CHEMICAL COMPOSITION

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Grade	Fe (max)	C (max)	N (max)	H (max)	O (max)	Al	V	Pd	Sn	Mo	Zr	Nb	Cr	Ni	Si	Ti	Other Elements max.each	Other Elements max.total
Ti Grade 1	0.2	0.08	0.03	0.015	0.18	~	~	~	~	~		~	~	~	~	Balance	0.1	0.4
Ti Grade 2	0.3	0.08	0.03	0.015	0.25											Balance	0.1	0.4
Ti Grade 3	0.3	0.08	0.05	0.015	0.35											Balance	0.1	0.4
Ti Grade 4	0.5	0.08	0.05	0.015	0.4											Balance	0.1	0.4
Ti Grade 5	0.4	0.08	0.05	0.015	0.2	5.50~6.75	3.50~4.50									Balance	0.1	0.4
Ti Grade 6	0.5	0.08	0.03	0.015	0.2	4.0~6.0			2.0~3.0							Balance	0.1	0.4
Ti Grade 7	0.3	0.08	0.03	0.015	0.25			0.12~0.25								Balance	0.1	0.4
Ti Grade 9	0.25	0.08	0.03	0.015	0.15	2.50~3.50	2.0~3.0									Balance	0.1	0.4
Ti Grade 11	0.2	0.08	0.03	0.015	0.18			0.12~0.25								Balance	0.1	0.4
Ti Grade 12	0.3	0.08	0.03	0.015	0.25					0.20~0.40				0.60~0.90		Balance	0.1	0.4
Ti Grade 16	0.3	0.08	0.03	0.015	0.25			0.04~0.08								Balance	0.1	0.4
Ti Grade 17	0.2	0.08	0.03	0.015	0.18			0.04~0.08								Balance	0.1	0.4
Ti Grade 23	0.25	0.08	0.03	0.015	0.13	5.50~6.50	3.5~4.5									Balance	0.1	0.4
Ti 6AL-7Nb	0.25	0.08	0.05	0.009	0.2	5.50~6.50						6.50~7.50				Balance	0.1	0.4
Ti15-3-3-3	0.25	0.05	0.05	0.015	0.13	2.50-3.50	14.0~16.0		2.50~3.50				2.50~3.50			Balance	0.1	0.4
Ti 6-2-4-2	0.25	0.05	0.05	0.015	0.15	5.50~6.50			1.80~2.20	1.80~2.20	3.60~4.40				0.06~0.12	Balance	0.1	0.4
Ti 6-2-4-6	0.15	0.04	0.04	0.0125	0.15	5.50~6.50			1.75~2.25	5.50~6.50	3.50~4.50					Balance	0.1	0.4

MECHANICAL PROPERTIES

Mechanical properties							
Grade	Yield Strength(0.2% offset)				UltimateTensile strength		ElongationMin, %
	min		max		min		
	ksi	MPa	ksi	MPa	ksi	MPa	
Ti Grade 1	20	138	45	310	35	240	24
Ti Grade 2	40	275	65	450	50	345	20
Ti Grade 2H	40	275	65	450	58	400	20
Ti Grade 3	55	380	80	550	65	450	18
Ti Grade 4	70	483	95	655	80	550	15
Ti Grade 5	120	828	---	---	130	895	10
Ti Grade 6	115	793	---	---	120	828	10
Ti Grade 7	40	275	65	450	50	345	20
Ti Grade7H	40	275	65	450	58	400	20
Ti Grade 9	70	483	---	---	90	620	15
Ti Grade 9	125.7	860	---	---	106	725	10
Ti Grade 11	20	138	45	310	35	240	24
Ti Grade 12	50	345	---	---	70	483	18
Ti Grade 16	40	275	65	450	50	345	20
Ti Grade 17	20	138	45	310	35	240	24
Ti Grade 23	110	759	---	---	120	828	10
Ti-6Al-7Nb	116	800	---	---	130.5	900	10
Ti15-3-3-3	140	965	---	---	145	1000	5
Ti 6-2-4-2	130	895	---	---	146	1004	19
Ti 6-2-4-6	1500	1034	---	---	160	1103	10

