



沧州博拓国际贸易有限公司

Cangzhou Botop International Co.,Ltd.

ASTM A335 P11 Specification

- Alloy Seamless Steel Pipe

<https://www.botopsteelpipe.com>

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What is ASTM A335 P11?



ASTM A335 P11 steel pipe is a seamless ferritic low alloy steel pipe for high-temperature service, UNS designation K11597.

P11 is a chromium-molybdenum alloy with a chromium content of 1.00-1.50% and a molybdenum content of 0.44-0.65%.

It is commonly used in boilers, superheaters, and heat exchangers in power stations and chemical plants.

The technical requirements of **ASME SA335** and **ASTM A335** are the same, so for ease of presentation, we will use "ASTM A335" to refer to these two standards.



Our Supply Range



- 👑 **Material:** ASTM A335 P11 seamless steel pipe;
- 👑 **OD:** 1/8"- 24";
- 👑 **WT:** in accordance with ASME B36.10 requirements;
- 👑 **Schedule:** SCH10, SCH20, SCH30, SCH40, SCH60, SCH80, SCH100, SCH120, SCH140 and SCH160;
- 👑 **Identification:** STD, XS, XXS;
- 👑 **Customization:** Non-standard pipe sizes are also available, customized sizes are available upon request;
- 👑 **Length:** Specific and random lengths;
- 👑 **IBR Certification:** We can contact the third-party inspection organization to get IBR certification according to your needs, our cooperation inspection organizations are BV, SGS, TUV, etc.;
- 👑 **End:** Flat end, beveled, or composite pipe end;
- 👑 **Surface:** Light pipe, paint, and other temporary protection, rust removal and polishing, galvanized and plastic coated, and other long-term protection;
- 👑 **Packing:** Wooden case, steel belt or steel wire packing, plastic or iron pipe end protector, etc.

General Requirements



Unless otherwise specified in A335, materials furnished under this specification shall conform to the applicable requirements of the current edition of Specification [A999/A999M](#).



