TITANIUM
Commercially Pure

IN STOCK FOR IMMEDIATE DELIVERY
COMMERCIALLY PURE TITANIUM PLATE
GRADE 2/2H (UNS R50400)
from .1875" (4.8 mm) through 3.5" (88.9 mm)

SANDMEYER'S
Grade 2/2H Commercially Pure Titanium
(UNS R50400) W. Nr. 3.7035

Combines High Strength and Ductility with Excellent Corrosion Resistance

Sandmeyer Steel Company is offering the "workhorse" commercially pure Titanium material from stock in full plates or custom cut sizes. Sandmeyer Steel Company has added commercially pure Titanium Grade 2/2H (UNS R50400) to North America's largest inventory of Stainless Steel and Nickel Alloy Plate and Plate Products.

Any Way You Want It!

At Sandmeyer Steel Company, we have over 100 pieces of Value-Added Plate Processing equipment all under one roof. You can purchase any custom shape or configuration you require to maximize plate yields. We can cut patterns utilizing five-axis abrasive waterjet or bandsaw. We can also offer *Machincut* rings and discs up to 124" (3150 mm) OD and can drill your tubesheets and baffles through 8" (203.2 mm). We can even have our plates produced into welded pipe, tubing, or structural shapes. Send us your drawings for finished or near-net shape parts, or we'd be happy to sell you full-size plates. At Sandmeyer Steel Company we work with the customer.

Stock Thicknesses

Grade 2/2H (UNS R50400) Commercially Pure Titanium Plate and Plate Products are available along with our inventory of Stainless Steel and Nickel Alloy Plate. We maintain the largest inventory of specialty plate in North America — over 18 million pounds! Grade 2/2H (UNS R50400) Commercially Pure Titanium is available in thicknesses from .1875" (4.8 mm) through 3.5" (88.9 mm).

Material Certifications

ASTM..... B265
ASME.....SB265

Applications

Grade 2/2H (UNS R50400) Commercially Pure Titanium Plate and Plate Products are the real "workhorses" for industrial applications requiring a combination of a low density and high strength-to-weight ratio with outstanding corrosion resistance over a wide range of service applications and industries.

- Aerospace
- Architectural
- Biotechnology and Pharmaceuticals
- Chemical Processing
- Desalination
- Hydrocarbon Processing and Petrochemicals
- Marine Service
- Medical
- Oil and Gas Processing
- Ore and Mineral Refining
- Power Generation — biomass, geothermal, nuclear
- Pulp and Paper — bleaching

Learn More About Sandmeyer Steel Company

Visit our website at *www.SandmeyerSteel.com* for a complete review of our alloy technical data, stock levels, and Value-Added Plate Processing Capabilities.

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Providing Solutions, With Materials and Value Added Products, for Process Industries

Titanium 2/2H 07/2019
rev 02/2023 PDF link

Specification Sheet: Titanium Grade 2/2H Plate

(UNS R50400) W. Nr. 3.7035

Commercially Pure Titanium Plate Combining High Strength and Ductility with Excellent Corrosion Resistance

Titanium Grade 2/2H (UNS R50400) plate is commercially pure titanium plate. It is the most widely used commercially pure titanium grade offering an excellent balance of strength and ductility with outstanding corrosion resistance in highly oxidizing and mildly reducing service.

Titanium Grade 2/2H (UNS R50400) plate has slightly lower strength than Titanium Grade 3 (UNS R50550) but is stronger than Titanium Grade 1 (UNS R50250). It has a minimum guaranteed yield strength of 40 ksi (275 MPa). Its corrosion resistance is equal to the other commercially pure plate grades.

Titanium Grade 2/2H (UNS R50400) plate can operate in continuous service up to 800ºF (425ºC) and in intermittent service up to 1000ºF (540ºC).

Titanium Grade 2/2H (UNS R50400) plate can be easily welded, machined, and hot and cold worked by standard shop fabrication practices.

Applications

- Aerospace
- Architectural
- Biotechnology and Pharmaceuticals
- Chemical Processing
- Desalination
- Hydrocarbon Processing and Petrochemicals
- Marine Service
- Medical
- Oil and Gas Processing
- Ore and Mineral Refining
- Power Generation — biomass, geothermal, nuclear
- Pulp and Paper — bleaching

Standards

ASTM B265
ASME SB265

Chemical Analysis

Typical Analysis (Weight %)

Element		Element	
Carbon	0.08 max.	**Oxygen**	0.25 max.
Hydrogen	0.015 max.	**Nitrogen**	0.030 max.
Iron	0.030 max.	**Titanium**	Balance
Residual Elements, each	0.10 max.	**Residual Elements, total**	0.40 max.