STANDARD

STANDARD	
ASTM B265/ASME SB265	Standard Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate.
ASTM B348/ASME SB348	Standard Specification for Titanium and Titanium Alloy Bars and Billets
ASTM B861/ASME SB861	Standard Specification for Titanium and Titanium Alloy Seamless Pipe
ASTM B862/ASME SB862	Standard Specification for Titanium and Titanium Alloy Welded Pipe
ASTM B863/ASME SB863	Standard Specification for Titanium and Titanium Alloy Wire
ASTM B338/ASME SB338	Standard Specification for Seamless and Welded Titanium and Titanium Alloy Tubes for Condensers and Heat Exchangers
ASTM B381/ASME SB381	Standard Specification for Titanium and Titanium Alloy Forgings
ASTM F67/ISO5832-2	Standard Specification for Unalloyed Titanium, for Surgical Implant Applications (UNS R50250, UNS R50400, UNS R50550, UNS R50700)
ASTM F136/ISO5832-3	Standard Specification for Wrought Titanium-6Aluminum-4Vanadium ELI (Extra Low Interstitial) Alloy for Surgical Implant Applications (UNS R56401)
ASTM F1295/ISO5832-11	Standard Specification for Wrought Titanium-6Aluminum-7Niobium Alloy for Surgical Implant Applications (UNS R56700)
AWS 5.16	Specification for Titanium and Titanium Alloy Welding Electrodes and Rods ERTi-1,ERTi-2,ERTi-5,ERTi-7,ERTi-12
SAE AMS4928	Specification for Titanium Alloy Bars, Wire, Forgings, Rings, and Drawn Shapes 6Al - 4V Annealed
SAE AMS4943	Specification for Titanium Alloy, Hydraulic, Seamless Tubing 3.0Al - 2.5V Annealed
SAE AMS 4944	Titanium Alloy Tubing, Seamless, Hydraulic 3.0Al - 2.5V Cold Worked, Stress Relieved
SAE AMS4945	Specification for Titanium Alloy Tubing, Seamless, Hydraulic 3Al - 2.5V, Controlled Contractile Strain Ratio Cold Worked, Stress Relieved
SAE AMS4911	Specification for Titanium Alloy, Sheet, Strip, and Plate 6Al - 4V Annealed
SAE AMS4914	Specification for Titanium Alloy Cold Rolled Sheet and Strip 15V - 3Al - 3Cr - 3Sn Solution Heat Treated
SAE AMS4956	Specification for Titanium Alloy Welding Wire 6Al - 4V, Extra Low Interstitial Environment Controlled Packaging
SAE AMS4975	Specification for Titanium Alloy, Bars, Wire, and Rings 6.0Al - 2.0Sn - 4.0Zr - 2.0Mo - 0.08Si Solution and Precipitation Heat Treated
SAE AMS4976	Specification for Titanium Alloy, Forgings 6.0Al - 2.0Sn - 4.0Zr - 2.0Mo - 08Si Solution and Precipitation Heat Treated
SAE AMS 4981	Specification forTitanium Alloy Bars, Wire, and Forgings 6.0Al - 2.0Sn - 4.0Zr - 6.0Mo Solution and Precipitation Heat Treated