Manufacturing Processes

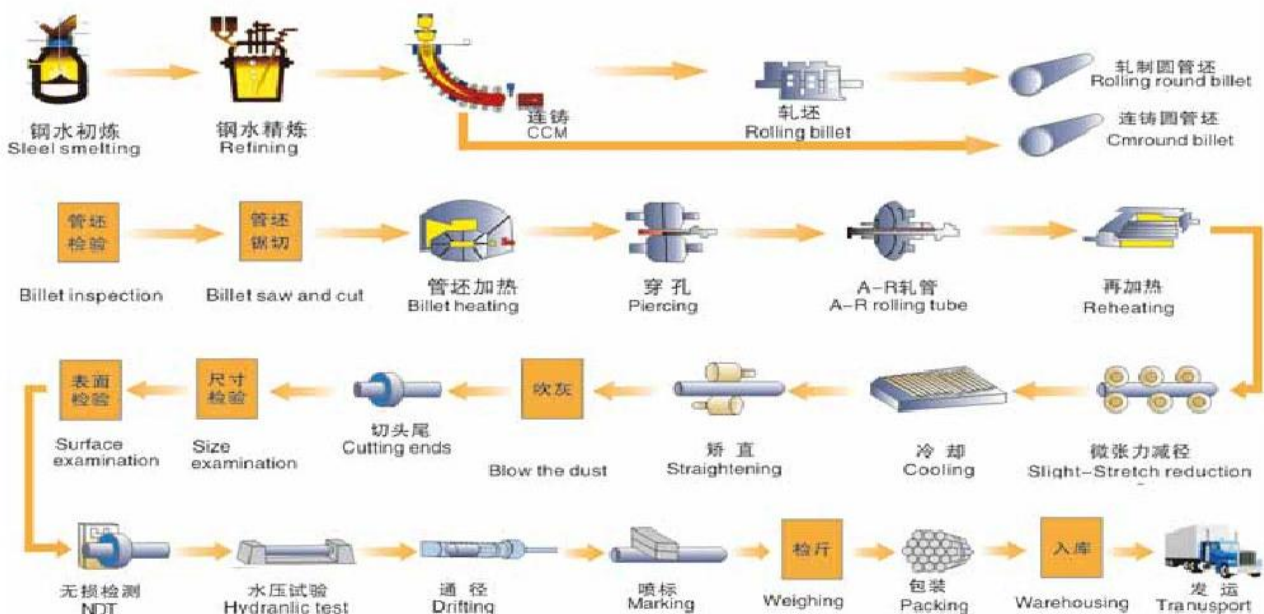


ASTM A335 steel pipe must be seamless.

Seamless steel tubes offer greater reliability and uniformity when subjected to high-pressure and temperature environments.

Seamless can be specifically categorized as cold drawn and hot finished, depending on the specific application and size.

- **Cold drawing** is usually used for small diameters or for tubes that require high precision and good surface quality.
- **Hot finishing** is usually used to produce large straight and thick-walled steel pipes.



Heat Treatment



Heat treatment of P11 materials may be either full or isothermal annealing or tempering after normalizing, and when normalizing and tempering, the tempering temperature should be at least 1200°F (650°C).

Grade	Heat Treat Type	Normalizing Temperature, min or range °F [°C]	Cooling Media	Subcritical Annealing or Tempering Temperature, min or range °F [°C]
P11	full or isothermal anneal or	—	—	—
	normalize and temper	—	—	1200 [650]

ASTM A335 P11 Chemical Composition



Grade	UNS Designation	C (Carbon)	Mn (Manganese)	p (Phosphorus)	S (Sulfur)	Si (Silicon)	Cr (Chromium)	Mo (Molybdenum)
P11	K11597	0.05-0.15	0.30-0.60	0.025 max	0.025 max	0.50-1.00	1.00-1.50	0.44-0.65

From the chemical composition, we can easily see that **P11 is a chromium-molybdenum alloy.**

Chromium-molybdenum alloys are a class of steels with chromium (Cr) and molybdenum (Mo) as the main alloying elements. The addition of these elements significantly increases the strength, hardness, wear resistance, and corrosion resistance of the steel. At high temperatures, Cr-Mo alloys are able to maintain good mechanical properties and a stable structure.

Cr: improves the oxidation resistance and corrosion resistance of the alloy, helps to form a stronger oxide film, and protects the material from corrosive media.

Mo: Enhances the strength of the alloy, especially at high temperatures, improves creep resistance, and enhances the high-temperature strength of the material.

ASTM A335 P11 Mechanical Properties



1. Tensile Property

The tensile test is commonly used to measure the **yield strength**, **tensile strength**, and **elongation** of the steel pipe experimental program, and is widely used in the material properties of the test.

List	Classification		P11
Tensile strength ,min	ksi		60
	MPa		415
Yield strength ,min	ksi		30
	MPa		205
Elongation	Longitudinal	Elongation in 2 in. or 50 mm, (or 4D), min, %; Basic minimum elongation for wall 6 in. [8 mm] and over in thickness, strip tests, and for all small sizes tested in full section	30
		When standard round 2-in. or 50-mm gage length or proportionally smaller size specimen with the gage length equal to 4D (4 times the diameter) is used	22
		For strip tests a deduction for each 1/32 in. [0.8 mm] decrease in wall thickness below 5/16 in. [8 mm] from the basic minimum elongation of the following percentage points shall be made	1.50 ^A
	Transverse	Elongation in 2 in. or 50 mm, (or 4D), min, %; Basic minimum elongation for wall 6 in. [8 mm] and over in thickness, strip tests, and for all small sizes tested in full section	20
		When standard round 2-in. or 50-mm gage length or proportionally smaller size specimen with the gage length equal to 4D (4 times the diameter) is used	14
		For strip tests a deduction for each 1/32 in. [0.8 mm] decrease in wall thickness below 5/16 in. [8 mm] from the basic minimum elongation of the following percentage points shall be made	1.00 ^A

^A Table 5 gives the calculated minimum values.

