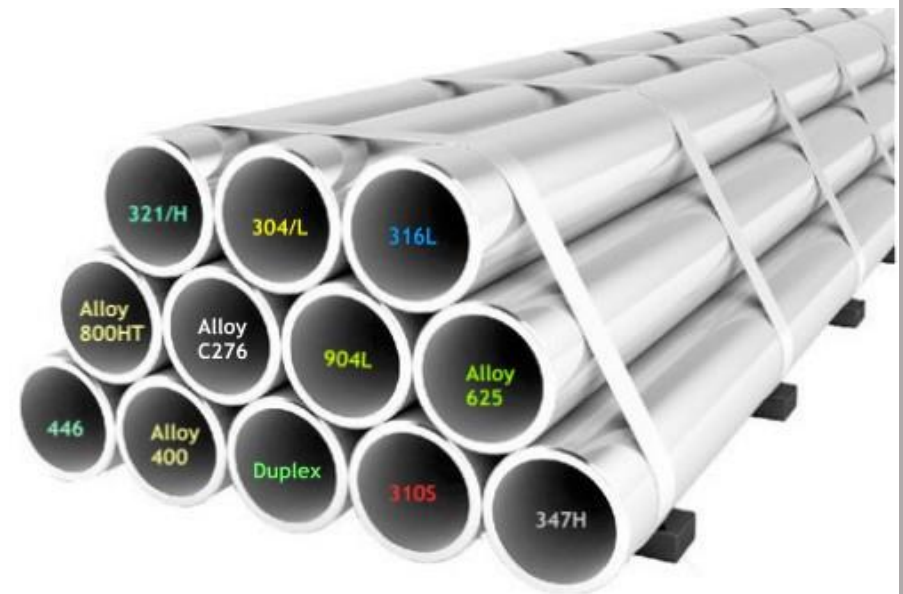


NIOBIUM

Datasheet for Niobium

- Pipes & Tubes
- Sheets & Plates
- Bars & Rods, Forgings
- Fittings & Flanges
- Nuts & Bolts
- Valves



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Datasheet for Niobium

Types 1 (UNS R04200), Types 2 (UNS R04210), Types 3 (UNS R04251), Types 4 (UNS R04261)

What is Niobium?

- Niobium, also known as columbium, is a chemical element with the symbol Nb and atomic number 41. Niobium is a light grey, crystalline, and ductile transition metal. Pure niobium has a Mohs hardness rating similar to that of pure titanium, and it has similar ductility to iron. Niobium oxidizes in the earth's atmosphere very slowly, hence its application in jewelry as a hypoallergenic alternative to nickel. Niobium is a rare, soft, malleable, ductile, gray-white metal. Niobium exhibits similar but slightly lower resistance against chemicals corrosive to tantalum. It must be placed in a protective atmosphere when processed at even moderate temperatures because it tends to react with oxygen, carbon, the halogens, nitrogen, and sulfur. The metal is inert to acids, even to aqua regia at room temperatures, but is attacked by hot, concentrated acids, and especially by alkalis and oxidizing agents. However, 90% of its total demand arises from the production of high-strength low-alloy steels, whereas rolled niobium-based products account for 4% and superalloys and compounds (oxides and chemicals) account for 3% each.
- The major grades of Niobium products are Unalloyed Niobium R04210, Nb-10W-10Hf, UNS Grade R04261—Niobium + 1 % Zirconium (Nb1Zr), UNS Grade R04295—Niobium + 10% Hf+1 % Ti (Nb10Hf1Ti); Reactor Grade - Unalloyed Niobium R04200, UNS Grade R04261—Niobium + 1 % Zirconium (Nb1Zr); Superconducting - Nb-50Ti.

Niobium Product Specification

Size	Outer Diameter 2.0-100 mm; Thickness 0.2-5.0 mm; Length 200-8000 mm
Standard	ASTM B394
Purity	99.5% 99.9%, 99.95%
Density	8.57 g/cm ³
Surface	Polished
Grade	R04200, R04210

ASTM Grade Specification of Niobium

- R04200-Type 1—Reactor grade unalloyed niobium
- R04210-Type 2—Commercial grade unalloyed niobium
- R04251-Type 3—Reactor grade niobium alloy containing 1 % zirconium
- R04261-Type 4—Commercial grade niobium alloy containing 1 % zirconium
- UNS R0xxxx -Type 5, Residual Resistivity Ratio (RRR) grade pure niobium.
 - RRR values: guaranteed min. RRR 300 *
 - (* the Residual Resistivity Ratio RRR is defined as the ratio of electrical resistivity at 295K to electrical resistivity at 4,2K)

