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Ulbrich Stainless Steels & Special Metals, Inc. • 153 Washington Avenue • North Haven, CT 06473 USA • 800-243-1676 • ULBRICH.com

NIOBIUM TYPE 1 & 2, UNS R04300, UNS R04210

Strip, Coil, Foil, Wire, ASTM B393

NIOB1 (Type 1 Reactor Grade Unalloyed)

NIOB2 (Type 2 Commercial Grade Unalloyed)

Applications

Type 1 and Type 2:

Used in jewelry, super-abrasives, thin film deposition (glass), high-energy physics, springs and superconducting magnets for aerospace, consumer electronics, medical and superconducting applications

Description

Niobium is a very soft refractory metal with an extremely high melting point and corrosive resistant properties. High thermal/electric conductivity, easily fabricated and bio-compatible.

Chemistry: Ingot

| Element | Type 1 Reactor Grade | Type 2 Commercial Grade |
|------------|----------------------|-------------------------|
| Niobium | Balance | Balance |
| Carbon | 0.01 | 0.01 |
| Nitrogen | 0.01 | 0.01 |
| Oxygen | 0.015 | 0.025 |
| Hydrogen | 0.0015 | 0.0015 |
| Zirconium | 0.02 | 0.02 |
| Tantalum | 0.1 | 0.3 |
| Iron | 0.005 | 0.005 |
| Silicon | 0.005 | 0.005 |
| Tungsten | 0.03 | 0.05 |
| Nickel | 0.005 | 0.005 |
| Molybdenum | 0.020 | 0.020 |

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NIOBIUM TYPE 1 & 2

| Element | Type 1 Reactor Grade | Type 2 Commercial Grade |
|----------|----------------------|-------------------------|
| Hafnium | 0.02 | 0.02 |
| Titanium | 0.02 | 0.02 |

Below Elements When Specified:

| | | |
|-----------|-------|-------|
| Boron | 2ppm | --- |
| Aluminum | 0.002 | 0.005 |
| Beryllium | 0.005 | --- |
| Chromium | 0.002 | --- |
| Cobalt | 0.002 | --- |

Physical Properties

Density: 0.310 lbs/in³, 8.66 g/cm³

Mean Coefficient of Thermal Expansion, in/in/°F (mm/m/°C)

70 - 212 °F (20 - 100 °C): 4.05×10^{-6} (7.3)

Thermal Conductivity: (W/m-°K)

(21 °C): 53.7

Modulus of Elasticity, ksi (MPa)

1.52×10^3 (104.9×10^3) in tension

Melting Point: 4490 °F (2477 °C)

Forms

Coil – Strip, Foil, Ribbon

Wire – Profile, Round, Flat, Square

Mechanical Properties at Room Temperature

Annealed: Typical

Ultimate Tensile Strength: 18 KSI min (124 MPa min)

Yield Strength (0.2% offset): 10.5 KSI min (72 MPa min)

Elongation:

Gauges: less than 0.010 inches: 15% min

Gauges: 0.010 inches and greater: 20% min

** Niobium Type 1 and Type 2 can be cold rolled to various tempers. Contact Ulbrich Technical Service for additional information.*

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Additional Properties

Corrosion Resistance

Refer to NACE (National Associate of Corrosion Engineers) for recommendations.

Finishes

#1 – Hot rolled annealed and descaled. It is available in strip, foil and ribbon. It is used for applications where a smooth decorative finish is not required.

#2D – Dull finish produced by cold rolling, annealing and descaling. Used for deep drawn parts and those parts that need to retain lubricants in the forming process.

#2B – Smooth finish produced by cold rolling, annealing and descaling. A light cold rolling pass is added after anneal with polished rolls giving it a brighter finish than 2D.

#BA – Bright annealed cold rolled and bright annealed

#CBA – Course bright annealed cold rolled matte finish and bright anneal

#2 – Cold Rolled

#2BA – Smooth finish produced by cold rolling and bright annealing. A light pass using highly polished rolls produces a glossy finish. A 2BA finish may be used for lightly formed applications where a glossy finish is desired in the formed part.

Polished – Various grit finish for specific polish finished requirements.

** Not all finishes are available in all alloys – Contact Ulbrich Sales for more information.*

Wire Finishes

XC – Extra clean. Bright annealed or bright annealed and cold rolled

Grease – Ultra bright finish for decorative applications

Soap – Soap is not removed from tempered wire to act as a lubricant.

** Contact Ulbrich Wire for custom finishes.*

Heat Treatment

Niobium Type 1 and Type 2 are non hardenable by heat treatment. They can only be hardened by cold working.

Welding

For best results refer to: SSINA's "Welding of Stainless Steels and Other Joining Methods".

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