81
ISA 45 × 45 × 5	45	45	5	3.4	1.77	1.77	0.197	2.28
ISA 45 × 45 × 6	45	45	6	4.0	1.77	1.77	0.236	2.69
ISA 50 × 50 × 3	50	50	3	2.3	1.97	1.97	0.118	1.55
ISA 50 × 50 × 4	50	50	4	3.0	1.97	1.97	0.157	2.02
ISA 50 × 50 × 5	50	50	5	3.8	1.97	1.97	0.197	2.55
ISA 50 × 50 × 6	50	50	6	4.5	1.97	1.97	0.236	3.02
ISA 55 × 55 × 5	55	55	5	4.1	2.17	2.17	0.197	2.76
ISA 55 × 55 × 6	55	55	6	4.9	2.17	2.17	0.236	3.29
ISA 55 × 55 × 8	55	55	8	6.4	2.17	2.17	0.315	4.30
ISA 55 × 55 × 10	55	55	10	7.9	2.17	2.17	0.394	5.31
ISA 60 × 60 × 5	60	60	5	4.5	2.36	2.36	0.197	3.02
ISA 60 × 60 × 6	60	60	6	5.4	2.36	2.36	0.236	3.63
ISA 60 × 60 × 8	60	60	8	7.0	2.36	2.36	0.315	4.70
ISA 60 × 60 × 10	60	60	10	8.6	2.36	2.36	0.394	5.78
ISA 65 × 65 × 5	65	65	5	4.9	2.56	2.56	0.197	3.29
ISA 65 × 65 × 6	65	65	6	5.8	2.56	2.56	0.236	3.90
ISA 65 × 65 × 8	65	65	8	7.7	2.56	2.56	0.315	5.17
ISA 65 × 65 × 10	65	65	10	9.4	2.56	2.56	0.394	6.32
ISA 70 × 70 × 5	70	70	5	5.3	2.76	2.76	0.197	3.56

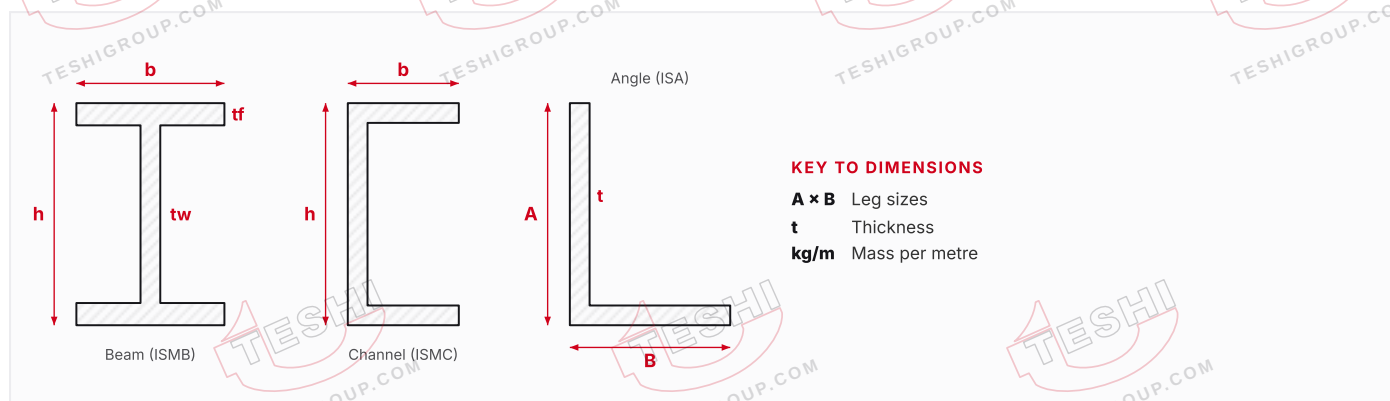
Notes

- Values are those of IS 808:1989.
- Other sizes and thicknesses are available on enquiry.

TG-DS-028 · Online: teshigroup.com/dimensional-standards/is-808-angle-sizes-weights/ · Verify against the current edition of the standard.

ISA Steel Angle Sizes and Weights — IS 808

Equal angles (part 2 of 2)



Equal angles (part 2 of 2)

Designation A × B × t	METRIC				IMPERIAL			
	A mm	B mm	t mm	Mass kg/m	A in	B in	t in	Mass lb/ft
ISA 70 × 70 × 6	70	70	6	6.3	2.76	2.76	0.236	4.23
ISA 70 × 70 × 8	70	70	8	8.3	2.76	2.76	0.315	5.58
ISA 70 × 70 × 10	70	70	10	10.2	2.76	2.76	0.394	6.85
ISA 75 × 75 × 5	75	75	5	5.7	2.95	2.95	0.197	3.83
ISA 75 × 75 × 6	75	75	6	6.8	2.95	2.95	0.236	4.57
ISA 75 × 75 × 8	75	75	8	8.9	2.95	2.95	0.315	5.98
ISA 75 × 75 × 10	75	75	10	11.0	2.95	2.95	0.394	7.39
ISA 80 × 80 × 6	80	80	6	7.3	3.15	3.15	0.236	4.91
ISA 80 × 80 × 8	80	80	8	9.6	3.15	3.15	0.315	6.45
ISA 80 × 80 × 10	80	80	10	11.8	3.15	3.15	0.394	7.93
ISA 80 × 80 × 12	80	80	12	14.0	3.15	3.15	0.472	9.41
ISA 90 × 90 × 6	90	90	6	8.2	3.54	3.54	0.236	5.51
ISA 90 × 90 × 8	90	90	8	10.8	3.54	3.54	0.315	7.26
ISA 90 × 90 × 10	90	90	10	13.4	3.54	3.54	0.394	9.00
ISA 90 × 90 × 12	90	90	12	15.8	3.54	3.54	0.472	10.62
ISA 100 × 100 × 6	100	100	6	9.2	3.94	3.94	0.236	6.18
ISA 100 × 100 × 8	100	100	8	12.1	3.94	3.94	0.315	8.13
ISA 100 × 100 × 10	100	100	10	14.9	3.94	3.94	0.394	10.01
ISA 100 × 100 × 12	100	100	12	17.7	3.94	3.94	0.472	11.89
ISA 110 × 110 × 8	110	110	8	13.4	4.33	4.33	0.315	9.00
ISA 110 × 110 × 10	110	110	10	16.6	4.33	4.33	0.394	11.15
ISA 110 × 110 × 12	110	110	12	19.7	4.33	4.33	0.472	13.24
ISA 110 × 110 × 16	110	110	16	25.7	4.33	4.33	0.630	17.27
ISA 130 × 130 × 8	130	130	8	15.9	5.12	5.12	0.315	10.68
ISA 130 × 130 × 10	130	130	10	19.7	5.12	5.12	0.394	13.24
ISA 130 × 130 × 12	130	130	12	23.5	5.12	5.12	0.472	15.79
ISA 130 × 130 × 16	130	130	16	30.7	5.12	5.12	0.630	20.63
ISA 150 × 150 × 10	150	150	10	22.9	5.91	5.91	0.394	15.39
ISA 150 × 150 × 12	150	150	12	27.3	5.91	5.91	0.472	18.34
ISA 150 × 150 × 16	150	150	16	35.8	5.91	5.91	0.630	24.06
ISA 150 × 150 × 20	150	150	20	44.1	5.91	5.91	0.787	29.63
ISA 200 × 200 × 12	200	200	12	36.9	7.87	7.87	0.472	24.80
ISA 200 × 200 × 16	200	200	16	48.5	7.87	7.87	0.630	32.59
ISA 200 × 200 × 20	200	200	20	60.0	7.87	7.87	0.787	40.32
ISA 200 × 200 × 25	200	200	25	73.9	7.87	7.87	0.984	49.66