ASTM Specifications of Niobium

Designation	Title
B391 - 18	Standard Specification for Niobium and Niobium Alloy Ingots
B392 - 18	Standard Specification for Niobium and Niobium Alloy Bar, Rod, and Wire
B393 - 18	Standard Specification for Niobium and Niobium Alloy Strip, Sheet, and Plate
B394 - 18	Standard Specification for Niobium and Niobium Alloy Seamless and Welded Tubes
B652 / B652M - 10(2018)	Standard Specification for Niobium-Hafnium Alloy Ingots
B654 / B654M - 10(2018)	Standard Specification for Niobium-Hafnium Alloy Foil, Sheet, Strip, and Plate
B655 / B655M - 10(2018)	Standard Specification for Niobium-Hafnium Alloy Bar and Wire
B884 - 11(2019)	Standard Specification for Niobium-Titanium Alloy Billets, Bar, and Rod for Superconducting Applications
B599 - 20	Standard Specification for Nickel-Iron-Chromium-Molybdenum-Niobium Stabilized Alloy Plate, Sheet, and Strip

Chemical Properties of Niobium

Element	Type 1	Type 2	Type 3	Type 4
	(Reactor Grade Unalloyed Nb)	(Commercial Grade Unalloyed Nb)	(Reactor Grade Nb-1%Nb)	(Commercial Grade Nb-1%Nb)
	R04200	R04210	R04251	R04261
Max Weight % (Except Where Otherwise Specified)				
C	0.01	0.01	0.01	0.01
N	0.01	0.01	0.01	0.01
O	0.015	0.025	0.015	0.025
H	0.0015	0.0015	0.0015	0.0015
Zr	0.02	0.02	0.8 - 1.2	0.8 - 1.2
Ta	0.1	0.3	0.1	0.5
Fe	0.005	0.01	0.005	0.01
Si	0.005	0.005	0.005	0.005
W	0.03	0.05	0.03	0.05
Ni	0.005	0.005	0.005	0.005
Mo	0.01	0.02	0.01	0.05
Hf	0.02	0.02	0.02	0.02
Ti	0.02	0.03	0.02	0.03

Mechanical Properties of Niobium

Grade Chart	Tensile Ultimate Strength	Yield Strength	Elongation in 1-inch	
	Minimum, psi (MPa)	Minimum, psi (MPa)	0.010 inch or Greater	Less Than 0.010 inch
Types 1 and 2	18 000 (125)	10 500 (73)	20	15
Types 3 and 4	28 000 (195)	18 000 (125)	20	15

Manufacturing Process of Niobium

Niobium tubes are manufactured by electron beam melting technology, including seamless niobium tube and welding niobium tube. First, melt the not forging niobium bar into niobium ingot by vacuum electron beam melting technology. There are two ways of smelting - single smelting and multiple smelting. Usually we smelt two times, or it can be more than two times depending on the product specific requirements. Second, forging and axial breakdown niobium ingot and then make it into niobium tube bloom by extrusion process manufacturing, then take it for annealing treatment and cleaning. After several times of rolling and annealing, we get the high quality niobium tube. The performance of this kind of technology is uniform, mainly used to produce small specification pipe and capillary materials, applicable to the production of various specifications of products.

Properties of Niobium

- Niobium is a shiny, white, ductile metal. In air an oxide layer forms whose color depends on its thickness. Shades of blue, green and yellow are typical.
- Niobium resists corrosion due to the oxide film. The metal starts to oxidize rapidly in air at 200°C.
- Niobium's chemical properties are very similar to those of tantalum.
- Niobium is one of the five major refractory metals (metals with very high resistance to heat and wear). The other refractory metals are tungsten, molybdenum, tantalum and rhenium.

Applications of Niobium

- Used for the heat exchange tube.
- The protect tube of thermometer in petrochemical industry.

- The electronics industry.
- Niobium is used for the production of high-temperature-resistant alloys and special stainless steels.
- Small amounts of niobium impart greater strength to other metals, especially those that are exposed to low temperatures.
- Niobium carbide is used in cutting tools.
- It is used in stainless steel alloys for nuclear reactors, jets, missiles, cutting tools, pipelines, super magnets and welding rods.
- Niobium-tin and niobium-titanium alloys are used as wires for superconducting magnets capable of producing exceedingly strong magnetic fields.
- Niobium is also used its pure form to make superconducting accelerating structures for particle accelerators.
- Niobium alloys are used in surgical implants because they do not react with human tissue.

