

Stainless
Steel
Tubular
Products

aalco[®]

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Aalco is the UK's largest independent multi-metals stockholder. Customers from every sector of the UK manufacturing and engineering industries, whether small local businesses or large multinational corporations, benefit from a cost-effective single source for all their metals requirements.

Aalco – delivering customer service and investing in capability:

- ◊ An inventory that includes aluminium, stainless steel, copper, brass, bronze and nickel alloys in all semi-finished forms
- ◊ Comprehensive processing services providing items cut and/or finished to customer requirements
- ◊ Eighteen locations bringing local service to every corner of the UK
- ◊ Ongoing investment in technology and logistics to ensure on-time delivery

No order is too large or too small and Aalco offers a responsive and competitive service for supplying anything from single item orders to major JIT contracts, tailoring this service to individual needs.

Whatever your requirement, in whatever quantity, your local Aalco service centre is ready and willing to satisfy your needs. For a quotation, for further information, more extensive technical information, advice on product selection or to place an order, please contact your local Aalco service centre or refer to the web site www.aalco.co.uk.

Service

The most comprehensive stock range; the highest investment in processing equipment; local service centres nationwide; helpful, friendly, knowledgeable staff and the industry's biggest fleet of delivery vehicles – it all adds up to unbeatable service.

Aalco has maintained market leadership over many years through an absolute dedication to customer service – a service level that is continuously monitored and improved through key performance indicators.

That's why, for reliable, on-time delivery of exactly what you want, when and where you need it, whether it's a small one-off item or a complex JIT contract, Aalco is the essential first choice.

People

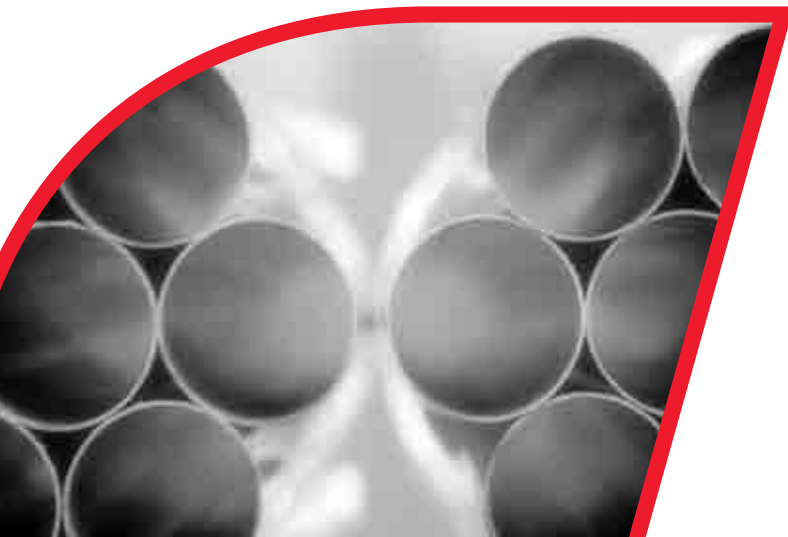
Exceptional customer service starts with people. Aalco develops and retains high quality personnel using a variety of 'in house' courses which cover both skills training, product knowledge and teamwork.

Every Aalco service centre has a dedicated team of people working together to provide an unbeatable service to customers in their region. Customers can expect to receive a quick and informed response to any enquiries for material or for information.

Quality

Aalco takes great care when selecting manufacturing sources for its products and every mill we use is measured against a series of predetermined quality control requirements. All products supplied by Aalco conform to the relevant BS or international standards. Certification can be supplied on request.

Aalco service centres operate a quality manual designed to ISO9001/2008 requirements. Many vendor approvals and bespoke quality control systems are operated through individual Aalco service centres.





Tube

Seamless to ASTM A269, imperial sizes from 1/8" O/D x 24swg to 4" O/D x 1/4" wall in grade 316L

Seamless to ASTM A269, grades 304L & 316L, in metric sizes 6mm O/D x 0.5mm wall to 38mm O/D x 4mm wall

Decorative – Round, Square, Rectangular

Structural – Square and Rectangular up to 250mm

Hygienic (see below)

Welded Metric Nominal Internal Diameter (see below)

Pipe

Seamless and Welded to ASTM A312 from 1/8" to 24" in grades 304L & 316L

Flanges

ASTM A182 / ANSI B16.5

BS 10 Table E, Grade 316L

BS 4504 / EN 1092 Raised Face, 16 Bar

Backing Flanges in Aluminium and Coated Mild Steel

Fittings

Butt Weld Fittings, Seamless and Welded, to ASTM A403 in grades 304L & 316L including elbows, tees & reducers

BSP Screwed Fittings, grade 316 from 1/8" to 3"

Hygienic fittings (see below)

Welded Metric Nominal Internal Diameter (see below)

Hygienic Tube and Fittings

Grades 304L & 316L 3/4" O/D to 4" O/D:

Tube – As Welded & Descaled, Annealed & Polished or Bright Annealed

Bends, Fitted Bends, Tees, Reducers, Clamps & Tube Hangers

Unions – RJT, IDF & DIN

Metric – Welded Nominal Internal Diameter (ND)

From 18mm O/D x 1.5mm wall to 910mm O/D x 5mm wall

Grades 1.4432 (316L High Molybdenum) & 1.4307 (304L)

Tube, Elbows, Tees, Reducers, Collars, End Caps, Tube Clamps & Clips

Backing Flanges in Aluminium & Coated Mild Steel

Further information is provided by these publications, available either from your local Service Centre or at www.aalco.co.uk



Product Guide

Technical information on applications, uses and specifications for stainless

steel, aluminium, copper, brass and bronze.

Stocklist



A guide to the Aalco standard stock range in stainless steel, aluminium, copper, brass and bronze.



Metric

A guide to the range of light-walled nominal diameter metric stainless steel tubular products used

in water treatment, pulp & paper and other industries.



Handrail

A guide to the Aalco range of stainless steel handrail/balustrade systems comprising tube and slotted tube plus associated fittings.

Butt Weld Fittings

Introduction

Butt Weld Fittings are a family of fittings used for forming circumferential butt weld joints in pipework systems.

They are used only in conjunction with ANSI Pipe and are available in the same size range. They are used in areas where pipe-work is permanent and are designed to provide good flow characteristics.

Manufacture

- ◉ **Materials.** Refer to chemical composition table ASTM A240 on page 1-6. Fittings may be made from forgings, bars, plates, or seamless or welded tubular products, provided the materials conform to the chemical composition table.
- ◉ **The steel** may be melted by electric-furnace, or vacuum-furnace, or by either of these followed by vacuum or electroslag-consumable remelting.
- ◉ **Forming.** Fittings may be formed by hammering, pressing, piercing, extruding, upsetting, rolling, bending, fusion welding, machining or any combination of these processes.
- ◉ **Heat Treatment.** All fittings are heat treated in accordance with the heat treatment table. All welding must be done prior to heat treatment.

Manufacturing standards

Wrought pipe fittings are manufactured to dimensions and tolerances in ANSI B16.9 with the exception of short radius elbows and return bends which are made to ANSI B16.28. Light-weight corrosion resistant fittings are made to MSS SP43.

Butt Weld Fittings are available to ASTM A403, ASTM A815 and MSS SP43. These standards require the fittings to be manufactured as follows:

- ◉ Seamless austenitic fittings are made from seamless pipe to ASTM A312.
- ◉ Welded fittings in austenitic grades are manufactured from welded pipe to ASTM A312 or plate to ASTM A240. Note that welded fittings manufactured from plate may have two-welds.
- ◉ Duplex (ferritic/austenitic) grades are manufactured from pipe to ASTM A790 or plate to ASTM A240.

ASTM A403/A815 Butt Weld Fittings are sub-divided into four classes:

- ◉ **WP-S:** Made from seamless pipe to ASTM A312 (Austenitic) or ASTM A790 (Duplex).
- ◉ **WP-W:** Manufactured from welded pipe to ASTM A312 (Austenitic) or ASTM A790 (Duplex). There is no requirement for radiography unless a manufacturer's weld has been introduced or there are welds made with the addition of filler metal.
- ◉ **WP-WX:** Of welded construction. All welds must be 100% radiographed in accordance with Paragraph UW-51 of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.
- ◉ **WP-WU:** Of welded construction. All welds must be 100% examined ultrasonically in accordance with Paragraph UW-51 of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code. Note that this Class only applies to austenitic fittings made to ASTM A403.