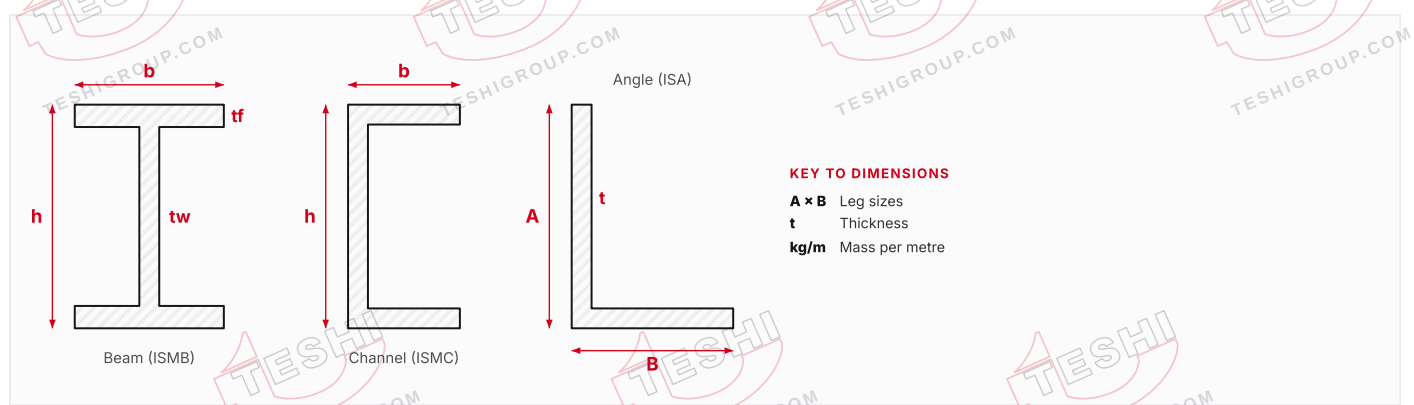
Notes

- Values are those of IS 808:1989.
- Other sizes and thicknesses are available on enquiry.

TG-DS-028 · Online: teshigroup.com/dimensional-standards/is-808-angle-sizes-weights/ · Verify against the current edition of the standard.

ISA Steel Angle Sizes and Weights — IS 808

Unequal angles



Unequal angles

Designation $A \times B \times t$	METRIC				IMPERIAL			
	A mm	B mm	t mm	Mass kg/m	A in	B in	t in	Mass lb/ft
ISA 30 × 20 × 3	30	20	3	1.1	1.18	0.787	0.118	0.74
ISA 30 × 20 × 4	30	20	4	1.4	1.18	0.787	0.157	0.94
ISA 30 × 20 × 5	30	20	5	1.8	1.18	0.787	0.197	1.21
ISA 40 × 25 × 3	40	25	3	1.5	1.57	0.984	0.118	1.01
ISA 40 × 25 × 4	40	25	4	1.9	1.57	0.984	0.157	1.28
ISA 40 × 25 × 5	40	25	5	2.4	1.57	0.984	0.197	1.61
ISA 40 × 25 × 6	40	25	6	2.8	1.57	0.984	0.236	1.88
ISA 45 × 30 × 3	45	30	3	1.7	1.77	1.18	0.118	1.14
ISA 45 × 30 × 4	45	30	4	2.2	1.77	1.18	0.157	1.48
ISA 45 × 30 × 5	45	30	5	2.8	1.77	1.18	0.197	1.88
ISA 45 × 30 × 6	45	30	6	3.3	1.77	1.18	0.236	2.22
ISA 50 × 30 × 3	50	30	3	1.8	1.97	1.18	0.118	1.21
ISA 50 × 30 × 4	50	30	4	2.4	1.97	1.18	0.157	1.61
ISA 50 × 30 × 5	50	30	5	3.0	1.97	1.18	0.197	2.02
ISA 50 × 30 × 6	50	30	6	3.5	1.97	1.18	0.236	2.35
ISA 60 × 40 × 5	60	40	5	3.7	2.36	1.57	0.197	2.49
ISA 60 × 40 × 6	60	40	6	4.4	2.36	1.57	0.236	2.96
ISA 60 × 40 × 8	60	40	8	5.8	2.36	1.57	0.315	3.90
ISA 65 × 45 × 5	65	45	5	4.1	2.56	1.77	0.197	2.76
ISA 65 × 45 × 6	65	45	6	4.9	2.56	1.77	0.236	3.29
ISA 65 × 45 × 8	65	45	8	6.4	2.56	1.77	0.315	4.30
ISA 70 × 45 × 5	70	45	5	4.3	2.76	1.77	0.197	2.89
ISA 70 × 45 × 6	70	45	6	5.2	2.76	1.77	0.236	3.49
ISA 70 × 45 × 8	70	45	8	6.7	2.76	1.77	0.315	4.50
ISA 70 × 45 × 10	70	45	10	8.3	2.76	1.77	0.394	5.58
ISA 75 × 50 × 5	75	50	5	4.7	2.95	1.97	0.197	3.16
ISA 75 × 50 × 6	75	50	6	5.6	2.95	1.97	0.236	3.76
ISA 75 × 50 × 8	75	50	8	7.4	2.95	1.97	0.315	4.97
ISA 75 × 50 × 10	75	50	10	9.0	2.95	1.97	0.394	6.05
ISA 80 × 50 × 5	80	50	5	4.9	3.15	1.97	0.197	3.29
ISA 80 × 50 × 6	80	50	6	5.9	3.15	1.97	0.236	3.96
ISA 80 × 50 × 8	80	50	8	7.7	3.15	1.97	0.315	5.17
ISA 80 × 50 × 10	80	50	10	9.4	3.15	1.97	0.394	6.32
ISA 90 × 60 × 6	90	60	6	6.8	3.54	2.36	0.236	4.57
ISA 90 × 60 × 8	90	60	8	8.9	3.54	2.36	0.315	5.98
ISA 90 × 60 × 10	90	60	10	11.0	3.54	2.36	0.394	7.39
ISA 90 × 60 × 12	90	60	12	13.0	3.54	2.36	0.472	8.74
ISA 100 × 65 × 6	100	65	6	7.5	3.94	2.56	0.236	5.04
ISA 100 × 65 × 8	100	65	8	9.9	3.94	2.56	0.315	6.65
ISA 100 × 65 × 10	100	65	10	12.2	3.94	2.56	0.394	8.20
ISA 100 × 75 × 6	100	75	6	8.0	3.94	2.95	0.236	5.38
ISA 100 × 75 × 8	100	75	8	10.5	3.94	2.95	0.315	7.06
ISA 100 × 75 × 10	100	75	10	13.0	3.94	2.95	0.394	8.74
ISA 100 × 75 × 12	100	75	12	15.4	3.94	2.95	0.472	10.35
ISA 125 × 75 × 6	125	75	6	9.2	4.92	2.95	0.236	6.18
ISA 125 × 75 × 8	125	75	8	12.1	4.92	2.95	0.315	8.13
ISA 125 × 75 × 10	125	75	10	14.9	4.92	2.95	0.394	10.01

Notes

- Values are those of IS 808:1989.