Types of Niobium Products

Niobium Hollow Pipe	Niobium Heater for High Temperature
Niobium Seamless Pipe	Niobium Heat Exchanger Tube
Niobium Bush Hex Pipe	Potassium-doped Niobium Wire
Niobium Round Pipe	Niobium Welded Pipe
Niobium Alloy Round Pipe	Niobium Rotating target
Niobium Aero engine tube	Niobium Custom Pipe
Niobium Alloy Custom Pipe	Niobium Thick Wall Pipe
Niobium Elliptical and Oval Tube	Niobium Thin Wall Pipe
Niobium Pipe Fittings	Niobium Forging
Niobium Strips	Niobium Fasteners
Niobium Flex pipe	Niobium Plates, Sheets and Bars
Niobium Alloy Polished Pipe	UNS Niobium lined pipe
Niobium Exhaust Pipe	Niobium Micro Tube

Niobium Bar/Billet	Niobium Wire/Welding Wire
Niobium Boiler Tube	Niobium Coil Tubing
Niobium Capillary Tube	Niobium U Shaped Tube
Niobium Rods	Precision Niobium Tubing
Niobium Suppliers	Niobium Pipe Manufacturers
Niobium Ingots	Niobium Foil
Niobium Metals	Niobium Crucibles

Manufacturing Niobium Products

Niobium Sheet	Niobium Plate Cuttings/Profiles	Niobium Nuts, Bolts and Fasteners
Niobium Plate	Niobium Foil, Coil	Niobium Wire
Niobium Blocks/Slabs	Niobium Strip	Niobium Ingot
Niobium Rod/Bar	Niobium Pipes and Tubes	Niobium Forgings and Castings
Niobium Flanges	Niobium Forged Fittings	Niobium Buttweld Fittings

About Metallica Metals – The Steel Pipes Factory

- Established in 1975, the Metallica Metals Group (The Steel Pipes Factory) has its operations spread across major cities in India. We are a pioneer in the stainless steel pipes, nickel alloy products, titanium products, carbon steel pipes and alloy steel pipes manufacturing and processing industry. Our products including pipe fittings, flanges, pipes, sheet plates and valves are exported to over 70 countries across the world, while in India we have supplied to even the remote areas. With over 250 tons of sale in stainless steel and carbon steel pipes every day, Metallica has emerged as a prominent vendor for many buyers in India and Overseas

- More than 3000 tons ready from stock and new production ready in just a few weeks.
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Our Key Products

STAINLESS STEEL & NICKEL ALLOYS

Pure Nickel Alloys
Monel Alloys (Ni-Cu Alloys)
Inconel (Ni-Cr-Mo) Alloys
Incoloy Alloys (Ni-Cr-Fe)
Hastelloy Alloys
Stainless Steel 304/304L
Stainless Steel 309S/309H
Stainless Steel 310/310S
Stainless Steel 316/316L
Stainless Steel 316Ti
Stainless Steel 317/317L
Stainless Steel 321/321H
Stainless Steel 347/347H
Stainless Steel 904L
Duplex Steels (UNS S32205, UNS S31803)
Super Duplex Steels (UNS S32760 / UNS S32750)
Stainless Steel 254 SMO (UNS S31254 / 1.4547)

INSTRUMENTATION TUBES & FITTINGS

Instrumentation Tube
Hydraulic Tubing
Seamless Tubing
Instrumentation Tube Fittings
Double Compression Tube Fittings
Precision Pipe Fittings
Needle & Gauge Valves
Manifold Valves

PRODUCTS

Steel Sheet & Plate
Steel Coil & Strip
Steel Pipes
Steel Tubes
Electropolish Tube
Heat Exchanger Tubes
Steel Bars/Rods & Wire
Fasteners (Nut, Bolt, Washer)
Steel Angle Bars
Hex Steel Bars
Round Steel Bars & Rod
Flat Steel Bars
Forgings, Rings & Forged Blocks
Stainless Steel Pipe
Stainless Steel Seamless Pipe
Stainless Steel Welded Pipe
Stainless Steel Tubes
Stainless Steel Furnace Tubes
Stainless Steel Seamless Tubing
Stainless Steel Heat Exchanger Tubes
Large Diameter Pipe

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