DATA SHEET

TITANIUM GRADE 5

UNS No - R56400

Other Common name: Titanium 6-4

Titanium Grade 5 is the most commonly utilize Titanium worldwide as well as in the oilfield. Availability of alpha-beta grade is huge and heavily utilized with all the titanium grades. Titanium Grade 5 is alloyed titanium and is treated to be an alpha-beta alloy. Titanium Grade 5 is alloyed along with 6% Aluminium and 4% Vanadium and is also called as Ti 6Al-4V. The alloy is heat treatable and combines excellent strength and corrosion resistance with weld and fabricability. Beta Transus (F +/- 25) 1830.Commercially pure titanium is not stronger than titanium grade 5while having the same stiffness and thermal properties (excluding thermal conductivity, which is about 60% lower in Grade 5 than in CP Ti). With having many advantages, it is heat treatable. This grade has good combination of corrosion resistance, strength, weld and fabricability. This alpha-beta grade is the most widely available and heavily utilized by all the titanium grades.

Applications

- Aircraft turbines
- Engine components
- Aircraft structural components
- Aerospace fasteners
- High-performance automatic parts
- Marine applications
- Sports equipments

Characteristics

- High Strength Titanium
- Heat Treatable
- Good Ductility
- Good Fabricability
- Good Weldability

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Machining
As a family, titanium and its alloys have built a persona as a nightmare to machine. This is just not the situation. Experienced operators have compared its qualities to those found in the 316 stainless steel. Recommended practice includes high coolant flow (to offset the material's low thermal conductivity), slow speeds and generally high feed rates. Tooling should be tungsten carbide designations C1-C4 or cobalt type high speed tools.

Forming
This alloy might be hot or cold formed. Hydro press, stretch or drop-hammer these are the most popular methods are included. This material responds same as to 300 series stainless steels.

Welding
Ti6Al4V may be welded by a wide assortment of standard fusion and solid-state processes, in spite of its chemical reactivity normally requires uncommon measures and process.

Forging
Rough forge at 982 C (1800 F), finish at @ 968 C (1750 C).

Hot Working
Both the spring back and required forming forces are reduced by hot forming and it will increase the overall ductility of the material.

Cold Working
The cold work qualities of this material are same as that of moderately tempered austenitic stainless steel. In numerous cold forming operations, intermediate stress relief is recommended to offset the alloy's tendency to work harden. Post-work annealing is required to reattain optimum performance qualities.

Annealing
Hold at 732 C (1350 F) between 1/4 and 4 hours, Furnace cool to 566 C (1050 F) then air cool. Furnace cooling is not needed for forgings and bars.

Heat Treatment
Solution treats at 904-954 C (1660-1750 F) for 2 hours followed by water quench.

Aging
Aging at 538 C (1000 F) for 4 hours and air cool.

Chemical Properties

N	C	H	Fe	O	Al	V	Residuals***	Residuals ***	Ti
0.05 max	0.08 Max	0.015 Max	0.40 Max	0.20 Max	5.5 - 6.75	3.5 - 4.5	0.1 Max	0.4 Max	Balance

*** Need not be reported.

*** A residual is an element present in a metal or an alloy in small quantities and is inherent to the manufacturing process but not added intentionally. In titanium these elements include aluminium, vanadium, tin, chromium, molybdenum, niobium, zirconium, hafnium, bismuth, ruthenium, palladium, yttrium, copper, silicon, cobalt, tantalum, nickel, boron, manganese, and tungsten.

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Mechanical Properties

Tensile Strength (ksi)	0.2% Yield Strength (ksi)	Elongation% in 2 inches
130	120	10

Physical Properties

Properties	Units	Temperature in °C
Density	4.42 g/cm^3	Room
Specific Heat	0.135 Kcal/kg.C	20°
Melting Point	1650 °C	-
Modulus of Elasticity	105-120 KN/mm^2	20°
Electrical Resistivity	170 Ω.cm	20°
Coefficient of Expansion	8.6 µm/m °C	20-100°
Thermal Conductivity	7.2 W/m-°K	20°

ASTM Specifications

Sheet / Plate	Bar	Forging
B 265	B 348	B 381

Availability

MANUFACTURING
Fasteners
Custom Machining
Custom Fabrication
Stamped Parts

RAW MATERIALS
Bars
Sheets
Plates
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