- Other sizes and thicknesses are available on enquiry.

TG-DS-028 · Online: [teshigroup.com/dimensional-standards/is-808-angle-sizes-weights/](http://www.teshigroup.com/dimensional-standards/is-808-angle-sizes-weights/) · Verify against the current edition of the standard.



PART 10

Materials — chemistry & mechanical properties

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Super Austenitic SS 904L & 254 SMO Flanges & Fittings

Super austenitic stainless steels combine high nickel, molybdenum and copper (904L) or 6 % molybdenum with nitrogen (254 SMO) to resist sulphuric and phosphoric acid, chloride pitting and stress corrosion cracking.

Teshi Group manufactures 904L and 254 SMO weld neck, slip-on, blind and socket weld flanges, forged fittings and butt weld fittings for acid plants, zinc and copper smelters and flue-gas desulphurisation, with EN 10204 3.1 certification and PMI on every piece.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
904L UNS N08904 · W.Nr. 1.4539	ASTM A182 F904L	ASTM A403 WP904L	ASTM A240 / B625	ASTM A312 / B677
254 SMO (6Mo) UNS S31254 · W.Nr. 1.4547	ASTM A182 F44	ASTM A403 WPS31254	ASTM A240 S31254	ASTM A312 S31254

Chemical composition (weight %, max unless range)

Grade	C	Mn	Si	Cr	Ni	Mo	Cu	N
904L	0.020	2.00	1.00	19.0–23.0	23.0–28.0	4.0–5.0	1.00–2.00	0.10
254 SMO (6Mo)	0.020	1.00	0.80	19.5–20.5	17.5–18.5	6.0–6.5	0.50–1.00	0.18–0.25

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
904L	490 MPa (71 ksi)	215 MPa (31 ksi)	35 %	PREN ≈ 34
254 SMO (6Mo)	650 MPa (94 ksi)	300 MPa (44 ksi)	35 %	PREN ≥ 42

Typical applications

- Sulphuric acid dilution, cooling and storage
- Zinc and copper smelter roaster gas cleaning and leaching circuits
- Phosphoric acid evaporators
- Flue-gas desulphurisation scrubbers
- Seawater and brackish cooling water

Testing & certification

- Solution annealed and water quenched
- PMI on every piece for Ni, Mo and Cu
- Intergranular corrosion test to ASTM A262 when specified
- EN 10204 3.1 certificate; 3.2 with third-party inspection on request

Duplex Stainless Steel 2205 Flanges & Fittings (F51 / F60)

Duplex 2205 has a balanced austenite–ferrite structure that gives roughly twice the yield strength of 316L, with much better resistance to chloride stress corrosion cracking and pitting.

Teshi Group manufactures 2205 flanges to ASTM A182 F51 and F60 and fittings to ASTM A815, heat treated and tested for ferrite content and detrimental phases before dispatch.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
2205 (S31803) UNS S31803 · W.Nr. 1.4462	ASTM A182 F51	ASTM A815 WPS31803	ASTM A240	ASTM A790
2205 (S32205) UNS S32205 · W.Nr. 1.4462	ASTM A182 F60	ASTM A815 WPS32205	ASTM A240	ASTM A790

Chemical composition (weight %, max unless range)

Grade	C	Mn	Si	Cr	Ni	Mo	N
2205 (S31803)	0.030	2.00	1.00	21.0–23.0	4.5–6.5	2.5–3.5	0.08–0.20
2205 (S32205)	0.030	2.00	1.00	22.0–23.0	4.5–6.5	3.0–3.5	0.14–0.20

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
2205 (S31803)	620 MPa (90 ksi)	450 MPa (65 ksi)	25 %	PREN ≈ 33
2205 (S32205)	655 MPa (95 ksi)	450 MPa (65 ksi)	25 %	PREN ≈ 35

Typical applications

- Brackish and produced-water lines
- Chemical process piping and vessels
- Oil and gas gathering and flow lines
- Pulp and paper digesters
- Hydrometallurgical leach circuits

Testing & certification

- Solution annealed and water quenched
- Ferrite content check, typically 35–65 %
- ASTM A923 tests for detrimental intermetallic phases when specified
- Impact testing and PMI as specified

Super Duplex 2507 (F53) & UNS S32760 (F55) Flanges & Fittings

Super duplex stainless steels raise chromium, molybdenum and nitrogen to give a pitting resistance equivalent number (PREN) of 40 or more, for seawater, high-chloride brines and sour service where duplex 2205 is not enough.

Teshi Group manufactures super duplex flanges to ASTM A182 F53 and F55 and fittings to ASTM A815, with heat treatment, ferrite and ASTM A923 testing, and PMI on every piece.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
2507 (S32750) UNS S32750 · W.Nr. 1.4410	ASTM A182 F53	ASTM A815 WPS32750	ASTM A240	ASTM A790
S32760 (Zeron® 100 type) UNS S32760 · W.Nr. 1.4501	ASTM A182 F55	ASTM A815 WPS32760	ASTM A240	ASTM A790

Chemical composition (weight %, max unless range)

Grade	C	Mn	Si	Cr	Ni	Mo	Cu	N	W
2507 (S32750)	0.030	1.20	0.80	24.0–26.0	6.0–8.0	3.0–5.0	0.50	0.24–0.32	—
S32760 (Zeron® 100 type)	0.030	1.00	1.00	24.0–26.0	6.0–8.0	3.0–4.0	0.50–1.00	0.20–0.30	0.50–1.00

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
2507 (S32750)	800 MPa (116 ksi)	550 MPa (80 ksi)	15 %	PREN ≥ 41
S32760 (Zeron® 100 type)	750 MPa (109 ksi)	550 MPa (80 ksi)	25 %	PREN ≥ 40

Typical applications

- Seawater reverse-osmosis desalination
- Offshore firewater and seawater injection
- Sour service to NACE MR0175 / ISO 15156 when specified
- High-chloride hydrometallurgical leaching
- Subsea manifolds and process piping

Testing & certification

- Solution annealed and water quenched
- ASTM A923 Methods A/B/C when specified
- Ferrite content 40–60 % by ASTM E562 point count
- ASTM G48 ferric chloride pitting test when specified
- Hardness checks for NACE MR0175 / ISO 15156 sour service when specified
- PMI on every piece

Titanium Flanges & Fittings — Grade 1, 2, 5, 7 & 12

Titanium is around 45 % lighter than steel and is practically immune to seawater, wet chlorine and hypochlorite thanks to a stable, self-healing oxide film.

