

Tolerances ANSI B16.9

Unit: mm

Nominal pipe size	Outside(1) diameter at bevel	Inside(2) diameter at end	Wall thickness	Center to end A-B-C-M	Overall Length H	Height E	Center to center O	Back to face	Alignment of ends	Outside Dia of lap G	Thickness of lap T	Fillet Radius of lap R	Welding bevel for fittings
1/2"-2 1/2"	+1.52-0.76	±0.76	Not less	±1.52	±1.52	±3.05	±6.35	±6.35	±0.76	+0-0.76	+1.52-0	+0-0.76	
3"/-3 1/2"	±1.52	±1.52	than	±1.52	±1.52	±3.05	±6.35	±6.35	±0.76	+0-0.76	+1.52-0	+0-0.76	
4"	±1.52	±1.52	87.5%	±1.52	±1.52	±3.05	±6.35	±6.35	±0.76	+0-0.76	+1.52-0	+0-1.52	
5"-6"	+2.29-1.52	±1.52	of	±1.52	±1.52	±6.35	±6.35	±6.35	±0.76	+0-0.76	+1.52-0	+0-1.52	
8"	+2.29-1.52	±1.52	nominal	±1.52	±1.52	±6.35	±6.35	±6.35	±0.76	+0-0.76	+1.52-0	+0-1.52	
10"	+4.06-3.05	±3.05	thickness	±2.29	±2.29	±6.35	±9.65	±6.35	±1.52	+0-1.52	+1.52-0	+0-1.52	
12"-18"	+4.06-3.05	±3.05		±2.29	±2.29	±6.35	±9.65	±6.35	±1.52	+0-1.52	+1.52-0	+1.52-0	
20"-24"	+6.35-4.83	±4.83		±2.29	±2.29	±6.35	±9.65	±6.35	±1.52	+0-1.52	+1.52-0	+1.52-0	
26"-30"	+6.35-4.83	±4.83		±3.05	±4.83	±9.65							
32"-48"	+6.35-4.83	±4.83		±4.83	±4.83	±9.65							

(1) Out-of round is the sum of absolute values of plus and minus tolerance.
 (2) The inside diameter at ends and the nominal wall thicknesses are to be specified by the purchaser.

Materials commonly used

Steel type	Grade	Chemical composition										Mechanical properties				
		C% max	Mn%	P% max	S% max	Si%	Cr%	Mo%	Ni%	Others	R.min. Tensile strength MPa	S.min. Yield strength MPa	A% min.(2"/4D) Elongation		Impact test KCV (2J)	
CARBON STEEL	A.234	WPB(1)	0.30	0.29-1.06	0.050	0.058	0.01min	-	-	-	-	415	240	30	20	-
		WPC(1)	0.35	0.29-1.06	0.050	0.058	0.01min	-	-	-	-	485	275	30	20	-
	A.420	WPL6(1)	0.30	0.39-1.06	0.048	0.058	0.01min	-	-	-	-	415	240	30	16.5	-46.6°C 17.6/13.6
		WPL3	0.20	0.31-0.64	0.050	0.050	0.13-0.37	-	-	3.18-3.82	-	450	240	30	20	-101.1°C 17.6/13.6
ALLOY STEEL	A.234	WP1	0.28	0.30-0.90	0.045	0.045	0.10-0.50	-	0.44-0.65	-	-	380	205	30	20	-
		WP12	0.20	0.30-0.80	0.045	0.045	0.60 max	0.80-1.25	0.44-0.65	-	-	415	205	30	20	-
		WP11	0.20	0.30-0.80	0.040	0.040	0.50-1.00	1.00-1.50	0.44-0.65	-	-	415	205	30	20	-
		WP22	0.15	0.30-0.60	0.040	0.040	0.50 max	1.90-2.60	0.87-1.13	-	-	415	205	30	20	-
		WP5	0.15	0.30-0.60	0.040	0.030	0.50 max	4.00-6.00	0.44-0.65	-	-	415	205	30	20	-
		WP9	0.15	0.30-0.60	0.030	0.030	0.25-1.00	8.00-10.00	0.90-1.10	-	-	415	205	30	20	-
STAINLESS STEEL	A.403	WP304	0.08	2.00	0.040	0.030	0.75 max	18.0-20.0	-	8.0-11.0	-	515	205	35	25	-
		WP304L	0.035	2.00	0.040	0.030	0.75 max	18.0-20.0	-	8.0-13.0	-	485	170	35	25	-
		WP304H	0.04-0.10	2.00	0.040	0.030	0.75 max	18.0-20.0	-	8.0-11.0	-	515	205	35	25	-
		WP321	0.08	2.00	0.040	0.030	0.75 max	17.0-20.0	-	9.0-13.0	Ti=5xC max0.70%	515	205	35	25	-
		WP321H	0.04-0.10	2.00	0.040	0.030	0.75 max	17.0-20.0	-	9.0-13.0	Ti=4xC max0.60%	515	205	35	25	-
		WP316	0.08	2.00	0.040	0.030	0.75 max	16.0-18.0	2.00-3.00	11.0-14.0	-	515	205	35	25	-
		WP316L	0.035	2.00	0.040	0.030	0.75 max	16.0-18.0	2.00-3.00	10.0-15.0	-	485	170	35	25	-
		WP316H	0.04-0.10	2.00	0.040	0.030	0.75 max	16.0-18.0	2.00-3.00	11.0-14.0	-	515	205	35	25	-