ASTM A335 P11 Mechanical Properties



Table 5 Calculated Minimum Elongation Values

Wall Thickness		P11	
		Elongation in 2 in. or 50 mm, min, %	
in.	mm	Longitudinal	Transverse
5/16 (0.312)	8.0	30	20
9/32 (0.281)	7.2	28	19
1/4 (0.250)	6.4	27	18
7/32 (0.219)	5.6	26	—
3/16 (0.188)	4.8	24	—
5/32 (0.156)	4.0	22	—
1/8 (0.125)	3.2	21	—
3/32 (0.094)	2.4	20	—
1/16 (0.062)	1.6	18	—

Where the wall thickness lies between the two values above, the minimum elongation value is determined by the following formula:

$$\text{Longitudinal, P11: } E = 48t + 15.00 \quad [E = 1.87t + 15.00]$$

$$\text{Transverse, P11: } E = 32t + 15.00 \quad [E = 1.25t + 15.00]$$

where:

E = elongation in 2 in. or 50 mm, %,

t = actual thickness of specimens, in. [mm].

ASTM A335 P11 Mechanical Properties



2. Hardness

Grade P11 pipe does not require hardness testing.

A reference hardness value is provided below.

Annealed condition:

The hardness is usually between 150 and 200 HB.

Normalized and tempered condition:

Hardness ranges from approximately 170 to 220 HB.

Hardened and tempered condition:

Hardness can reach 250 to 300 HB or more, depending on tempering temperature and time.

ASTM A335 P11 Mechanical Properties



3. Optional Experimental Programs

The following experimental items are not required test items, if necessary can be determined by negotiation.

Product Analysis

Flattening Test

Bend Test

Metal Structure and Etching Tests

Photomicrographs

Photomicrographs for Individual Pieces

Hydrostatic Test



- The P11 hydrotest shall comply with the following requirements.

Outside diameter > 10in. [250mm] and wall thickness ≤ 0.75in. [19mm]: this should be a hydrostatic test.

Other sizes for non-destructive electrical testing.

- For ferritic alloy steel and stainless steel tubes, the wall is subjected to a pressure of not less than **60% of the specified minimum yield strength**.
- The hydro test pressure shall be maintained for at **least 5s** without leakage or other defects.
- Hydraulic pressure can be calculated using the formula:

$$P = 2St/D$$

P = hydrostatic test pressure in psi [MPa];

S = pipe wall stress in psi or [MPa];

t = specified wall thickness, nominal wall thickness according to specified ANSI schedule number or 1.143 times the specified minimum wall thickness, in. [mm];

D = specified outside diameter, outside diameter corresponding to specified ANSI pipe size, or outside diameter calculated by adding 2t (as defined above) to the specified inside diameter, in. [mm].

Nondestructive Examination



Each pipe shall be examined by a non-destructive examination method in accordance with Practice **E213**, Practice **E309**, or Practice **E570**.

Dimensional Tolerances



Permissible Variations in Diameter

For pipe ordered to **inside diameter**, the inside diameter shall not vary more than $\pm 1\%$ from the specified inside diameter.

Tubing ordered in **NPS [DN] or outside diameters** must not vary outside diameters more than specified in the tables below.