Teshi Group manufactures titanium flanges to ASTM B381 and fittings to ASTM B363 in commercially pure grades 1 and 2, the high-strength Ti-6Al-4V alloy (Grade 5), and the corrosion-enhanced grades 7 and 12, with full heat traceability.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
Grade 1 UNS R50250 · W.Nr. 3.7025	ASTM B381 F-1	ASTM B363 WPT1	ASTM B265 Gr 1	ASTM B861 / B862 Gr 1
Grade 2 UNS R50400 · W.Nr. 3.7035	ASTM B381 F-2	ASTM B363 WPT2	ASTM B265 Gr 2	ASTM B861 / B862 Gr 2
Grade 5 (Ti-6Al-4V) UNS R56400 · W.Nr. 3.7165	ASTM B381 F-5	Machined from B381 / B348	ASTM B265 Gr 5	On request
Grade 7 (Ti-Pd) UNS R52400 · W.Nr. 3.7235	ASTM B381 F-7	ASTM B363 WPT7	ASTM B265 Gr 7	ASTM B861 / B862 Gr 7
Grade 12 UNS R53400 · W.Nr. 3.7105	ASTM B381 F-12	ASTM B363 WPT12	ASTM B265 Gr 12	ASTM B861 / B862 Gr 12

Chemical composition (weight %, max unless range)

Grade	C	Ni	Mo	N	V	Al	Pd	Fe	O	H
Grade 1	0.08	—	—	0.03	—	—	—	0.20	0.18	0.015
Grade 2	0.08	—	—	0.03	—	—	—	0.30	0.25	0.015
Grade 5 (Ti-6Al-4V)	0.08	—	—	0.05	3.5–4.5	5.5–6.75	—	0.40	0.20	—
Grade 7 (Ti-Pd)	0.08	—	—	0.03	—	—	0.12–0.25	0.30	0.25	—
Grade 12	0.08	0.6–0.9	0.2–0.4	—	—	—	—	0.30	0.25	—

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
Grade 1	240 MPa (35 ksi)	170 MPa (25 ksi)	24 %	Highest ductility
Grade 2	345 MPa (50 ksi)	275 MPa (40 ksi)	20 %	Industrial workhorse
Grade 5 (Ti-6Al-4V)	895 MPa (130 ksi)	828 MPa (120 ksi)	10 %	High strength
Grade 7 (Ti-Pd)	345 MPa (50 ksi)	275 MPa (40 ksi)	20 %	Reducing acids
Grade 12	483 MPa (70 ksi)	345 MPa (50 ksi)	18 %	Hot brines

Typical applications

- Chlor-alkali brine and wet chlorine lines
- Seawater cooling and desalination
- Naval and marine cooling and ballast systems
- Copper, nickel and cobalt autoclave leaching
- Offshore and subsea piping

Testing & certification

- Chemistry including interstitials (O, N, H) reported on the certificate
- Ultrasonic testing of forgings when specified
- Dimensional inspection to ASME B16.5 / B16.9
- Clean-room handling to avoid iron contamination

Inconel 600, 625 & 825 Flanges & Fittings

Nickel–chromium alloys hold their strength and resist oxidation, carburisation and chloride stress corrosion cracking from cryogenic temperatures to well above 900 °C.

Teshi Group manufactures Inconel 600, 625 and 825 flanges to ASTM B564 and butt weld fittings to ASTM B366, with PMI on every piece and full heat traceability.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
Alloy 600 UNS N06600 · W.Nr. 2.4816	ASTM B564 N06600	ASTM B366 WPNCI	ASTM B168	ASTM B167
Alloy 625 UNS N06625 · W.Nr. 2.4856	ASTM B564 N06625	ASTM B366 WPNCMC	ASTM B443	ASTM B444
Alloy 825 UNS N08825 · W.Nr. 2.4858	ASTM B564 N08825	ASTM B366 WPNCMC	ASTM B424	ASTM B423

Chemical composition (weight %, max unless range)

Grade	C	Mn	Si	Cr	Ni	Mo	Cu	Nb	Ti	Fe
Alloy 600	0.15	1.00	0.50	14.0–17.0	72.0 min	—	0.50	—	—	6.0–10.0
Alloy 625	0.10	—	—	20.0–23.0	58.0 min	8.0–10.0	—	3.15–4.15 (Nb+Ta)	—	5.0
Alloy 825	0.05	—	—	19.5–23.5	38.0–46.0	2.5–3.5	1.5–3.0	—	0.6–1.2	22.0 min

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
Alloy 600	550 MPa (80 ksi)	240 MPa (35 ksi)	30 %	Annealed
Alloy 625	827 MPa (120 ksi)	414 MPa (60 ksi)	30 %	Annealed
Alloy 825	586 MPa (85 ksi)	241 MPa (35 ksi)	30 %	Annealed

Typical applications

- Furnace, heater and high-temperature process piping
- Sour gas and oil well equipment (825, 625)
- Sulphuric and phosphoric acid service (825)
- Seawater and chloride service (625)
- Chemical and petrochemical reactors

Testing & certification

- PMI on every piece
- Intergranular corrosion testing to ASTM G28 when specified
- Ultrasonic testing of forgings when specified
- EN 10204 3.1 certificate; 3.2 on request

Hastelloy C-276, C-22, Monel 400 & Alloy 20 Flanges & Fittings

When stainless and duplex steels are not enough, nickel-molybdenum and nickel-copper alloys handle wet chlorine, hydrochloric and hydrofluoric acids, ferric chlorides and hot sulphuric acid.

Teshi Group manufactures Hastelloy C-276 and C-22, Monel 400 and Alloy 20 flanges and fittings to ASTM B564, B462 and B366 for severe chemical, petrochemical and pollution-control service.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
Hastelloy C-276 UNS N10276 · W.Nr. 2.4819	ASTM B564 N10276	ASTM B366 WPHC276	ASTM B575	ASTM B622
Hastelloy C-22 UNS N06022 · W.Nr. 2.4602	ASTM B564 N06022	ASTM B366 WPHC22	ASTM B575	ASTM B622
Monel 400 UNS N04400 · W.Nr. 2.4360	ASTM B564 N04400	ASTM B366 WPNC	ASTM B127	ASTM B165
Alloy 20 UNS N08020 · W.Nr. 2.4660	ASTM B462 N08020	ASTM B366 WP20CB	ASTM B463	ASTM B464 / B729

Chemical composition (weight %, max unless range)

Grade	C	Mn	Si	Cr	Ni	Mo	Cu	W	Nb	Co	Fe
Hastelloy C-276	0.010	—	—	14.5–16.5	Balance	15.0–17.0	—	3.0–4.5	—	2.5	4.0–7.0
Hastelloy C-22	0.015	—	—	20.0–22.5	Balance	12.5–14.5	—	2.5–3.5	—	2.5	2.0–6.0
Monel 400	0.3	2.0	0.5	—	63.0 min	—	28.0–34.0	—	—	—	2.5
Alloy 20	0.07	—	—	19.0–21.0	32.0–38.0	2.0–3.0	3.0–4.0	—	8×C – 1.00	—	—

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
Hastelloy C-276	690 MPa (100 ksi)	283 MPa (41 ksi)	40 %	Universal corrosion
Hastelloy C-22	690 MPa (100 ksi)	310 MPa (45 ksi)	45 %	Oxidising media
Monel 400	483 MPa (70 ksi)	172 MPa (25 ksi)	35 %	HF, seawater
Alloy 20	551 MPa (80 ksi)	241 MPa (35 ksi)	30 %	Hot H ₂ SO ₄

Typical applications

- Wet chlorine and chlorine dioxide service (C-276, C-22)
- Flue-gas desulphurisation and pollution control
- Hydrofluoric acid alkylation and seawater (Monel 400)
- Hot sulphuric acid piping (Alloy 20)
- Pharmaceutical and fine-chemical reactors

Testing & certification

- PMI on every piece
- ASTM G28 intergranular corrosion testing when specified
- Solution annealing per specification
- EN 10204 3.1 certificate; 3.2 on request

Copper-Nickel 90/10 & 70/30 Flanges & Fittings for Marine Piping

Copper-nickel alloys resist seawater corrosion and biofouling, which is why they are the standard choice for ship and naval seawater systems, firemain systems and offshore cooling.