1) For each reduction 0.01% carbon below 0.30% an increase of 0.05% manganese above 1.06% will be permitted to a maximum of 1.35%
 2) Relative to 10 x 10 specimen.

Carbon steel high yield acc. to MSS-SP-75 for gas pipelines

MSS-SP-75	Grade	Chemical composition										Mechanical properties				
		C%	Mn%	Si%	P%	S%	Cr%	Mo%	Ni%	Cu%	V%	Cb%	R.min. Tensile strength MPa	S.min. Yield strength MPa	A% min.(2"/4D) Elongation	
WPHY42	0.30	1.60	0.35	0.12	0.06	0.25	0.25	1.00	1.50	0.13	0.10	414	289	25	25	KCV-7°C SHEAR AREA > =50%
WPHY46	0.30	1.60	0.35	0.12	0.06	0.25	0.25	1.00	1.50	0.13	0.10	434	317	25	25	
WPHY52	0.30	1.60	0.35	0.12	0.06	0.25	0.25	1.00	1.50	0.13	0.10	455	358	25	25	
WPHY60	0.30	1.60	0.35	0.12	0.06	0.25	0.25	1.00	1.50	0.13	0.10	517	414	20	20	
WPHY65	0.30	1.60	0.35	0.12	0.06	0.25	0.25	1.00	1.50	0.13	0.10	531	448	20	20	

Fittings on this specification are manufactured and verified in accordance with ANSI B31.1/3/4/8.