CR Fittings are manufactured to the requirements of MSS SP43. These are light-weight fittings and do not require radiography.

Notes:
WP: Means Wrought Pipe
CR: Means Corrosion Resistant

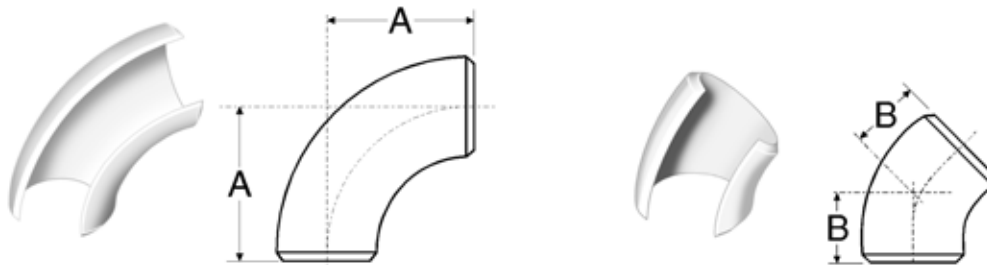
Markings on tube and fittings

The full identification of the fitting should be marked on it including:

- ◉ Nominal Pipe Size (Nominal Bore)
- ◉ Schedule (Wall Thickness)
- ◉ Specification
- ◉ Grade
- ◉ Method of Manufacture (Seamless or Welded)
- ◉ Heat Number
- ◉ Manufacturer's Name or Symbol

Butt Weld Fittings

Range/Sizes - 90° and 45° Long Radius Elbows - ANSI B16.9



Dimensions (based on ASME/ANSI B16.9) and example weights for long radius elbows

Nominal Pipe Size	Common		90° Elbow			45° Elbow		
	OD at Bevel		A		40S/STD ¹	B		40S/STD ¹
	in	mm	in	mm	kg/piece	in	mm	kg/piece
1/2	0.84	21	1.50	38	0.08	0.62	16	0.04
3/4	1.05	27	1.50	38	0.10	0.75	19	0.05
1	1.32	33	1.50	38	0.15	0.88	22	0.07
1 1/4	1.66	42	1.88	48	0.25	1.00	25	0.12
1 1/2	1.90	48	2.25	57	0.36	1.12	29	0.18
2	2.38	60	3.00	76	0.65	1.38	35	0.32
2 1/2	2.88	73	3.75	95	1.29	1.75	44	0.64
3	3.50	89	4.50	114	2.02	2.00	51	1.01
3 1/2	4.00	102	5.25	133	2.83	2.25	57	1.41
4	4.50	114	6.00	152	3.84	2.50	64	1.92
5	5.56	141	7.50	190	6.51	3.12	79	3.25
6	6.62	168	9.00	229	10.1	3.75	95	5.05
8	8.62	219	12.00	305	20.3	5.00	127	10.15
10	10.75	273	15.00	381	36.0	6.25	159	18.0
12	12.75	324	18.00	457	53.0	7.50	190	26.5
14	14.00	356	21.00	533	68.0	8.75	222	34.0
16	16.00	406	24.00	610	89.2	10.00	254	44.6
18	18.00	457	27.00	686	113.0	11.25	286	56.5
20	20.00	508	30.00	762	140.0	12.50	318	70.0
22	22.00	559	33.00	838	170.0	13.50	343	85.0
24	24.00	610	36.00	914	202.0	15.00	381	101.0
26	26.00	660	39.00	991	241.4	16.00	406	120.5
28	28.00	711	42.00	1067	279.9	17.25	438	140.0
30	30.00	762	45.00	1143	321.3	18.50	470	160.5
32	32.00	813	48.00	1219	365.6	19.75	502	183.0
34	34.00	864	51.00	1295	-	21.00	533	-
36	36.00	914	54.00	1372	462.7	22.25	565	231.0
38	38.00	965	57.00	1448	-	23.62	600	-
40	40.00	1016	60.00	1524	571.3	24.88	632	285.5
42	42.00	1067	63.00	1600	629.8	26.00	660	315.0
44	44.00	1118	66.00	1676	-	27.38	695	-
46	46.00	1168	69.00	1753	-	28.62	727	-
48	48.00	1219	72.00	1829	-	29.88	759	-

Notes

- Dimensions quoted in mm are 'Nominal' values from B16.9 (i.e. rounded equivalents of the inch dimensions). Refer to ASME/ANSI B16.9 for additional 'Max' and 'Min' metric dimensions.
- For tolerances see page 3-14.
- ¹ Weights are approximate and based on manufacturers' data (where available) for Schedule 40S/Standard fittings. See page 3-15 for further information.

Butt Weld Fittings

Range/Sizes - Equal Tees - ANSI B16.9



Dimensions (based on ASME/ANSI B16.9) and example weights for equal tees

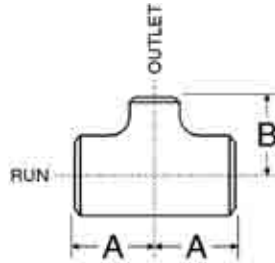
Nominal Pipe Size	OD at Bevelled		Run		Outlet		Weight (Tees only)
	OD		A		B		40S/STD ¹
	in	mm	in	mm	in	mm	kg/piece
1/2	0.84	21	1.00	25	1.00	25	0.08
3/4	1.05	27	1.12	29	1.12	29	0.11
1	1.32	33	1.50	38	1.50	38	0.24
1 1/4	1.66	42	1.88	48	1.88	48	0.41
1 1/2	1.90	48	2.25	57	2.25	57	0.60
2	2.38	60	2.50	64	2.50	64	0.87
2 1/2	2.88	73	3.00	76	3.00	76	1.66
3	3.50	89	3.38	86	3.38	86	1.90
3 1/2	4.00	102	3.75	95	3.75	95	-
4	4.50	114	4.12	105	4.12	105	4.13
5	5.56	141	4.88	124	4.88	124	6.55
6	6.62	168	5.62	143	5.62	143	9.73
8	8.62	219	7.00	178	7.00	178	18.0
10	10.75	273	8.50	216	8.50	216	30.8
12	12.75	324	10.00	254	10.00	254	44.3
14	14.00	356	11.00	279	11.00	279	53.7
16	16.00	406	12.00	305	12.00	305	66.3
18	18.00	457	13.50	343	13.50	343	84.1
20	20.00	508	15.00	381	15.00	381	104
22	22.00	559	16.50	419	16.50	419	126
24	24.00	610	17.00	432	17.00	432	140
26	26.00	660	19.50	495	19.50	495	158
28	28.00	711	20.50	521	20.50	521	176
30	30.00	762	22.00	559	22.00	559	203
32	32.00	813	23.50	597	23.50	597	231
34	34.00	864	25.00	635	25.00	635	-
36	36.00	914	26.50	673	26.50	673	294
38	38.00	965	28.00	711	28.00	711	-
40	40.00	1016	29.50	749	29.50	749	363
42	42.00	1067	30.00	762	28.00	711	382
44	44.00	1118	32.00	813	30.00	762	-
46	46.00	1168	33.50	851	31.50	800	-
48	48.00	1219	35.00	889	33.00	838	-

Notes

- For NPS 26 and larger: Dimensions are not applicable to crosses. Also, dimension B is recommended but not required.
- Dimensions quoted in mm are 'Nominal' values from B16.9 (i.e. rounded equivalents of the inch dimensions). Refer to B16.9 for additional 'Max' and 'Min' metric dimensions.
- For tolerances see page 3-14.
- ¹ Weights are approximate and based on manufacturers' data (where available) for Schedule 40S/Standard fittings. See page 3-15 for further information.