Teshi Group manufactures copper-nickel 90/10 and 70/30 flanges and fittings for shipyards and marine projects, to EEMUA 145 / 146 dimensions and ASTM material specifications, or to naval drawings.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
Cu-Ni 90/10 UNS C70600 · W.Nr. 2.0872	EEMUA 145 / to drawing	EEMUA 146	ASTM B171	ASTM B466 / B467
Cu-Ni 70/30 UNS C71500 · W.Nr. 2.0882	EEMUA 145 / to drawing	EEMUA 146	ASTM B171	ASTM B466 / B467

Chemical composition (weight %, max unless range)

Grade	Mn	Ni	Cu	Fe	Zn	Pb
Cu-Ni 90/10	1.0	9.0–11.0	Balance	1.0–1.8	1.0	0.05
Cu-Ni 70/30	1.0	29.0–33.0	Balance	0.40–1.0	1.0	0.05

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
Cu-Ni 90/10	275 MPa (40 ksi)	105 MPa (15 ksi)	—	Seawater systems
Cu-Ni 70/30	360 MPa (52 ksi)	125 MPa (18 ksi)	—	Higher velocity

Typical applications

- Ship and naval seawater cooling, ballast and firemain systems
- Offshore platform seawater and firewater
- Desalination and condenser cooling
- Hydraulic and instrumentation lines

Testing & certification

- Chemistry and mechanical tests per specification
- Hydrostatic testing of fabricated assemblies
- Dimensional inspection to EEMUA 145 / 146 or drawing
- Inspection by the shipyard or classification agency when specified

Austenitic Stainless Steel Flanges & Fittings — 304L to 310S

Austenitic stainless steels are the everyday choice for corrosive process lines, with grades tuned for low carbon (L), molybdenum for chlorides (316, 317L), stabilisation for high temperature (321, 347) and oxidation resistance (310).

Teshi Group manufactures stainless steel flanges to ASTM A182 and butt weld fittings to ASTM A403 in all common grades, dual-certified where the chemistry allows.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
304 / 304L UNS S30400 / S30403 · W.Nr. 1.4301 / 1.4306	ASTM A182 F304 / F304L	ASTM A403 WP304 / WP304L	ASTM A240	ASTM A312
316 / 316L UNS S31600 / S31603 · W.Nr. 1.4401 / 1.4404	ASTM A182 F316 / F316L	ASTM A403 WP316 / WP316L	ASTM A240	ASTM A312
317L UNS S31703 · W.Nr. 1.4438	ASTM A182 F317L	ASTM A403 WP317L	ASTM A240	ASTM A312
321 / 321H UNS S32100 / S32109 · W.Nr. 1.4541	ASTM A182 F321 / F321H	ASTM A403 WP321	ASTM A240	ASTM A312
347 / 347H UNS S34700 / S34709 · W.Nr. 1.4550	ASTM A182 F347 / F347H	ASTM A403 WP347	ASTM A240	ASTM A312
310 / 310S UNS S31000 / S31008 · W.Nr. 1.4845	ASTM A182 F310	ASTM A403 WP310S	ASTM A240	ASTM A312

Chemical composition (weight %, max unless range)

Grade	C	Mn	Si	Cr	Ni	Mo	Nb	Ti
304 / 304L	0.08 / 0.030	2.00	1.00	18.0–20.0	8.0–11.0 / 8.0–12.0	—	—	—
316 / 316L	0.08 / 0.030	2.00	1.00	16.0–18.0	10.0–14.0	2.00–3.00	—	—
317L	0.030	2.00	1.00	18.0–20.0	11.0–15.0	3.0–4.0	—	—
321 / 321H	0.08	2.00	1.00	17.0–19.0	9.0–12.0	—	—	5×(C+N) – 0.70
347 / 347H	0.08	2.00	1.00	17.0–20.0	9.0–13.0	—	10×C – 1.10	—
310 / 310S	0.25 / 0.08	2.00	1.00–1.50	24.0–26.0	19.0–22.0	—	—	—

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
304 / 304L	515 MPa (75 ksi)	205 MPa (30 ksi)	30 %	304L: 485 / 170 MPa
316 / 316L	515 MPa (75 ksi)	205 MPa (30 ksi)	30 %	316L: 485 / 170 MPa
317L	—	—	—	Higher Mo for pitting
321 / 321H	515 MPa (75 ksi)	205 MPa (30 ksi)	30 %	Ti-stabilised
347 / 347H	515 MPa (75 ksi)	205 MPa (30 ksi)	30 %	Nb-stabilised
310 / 310S	515 MPa (75 ksi)	205 MPa (30 ksi)	30 %	Oxidation resistant

Typical applications

- Chemical, fertiliser and pharmaceutical process piping
- Food, water and utility lines
- Refinery hydrotreater and high-temperature lines (321, 347)
- Furnace and kiln piping (310S)
- Cryogenic service

Testing & certification

- Solution annealed
- Intergranular corrosion test to ASTM A262 Practice E when specified
- PMI and dimensional inspection
- EN 10204 3.1 certificate

Chrome-Moly Alloy Steel Flanges & Fittings — F5 to F91

Chromium-molybdenum steels keep their strength and resist creep and hydrogen attack at high temperature, which makes them standard for steam, boiler, refinery heater and hot-blast service.

Teshi Group manufactures chrome-moly flanges to ASTM A182 and fittings to ASTM A234, normalised and tempered with recorded furnace charts, and supplies them with IBR certification for boiler service.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
F5 (5Cr-½Mo) UNS K41545 · W.Nr. 1.7362	ASTM A182 F5	ASTM A234 WP5	ASTM A387 Gr 5	ASTM A335 P5
F9 (9Cr-1Mo) UNS K90941 · W.Nr. 1.7386	ASTM A182 F9	ASTM A234 WP9	ASTM A387 Gr 9	ASTM A335 P9
F11 Cl.2 (1¼Cr-½Mo) UNS K11572 · W.Nr. 1.7335	ASTM A182 F11 Cl.2	ASTM A234 WP11 Cl.1	ASTM A387 Gr 11	ASTM A335 P11
F22 Cl.3 (2¼Cr-1Mo) UNS K21590 · W.Nr. 1.7380	ASTM A182 F22 Cl.3	ASTM A234 WP22 Cl.1	ASTM A387 Gr 22	ASTM A335 P22
F91 (9Cr-1Mo-V) UNS K90901 · W.Nr. 1.4903	ASTM A182 F91	ASTM A234 WP91	ASTM A387 Gr 91	ASTM A335 P91

Chemical composition (weight %, max unless range)