Unit: mm

Nominal pipe size	ANSI B 36.10												ANSI B 36.19							
	Outside diameter	Sch. 10	Sch. 20	Sch. 30	Standard WT	Sch. 40	Sch. 60	Extra Strong	Sch. 80	Sch. 100	Sch. 120	Sch. 140	Sch. 160	Double Extra Strong	Sch. 5 S	Sch. 10 S	Sch. 40 S	Sch. 80 S		
1/2"	21.34				2.77	2.77		3.73	3.73				4.78	7.47	1.65	2.11	2.77	3.73		
3/4"	26.67				2.87	2.87		3.91	3.91				5.56	7.82	1.65	2.11	2.87	3.91		
1"	33.40				3.38	3.38		4.55	4.55				6.35	9.09	1.65	2.77	3.38	4.55		
1 1/4"	42.16				3.56	3.56		4.85	4.85				6.35	9.70	1.65	2.77	3.56	4.85		
1 1/2"	48.26				3.68	3.68		5.08	5.08				7.14	10.16	1.65	2.77	3.68	5.08		
2"	60.32				3.91	3.91		5.54	5.54				8.74	11.07	1.65	2.77	3.91	5.54		
2 1/2"	73.02				5.16	5.16		7.01	7.01				9.52	14.02	2.11	3.05	5.16	7.01		
3"	88.90				5.49	5.49		7.62	7.62				11.13	15.24	2.11	3.05	5.49	7.62		
3 1/2"	101.60				5.74	5.74		8.08	8.08						2.11	3.05	5.74	8.08		
4"	114.30				6.02	6.02		8.56	8.56	11.13			13.49	17.12	2.11	3.05	6.02	8.56		
5"	141.30				6.55	6.55		9.52	9.52	12.70			15.88	19.05	2.77	3.40	6.55	9.52		
6"	168.27				7.11	7.11		10.97	10.97	14.27			18.26	21.95	2.77	3.40	7.11	10.97		
8"	219.07	6.35	7.04		8.18	8.18	10.31	12.70	12.70	15.09	18.26	20.62	23.01	22.22	2.77	3.76	8.18	12.70		
10"	273.05	6.35	7.80	9.27	9.27	12.70	12.70	15.09	18.26	21.44	25.40	28.58	33.32	25.40	3.40	4.19	9.27	12.70		
12"	323.85	6.35	8.38	9.52	10.31	14.27	12.70	17.48	21.44	25.40	28.58	33.32	39.6	4.57	9.52					
14"	355.60	6.35	7.92	9.52	9.52	11.13	15.09	12.70	19.05	23.83	27.79	31.75	35.71	3.96	4.77					
16"	406.40	6.35	7.92	9.52	9.52	12.70	16.66	12.70	21.44	26.19	30.96	36.53	40.49	4.19	4.77					
18"	457.20	6.35	7.92	11.13	9.52	14.27	19.05	12.70	23.83	29.36	34.93	39.67	45.24	4.19	4.77					
20"	508.00	6.35	9.52	12.70	9.52	15.09	20.62	12.70	26.19	32.54	38.10	44.45	50.01	4.77	5.54					
22"	558.80	6.35	9.52	12.70	9.52	15.88	22.22	12.70	28.58	34.92	41.28	47.63	53.98	4.77	5.54					
24"	609.60	6.35	9.52	14.27	9.52	17.48	24.61	12.70	30.96	38.89	46.02	52.37	59.54	5.54	6.35					
26"	660.40	7.92			9.52															
28"	711.20	7.92			12.70															
30"	762.00	7.92			15.88															
32"	812.80	7.92			17.48															
34"	863.60	7.92			17.48															
36"	914.40	7.92			19.05															

Note: Above 36" there are only STD (9.52 mm) and XS (12.7 mm) schedule

Butt Welding Fittings



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Dimensions according to ANSI B16.9

Nominal pipe size	Outside diameter D	Center to face A	Center to face A1	Center to center O	Center to center O1	Center to face B	Height E*		Center to end C-M	Equal Tees	Caps
							XS ≤	XS >			
1/2"	21.3	38.1	19	76.2	38	15.7	25	25	25		
3/4"	26.7	38.1	18	76.2	36	19.1	25	25	29		
1"	33.4	38.1	25.4	76.2	50.8	22.4	38.1	38.1	38		
1 1/4"	42.2	47.8	31.8	95.3	63.5	25.4	38.1	38.1	48		
1 1/2"	48.3	57.2	38.1	114.3	76.2	28.4	38.1	38.1	57.2		
2"	60.3	76.2	50.8	152.4	101.6	35.1	38.1	44	63.5		
2-1/2"	73	95.3	63.5	190.5	127	44.5	38.1	51	76.2		
3"	88.9	114.3	76.2	228.6	152.4	50.8	50.8	64	85.9		
3 1/2"	102	133	89	267	178	57	64	76	95		
4"	114.3	152.4	101.6	304.8	203.2	63.5	63.5	76	104.6		
5"	141.3	190.5	127	381	254	79.2	76.2	89	124		
6"	168.3	228.6	152.4	457.2	304.8	95.3	88.9	102	142.7		
8"	219.1	304.8	203.2	609.6	406.4	127	101.6	127	177.8		
10"	273	381	254	762	508	158.8	127	152	215.9		
12"	323.9	457.2	304.8	914.4	609.6	190.5	152.4	178	254		
14"	355.6	533.4	355.6	1066.8	711.2	222.3	165.1	191	279.4		
16"	406.4	609.6	406.4	1219.2	812.8	254	177.8	203	304.8		
18"	457	685.8	457.2	1371.6	914.4	285.8	203.2	229	343		
20"	508	762	508	1524	1016	317.5	228.6	254	381		
22"	559	838.2	558.8	1676.4	1117.6	342.9	254	254	419		
24"	610	914.4	609.6	1828.8	1219.2	381	266.7	305	432		
26"	660	990.6	660		406.4		266.7		495		
28"	711	1066.8	711		438.2		266.7		521		
30"	762	1143	762		469.9		266.7		559		
32"	813	1219.2	813		501.7		266.7		597		
34"	864	1295.4	864		533.4		266.7		635		
36"	914	1371.6	914		565.2		266.7		673		
38"	965	1448	965		600		305		711		
40"	1016	1524	1016		632		305		749		
42"	1067	1600	1067		660		305		762-711		
44"	1118	1676	1118		695		343		813-762		
46"	1168	1753	1168		727		343		851-800		
48"	1219	1829	1219		759		343		889-838		