Physical Properties

Density
0.163 lb/in^{-3}
4.51 g/cm^{-3}

Modulus of Elasticity 78ºF (25ºC)
15.2–17.4 Msi
105–120 GPa

Electrical Resistivity
21 µΩ/in
0.53 µΩ/m

Thermal Conductivity
12.60 Btu/hr^{-1}/ft^{-1}
21.79 W/m^{-1}/K^{-1}

Beta Transus (±25ºF, ±-3.9ºC)
1680°F
915°C

Magnetic Permeability
Nonmagnetic

Mean Coefficient of Thermal Expansion

Temperature Range		Coefficient of Expansion	
°F	°C	10^{-6} in/in^{-1} °F^{-1}	10^{-6} m/m^{-1} °C^{-1}
68–212	-20–100	4.8	8.6
68–572	20–300	5.3	9.5
68–932	20–500	5.4	9.7

Mechanical Properties

Typical Room Temperature Mechanical Properties

	Temperature		Ultimate Tensile Strength		Yield Strength 0.2% Offset		Elongation
	ºF	ºC	ksi	(MPa)	ksi	(MPa)	%
Titanium	68	20	70	485	50	345	28

Corrosion Resistance

The corrosion resistance of Titanium Grade 2/2H (UNS R50400) plate is the result of a strong, stable, protective oxide film layer that forms when the metal surface is exposed to oxygen or moisture. The film growth accelerates under strong oxidizing conditions.

The protective film layer of Titanium Grade 2/2H (UNS R50400) plate provides excellent corrosion resistance in many challenging service environments — including oxidizing and organic acids, alkaline solutions, bleaches, wet chlorine, inorganic salts, salt brines, and seawater.

Titanium Grade 2/2H (UNS R50400) plate should not be used in strong reducing acids, anhydrous chlorine, strong caustic solutions, fluorides, or pure oxygen service.

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Titanium Grade 2/2H Plate (UNS R50400) Seawater Erosion/Corrosion

Test Description	Flow Rate (ft/s)	Duration (months)	Erosion/Corrosion Rate (mpv)
Brixham Sea, condenser	32	12	0.12
Kure Beach, NC, disk	28	2	0.005
Kure Beach, NC, jet impinge	23.6	1	0.02
Wrightsville Beach, NC	29.5	2	0.007

Titanium Grade 2/2H Plate (UNS R50400) Aqueous Media Corrosion Rates

Media	Concentration (%)	Temperature (°F)	Corrosion Rate (mpy)
Acetic Acid	0–99.5	boiling	nil.
Aluminum Chloride	10	220	1.1
Aluminum Chloride	25	68	0.04
Ammonium Hydroxide	70	boiling	nil.
Bismuth/Lead	molten	570	<4
Boric Acid	10	boiling	nil.
Bromine (moist)	vapor	86	0.12
Chlorine Gas (dry)	100	140	very high
Chlorine Gas (wet)	>1.5% H_2O	392	nil.
Copper Sulfate	50	boiling	nil.
Ferric Chloride	1–30	212	nil.
Formic Acid (aerated)	90	212	0.05
Formic Acid (non-aerated)	90	212	118
Hydrochloric Acid	1	100	1.2
Hydrochloric Acid	5	200	260
Hydrochloric Acid	20	95	165
Hydrogen Peroxide	5	150	2.4
Magnesium Chloride	50	392	0.2
Nitric Acid	35	boiling	5.0–20.0
Nitric Acid	7	158	1.56
Oxalic Acid	10	95	0.58
Phosphoric Acid	5	151	0.2
Phosphoric Acid	30	140	39
Phosphoric Acid	85	70	7
Stearic Acid	100	boiling	0.12
Sulfuric Acid	5	70	9
Sulfuric Acid	25	77	28.3
Sulfuric Acid	75	95	41
Sulfuric Acid	98	392	1.5

Fabrication Data

Titanium Grade 2/2H (UNS R50400) plate can be easily welded, machined, and hot and cold worked by standard shop fabrication practices.

Hot Forming

Hot forming operations should be performed in the temperature range between 400°F and 600°F (204°C and 316°C). Care must be taken to prevent the formation of excessive alpha case which should be removed after processing.

Cold Forming

Titanium Grade 2/2H (UNS R50400) plate can be worked by any conventional cold-forming method at room temperature. Three factors make titanium somewhat different from other metals.

1. Room temperature ductility that is less than other materials may require more generous bend radii and lower stretch formability.
2. Modulus of Elasticity is about half that of steel which can cause spring back after forming.
3. Galling tendency is greater than stainless steel which calls for close attention to lubrication in any forming operation in which titanium is in contact with metal dies or forming equipment.

Welding

Titanium Grade 2/2H (UNS R50400) plate can be joined by a variety of welding procedures using titanium filler metal. Gas tungsten arc welding (GTAW) is the most common welding process for Titanium Grade 2/2H (UNS R50400) plate, but plasma arc welding, spot welding, electron beam, laser beam, resistance welding, and diffusion welding can all be utilized. For whichever process that is selected, inert gas shielding techniques must be employed to prevent oxygen pickup and embrittlement in the weld area.

Machining

Titanium Grade 2/2H (UNS R50400) plate's machining characteristics are similar to those of austenitic stainless steels. Low cutting speeds, heavy feed rates, and a heavy dosage of cutting fluids are recommended. Sharp cutting tools and rigid setups are suggested. Given titanium's tendency to gall, the feeding should never be stopped while the tool and piece are in moving contact. Titanium chips are highly combustible, and precautions should be taken to avoid fire hazards.

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