Grade	C	Mn	Si	Cr	Mo	N	Nb	V
F5 (5Cr-½Mo)	0.15	0.30–0.60	0.50	4.0–6.0	0.44–0.65	—	—	—
F9 (9Cr-1Mo)	0.15	0.30–0.60	0.50–1.00	8.0–10.0	0.90–1.10	—	—	—
F11 Cl.2 (1¼Cr-½Mo)	0.10–0.20	0.30–0.80	0.50–1.00	1.00–1.50	0.44–0.65	—	—	—
F22 Cl.3 (2¼Cr-1Mo)	0.05–0.15	0.30–0.60	0.50	2.00–2.50	0.87–1.13	—	—	—
F91 (9Cr-1Mo-V)	0.08–0.12	—	—	8.0–9.5	0.85–1.05	0.03–0.07	0.06–0.10	0.18–0.25

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
F5 (5Cr-½Mo)	485 MPa (70 ksi)	275 MPa (40 ksi)	20 %	Refinery heaters
F9 (9Cr-1Mo)	585 MPa (85 ksi)	380 MPa (55 ksi)	20 %	Hydrogen service
F11 Cl.2 (1¼Cr-½Mo)	485 MPa (70 ksi)	275 MPa (40 ksi)	20 %	Steam lines
F22 Cl.3 (2¼Cr-1Mo)	515 MPa (75 ksi)	310 MPa (45 ksi)	20 %	Boiler headers
F91 (9Cr-1Mo-V)	585 MPa (85 ksi)	415 MPa (60 ksi)	20 %	Supercritical boilers

Typical applications

- Boiler, superheater and steam headers (IBR)
- Supercritical and ultra-supercritical power plants (F91)
- Blast-furnace hot-blast stoves and mains
- Refinery heaters and hydrogen service
- Petrochemical high-temperature lines

Testing & certification

- Normalised and tempered with recorded furnace charts
- Hardness testing of every heat treatment lot
- UT and MPI as specified; PMI on every piece
- IBR Form III-C certification when specified

Carbon Steel, Low-Temperature & High-Yield Pipeline Flanges

Carbon steel covers most piping by volume: A105 for general service, A350 LF2 and LF3 where impact toughness is needed at low temperature, and A694 high-yield grades matched to API 5L line pipe.

Teshi Group manufactures carbon steel flanges and fittings in all three families, normalised where required and supplied with EN 10204 3.1 certificates, Charpy results for low-temperature grades and IBR certification when specified.

Grades and ASTM / ASME specifications

Grade	Forged flanges & fittings	Butt weld fittings	Plate	Pipe
A105 / A105N UNS K03504 · W.Nr. ~1.0460	ASTM A105 (N = normalised)	ASTM A234 WPB	ASTM A516 Gr 70 / IS 2062	ASTM A106 Gr B / API 5L
A350 LF2 Cl.1 UNS K03011 · W.Nr. ~1.0566	ASTM A350 LF2 Cl.1	ASTM A420 WPL6	ASTM A516 Gr 70	ASTM A333 Gr 6
A350 LF3 UNS K32025 · W.Nr. —	ASTM A350 LF3	ASTM A420 WPL3	ASTM A203	ASTM A333 Gr 3
A694 F42 – F70 UNS — · W.Nr. —	ASTM A694 F42 to F70	MSS SP-75 WPHY 42–70	—	API 5L X42 – X70

Chemical composition (weight %, max unless range)

Grade	C	Mn	Si	P	S	Ni
A105 / A105N	0.35	0.60–1.05	0.10–0.35	0.035	0.040	—
A350 LF2 Cl.1	0.30	0.60–1.35	0.15–0.30	0.035	0.040	—
A350 LF3	0.20	0.90	0.20–0.35	—	—	3.3–3.7
A694 F42 – F70	0.26	1.60	—	0.025	0.025	—

Mechanical properties (minimum, room temperature)

Grade	Tensile	Yield (0.2 %)	Elongation	Note
A105 / A105N	485 MPa (70 ksi)	250 MPa (36 ksi)	22 %	Max 187 HB
A350 LF2 Cl.1	485 MPa (70 ksi)	250 MPa (36 ksi)	22 %	Charpy at –46 °C
A350 LF3	485 MPa (70 ksi)	260 MPa (38 ksi)	22 %	Charpy at –101 °C
A694 F42 – F70	—	—	—	Yield = grade number in ksi (F52 = 52 ksi / 360 MPa)

Typical applications

- General refinery, process and utility piping (A105N)
- LNG, ammonia and low-temperature service (LF2, LF3)
- Oil and gas transmission pipelines (A694)
- Steel plant water, air and gas mains
- Boiler and steam service with IBR certification

Testing & certification

- Normalising where specified (A105N)
- Carbon equivalent limit (e.g. CE ≤ 0.43) when the project specifies it
- Charpy V-notch impact testing for LF grades
- Hardness, dimensional and visual inspection
- IBR certification when specified

Material Grade Data Sheets

Chemical composition limits (weight %), minimum room-temperature mechanical properties and heat treatment for the specification grades most often ordered with Teshi flanges, fittings, pipe, plate, bolting and castings, summarised from the governing specifications.

Forgings — flanges & forged fittings

Grade	Chemical composition (wt %)	Tensile min	Yield min	Elong. min	Hardness	Heat treatment
ASTM A105 Forged flanges & fittings	C 0.35 max · Mn 0.60–1.05 · P max 0.035 · S max 0.040 · Si 0.10–0.35 · Cr 0.30 max · Ni 0.40 max · Mo 0.12 max · Cu 0.40 max; V 0.08 max; Cu+Ni+Cr+Mo+V 1.00 max; Cr+Mo 0.32 max	485 MPa	250 MPa	22 %	197 HBW	Not mandatory for standard flanges up to Class 300; anneal, normalize, N&T or Q&T required above Class 300, for special designs and similar cases (A105N = normalized)
ASTM A350 LF2 Cl.1 Forged flanges & fittings	C 0.30 max · Mn 0.60–1.35 · P max 0.035 · S max 0.040 · Si 0.15–0.30 · Cr 0.30 max · Ni 0.40 max · Mo 0.12 max · Cu 0.40 max; V 0.08 max; Nb 0.02 max	485 MPa	250 MPa	22 %	197 HBW	Normalized, N&T or Q&T; Charpy V 20 J avg / 16 J min at -46 °C
ASTM A182 F304 Forged flanges & fittings	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 18.0–20.0 · Ni 8.0–11.0 · Mo — · N 0.10 max	515 MPa	205 MPa	30 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A182 F304L Forged flanges & fittings	C 0.030 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 18.0–20.0 · Ni 8.0–13.0 · Mo — · N 0.10 max	485 MPa	170 MPa	30 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A182 F316 Forged flanges & fittings	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 16.0–18.0 · Ni 10.0–14.0 · Mo 2.00–3.00 · N 0.10 max	515 MPa	205 MPa	30 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A182 F316L Forged flanges & fittings	C 0.030 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 16.0–18.0 · Ni 10.0–15.0 · Mo 2.00–3.00 · N 0.10 max	485 MPa	170 MPa	30 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A182 F321 Forged flanges & fittings	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 17.0–19.0 · Ni 9.0–12.0 · Mo — · Ti 5xC min, 0.70 max	515 MPa	205 MPa	30 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A182 F11 Cl.2 Forged flanges & fittings	C 0.10–0.20 · Mn 0.30–0.80 · P max 0.040 · S max 0.040 · Si 0.50–1.00 · Cr 1.00–1.50 · Ni — · Mo 0.44–0.65	485 MPa	275 MPa	20 %	143–207 HBW	Annealed or normalized & tempered (temper 620 °C min)
ASTM A182 F22 Cl.3 Forged flanges & fittings	C 0.05–0.15 · Mn 0.30–0.60 · P max 0.040 · S max 0.040 · Si 0.50 max · Cr 2.00–2.50 · Ni — · Mo 0.87–1.13	515 MPa	310 MPa	20 %	156–207 HBW	Annealed or normalized & tempered (temper 675 °C min)
ASTM A182 F91 Forged flanges & fittings	C 0.08–0.12 · Mn 0.30–0.60 · P max 0.020 · S max 0.010 · Si 0.20–0.50 · Cr 8.0–9.5 · Ni 0.40 max · Mo 0.85–1.05 · V 0.18–0.25; Nb 0.06–0.10; N 0.03–0.07; Al 0.02 max; Ti 0.01 max; Zr 0.01 max	620 MPa	415 MPa	20 %	190–248 HBW	Normalized 1040–1080 °C and tempered 730–800 °C
ASTM A182 F51 Forged flanges & fittings	C 0.030 max · Mn 2.00 max · P max 0.030 · S max 0.020 · Si 1.00 max · Cr 21.0–23.0 · Ni 4.5–6.5 · Mo 2.5–3.5 · N 0.08–0.20	620 MPa	450 MPa	25 %	Not specified	Solution annealed at 1020 °C min, liquid quench
UNS N08904 (904L) Forgings (A182 F904L)	C 0.020 max · Mn 2.00 max · P max 0.040 · S max 0.030 · Si 1.00 max · Cr 19.0–23.0 · Ni 23.0–28.0 · Mo 4.0–5.0 · Cu 1.00–2.00; N 0.10 max	490 MPa	215 MPa	35 %	Not specified	Solution annealed 1050–1150 °C, liquid quench