*The data indicated on the left column is referring to caps with wall thickness ≤sch XS. The data indicated on the right column is referring to caps with wall thickness >sch XS.

DIN and JIS standard fittings are also available

Nominal pipe size (inch)	Outside diameter D	Outside diameter D1	Center to End C	Center to End M	length H	Nominal pipe size (inch)	Outside diameter D	Outside diameter D1	Center to End C	Center to End M	length H	Nominal pipe size (inch)	Outside diameter D	Outside diameter D1	Center to End C	Center to End M	length H
		Sch. 5S	Sch. 10S	Sch. 40S	ANSI	MSS	Type A (Max)	Type B (Max)									
3/4X3/8	26.7	17	29	29	38	16X6	406.4	168.3	305	264	355.6	36X20	914	508	673	584	610
3/4X1/2	26.7	21.3	29	29	38	16X8	406.4	219.1	305	273	355.6	36X22	914	559	673	597	610
1X1/2	33.4	21.3	38	38	50.8	16X10	406.4	273	305	283	355.6	36X24	914	610	673	610	610
1X3/4	33.4	26.7	38	38	50.8	16X12	406.4	323.9	305	295	355.6	36X26	914	660	673	622	610
1 1/4X1/2	42.2	21.3	48	48	50.8	16X14	406.4	355.6	305	305	355.6	36X28	914	711	673	622	610
1 1/4X3/4	42.2	26.7	48	48	50.8	18X8	457	219.1	343	298	381	36X30	914	762	673	635	610
1 1/4X1	42.2	33.4	48	48	50.8	18X10	457	273	343	308	381	36X32	914	813	673	648	610
1 1/2X1/2	48.3	21.3	57	57	63.5	18X12	457	323.9	343	321	381	36X34	914	864	673	660	610
1 1/2X3/4	48.3	26.7	57	57	63.5	18X14	457	355.6	343	330	381	38X24	965	610	711	635	610
1 1/2X1	48.3	33.4	57	57	63.5	18X16	457	406.4	343	330	381	38X26	965	660	711	648	610
1 1/2X1 1/4	48.3	42.2	57	57	63.5	20X8	508	219.1	381	324	508	38X28	965	711	711	648	610
2X3/4	60.3	26.7	64	44	76.2	20X10	508	273	381	333	508	38X30	965	762	711	673	610
2X1	60.3	33.4	64	51	76.2	20X12	508	323.9	381	346	508	38X32	965	813	711	686	610
2X1 1/4	60.3	42.2	64	57	76.2	20X14	508	355.6	381	356	508	38X34	965	864	711	698	610
2X1 1/2	60.3	48.3	64	60	76.2	20X16	508	406.4	381	356	508	38X36	965	914	711	711	610
2 1/2X1	73	33.4	76	57	88.9	20X18	508	457	381	368	508	40X24	1016	610	749	660	610
2 1/2X1 1/4	73	42.2	76	64	88.9	22X10	559	273	419	359	508	40X26	1016	660	749	673	610
2 1/2X1 1/2	73	48.3	76	67	88.9	22X12	559	323.9	419	371	508	40X28	1016	711	749	673	610
2 1/2X2	73	60.3	76	70	88.9	22X14	559	355.6	419	381	508	40X30	1016	762	749	698	610
3X1 1/4	88.9	42.2	86	70	88.9	22X16	559	406.4	419	381	508	40X32	1016	813	749	711	610
3X1 1/2	88.9	48.3	86	73	88.9	22X18	559	457	419	394	508	40X34	1016	864	749	724	610
3X2	88.9	60.3	86	76	88.9	22X20	559	508	419	406	508	40X36	1016	914	749	737	610
3X2 1/2	88.9	73	86	83	88.9	24X10	610	273	432	384	508	40X38	1016	965	749	749	610