Butt Weld Fittings

Range/Sizes - Reducing Tees - ANSI B16.9



Nominal Pipe Size	Run OD		Outlet OD		Run		Outlet		Weight
	OD at Bevel		OD at Bevel		A		B		40S/STD ¹
	in	mm	in	mm	in	mm	in	mm	kg/piece
1/2⇨3/8	0.84	21	0.68	17	1.00	25	1.00	25	-
1/2⇨1/4	0.84	21	0.54	14	1.00	25	1.00	25	-
3/4⇨1/2	1.05	27	0.84	21	1.12	29	1.12	29	0.12
3/4⇨3/8	1.05	27	0.68	17	1.12	29	1.12	29	-
1⇨3/4	1.32	33	1.05	27	1.50	38	1.50	38	0.23
1⇨1/2	1.32	33	0.84	21	1.50	38	1.50	38	0.22
1 1/4⇨1	1.66	42	1.32	33	1.88	48	1.88	48	0.39
1 1/4⇨3/4	1.66	42	1.05	27	1.88	48	1.88	48	0.37
1 1/4⇨1/2	1.66	42	0.84	21	1.88	48	1.88	48	-
1 1/2⇨1 1/4	1.90	48	1.66	42	2.25	57	2.25	57	0.57
1 1/2⇨1	1.90	48	1.32	33	2.25	57	2.25	57	0.55
1 1/2⇨3/4	1.90	48	1.05	27	2.25	57	2.25	57	0.52
1 1/2⇨1/2	1.90	48	0.84	21	2.25	57	2.25	57	0.51
2⇨1 1/2	2.38	60	1.90	48	2.50	64	2.38	60	0.83
2⇨1 1/4	2.38	60	1.66	42	2.50	64	2.25	57	0.80
2⇨1	2.38	60	1.32	33	2.50	64	2.00	51	0.74
2⇨3/4	2.38	60	1.05	27	2.50	64	1.75	44	-
2 1/2⇨2	2.88	73	2.38	60	3.00	76	2.75	70	1.53
2 1/2⇨1 1/2	2.88	73	1.90	48	3.00	76	2.62	67	1.49
2 1/2⇨1 1/4	2.88	73	1.66	42	3.00	76	2.50	64	1.38
2 1/2⇨1	2.88	73	1.32	33	3.00	76	2.25	57	-
3⇨2 1/2	3.50	89	2.88	73	3.38	86	3.25	83	2.29
3⇨2	3.50	89	2.38	60	3.38	86	3.00	76	2.16
3⇨1 1/2	3.50	89	1.90	48	3.38	86	2.88	73	2.05
3⇨1 1/4	3.50	89	1.66	42	3.38	86	2.75	70	-
3 1/2⇨3	4.00	102	3.50	89	3.75	95	3.62	92	-
3 1/2⇨2 1/2	4.00	102	2.88	73	3.75	95	3.50	89	-
3 1/2⇨2	4.00	102	2.38	60	3.75	95	3.25	83	-
3 1/2⇨1 1/2	4.00	102	1.90	48	3.75	95	3.12	79	-
4⇨3 1/2	4.50	114	4.00	102	4.12	105	4.00	102	-
4⇨3	4.50	114	3.50	89	4.12	105	3.88	98	3.83
4⇨2 1/2	4.50	114	2.88	73	4.12	105	3.75	95	3.70
4⇨2	4.50	114	2.38	60	4.12	105	3.50	89	3.52
4⇨1 1/2	4.50	114	1.90	48	4.12	105	3.38	86	3.41
5⇨4	5.56	141	4.50	114	4.88	124	4.62	117	6.14
5⇨3 1/2	5.56	141	4.00	102	4.88	124	4.50	114	-
5⇨3	5.56	141	3.50	89	4.88	124	4.38	111	5.85
5⇨2 1/2	5.56	141	2.88	73	4.88	124	4.25	108	5.71
5⇨2	5.56	141	2.38	60	4.88	124	4.12	105	-
6⇨5	6.62	168	5.56	141	5.62	143	5.38	137	9.21
6⇨4	6.62	168	4.50	114	5.62	143	5.12	130	8.81
6⇨3 1/2	6.62	168	4.00	102	5.62	143	5.00	127	-
6⇨3	6.62	168	3.50	89	5.62	143	4.88	124	8.52
6⇨2 1/2	6.62	168	2.88	73	5.62	143	4.75	121	-
8⇨6	8.62	219	6.62	168	7.00	178	6.62	168	16.8
8⇨5	8.62	219	5.56	141	7.00	178	6.38	162	16.3
8⇨4	8.62	219	4.50	114	7.00	178	6.12	156	15.9

Butt Weld Fittings

Range/Sizes - Reducing Tees - ANSI B16.9

Nominal Pipe Size	Run OD		Outlet OD		Run		Outlet		Weight
	OD at Bevel		OD at Bevel		A		B		40S/STD ¹
	in	mm	in	mm	in	mm	in	mm	kg/piece
8⇒3½	8.62	219	4.00	102	7.00	178	6.00	152	-
10⇒8	10.75	273	8.62	219	8.50	216	8.00	203	28.9
10⇒6	10.75	273	6.62	168	8.50	216	7.62	194	27.6
10⇒5	10.75	273	5.56	141	8.50	216	7.50	191	27.1
10⇒4	10.75	273	4.50	114	8.50	216	7.25	184	-
12⇒10	12.75	324	10.75	273	10.00	254	9.50	241	42.3
12⇒8	12.75	324	8.62	219	10.00	254	9.00	229	40.3
12⇒6	12.75	324	6.62	168	10.00	254	8.62	219	39.1
12⇒5	12.75	324	5.56	141	10.00	254	8.50	216	-
14⇒12	14.00	356	12.75	324	11.00	279	10.62	270	52.2
14⇒10	14.00	356	10.75	273	11.00	279	10.12	257	50.2
14⇒8	14.00	356	8.625	219	11.00	279	9.75	248	48.4
14⇒6	14.00	356	6.62	168	11.00	279	9.38	238	-
16⇒14	16.00	406	14.00	356	12.00	305	12.00	305	65.1
16⇒12	16.00	406	12.75	324	12.00	305	11.62	295	63.6
16⇒10	16.00	406	10.75	273	12.00	305	11.12	283	61.6
16⇒8	16.00	406	8.62	219	12.00	305	10.75	273	-
16⇒6	16.00	406	6.62	168	12.00	305	10.38	264	-
18⇒16	18.00	457	16.00	406	13.50	343	13.00	330	81.5
18⇒14	18.00	457	14.00	356	13.50	343	13.00	330	80.3
18⇒12	18.00	457	12.75	324	13.50	343	12.62	321	78.9
18⇒10	18.00	457	10.75	273	13.50	343	12.12	308	-
18⇒8	18.00	457	8.62	219	13.50	343	11.75	298	-
20⇒18	20.00	508	18.00	457	15.00	381	14.50	368	101
20⇒16	20.00	508	16.00	406	15.00	381	14.00	356	98.6
20⇒14	20.00	508	14.00	356	15.00	381	14.00	356	97.4
20⇒12	20.00	508	12.75	321	15.00	381	13.62	346	-
20⇒10	20.00	508	10.75	273	15.00	381	13.12	333	-
20⇒8	20.00	508	8.62	219	15.00	381	12.75	324	-
22⇒20	22.00	559	20.00	508	16.50	419	16.00	406	123
22⇒18	22.00	559	18.00	457	16.50	419	15.50	394	120
22⇒16	22.00	559	16.00	406	16.50	419	15.00	381	118
22⇒14	22.00	559	14.00	356	16.50	419	15.00	381	-
22⇒12	22.00	559	12.75	324	16.50	419	14.62	371	-
22⇒10	22.00	559	10.75	273	16.50	419	14.12	359	-
24⇒22	24.00	610	22.00	559	17.00	432	17.00	432	138
24⇒20	24.00	610	20.00	508	17.00	432	17.00	432	137
24⇒18	24.00	610	18.00	457	17.00	432	16.50	419	134
24⇒16	24.00	610	16.00	406	17.00	432	16.00	406	-
24⇒14	24.00	610	14.00	356	17.00	432	16.00	406	-
24⇒12	24.00	610	12.75	324	17.00	432	15.62	397	-
24⇒10	24.00	610	10.75	273	17.00	432	15.12	384	-
26⇒24	26.00	660	24.00	610	19.50	495	19.00	483	-
26⇒22	26.00	660	22.00	559	19.50	495	18.50	470	-
26⇒20	26.00	660	20.00	508	19.50	495	18.00	457	-
26⇒18	26.00	660	18.00	457	19.50	495	17.50	444	-
Reducing tees 26⇒16, ⇒14 and ⇒12 are also available									
28⇒26	28.00	711	26.00	660	20.50	521	20.50	521	-
28⇒24	28.00	711	24.00	610	20.50	521	20.00	508	-
28⇒22	28.00	711	22.00	559	20.50	521	19.50	495	-
28⇒20	28.00	711	20.00	508	20.50	521	19.00	483	-
28⇒18	28.00	711	18.00	457	20.50	521	18.50	470	-
Reducing tees 28⇒16, ⇒14 and ⇒12 are also available									
30⇒28	30.00	762	28.00	711	22.00	559	21.50	546	-
30⇒26	30.00	762	26.00	660	22.00	559	21.50	546	-
30⇒24	30.00	762	24.00	610	22.00	559	21.00	533	-
30⇒22	30.00	762	22.00	559	22.00	559	20.50	521	-
30⇒20	30.00	762	20.00	508	22.00	559	20.00	508	-
Reducing tees 30⇒18, ⇒16, ⇒14, ⇒12 and ⇒10 are also available									
32⇒30	32.00	813	30.00	762	23.50	597	23.00	584	-