Material Grade Data Sheets

Butt weld fittings

Grade	Chemical composition (wt %)	Tensile min	Yield min	Elong. min	Hardness	Heat treatment
ASTM A234 WPB Wrought butt-weld fittings	C 0.30 max · Mn 0.29–1.06 · P max 0.050 · S max 0.058 · Si 0.10 min · Cr 0.40 max · Ni 0.40 max · Mo 0.15 max · Cu 0.40 max; V 0.08 max; Cu+Ni+Cr+Mo 1.00 max; Cr+Mo 0.32 max	415 MPa	240 MPa	22 %	197 HBW	Hot-formed (finished 620–980 °C) need not be heat treated; otherwise normalize, anneal or stress relieve
ASTM A234 WP11 Cl.1 Wrought butt-weld fittings	C 0.05–0.15 · Mn 0.30–0.60 · P max 0.030 · S max 0.030 · Si 0.50–1.00 · Cr 1.00–1.50 · Ni — · Mo 0.44–0.65	415 MPa	205 MPa	22 %	197 HBW	Annealed or normalized & tempered
ASTM A234 WP22 Cl.1 Wrought butt-weld fittings	C 0.05–0.15 · Mn 0.30–0.60 · P max 0.040 · S max 0.040 · Si 0.50 max · Cr 1.90–2.60 · Ni — · Mo 0.87–1.13	415 MPa	205 MPa	22 %	197 HBW	Annealed or normalized & tempered
ASTM A420 WPL6 Wrought butt-weld fittings	C 0.30 max · Mn 0.50–1.35 · P max 0.035 · S max 0.040 · Si 0.15–0.40 · Cr 0.30 max · Ni 0.40 max · Mo 0.12 max · Cu 0.40 max; V 0.08 max; Nb 0.02 max	415 MPa	240 MPa	22 %	Not specified	Normalized, N&T, annealed or Q&T; Charpy V 17.6 J avg / 13.6 J min at -46 °C
ASTM A403 WP304 Wrought butt-weld fittings	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 18.0–20.0 · Ni 8.0–11.0 · Mo —	515 MPa	205 MPa	28 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A403 WP304L Wrought butt-weld fittings	C 0.030 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 18.0–20.0 · Ni 8.0–12.0 · Mo —	485 MPa	170 MPa	28 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A403 WP316 Wrought butt-weld fittings	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 16.0–18.0 · Ni 10.0–14.0 · Mo 2.00–3.00	515 MPa	205 MPa	28 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A403 WP316L Wrought butt-weld fittings	C 0.030 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 16.0–18.0 · Ni 10.0–14.0 · Mo 2.00–3.00	485 MPa	170 MPa	28 %	Not specified	Solution annealed at 1040 °C min, rapid cool

Material Grade Data Sheets

Pipe

Grade	Chemical composition (wt %)	Tensile min	Yield min	Elong. min	Hardness	Heat treatment
ASTM A106 Gr.B Seamless pipe	C 0.30 max · Mn 0.29–1.06 · P max 0.035 · S max 0.035 · Si 0.10 min · Cr 0.40 max · Ni 0.40 max · Mo 0.15 max · Cu 0.40 max; V 0.08 max; Cr+Cu+Mo+Ni+V 1.00 max	415 MPa	240 MPa	30 %	Not specified	Hot-finished: none required; cold-drawn: heat treat at 650 °C min
ASTM A53 Gr.B (seamless) Seamless pipe (Type S)	C 0.30 max · Mn 1.20 max · P max 0.05 · S max 0.045 · Si — · Cr 0.40 max · Ni 0.40 max · Mo 0.15 max · Cu 0.40 max; V 0.08 max; Cu+Ni+Cr+Mo+V 1.00 max	415 MPa	240 MPa	Not specified	Not specified	None required for seamless
API 5L Gr.B PSL1 Seamless line pipe	C 0.28 max · Mn 1.20 max · P max 0.030 · S max 0.030 · Si — · Cr 0.50 max · Ni 0.50 max · Mo 0.15 max · Cu 0.50 max; Nb+V 0.06 max (unless agreed); Nb+V+Ti 0.15 max	415 MPa	245 MPa	Not specified	Not specified	As-rolled, normalized or as agreed (delivery condition per PSL1)
ASTM A312 TP304 Seamless pipe (seamless & welded)	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 18.0–20.0 · Ni 8.0–11.0 · Mo —	515 MPa	205 MPa	35 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A312 TP304L Seamless pipe (seamless & welded)	C 0.035 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 18.0–20.0 · Ni 8.0–13.0 · Mo —	485 MPa	170 MPa	35 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A312 TP316 Seamless pipe (seamless & welded)	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 16.0–18.0 · Ni 10.0–14.0 · Mo 2.00–3.00	515 MPa	205 MPa	35 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A312 TP316L Seamless pipe (seamless & welded)	C 0.035 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 16.0–18.0 · Ni 10.0–14.0 · Mo 2.00–3.00	485 MPa	170 MPa	35 %	Not specified	Solution annealed at 1040 °C min, rapid cool
ASTM A335 P11 Seamless pipe	C 0.05–0.15 · Mn 0.30–0.60 · P max 0.025 · S max 0.025 · Si 0.50–1.00 · Cr 1.00–1.50 · Ni — · Mo 0.44–0.65	415 MPa	205 MPa	30 %	Not specified	Full or isothermal anneal, or normalized & tempered (temper 650 °C min)
ASTM A335 P22 Seamless pipe	C 0.05–0.15 · Mn 0.30–0.60 · P max 0.025 · S max 0.025 · Si 0.50 max · Cr 1.90–2.60 · Ni — · Mo 0.87–1.13	415 MPa	205 MPa	30 %	Not specified	Full or isothermal anneal, or normalized & tempered (temper 675 °C min)
ASTM A335 P91 Seamless pipe	C 0.08–0.12 · Mn 0.30–0.60 · P max 0.020 · S max 0.010 · Si 0.20–0.50 · Cr 8.00–9.50 · Ni 0.40 max · Mo 0.85–1.05 · V 0.18–0.25; Nb 0.06–0.10; N 0.030–0.070; Al 0.02 max; Ti 0.01 max; Zr 0.01 max	585 MPa	415 MPa	20 %	190–250 HBW	Normalized 1040–1080 °C and tempered 730–800 °C