3 1/2X1 1/2	101.6	48.3	95	79	102	24X12	610	323.9	432	397	508	42X24	1067	610	762	660	610
3 1/2X2	101.6	60.3	95	83	102	24X14	610	355.6	432	406	508	42X26	1067	660	762	698	610
3 1/2X2 1/2	101.6	73	95	89	101	24X16	610	406.4	432	406	508	42X28	1067	711	762	698	610
3 1/2X3	101.6	88.9	95	92	101	24X18	610	457	432	419	508	42X30	1067	762	762	711	610
4X1 1/2	114.3	48.3	105	86	101.6	24X20	610	508	432	432	508	42X32	1067	813	762	711	610
4X2	114.3	60.3	105	89	101.6	24X22	610	559	432	432	508	42X34	1067	864	762	711	610
4X2 1/2	114.3	73	105	95	101.6	26X18	660	457	495	444	610	42X36	1067	914	762	711	610
4X3	114.3	88.9	105	98	101.6	26X20	660	508	495	457	610	42X38	1067	965	762	711	610
4X3 1/2	114.3	101.6	105	102	101.6	26X22	660	559	495	470	610	42X40	1067	1016	762	711	610
5X2	141.3	60.3	124	105	127	26X24	660	610	495	483	610	44X30	1118	762	813	711	610
5X2 1/2	141.3	73	124	108	127	28X18	711	457	521	470	610	44X32	1118	813	813	711	610
5X3	141.3	88.9	124	111	127	28X20	711	508	521	483	610	44X34	1118	864	813	724	610
5X3 1/2	141.3	101.6	124	114	127	28X22	711	559	521	495	610	44X36	1118	914	813	724	610
5X4	141.3	114.3	124	117	127	28X24	711	610	521	508	610	44X38	1118	965	813	737	610
6X2 1/2	168.3	73	143	121	139.7	28X26	711	660	521	521	610	44X40	1118	1016	813	749	610
6X3	168.3	88.9	143	124	139.7	30X18	762	457	559	495	610	44X42	1118	1067	813	762	610
6X3 1/2	168.3	101.6	143	127	139.7	30X20	762	508	559	508	610	46X30	1168	762	851	737	711
6X4	168.3	114.3	143	130	139.7	30X22	762	559	559	521	610	46X32	1168	813	851	749	711
6X5	168.3	141.3	143	137	139.7	30X24	762	610	559	533	610	46X34	1168	864	851	749	711
8X3 1/2	219.1	101.6	178	152	152.4	30X26	762	660	559	546	610	46X36	1168	914	851	762	711
8X4	219.1	114.3	178	156	152.4	30X28	762	711	559	456	610	46X38	1168	965	851	762	711
8X5	219.1	141.3	178	162	152.4	32X20	813	508	597	533	610	46X40	1168	1016	851	775	711
8X6	219.1	168.3	178	168	152.4	32X22	813	559	597	546	610	46X42	1168	1067	851	787	711
10X4	273	114.3	216	184	177.8	32X24	813	610	597	559	610	46X44	1168	1118	851	800	711
10X5	273	141.3	216	191	177.8	32X26	813	660	597	572	610	48X30	1219	762	889	762	711
10X6	273	168.3	216	194	177.8	32X28	813	711	597	572	610	48X32	1219	813	889	787	711
10X8	273	219.1	216	203	177.8	32X30	813	762	597	584	610	48X34	1219	864	889	787	711
12X5	323.9	141.3	254	216	203.2	34X20	864	508	635	559	610	48X36	1219	914	889	787	711
12X6	323.9	168.3	254	219	203.2	34X22	864	559	635	572	610	48X38	1219	965	889	813	711
12X8	323.9	219.1	254	229	203.2	34X24	864	610	635	584	610	48X40	1219	1016	889	813	711
12X10	323.																