

ASTM A335 P22 Alloy Steel Seamless Pipe Specification

Keywords: ASTM A335 P22, ASME SA335 P22, 2.25Cr-1Mo Alloy Steel Pipe, High Temperature Seamless Pipe

ASTM A335 / ASME SA335 Standard Introduction

ASTM A335 / ASME SA335 specifies seamless ferritic alloy steel pipes for high-temperature and high-pressure service. Grade P22 is a chromium-molybdenum alloy steel widely used in power plants and refineries.

ASTM A335 P22 Material Description

ASTM A335 P22 is a 2.25Cr-1Mo alloy steel pipe providing higher creep strength, oxidation resistance, and elevated-temperature performance than P11. It is suitable for long-term high-temperature service.

Chemical Composition of ASTM A335 P22 (Typical, wt.%)

Element	Requirement
Carbon (C)	0.05 – 0.15
Manganese (Mn)	0.30 – 0.60
Silicon (Si)	0.50 max
Phosphorus (P)	0.025 max
Sulfur (S)	0.025 max
Chromium (Cr)	1.90 – 2.60
Molybdenum (Mo)	0.87 – 1.13

Mechanical Properties of ASTM A335 P22 (Typical)

Property	Minimum Requirement
Tensile Strength	≥ 415 MPa
Yield Strength	≥ 205 MPa
Elongation	≥ 30 %

Heat Treatment Requirements

ASTM A335 P22 pipes shall be supplied in the fully annealed, isothermal annealed, or normalized and tempered condition. Post weld heat treatment is generally required.

Size Range and Supply Condition

Outside Diameter: 1/8" NB – 24" NB

Wall Thickness: SCH 10 / SCH 20 / SCH 40 / STD / XS / SCH 80 / SCH 160

Manufacturing Process: Seamless (hot finished or cold drawn)

Length: Random length or fixed length

Typical Applications

Power plant boiler piping, superheaters and reheaters, high-temperature steam pipelines, refinery process piping, petrochemical plants, and pressure vessel systems.

Inspection and Testing

Chemical analysis, mechanical testing, hardness testing, flattening test, hydrostatic test or non-destructive electric test, and dimensional inspection are performed in accordance with ASTM A335.

Certification and Documentation

EN 10204 3.1 Mill Test Certificate (MTC), Manufacturer Test Report (MTR), and third-party inspection certificates are available upon request.



DIMENSIONS ASME B36.10

Nominal Size		Outside Diameter mm (inch)	Wall Thickness mm	Inside Diameter mm	Plain End Mass kg/m	Identification	
☆ NPS	DN					Standard (STD) X-Strong (XS) XX-Strong (XXS)	Schedule Number
1/8	6	10.3	1.73	6.8	0.37	STD	40
		(0.405)	2.41	5.5	0.47	XS	80
1/4	8	13.7	2.24	9.2	0.63	STD	40
		(0.540)	3.02	7.7	0.80	XS	80
3/8	10	17.1	2.31	12.5	0.84	STD	40
		(0.675)	3.20	10.7	1.10	XS	80
1/2	15	21.3 (0.840)	2.77	15.8	1.27	STD	40
			3.73	13.9	1.62	XS	80
			4.78	11.8	1.95	-	160
			7.47	6.4	2.55	XXS	-
3/4	20	26.7 (1.050)	2.87	20.9	1.69	STD	40
			3.91	18.9	2.20	XS	80
			5.56	15.5	2.90	-	160
			7.82	11.0	3.64	XXS	-
1	25	33.4 (1.315)	3.38	26.6	2.50	STD	40
			4.55	24.3	3.24	XS	80
			6.35	20.7	4.24	-	160
			9.09	15.2	5.45	XXS	-
1 1/4	32	42.2 (1.660)	3.56	35.1	3.39	STD	40
			4.85	32.5	4.47	XS	80
			6.35	29.5	5.61	-	160
			9.70	22.8	7.77	XXS	-
1 1/2	40	48.3 (1.900)	3.68	40.9	4.05	STD	40
			5.08	38.1	5.41	XS	80
			7.14	34.0	7.25	-	160
			10.15	27.9	9.55	XXS	-
2	50	60.3 (2.375)	3.91	52.5	5.44	STD	40
			5.54	49.2	7.48	XS	80
			8.74	42.9	11.11	-	160
			11.07	38.2	13.44	XXS	-
2 1/2	65	73.0 (2.875)	5.16	62.7	8.63	STD	40
			7.01	59.0	11.41	XS	80
			9.53	54.0	14.92	-	160
			14.02	45.0	20.39	XXS	-