Permissible Variations in Outside Diameter			
NPS	DN	Permissible Variations	
		in.	mm
1/8 - 1 1/2, inch.	6 - 40, inch.	$\pm 1/64$ (0.015)	± 0.40
Over 1 1/2 to 4 inch.	Over 40 to 100 inch.	$\pm 1/32$ (0.031)	± 0.79
Over 4 to 8 inch.	Over 100 to 200 inch.	-1/32 (0.031) - +1/16 (0.062)	-0.79 - +1.59
Over 8 to 12 inch.	Over 200 to 300 inch.	-1/32 (0.031) - +3/32 (0.093)	-0.79 - +2.38
Over 12	Over 300	$\pm 1\%$ of specified outside diameter	

Dimensional Tolerances



Permissible Variations in Wall Thickness

Wall thickness measurements shall be made using mechanical calipers or properly calibrated nondestructive testing devices of appropriate accuracy. In case of dispute, the measurement determined using mechanical calipers shall prevail.

Permitted Variations in Wall Thickness		
NPS	DN	Tolerance, % from Specified
1/8 to 2 1/2 incl. all t/D ratios	6 to 65 incl. all t/D ratios	-12.5 - +20.0
Above 2 1/2, t/D ≤ 5 %	Above 65, t/D ≤ 5 %	-12.5 - +22.5
Above 2 1/2, t/D > 5 %	Above 65, t/D > 5 %	-12.5 - +15.0

t = Specified Wall Thickness; D = Specified Outside Diameter.

The minimum wall thickness and outside diameter for inspection for compliance with this requirement for the pipe ordered by NPS [DN] and schedule number are shown in [ASME B36.10M](#).

ASTM A335 P11 Applications



Typically used in boilers, superheaters, and heat exchangers in power stations and chemical plants.

- ✎ **Boilers:** P11 is widely used in the construction of boilers due to its resistance to high temperatures and pressures, especially in sections that are subjected to extreme temperatures and pressures.
- ✎ **Superheater:** Used to increase the steam temperature to further enhance thermal efficiency. p11 ensures that the strength and durability of the material is maintained even at high temperatures.
- ✎ **Heat exchangers:** P11 enhances the corrosion and high-temperature resistance of heat exchangers, thus improving the reliability and safety of the equipment.
- ✎ **Piping systems:** Piping systems in chemical plants often need to transport high-temperature fluids or steam. the high-temperature strength and good mechanical properties of P11 make it ideal for these applications.

ASTM A335 P11 FAQ



What is the ASTM A335 P11 equivalent to?

GB/T 5310: 12CrMo;

DIN 17175: 10CrMo9-10 (1.7380);

EN 10216-2: 10CrMo9-10;

BS 3604: 10CrMo9-10;

JIS G3462: STPA23;

GOST 550-75: 12Kh1MF.

Is P11 a low-alloy steel?

Yes, P11 is a low alloy steel.

Low alloy steel is an iron-carbon alloy to which one or more alloying elements (e.g., chromium, molybdenum, nickel, etc.) have been added, with a total alloying element content generally ranging from 1 to 5 %.

What is the tensile strength of ASTM A335 P11?

Minimum tensile strength of 415 MPa [60 ksi].

What is the yield strength of ASTM A335 P11?

Minimum tensile strength of 205 MPa [30 ksi].

ASTM A335 P11 FAQ



What is the temperature limit for ASTM A335 P11?

In oxidizing environments: Maximum service temperatures are typically about 593°C (1100°F).

In non-oxidizing environments: maximum service temperatures of approximately 650°C (1200°F) can be achieved.

Is the A335 P11 magnetic?

It is magnetic at room temperature. This property may be useful in certain applications, such as when the material is required to be compatible with magnetic detection equipment.

What is the price of ASTM A335 P11?

Prices vary with the market, contact us for an accurate quote.

About Us



Since its establishment in 2014, **Botop Steel** has become a leading supplier of carbon steel pipe in Northern China, known for excellent service, high-quality products, and comprehensive solutions.

The company offers a variety of carbon steel pipes and related products, including seamless, ERW, LSAW, and SSAW steel pipe, as well as a complete lineup of pipe fittings and flanges. Its specialty products also include high-grade alloys and austenitic stainless steels, tailored to meet the demands of various pipeline projects.



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