Butt Weld Fittings

Range/Sizes - Reducing Tees - ANSI B16.9

Nominal Pipe Size	Run OD		Outlet OD		Run		Outlet		Weight
	OD at Bevel		OD at Bevel		A		B		40S/STD ¹
	in	mm	in	mm	in	mm	in	mm	kg/piece
32⇨28	32.00	813	28.00	711	23.50	597	22.50	572	-
32⇨26	32.00	813	26.00	660	23.50	597	22.50	572	-
32⇨24	32.00	813	24.00	610	23.50	597	22.00	559	-
Reducing tees 32⇨22, ⇨20, ⇨18, ⇨16 and ⇨14 are also available									
34⇨32	34.00	864	32.00	813	25.00	635	24.50	622	-
34⇨30	34.00	864	30.00	762	25.00	635	24.00	610	-
34⇨28	34.00	864	28.00	711	25.00	635	23.50	597	-
34⇨26	34.00	864	26.00	660	25.00	635	23.50	597	-
34⇨24	34.00	864	24.00	610	25.00	635	23.00	584	-
Reducing tees 34⇨22, ⇨20, ⇨18, and ⇨16 are also available									
36⇨34	36.00	914	34.00	864	26.50	673	26.00	660	-
36⇨32	36.00	914	32.00	813	26.50	673	25.50	648	-
36⇨30	36.00	914	30.00	762	26.50	673	25.00	635	-
36⇨28	36.00	914	28.00	711	26.50	673	24.50	622	-
36⇨26	36.00	914	26.00	660	26.50	673	24.50	622	-
36⇨24	36.00	914	24.00	610	26.50	673	24.00	610	-
Reducing tees 36⇨22, ⇨20, ⇨18, and ⇨16 are also available									
38⇨36	38.00	965	36.00	914	28.00	711	28.00	711	-
38⇨34	38.00	965	34.00	864	28.00	711	27.50	698	-
38⇨32	38.00	965	32.00	813	28.00	711	27.00	686	-
38⇨30	38.00	965	30.00	762	28.00	711	26.50	673	-
38⇨28	38.00	965	28.00	711	28.00	711	25.50	648	-
38⇨26	38.00	965	26.00	660	28.00	711	25.50	648	-
Reducing tees 38⇨24, ⇨22, ⇨20, and ⇨18 are also available									
40⇨38	40.00	1016	38.00	965	29.50	749	29.50	749	-
40⇨36	40.00	1016	36.00	914	29.50	749	29.00	737	-
40⇨34	40.00	1016	34.00	864	29.50	749	28.50	724	-
40⇨32	40.00	1016	32.00	813	29.50	749	28.00	711	-
40⇨30	40.00	1016	30.00	762	29.50	749	27.50	698	-
Reducing tees 40⇨28, ⇨26, ⇨24, ⇨22, ⇨20, and ⇨18 are also available									
42⇨40	42.00	1067	40.00	1016	30.00	762	28.00	711	-
42⇨38	42.00	1067	38.00	965	30.00	762	28.00	711	-
42⇨36	42.00	1067	36.00	914	30.00	762	28.00	711	-
42⇨34	42.00	1067	34.00	864	30.00	762	28.00	711	-
42⇨32	42.00	1067	32.00	813	30.00	762	28.00	711	-
42⇨30	42.00	1067	30.00	762	30.00	762	28.00	711	-
Reducing tees 42⇨28, ⇨26, ⇨24, ⇨22, ⇨20, ⇨18, and ⇨16 are also available									
44⇨42	44.00	1118	42.00	1067	32.00	813	30.00	762	-
44⇨40	44.00	1118	40.00	1016	32.00	813	29.50	749	-
44⇨38	44.00	1118	38.00	965	32.00	813	29.00	737	-
44⇨36	44.00	1118	36.00	914	32.00	813	28.50	724	-
Reducing tees 44⇨34, ⇨32, ⇨30, ⇨28, ⇨26, ⇨24, ⇨22, and ⇨20 are also available									
46⇨44	46.00	1168	44.00	1118	33.50	851	31.50	800	-
46⇨42	46.00	1168	42.00	1067	33.50	851	31.00	787	-
46⇨40	46.00	1168	40.00	1016	33.50	851	30.50	775	-
46⇨38	46.00	1168	38.00	965	33.50	851	30.00	762	-
Reducing tees 46⇨36, ⇨34, ⇨32, ⇨30, ⇨28, ⇨26, ⇨24, and ⇨22 are also available									
48⇨46	48.00	1219	46.00	1168	35.00	889	33.00	838	-
48⇨44	48.00	1219	44.00	1118	35.00	889	33.00	838	-
48⇨42	48.00	1219	42.00	1067	35.00	889	32.00	813	-
48⇨40	48.00	1219	40.00	1016	35.00	889	32.00	813	-
Reducing tees 48⇨38, ⇨36, ⇨34, ⇨32, ⇨30, ⇨28, ⇨26, ⇨24, and ⇨22 are also available									

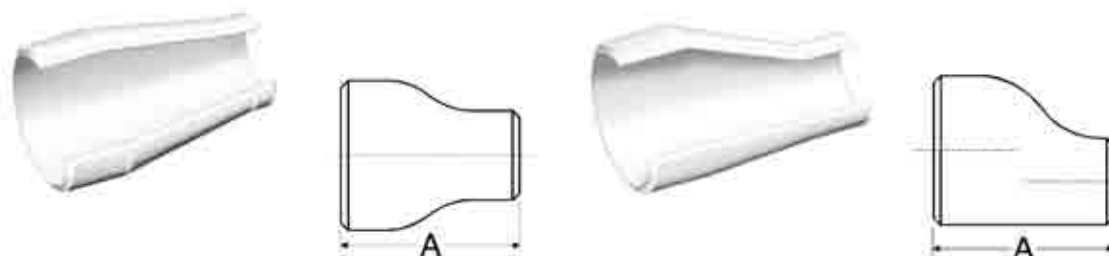
Notes

- For run size NPS 14 and larger, outlet dimension B is recommended but not required.
- Dimensions quoted in mm are 'Nominal' values from B16.9 (i.e. rounded equivalents of the inch dimensions). Refer to B16.9 for additional 'Max' and 'Min' metric dimensions.
- The run and outlet NPS sizes are as shown in the left hand column. The corresponding size designation for a reducing tee is, for example, for the tee shown as 4⇨3 : 4 x 4 x 3, and for the tee shown as 44⇨36 : 44 x 44 x 36.
- For tolerances see page 3-14.

¹ Weights are approximate and based on manufacturers' data (where available) for Schedule 40S/Standard fittings. See page 3-15 for further information.