Nominal Size		Outside Diameter mm (inch)	Wall Thickness mm	Inside Diameter mm	Plain End Mass kg/m	Identification	
☆ NPS	DN					Standard (STD) X-Strong (XS) XX-Strong (XXS)	Schedule Number
3	80	88.9 (3.500)	5.49	77.9	11.29	STD	40
			7.62	73.7	15.27	XS	80
			11.13	66.7	21.35	-	160
3 1/2	90	101.6 (4.000)	5.74	90.1	13.57	STD	40
			8.08	85.4	18.64	XS	80
4	100	114.3 (4.500)	6.02	102.3	16.08	STD	40
			8.56	97.2	22.32	XS	80
			11.13	92.1	28.32	-	120
			13.49	87.3	33.54	-	160
5	125	141.3 (5.563)	6.55	128.2	21.77	STD	40
			9.53	122.3	30.97	XS	80
			12.70	115.9	40.28	-	120
			15.88	109.6	49.12	-	160
6	150	168.3 (6.625)	6.55	128.2	21.77	STD	40
			9.53	122.3	30.97	XS	80
			12.70	115.9	40.28	-	120
			15.88	109.6	49.12	-	160
8	200	219.1 (8.625)	7.11	154.1	28.26	STD	40
			10.97	146.3	42.56	XS	80
			14.27	139.7	54.21	-	120
			18.26	131.8	67.57	-	160
10	250	273.1 (10.75)	6.35	206.4	33.32	-	20
			7.04	205.0	36.82	-	30
			8.18	202.7	42.55	STD	40
			10.31	198.5	53.09	-	60
10	250	273.1 (10.75)	12.70	193.7	64.64	XS	80
			15.09	188.9	75.92	-	100
			18.26	182.6	90.44	-	120
			20.62	177.8	100.93	-	140
10	250	273.1 (10.75)	22.23	174.6	107.93	XXS	-
			23.01	173.1	111.27	-	160
			6.35	260.3	41.76	-	20
			7.80	257.5	51.01	-	30
10	250	273.1 (10.75)	9.27	254.5	60.29	STD	40
			12.70	247.7	81.53	XS	60
			15.09	242.9	95.98	-	80
			18.26	236.5	114.71	-	100
10	250	273.1 (10.75)	21.44	230.2	133.01	-	120
			25.40	222.3	155.10	XXS	140
			28.58	215.9	172.27	-	160

☆ NPS: ASME term.

⌀ DN: SI Metric term.

All dimensions are nominal

NOTE: API and BS 1600 are dimensionally similar to ASME B36.10

DIMENSIONS SHOWN ARE TO ASME B36.10

Nominal Size		Outside Diameter mm (inch)	Wall Thickness mm	Inside Diameter mm	Plain End Mass kg/m	Identification				
☆ NPS	DN					Standard (STD) X-Strong (XS) XX-Strong (XXS)	Schedule Number			
12	300	323.9 (12.75)	6.35	311.1	49.71	-	20			
			8.38	307.1	65.19	-	30			
			9.53	304.8	73.86	STD	-			
			10.31	303.2	79.71	-	40			
			12.70	298.5	97.44	XS	-			
			14.27	295.3	108.93	-	60			
			17.48	288.9	132.05	-	80			
			21.44	281.0	159.87	-	100			
			25.40	273.1	186.92	XXS	120			
			28.58	266.7	208.08	-	140			
			33.32	257.2	238.69	-	160			
14	350	355.6 (14.00)	6.35	342.9	54.69	-	10			
			7.92	339.8	67.91	-	20			
			9.53	336.6	81.33	STD	30			
			11.13	333.3	94.55	-	40			
			11.91	331.8	100.95	-	-			
			12.70	330.2	107.40	XS	-			
			15.09	325.4	126.72	-	60			
			19.05	317.5	158.11	-	80			
			23.83	307.9	194.98	-	100			
			27.79	300.0	224.66	-	120			
			31.75	292.1	253.58	-	140			
			35.71	284.2	281.72	-	160			
			16	400	406.4 (16.00)	6.35	393.7	62.65	-	10
						7.92	390.6	77.83	-	20
9.53	387.4	93.27				STD	30			
12.70	381.0	123.31				XS	40			
16.66	373.1	160.13				-	60			
21.44	363.5	203.54				-	80			
26.19	354.0	245.57				-	100			
30.96	344.5	286.66				-	120			
36.53	333.3	333.21				-	140			
40.49	325.4	365.38				-	160			
18	450	457 (18.00)	6.35	444.5	70.57	-	10			
			7.92	441.4	87.71	-	20			
			9.53	438.2	105.17	STD	-			
			11.13	434.9	122.38	-	30			
			12.70	431.8	139.16	XS	-			
			14.27	428.7	155.81	-	40			
			19.05	419.1	205.75	-	60			
			23.83	409.5	254.57	-	80			
			29.36	398.5	309.64	-	100			
			34.93	387.4	363.58	-	120			
			39.67	377.9	408.28	-	140			
			45.24	366.7	459.39	-	160			