Material Grade Data Sheets

Plate & structural

Grade	Chemical composition (wt %)	Tensile min	Yield min	Elong. min	Hardness	Heat treatment
ASTM A516 Gr.70 Pressure-vessel plate	C 0.27 max (≤12.5 mm) to 0.31 max (>100 mm) · Mn 0.85–1.20 · P max 0.025 · S max 0.025 · Si 0.15–0.40 · Cr — · Ni — · Mo —	485 MPa	260 MPa	21 %	Not specified	As-rolled up to 40 mm; normalized above 40 mm (or when specified)
ASTM A36 Structural plate, bars & shapes	C 0.25 max (plate ≤20 mm) to 0.29 max (>100 mm) · Mn 0.80–1.20 (plate >20 mm; not specified ≤20 mm) · P max 0.030 · S max 0.030 · Si 0.40 max (0.15–0.40 above 40 mm) · Cr — · Ni — · Mo — · Cu 0.20 min when copper steel is specified	400 MPa	250 MPa	23 %	Not specified	As-rolled
IS 2062 E250 BR Structural plate, sections & bars	C 0.22 max · Mn 1.50 max · P max 0.045 · S max 0.045 · Si 0.40 max · Cr — · Ni — · Mo — · CE 0.41 max; Charpy V 27 J min at room temperature	410 MPa	250 MPa	23 %	Not specified	As-rolled (normalizing / controlled rolling optional)
IS 2062 E350 BR Structural plate, sections & bars	C 0.20 max · Mn 1.55 max · P max 0.045 · S max 0.045 · Si 0.45 max · Cr — · Ni — · Mo — · CE 0.47 max; micro-alloying Nb+V+Ti 0.25 max; Charpy V 27 J min at room temperature	490 MPa	350 MPa	22 %	Not specified	As-rolled / controlled rolled / normalized

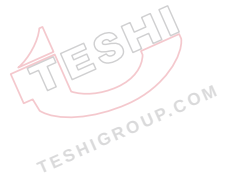
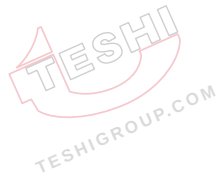
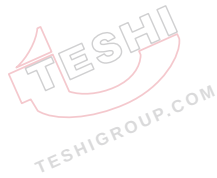
Material Grade Data Sheets

Bolting

Grade	Chemical composition (wt %)	Tensile min	Yield min	Elong. min	Hardness	Heat treatment
ASTM A193 B7 Stud bolts / bolting	C 0.37–0.49 · Mn 0.65–1.10 · P max 0.035 · S max 0.040 · Si 0.15–0.35 · Cr 0.75–1.20 · Ni — · Mo 0.15–0.25	860 MPa	720 MPa	16 %	321 HBW (35 HRC)	Quenched & tempered, 593 °C min temper
ASTM A193 B7M Stud bolts / bolting	C 0.37–0.49 · Mn 0.65–1.10 · P max 0.035 · S max 0.040 · Si 0.15–0.35 · Cr 0.75–1.20 · Ni — · Mo 0.15–0.25	690 MPa	550 MPa	18 %	235 HBW (99 HRB)	Quenched & tempered, 620 °C min temper; 100 % hardness tested
ASTM A193 B16 Stud bolts / bolting	C 0.36–0.47 · Mn 0.45–0.70 · P max 0.035 · S max 0.040 · Si 0.15–0.35 · Cr 0.80–1.15 · Ni — · Mo 0.50–0.65 · V 0.25–0.35; Al 0.015 max	860 MPa	725 MPa	18 %	321 HBW (35 HRC)	Quenched & tempered, 650 °C min temper
ASTM A193 B8 Cl.1 Stud bolts / bolting	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 18.0–20.0 · Ni 8.0–11.0 · Mo —	515 MPa	205 MPa	30 %	223 HBW (96 HRB)	Carbide solution treated
ASTM A193 B8M Cl.1 Stud bolts / bolting	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 16.0–18.0 · Ni 10.0–14.0 · Mo 2.00–3.00	515 MPa	205 MPa	30 %	223 HBW (96 HRB)	Carbide solution treated
ASTM A194 2H Heavy hex nuts	C 0.40 min · Mn 1.00 max · P max 0.040 · S max 0.050 · Si 0.40 max · Cr — · Ni — · Mo —	—	—	—	248–327 HBW (24–35 HRC), sizes ≤ 1½ in.	Quenched & tempered, 455 °C min temper
ASTM A194 2HM Heavy hex nuts	C 0.40 min · Mn 1.00 max · P max 0.040 · S max 0.050 · Si 0.40 max · Cr — · Ni — · Mo —	—	—	—	159–235 HBW (84–99 HRB)	Quenched & tempered, 620 °C min temper
ASTM A194 8 Heavy hex nuts	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 18.0–20.0 · Ni 8.0–11.0 · Mo —	—	—	—	126–300 HBW	Carbide solution treated
ASTM A194 8M Heavy hex nuts	C 0.08 max · Mn 2.00 max · P max 0.045 · S max 0.030 · Si 1.00 max · Cr 16.0–18.0 · Ni 10.0–14.0 · Mo 2.00–3.00	—	—	—	126–300 HBW	Carbide solution treated
ASTM A320 L7 Stud bolts / bolting	C 0.38–0.48 · Mn 0.75–1.00 · P max 0.035 · S max 0.040 · Si 0.15–0.35 · Cr 0.80–1.10 · Ni — · Mo 0.15–0.25	860 MPa	725 MPa	16 %	321 HBW (35 HRC)	Quenched & tempered, 593 °C min temper; Charpy V 27 J avg / 20 J min at -101 °C

Castings

Grade	Chemical composition (wt %)	Tensile min	Yield min	Elong. min	Hardness	Heat treatment
ASTM A216 WCB Steel castings	C 0.30 max · Mn 1.00 max · P max 0.035 · S max 0.035 · Si 0.60 max · Cr 0.50 max · Ni 0.50 max · Mo 0.20 max · Cu 0.30 max; V 0.03 max; total residuals 1.00 max; Mn may rise 0.04 % per 0.01 % C below max, to 1.28 %	485 MPa	250 MPa	22 %	Not specified	Annealed, normalized, N&T or Q&T
ASTM A351 CF8M Austenitic steel castings	C 0.08 max · Mn 1.50 max · P max 0.040 · S max 0.040 · Si 1.50 max · Cr 18.0–21.0 · Ni 9.0–12.0 · Mo 2.0–3.0	485 MPa	205 MPa	30 %	Not specified	Solution annealed at 1040 °C min, quench



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