Butt Weld Fittings

Range/Sizes - Concentric and Eccentric Reducers - ANSI B16.9



Dimensions (based on ASME/ANSI B16.9) and example weights for reducers

Nominal Pipe Size	Large End		Small End		End to End		Weight
	OD at Bevel		OD at Bevel		A		40S/STD ¹
	in	mm	in	mm	in	mm	kg/piece
3/4⇔1/2	1.05	27	0.84	21	1.50	38	0.06
3/4⇔3/8	1.05	27	0.68	17	1.50	38	-
1⇔3/4	1.32	33	1.05	27	2.00	51	0.12
1⇔1/2	1.32	33	0.84	21	2.00	51	0.11
1 1/4⇔1	1.66	42	1.32	33	2.00	51	0.16
1 1/4⇔3/4	1.66	42	1.05	27	2.00	51	0.14
1 1/4⇔1/2	1.66	42	0.84	21	2.00	51	0.13
1 1/2⇔1 1/4	1.90	48	1.66	42	2.50	64	0.24
1 1/2⇔1	1.90	48	1.32	33	2.50	64	0.22
1 1/2⇔3/4	1.90	48	1.05	27	2.50	64	0.20
1 1/2⇔1/2	1.90	48	0.84	21	2.50	64	0.18
2⇔1 1/2	2.38	60	1.90	48	3.00	76	0.37
2⇔1 1/4	2.38	60	1.66	42	3.00	76	0.35
2⇔1	2.38	60	1.32	33	3.00	76	0.32
2⇔3/4	2.38	60	1.05	27	3.00	76	0.30
2 1/2⇔2	2.88	73	2.38	60	3.50	89	0.72
2 1/2⇔1 1/2	2.88	73	1.90	48	3.50	89	0.66
2 1/2⇔1 1/4	2.88	73	1.66	42	3.50	89	0.63
2 1/2⇔1	2.88	73	1.32	33	3.50	89	-
3⇔2 1/2	3.50	89	2.88	73	3.50	89	0.93
3⇔2	3.50	89	2.38	60	3.50	89	0.85
3⇔1 1/2	3.50	89	1.90	48	3.50	89	0.78
3⇔1 1/4	3.50	89	1.66	42	3.50	89	0.75
3 1/2⇔3	4.00	102	3.50	89	4.00	102	-
3 1/2⇔2 1/2	4.00	102	2.88	73	4.00	102	-
3 1/2⇔2	4.00	102	2.38	60	4.00	102	-
3 1/2⇔1 1/2	4.00	102	1.90	48	4.00	102	-
Reducers 3 1/2⇔1 1/4, and 4, 5, 6, & 8⇔3 1/2 are also available							
4⇔3 1/2	4.50	114	4.00	102	4.00	102	-
4⇔3	4.50	114	3.50	89	4.00	102	1.45
4⇔2 1/2	4.50	114	2.88	73	4.00	102	1.37
4⇔2	4.50	114	2.38	60	4.00	102	1.27
4⇔1 1/2	4.50	114	1.90	48	4.00	102	1.18
5⇔4	5.56	141	4.50	114	5.00	127	2.50
5⇔3	5.56	141	3.50	89	5.00	127	2.27
5⇔2 1/2	5.56	141	2.88	73	5.00	127	2.16
6⇔5	6.62	168	5.56	141	5.50	140	3.57
6⇔4	6.62	168	4.50	114	5.50	140	3.30
6⇔3	6.62	168	3.50	89	5.50	140	3.04
8⇔6	8.62	219	6.62	168	6.00	152	5.71
8⇔5	8.62	219	5.56	141	6.00	152	5.40
8⇔4	8.62	219	4.50	114	6.00	152	5.10
10⇔8	10.75	273	8.62	219	7.00	178	9.58
10⇔6	10.75	273	6.62	168	7.00	178	8.78
10⇔5	10.75	273	5.56	141	7.00	178	8.42

Butt Weld Fittings

Range/Sizes - Concentric and Eccentric Reducers - ANSI B16.9

Nominal Pipe Size	Large End		Small End		End to End		Weight
	OD at Bevel		OD at Bevel		A		40S/STD ¹
	in	mm	in	mm	in	mm	kg/piece
12⇒10	12.75	324	10.75	273	8.00	203	13.6
12⇒8	12.75	324	8.62	219	8.00	203	12.7
12⇒6	12.75	324	6.62	168	8.00	203	11.8
14⇒12	14.00	356	12.75	324	13.00	330	25.4
14⇒10	14.00	356	10.75	273	13.00	330	23.6
14⇒8	14.00	356	8.62	219	13.00	330	21.8
16⇒14	16.00	406	14.00	356	14.00	356	31.0
16⇒12	16.00	406	12.75	324	14.00	356	29.6
16⇒10	16.00	406	10.75	273	14.00	356	27.8
18⇒16	18.00	457	16.00	406	15.00	381	37.8
18⇒14	18.00	457	14.00	356	15.00	381	35.7
18⇒12	18.00	457	12.75	324	15.00	381	34.3
20⇒18	20.00	508	18.00	457	20.00	508	56.4
20⇒16	20.00	508	16.00	406	20.00	508	53.5
20⇒14	20.00	508	14.00	356	20.00	508	50.8
22⇒20	22.00	559	20.00	508	20.00	508	62.6
22⇒18	22.00	559	18.00	457	20.00	508	59.7
22⇒16	22.00	559	16.00	406	20.00	508	57.1
24⇒22	24.00	610	22.00	559	20.00	508	68.6
24⇒20	24.00	610	20.00	508	20.00	508	65.7
24⇒18	24.00	610	18.00	457	20.00	508	63.0
26⇒24	26.00	660	24.00	610	24.00	610	-
26⇒22	26.00	660	22.00	559	24.00	610	-
26⇒20	26.00	660	20.00	508	24.00	610	-
26⇒18	26.00	660	18.00	457	24.00	610	-
28⇒26	28.00	711	26.00	660	24.00	610	-
28⇒24	28.00	711	24.00	610	24.00	610	-
28⇒20	28.00	711	20.00	508	24.00	610	-
28⇒18	28.00	711	18.00	457	24.00	610	-
30⇒28	30.00	762	28.00	711	24.00	610	-
30⇒26	30.00	762	26.00	660	24.00	610	-
30⇒24	30.00	762	24.00	610	24.00	610	-
30⇒20	30.00	762	20.00	508	24.00	610	-
32⇒30	32.00	813	30.00	762	24.00	610	-
32⇒28	32.00	813	28.00	711	24.00	610	-
32⇒26	32.00	813	26.00	660	24.00	610	-
32⇒24	32.00	813	24.00	610	24.00	610	-
34⇒32	34.00	864	32.00	813	24.00	610	-
34⇒30	34.00	864	30.00	762	24.00	610	-
34⇒26	34.00	864	26.00	660	24.00	610	-
34⇒24	34.00	864	24.00	610	24.00	610	-
36⇒34	36.00	914	34.00	864	24.00	610	-
36⇒32	36.00	914	32.00	813	24.00	610	-
36⇒30	36.00	914	30.00	762	24.00	610	-
36⇒26	36.00	914	26.00	660	24.00	610	-
36⇒24	36.00	914	24.00	610	24.00	610	-

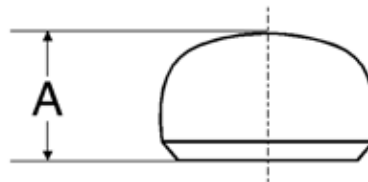
Reducers 38⇒36/34/32/30/28/26, 40⇒38/36/34/32/30, 42⇒40/38/36/34/32/30, 44⇒42/40/38/36, 46⇒44/42/40 and 48⇒46/44/42/40 are also available

Notes

- Dimensions quoted in mm are 'Nominal' values from B16.9 (i.e. rounded equivalents of the inch dimensions). Refer to B16.9 for additional 'Max' and 'Min' metric dimensions.
- For tolerances see page 3-14.
- Other sizes listed in B16.9 are 5⇒2, 6⇒2½, 10⇒4, 12⇒5, 14⇒6, 16⇒8, 18⇒10, 20⇒12, 22⇒14 and 24⇒16.
- 1 Weights are approximate and based on manufacturers' data (where available) for Schedule 40S/Standard fittings. See page 3-15 for further information.