Nominal Size		Outside Diameter mm (inch)	Wall Thickness mm	Inside Diameter mm	Plain End Mass kg/m	Identification	
☆ NPS	DN					Standard (STD) X-Strong (XS) XX-Strong (XXS)	Schedule Number
20	500	508 (20.00)	6.35	495.3	78.56	-	10
			9.53	489.0	117.15	STD	20
			12.70	482.6	155.13	XS	30
			15.09	477.8	183.43	-	40
			20.62	466.8	247.84	-	60
			26.19	455.6	311.19	-	80
			32.54	442.9	381.55	-	100
			38.10	431.8	441.52	-	120
			44.45	419.1	508.15	-	140
			50.01	408.0	564.85	-	160
			22	550	559 (22.00)	6.35	546.1
9.53	539.8	129.14				STD	20
12.70	533.4	171.10				XS	30
22.23	514.4	294.27				-	60
28.58	501.7	373.85				-	80
34.93	489.0	451.45				-	100
41.28	476.2	527.05				-	120
47.63	463.5	600.67	-	140			
53.98	450.8	672.30	-	160			
24	600	610 (24.00)	6.35	596.9	94.53	-	10
			9.53	590.6	141.12	STD	20
			12.70	584.2	187.07	XS	-
			14.27	581.1	209.65	-	30
			17.48	574.6	255.43	-	40
			24.61	560.4	355.28	-	60
			30.96	547.7	442.11	-	80
			38.89	531.8	547.74	-	100
			46.02	517.6	640.07	-	120
			52.37	504.9	720.19	-	140
59.54	490.5	808.27	-	160			
26	650	660 (26.00)	7.92	644.6	127.36	-	10
			9.53	641.4	152.88	STD	-
28	700	711 (28.00)	12.70	635.0	202.74	XS	20
			7.92	695.4	137.32	-	10
			9.53	692.2	164.86	STD	-
			12.70	685.8	218.71	XS	20
30	750	762 (30.00)	15.88	679.5	271.23	-	30
			7.92	746.2	147.29	-	10
			9.53	743.0	176.85	STD	-
36	900	914 (36.00)	12.70	736.6	234.68	XS	20
			15.88	730.2	292.20	-	30
			7.92	898.6	176.97	-	10
			9.53	895.4	212.57	STD	-
			12.70	889.0	282.29	XS	20
42	1050	1067 (42.00)	15.88	882.6	351.73	-	30
			19.05	876.3	420.45	-	40
			9.53	1047.8	248.53	STD	-
12.70	1041.4	330.21	XS	-			

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↕ DN: SI Metric term.

All dimensions are nominal

NOTE: API and BS 1600 are dimensionally similar to ASME B36.10

FORMULA TO ATTAIN APPROXIMATE MASS IN KILOGRAMS PER METRE (kg/m) FOR STEEL ROUND PIPE AND TUBING M

$$= (D - T) T \times 0.02466$$

Where: **m** = mass to the nearest 0.01 kg/m.

D = Outside Diameter in millimetres (mm).

(To nearest 0.1mm for O.D. up to 406.4mm)

(To nearest 1.0mm for O.D. 457mm and above)

t = Wall Thickness to nearest 0.01mm

EXAMPLE

NOMINAL SIZE: NPS-12. DN-300

O.D. = 323.9mm W.T. = 9.53mm

Step 1. 323.9 - 9.53 = 314.37

Step 2. 314.37 x 9.53 = 2995.9461

Step 3. 2995.9461 x 0.02466 = **73.88 kg/m**