TITANIUM GRADE

Titanium Grade			
Grade	Description	Product Forms	Typical Applications
Grade 1 (3.7025, R50250)	Pure titanium gr1, the mechanical properties of commercially pure titanium alloys are influenced by the content of lower oxygen and iron. Therefore,ductile and softest making this grade easily formable. And this alloy has the higher purity,so it have an excellent resistance to mildly reducing to highly oxidizing media with or without chlorides, weldability perfornaced, outstanding impact toughness, excellent ductility and nonmagnetic in room terperature, innocuity.	Ingot, Bar,forgings, Billet, Plate,Sheet, Strip, foil, seamless tubing, Welded Pipe, Wire.	*Marine components*Pharmaceuticaland food*Stamped or etched fabrications *Chemical processing equipment *Anode/cathode*battery implantable cell components*Hydrocarbon refining/processing*Pulp/paper bleaching*Washing equipment *Desalination, brine concentration/evaporation*Medical implants/devices
Grade 2 (3.7035, R50400)	Pure titanium gr2,Commercially pure titanium, an outstanding balance between strength and ductility. It has fine impact strength and easily weldable, pretty good corrosion resistance in highly oxidizing circumstance, alkaline media, aqueous salt solutions, slightly reducing circumstance, nitric acid and wet chlorine gas. It also has terrific resistance to seawater and salt solutions. Titanium's low density, high strength-to-weight ratio and resistance to corrosion make it an ideal metal for various applications.	Ingot, Bar,forgings, Billet, Plate,Sheet, Strip, foil, seamless tubing, Welded Pipe, Wire.	*Navy ship parts*Food processing/pharmaceutical*Chemical processing equipment*Anode/cathode/cell parts*Aircraft ducting, hydraulic, and tubing*Air pollution control equipment *Hydrocarbon refining/processing*Pulp/paper bleaching/washing equipment*Power plant cooling system components*Desalination, brine concentration/evaporation*Hydrometallurgical extraction/electrowinning*Medical implants/devices, surgical instruments*Consumer products*Sports/recreational equipment*Offshore hydrocarbon production/drilling
Grade 3 (3.7055, R50550)	Pure titanium gr3,Commercially pure titanium alloys based on titanium gr2 abilities be adjusted little small percent elements of oxygen and iron,have changed it mechanical properties for commercial grade more suitable different applications.It is little bit stronger than gr2 titanium alloy. It also has good impact properties at low temperatures.	Bar,forgings, Billet, Plate,Sheet, Strip, foil, seamless tubing, Welded Pipe, Wire.	*Navy ship parts*Chemical processing equipment *Power plant cooling system components *Bellows, aircraft structural, honeycomb, gaskets, aircraft skin, heat exchanger parts.
Grade 4 (3.7065, R50700)	Pure titanium gr4,Commercially pure titanium alloys based on titanium gr3 abilities be adjusted small percent elements of oxygen and iron,have changed it mechanical preoperties. Commercially pure titanium alloys an be altered via small quantities of oxygen and iron, that tend to influence the mechanical properties. Gr4 shows the highest strength among all the CP titanium grades. It combines excellent corrosion resistance with commendable formability and weldability.	Bar,forgings, Billet, Plate,Sheet, Strip, foil, seamless tubing, Welded Pipe, Wire.	*Aerospace Components *Cryogenic vessels*Chemical processing equipment *Hydrometallurgy *implantable battery cathodes/connectors *Medical and Dental devices *eye glass frames
Grade 5 (Ti-6Al-4V, 3.7165, R56400)	Gr5 titanium alloy well known as Ti6Al4V, Ti-6Al-4V or Ti 6-4 a kind of alpha-plus-beta class.It is combination of excellent strength, low weight and excellent corrosion resistance, this alloy is now used in numerous usages, one of the most widely used titanium alloys today. Another advantage of Ti-6Al4V Gr5 when annealed is that it is suitable for use at temperatures up to 400°C and is easy to forge, form and weld.	Ingot, Bar,forgings, Billet, Plate,Sheet, Strip, foil, seamless tubing, Welded Pipe, Wire.	*Chemical Industry *Aerospace Industry *Aircraft Turbines*Engine Components *Aircraft Structural Components *Aerospace Fasteners*High-Performance Automatic Parts *Marine Applications