Butt Weld Fittings

Range/Sizes - End Caps - ANSI B16.9



Dimensions (based on ASME/ANSI B16.9) and example weights

Nominal Pipe Size	Common		Limiting Wall Thickness		Length for wall $\leq T$		Length for wall $> T$		Weight
	OD at Bevel		T		A				40S/STD ¹
	in	mm	in	mm	in	mm	in	mm	kg/piece
1/2	0.84	21	0.145	3.73	1.00	25	1.00	25	0.04
3/4	1.05	27	0.15	3.91	1.00	25	1.00	25	0.05
1	1.32	33	0.18	4.55	1.50	38	1.50	38	0.11
1 1/4	1.66	42	0.19	4.85	1.50	38	1.50	38	0.14
1 1/2	1.90	48	0.20	5.08	1.50	38	1.50	38	0.17
2	2.38	60	0.22	5.54	1.50	38	1.75	44	0.23
2 1/2	2.88	73	0.28	7.01	1.50	38	2.00	51	0.39
3	3.50	89	0.30	7.62	2.00	51	2.50	64	0.66
3 1/2	4.00	102	0.32	8.08	2.50	64	3.00	76	-
4	4.50	114	0.34	8.56	2.50	64	3.00	76	1.17
5	5.56	141	0.38	9.53	3.00	76	3.50	89	1.91
6	6.62	168	0.43	10.97	3.50	89	4.00	102	2.90
8	8.62	219	0.50	12.70	4.00	102	5.00	127	5.19
10	10.75	273	0.50	12.70	5.00	127	6.00	152	9.15
12	12.75	324	0.50	12.70	6.00	152	7.00	178	13.3
14	14.00	356	0.50	12.70	6.50	165	7.50	191	15.9
16	16.00	406	0.50	12.70	7.00	178	8.00	203	20.0
18	18.00	457	0.50	12.70	8.00	203	9.00	229	25.6
20	20.00	508	0.50	12.70	9.00	229	10.00	254	31.9
22	22.00	559	0.50	12.70	10.00	254	10.00	254	38.8
24	24.00	610	0.50	12.70	10.50	267	12.00	305	45.1
26	26.00	660	-	-	10.50	267	Subject to agreement with purchaser	53.8	
28	28.00	711	-	-	10.50	267		62.4	
30	30.00	762	-	-	10.50	267		71.7	
32	32.00	813	-	-	10.50	267		81.6	
34	34.00	864	-	-	10.50	267		-	
36	36.00	914	-	-	10.50	267		103	
38	38.00	965	-	-	12.00	305		-	
40	40.00	1016	-	-	12.00	305		127	
42	42.00	1067	-	-	12.00	305		140	
44	44.00	1118	-	-	13.50	343		-	
46	46.00	1168	-	-	13.50	343		-	
48	48.00	1219	-	-	13.50	343		-	

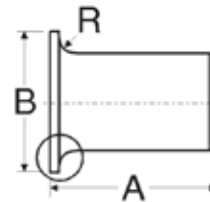
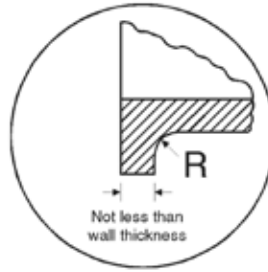
Notes

- Dimensions quoted in mm (except T) are 'Nominal' values from B16.9 (rounded equivalents of the inch dimensions). Refer to B16.9 for additional 'Max' and 'Min' metric dimensions.
- The shape of caps shall be ellipsoidal and conform to shape requirements in the ASME Boiler and Pressure Code.
- For tolerances see page 3-14.

¹ Weights are approximate and based on manufacturers' data (where available) for Schedule 40S/Standard fittings. See page 3-15 for further information.

Butt Weld Fittings

Range/Sizes - Lap Joint Stub Ends - ANSI B16.9



Dimensions (based on ASME/ANSI B16.9) and example weights

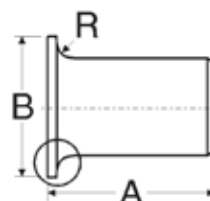
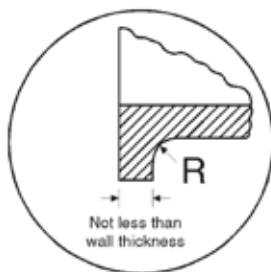
Nominal Pipe Size	Common		Long Pattern		Short Pattern		Diameter of Lap		Radius of Fillet		OD of Barrel				Weight 40S/STD ¹ kg/piece
	OD at Bevel		A		A		B		R		max OD		min		
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	
1/2	0.84	21	3.00	76	2.00	51	1.38	35	0.12	3	0.90	23	0.81	21	0.14
3/4	1.05	27	3.00	76	2.00	51	1.69	43	0.12	3	1.11	28	1.02	26	0.18
1	1.32	33	4.00	102	2.00	51	2.00	51	0.12	3	1.38	35	1.28	33	0.30
1 1/4	1.66	42	4.00	102	2.00	51	2.50	64	0.19	5	1.72	44	1.63	41	0.41
1 1/2	1.90	48	4.00	102	2.00	51	2.88	73	0.25	6	1.97	50	1.87	47	0.55
2	2.38	60	6.00	152	2.50	64	3.62	92	0.31	8	2.46	62	2.34	60	1.00
2 1/2	2.88	73	6.00	152	2.50	64	4.12	105	0.31	8	2.97	75	2.84	72	1.56
3	3.50	89	6.00	152	2.50	64	5.00	127	0.38	10	3.60	91	3.47	88	2.15
3 1/2	4.00	102	6.00	152	3.00	76	5.50	140	0.38	10	4.10	104	3.97	101	-
4	4.50	114	6.00	152	3.00	76	6.19	157	0.44	11	4.59	117	4.47	114	3.05
5	5.56	141	8.00	203	3.00	76	7.31	186	0.44	11	5.68	144	5.53	141	5.30
6	6.62	168	8.00	203	3.50	89	8.50	216	0.50	13	6.74	171	6.59	168	6.90
8	8.62	219	8.00	203	4.00	102	10.62	270	0.50	13	8.74	222	8.59	218	10.45
10	10.75	273	10.00	254	5.00	127	12.75	324	0.50	13	10.91	277	10.72	272	18.15
12	12.75	324	10.00	254	6.00	152	15.00	381	0.50	13	12.91	328	12.72	323	22.25
14	14.00	356	12.00	305	6.00	152	16.25	413	0.50	13	14.17	360	13.97	355	29.05
16	16.00	406	12.00	305	6.00	152	18.50	470	0.50	13	16.18	411	15.97	406	32.69
18	18.00	457	12.00	305	6.00	152	21.00	533	0.50	13	18.19	462	17.97	456	38.60
20	20.00	508	12.00	305	6.00	152	23.00	584	0.50	13	20.24	514	19.97	507	42.68
22	22.00	559	12.00	305	6.00	152	25.25	641	0.50	13	22.24	565	21.97	558	-
24	24.00	610	12.00	305	6.00	152	27.25	692	0.50	13	24.24	616	23.97	609	51.30

Notes

- Dimensions quoted in mm are 'Nominal' values from B16.9 (rounded equivalents of the inch dimensions). Refer to B16.9 for additional 'Max' and 'Min' metric dimensions.
- OD of barrel max and min dimensions (in and mm) are rounded. Refer to B16.9 for the exact values.
- Long pattern stub ends are standard. Purchaser should specify if short pattern is required. Long pattern stub ends are also known as ASA Stub Ends.
- Short pattern stub ends are used with larger flanges in Classes 300 and 600, and with most sizes in Class 900 and higher. When long pattern stub ends are used with flanges in Classes 1500 and 2500, it may be necessary to increase the length A.
- Additional lap thickness must be provided for special facings (e.g. tongue and groove); this is within length A.
- Dimension B conforms to ASME/ANSI B16.5, Pipe Flanges and Forged Fittings.
- Gasket face finish shall be accordance with ASME/ANSI B16.5 for raised face flanges.
- For tolerances see page 3-14.
- ¹ Long pattern weights are listed (short pattern weights are similar to MSS SP-43 lap joint stub ends, page 3-11). Weights are approximate and based on manufacturers' data (where available) for Schedule 40S/Standard fittings. See page 3-15 for further information.

Butt Weld Fittings

Range/Sizes - Lap Joint Stub Ends - MSS SP-43



Note:
Type A is shown.
Type B has a square corner, as indicated by the maximum dimension R in the table below.

Dimensions (based on MSS SP-43) and example weights

Nominal Pipe Size	Common		Length		Diameter of Lap		Radius of Fillet				Weight	
	OD at Bevel		A		B		Type A for Lap Joint Flange		R	Type B for Slip-on Flange		40S/STD ¹
	in	mm	in	mm	in	mm	in	mm		in	mm	kg/piece
1/2	0.84	21	2.00	51	1.38	35	0.12	3.05	0.03	0.76	0.09	
3/4	1.05	27	2.00	51	1.69	43	0.12	3.05	0.03	0.76	0.12	
1	1.32	33	2.00	51	2.00	51	0.12	3.05	0.03	0.76	0.15	
1 1/4	1.66	42	2.00	51	2.50	64	0.19	4.83	0.03	0.76	0.20	
1 1/2	1.90	48	2.00	51	2.88	73	0.25	6.35	0.03	0.76	0.28	
2	2.38	60	2.50	64	3.62	92	0.31	7.87	0.03	0.76	0.41	
2 1/2	2.88	73	2.50	64	4.12	105	0.31	7.87	0.03	0.76	0.66	
3	3.50	89	2.50	64	5.00	127	0.38	9.65	0.03	0.76	0.89	
3 1/2	4.00	102	3.00	76	5.50	140	0.38	9.65	0.03	0.76	-	
4	4.50	114	3.00	76	6.19	157	0.44	11.18	0.03	0.76	1.51	
5	5.56	141	3.00	76	7.31	186	0.44	11.18	0.06	1.52	2.66	
6	6.62	168	3.50	89	8.50	216	0.50	12.70	0.06	1.52	3.02	
8	8.62	219	4.00	102	10.62	270	0.50	12.70	0.06	1.52	5.22	
10	10.75	273	5.00	127	12.75	324	0.50	12.70	0.06	1.52	9.08	
12	12.75	324	6.00	152	15.00	381	0.50	12.70	0.06	1.52	13.35	
14	14.00	356	6.00	152	16.25	413	0.50	12.70	0.06	1.52	14.53	
16	16.00	406	6.00	152	18.50	470	0.50	12.70	0.06	1.52	16.34	
18	18.00	457	6.00	152	21.00	533	0.50	12.70	0.06	1.52	19.30	
20	20.00	508	6.00	152	23.00	584	0.50	12.70	0.06	1.52	21.34	
24	24.00	610	6.00	152	27.25	692	0.50	12.70	0.06	1.52	25.65	

Notes

- Dimensions quoted in mm are equivalents of the inch dimensions (i.e. 25.4 x in). Metric dimensions are not specified in MSS SP-43.
- Length A and Radius R are applicable for Schedule 40S or thinner.
- Contact faces of stub ends shall have a modified spiral or concentric serration.
- For tolerances see page 3-14.

¹ Weights are approximate and based on manufacturers' data (where available) for Schedule 40S/Standard fittings. See page 3-15 for further information.

Butt Weld Fittings

Specifications - ASTM A403

Finish and repair

- **Surface discontinuities** deeper than 5% of nominal wall thickness to be removed.
- **Defect removal by grinding or machining.** The following are removed:
 - Surface discontinuity as above.
 - Surface checks (fishscale) deeper than $\frac{1}{64}$ in (0.4mm).
 - Mechanical marks deeper than $\frac{1}{16}$ in (1.6mm).
 - When removal reduces wall thickness below 87 $\frac{1}{2}$ % of nominal, the fitting is rejected or repaired.
- **Defect repair by welding**
 - Permitted for fitting made to specifications.
 - Purchaser agreement is necessary for weld repair of special fitting.
 - Repair is limited to 10% of outside surface and 33 $\frac{1}{3}$ % of nominal wall thickness.
 - All weld repairs are examined using liquid penetration test.
 - There should be no cracks in prepared cavities, or in finished weld, or in the surrounding $\frac{1}{2}$ in (13mm) of base metal.

Tensile requirements

Grade	UNS	Tensile Strength min		Yield Strength min		Elongation min% in 4D	
		ksi	MPa	ksi	MPa	Longit %	Trans %
All	All	75	515	30	205	28	20
All = All grades listed in the chemical composition table except those listed below							
304L	S30403	70	485	25	170	28	20
316L	S31603	70	485	25	170	28	20
304N	S30451	80	550	35	240	28	20
316N	S31651	80	550	35	240	28	20
XM-19	S20910	100	690	55	380	28	20
	S31254	94-119	650-820	44	300	28	20
	S34565	115	795	60	415	28	20
	S33228	73	500	27	185	28	20

Notes

- Grades or UNS designations are prefixed with letters 'WP' or 'CR' to indicate class.

Butt Weld Fittings

Specifications - General

Applicable specifications

Specifications applicable to butt welding fittings are as follows:

- ◊ **ASME/ANSI B16.9-2007** - Factory-made wrought steel butt welding fittings.
- ◊ **ASME/ANSI B16.28-1997** - Wrought steel butt welding short radius elbows and returns.
- ◊ **MSS SP-43 1991**, Reaffirmed 1996 - Wrought stainless steel butt welding fittings. This applies to 5S, 10S, and 40S wall thicknesses only.
- ◊ **ASME/ANSI B16.25-1997** - Butt welding ends. This defines various weld bevel designs and dimensions, beyond the scope of this manual.
- ◊ **Wall Thicknesses.** Fittings are manufactured to match the wall thicknesses of pipe.
- ◊ **Weights** quoted in the fitting tables are based on manufacturers' data and are approximate. Actual weights may vary from those quoted depending on the type of construction. For austenitic and duplex stainless steel, multiply the quoted weight by 1.014. For ferritic and martensitic stainless steel, multiply the quoted weight by 0.985.

Manufacture and test

- ◊ **Materials and Manufacture.** ASME/ANSI and MSS stainless steel butt welding fittings are most commonly manufactured to ASTM A403.
- ◊ **Production Testing.** Test requirements are defined in ASTM A430.
- ◊ **ASME/ANSI Test Requirements.** B16.9 and B16.28 do not require production testing of fittings although they must be capable of withstanding the rated pressure:

Pressure Ratings. The rated pressure is as for straight seamless pipe of equivalent NPS, wall thickness and material.

Proof testing to qualify the fitting design comprises a bursting strength test. The fitting is required to withstand, without rupture, 105% of the pressure P given by: $P = (2St) / D$
where

S = Actual ultimate tensile strength of a specimen from a representative fitting.

t = Nominal wall thickness

D = Outside diameter

- ◊ **MSS SP-43 Test Requirements.** SP-43 does not require hydrostatic testing of fittings although they must be capable of withstanding 1.5 times the pressure ratings at 100 °F:
Pressure Ratings. Fittings produced to MSS SP-43 have the pressure ratings shown in this table.

Temperature	Schedule 5S	Schedule 10S
°F	Pressure, psi	
100	225	275
150	215	255
200	200	240
250	190	225
300	175	210
350	165	195
400	150	180
450	Not recommended for use at these temperatures	165
500		150
600		130
700		110
750		100

Butt Weld Fittings

Specifications - General

Cross-sectional tolerances for all butt welding fittings (ASME/ANSI B16.9 and B16.28)

Nominal Pipe Size (NPS)	All Fittings				Wall Thickness (t)
	OD at Bevel		ID at Bevel, ±		
	in	mm	in	mm	
1/2 to 2 1/2	+0.06, -0.03	+1.6, -0.8	0.03	0.8	Not less than 87.5% of nominal wall thickness
3 to 3 1/2	±0.06	±1.6	0.06	1.6	
4	±0.06	±1.6	0.06	1.6	
5 to 6	+0.09, -0.06	+3.2, -0.8	0.06	1.6	
8	+0.09, -0.06	+3.2, -0.8	0.06	1.6	
10	+0.16, -0.12	+4.8, -3.2	0.12	3.2	
12 to 18	+0.16, -0.12	+4.8, -3.2	0.12	3.2	
20 to 24	+0.25, -0.19	+6.35, -5.8	0.19	4.8	
26 to 30	+0.25, -0.19	+6.35, -5.8	0.19	4.8	
32 to 48	+0.25, -0.19	+6.35, -5.8	0.19	4.8	

Dimensional tolerances for elbows and returns (ASME/ANSI B16.9 and B16.28)

Nominal Pipe Size (NPS)	90° and 45° Long Radius Elbows, 90° Short Radius Elbows, and Tees		180° Returns			
	Centre-to-End Dimension, ± A,B		Centre-to-Centre Dimension, ± B (=2 x A)		Back-to-face Dimension, ± C	
	in	mm	in	mm	in	mm
1/2 to 2 1/2	0.06	1.6	0.25	6.35	0.25	6.35
3 to 3 1/2	0.06	1.6	0.25	6.35	0.25	6.35
4	0.06	1.6	0.25	6.35	0.25	6.35
5 to 6	0.06	1.6	0.25	6.35	0.25	6.35
8	0.06	1.6	0.25	6.35	0.25	6.35
10	0.09	1.6	0.38	10.0	0.25	6.35
12 to 18	0.09	2.4	0.38	10.0	0.25	6.35
20 to 24	0.09	2.4	0.38	10.0	0.25	6.35
26 to 30	0.12	2.4	-	-	-	-
32 to 48	0.19	4.8	-	-	-	-

Dimensional tolerances for reducers, end caps and stub ends (ASME/ANSI B16.9)

Nominal Pipe Size (NPS)	Reducers and Lap Joint Stub Ends		End Caps		Lap Joint Stub Ends				
	Overall Length, ± A		Overall Length, ± A		OD of Lap B		Fillet Radius of Lap R		OD of Barrel
	in	mm	in	mm	in	mm	in	mm	
1/2 to 2 1/2	0.06	1.6	0.12	3.2	+0, -0.03	+0, -1	+0, -0.03	+0, -1	See Lap Joint Stub Ends table for limiting dimension (page 3-10)
3 to 3 1/2	0.06	1.6	0.12	3.2	+0, -0.03	+0, -1	+0, -0.03	+0, -1	
4	0.06	1.6	0.12	3.2	+0, -0.03	+0, -1	+0, -0.06	+0, -2	
5 to 6	0.06	1.6	0.25	6.35	+0, -0.03	+0, -1	+0, -0.06	+0, -2	
8	0.06	1.6	0.25	6.35	+0, -0.03	+0, -1	+0, -0.06	+0, -2	
10	0.09	1.6	0.25	6.35	+0, -0.06	+0, -2	+0, -0.06	+0, -2	
12 to 18	0.09	2.4	0.25	6.35	+0, -0.06	+0, -2	+0, -0.06	+0, -2	
20 to 24	0.09	2.4	0.25	6.35	+0, -0.06	+0, -2	+0, -0.06	+0, -2	
26 to 30	0.19	2.4	0.38	10.0	-	-	-	-	
32 to 48	0.19	4.8	0.38	10.0	-	-	-	-	

Butt Weld Fittings

Weights

Buttweld fitting weights

As mentioned previously, the ANSI/ASME and MSS buttweld fitting specifications do not specify wall thicknesses and weights for fittings. Weights quoted in the dimension and weight tables are therefore based on manufacturers' information and should be considered as approximate and provided as a guide only (fitting weights can vary considerably between manufacturers due to differences in construction). The example weights quoted are for 40S or Standard (STD) wall thicknesses only. It is possible to calculate the approximate weight at any other wall thicknesses using the factors provided in the table below. These factors are calculated from the ANSI/ASME B36.19M and B36.10M pipe weights and are based on the proportional relationship of the pipe weights (kg/m) to the weights of 40S and STD wall thickness pipe at each NPS.

ASME/ANSI pipe sizes and weight multiplication factors for use in obtaining approximate fitting weights. For use with the example (40S/STD) weights provided in the ANSI/ASME tables of this section.

NPS	Multiplication Factors = Proportional relationship of pipe weights to 40S or STD pipe at each NPS ¹ . Multiply the example 40S/STD fitting weights (at the required NPS) by the factors below (at the same NPS) to give approximate weights at different wall thicknesses.																
	5S	10S	40S	80S	10	20	30	40	STD	60	XS	80	100	120	140	160	XXS
1/8	-	0.76	1.00	1.27	-	-	0.86	1.00	1.00	-	1.27	1.27	-	-	-	-	-
1/4	-	0.78	1.00	1.27	-	-	0.86	1.00	1.00	-	1.27	1.27	-	-	-	-	-
3/8	-	0.75	1.00	1.31	-	-	0.83	1.00	1.00	-	1.31	1.31	-	-	-	-	-
1/2	0.64	0.79	1.00	1.28	-	-	0.88	1.00	1.00	-	1.28	1.28	-	-	-	1.54	2.01
3/4	0.61	0.76	1.00	1.30	-	-	0.85	1.00	1.00	-	1.30	1.30	-	-	-	1.72	2.15
1	0.52	0.84	1.00	1.30	-	-	0.87	1.00	1.00	-	1.30	1.30	-	-	-	1.70	2.18
1 1/4	0.49	0.80	1.00	1.32	-	-	0.85	1.00	1.00	-	1.32	1.32	-	-	-	1.65	2.29
1 1/2	0.47	0.77	1.00	1.34	-	-	0.87	1.00	1.00	-	1.34	1.34	-	-	-	1.79	2.36
2	0.44	0.72	1.00	1.38	-	-	0.82	1.00	1.00	-	1.38	1.38	-	-	-	2.04	2.47
2 1/2	0.43	0.61	1.00	1.32	-	-	0.93	1.00	1.00	-	1.32	1.32	-	-	-	1.73	2.36
3	0.40	0.57	1.00	1.35	-	-	0.88	1.00	1.00	-	1.35	1.35	-	-	-	1.89	2.45
3 1/2	0.38	0.55	1.00	1.37	-	-	0.84	1.00	1.00	-	1.37	1.37	-	-	-	-	-
4	0.36	0.52	1.00	1.39	-	-	0.80	1.00	1.00	-	1.39	1.39	-	1.76	-	2.09	2.55
5	0.44	0.53	1.00	1.42	-	-	-	1.00	1.00	-	1.42	1.42	-	1.85	-	2.26	2.64
6	0.40	0.49	1.00	1.51	-	-	-	1.00	1.00	-	1.51	1.51	-	1.92	-	2.39	2.80
8	0.35	0.47	1.00	1.52	-	0.78	0.87	1.00	1.00	1.25	1.52	1.52	1.78	2.13	2.37	2.62	2.54
10	0.38	0.46	1.00	1.59	-	0.69	0.85	1.00	1.00	1.35	1.35	1.59	1.90	2.21	2.57	2.86	2.57
12	0.42	0.49	1.00	1.79	-	0.67	0.88	1.08	1.00	1.47	1.32	1.79	2.16	2.53	2.82	3.23	2.53
14	0.42	0.51	-	-	0.67	0.83	1.00	1.16	1.00	1.56	1.32	1.94	2.40	2.76	3.12	3.46	-
16	0.45	0.51	-	-	0.67	0.83	1.00	1.32	1.00	1.72	1.32	2.18	2.73	3.07	3.57	3.92	-
18	0.45	0.51	-	-	0.67	0.83	1.16	1.48	1.00	1.96	1.32	2.42	2.94	3.46	3.88	4.37	-
20	0.51	0.59	-	-	0.67	1.00	1.32	1.57	1.00	2.12	1.32	2.66	3.26	3.80	4.34	4.82	-
22	0.51	0.58	-	-	0.67	1.00	1.32	-	1.00	2.28	1.32	2.89	3.50	4.08	4.65	5.21	-
24	0.58	0.67	-	-	0.67	1.00	1.49	1.81	1.00	2.52	1.33	3.13	3.88	4.54	5.10	5.73	-
26	-	-	-	-	0.83	1.33	-	-	1.00	-	1.33	-	-	-	-	-	-
28	-	-	-	-	0.83	1.33	1.65	-	1.00	-	1.33	-	-	-	-	-	-
30	0.67	0.83	-	-	0.83	1.33	1.65	-	1.00	-	1.33	-	-	-	-	-	-
32	-	-	-	-	0.83	1.33	1.65	1.82	1.00	-	1.33	-	-	-	-	-	-
34	-	-	-	-	0.83	1.33	1.66	1.82	1.00	-	1.33	-	-	-	-	-	-
36	-	-	-	-	0.83	1.33	1.65	1.98	1.00	-	1.33	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	1.00	-	1.33	-	-	-	-	-	-
40	-	-	-	-	-	-	-	-	1.00	-	1.33	-	-	-	-	-	-
42	-	-	-	-	-	-	-	-	1.00	-	1.33	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-	1.00	-	1.33	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	1.00	-	1.29	-	-	-	-	-	-
48	-	-	-	-	-	-	-	-	1.00	-	1.33	-	-	-	-	-	-

Notes

¹ The relationship between pipe weights at each NPS can strictly only be applied to fittings where the same proportional relationship is maintained in the fitting. Less accurate results will therefore be obtained for reducing tees, for example, than for elbows, equal tees, etc. The type of fitting construction may also make the factors inaccurate.



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