Grade 6 (5AL-2.5Tin,3.7115,R54520)	Gr6 titanium alloy, a kind of alpha plus beta alloy and well known as Ti-5Al-2.5Snhas good weldability and shows stability and oxidation resistance at elevated temperatures (600 – 1000°F). The alloy is a more difficult alloy to forge with a narrow forgeability range and greater yield loss.	Bar,forgings, Billet, Plate,Sheet, Wire.	*Gas turbine engine casings and rings *Chemical processing equipment *jet turbine compressor blades, ducting, and steam turbine blades*Aerospace structural members
Grade 7 (0.12~0.25Pd,3.7235, R52400)	Titanium Gr7 Ti-Pd unalloyed titanium,addition of the Pd powder based on the grade Gr2 when it melting the ingots for sure it Pd content 0.12_0.25% ,it is developed for chemical processing industries only. Gr7 titanium enhanced resistance to chemical crevice corrosion. It combines excellent corrosion resistance with good formability and weldability. Improved resistance to general and localized crevice corrosion infar-ranging reducing acid environments, including chlorides, and where low pH and high temperatures.	Ingot,Bar,forgings, Billet, Plate,Sheet, Strip, foil, seamless tubing, Welded Pipe, Wire.	*Chloride containing storages *Chemical processing equipment *Marine applications *Hydrocarbon Processing
Grade 9 (Ti-3Al-2.5V, 3.7195, R56320)	TItanium gr9 Ti-3Al-2.5V alloy is a kind of alpha plus beta alloy adding minor Pb corrosion resistance be enhanced, and the grade is characterized by good weldability possessing excellent fabricability. The alloys shows high mechanical strength, superior strength to weight ratio. It combines good corrosion resistance with good cold forming.The material shows good ductility and toughness.	Bar,forgings, Billet, Plate,Sheet, seamless tubing, Welded Pipe	*Hydraulic tubing " honeycomb structures *Desalination Plant *Oil and Gas Industry *Marine application *bicycle frames tube
Grade 11 (0.12~0.25Pd,3.7225, R52250)	Gr11 titaniu is unalloyed titanium has low oxygen content based on Gr7. It is equivilent of Gr1 with a palladium addition .Gr7 is is equivilent of Gr2 with a palladium addition.It is good drawability and enhanced resistance to chemical crevice corrosion. It combines excellent corrosion resistance with good formability and weldability. Improved resistance to general and localized crevice corrosion infar-ranging reducing acid environments, including chlorides, and where low pH enhanced resistance to chemical crevice corrosion. It combines excellent corrosion resistance with good formability and weldability. Improved resistance to general and localized crevice corrosion infar-ranging reducing acid environments, including chlorides, and where low pH and high temperatures.	Bar,forgings, Billet, Plate,Sheet, seamless tubing, Welded Pipe	*Chemical Industry *Reducing substance storage units *Marine applications
Grade 12 (Ti 0.3Mo-0.8Ni,3.7105, R53400)	Gr12 titanium alloy is near-alpha alloy alloyed with Molybdenum Nickel.it is better heat resistance than pure titanium grades.Enhanced strength at elevated temperatures and optimum ASME Code design allowables.The material is readily weldable, and has superior crevice corrosion resistance.	Ingot, Bar,forgings, Billet, Plate,Sheet, Strip, foil, seamless tubing, Welded Pipe, Wire.	*Chemical Industry *Shell *Marine Applications *Tube Heat Exchangers
Grade 16 (0.04~0.08Pd,R52402)	Titanium Gr16 is an unalloyed titanium grade addition of palladium 0.04–0.08% based on Gr2 pure titanium, The material has good toughness and is readily weldable,very corrosion resistant in highly oxidizing and mildly reducing circumstance. good ductility In sheets forming,gr16 titanium is also used explosively boned to make clad plate.	Ingot, Bar,forgings, Billet, Plate,Sheet, seamless tubing, Welded Pipe	*Chemical Industry *Shell *Chemical processing equipment *Chloride containing storages
Grade 17 (0.04~0.08Pd,R52252)	Titanium Gr17 is an unalloyed titanium grade addition of palladium 0.04–0.08% based on Gr1 pure titanium,it provides optimum ductility and cold formability, with properties near Gr1 and Gr11, but Gr17 lower palladium Gr11.This material has good toughness and is readily weldable,very corrosion resistant in highly oxidizing and mildly reducing circumstance.	Ingot, Bar,forgings, Billet, Plate,Sheet, seamless tubing, Welded Pipe	*Chloride containing storages *Chemical processing equipment *Hydrocarbon Processing *Shell
Grade 23 (Ti-6Al-4V ELI, R56407)	TI-6Al4V-ELI (Extra Low Interstitial),it is require have lower oxygen,Iron and carbon,lower based on gr5 titanium,The wrought material is used in applications where moderate strength, good strength to weight, and favorable corrosion properties are required. Thus shows improved fracture toughness and ductility. Ductility (elasticity, formability) improves at low temperatures, which is why TI-6Al4V-ELI is also used in cryogenic applications (cooling and freezing applications).This alloy more suitable for biomedical and medical fields as well as for a wide range of industrial applications.	Ingot, Bar,Rod,forgings, Billet, Plate,Sheet, seamless tube	*Medical InOrthopedic implants, *surgical instruments *Bone screws and plates, medical devices, *cryogenic applications *Aviation and aerospace Components
Titanium(6AL-7Nb,R56700)	Titanium 6Al-7Nb is a kind of alpha-beta titanium alloy very near in properties and metallurgical behaviour to Ti-6Al-4V ELI with replaced thevanadium by niobium improved biocompatibility.	Bar,rod,wire	* Hip joints *fracture fixation plates, Spinal devices*Screws and Wires. *Orthopedic implants*Bone screws * plates and medical devices
Titanium 15-3-3-3 (Ti-15V, R58153)	Titanium 15-3-3-3 is a beta titanium alloy that offers substantial weight reductions over other engineering materials if used in the solution treated condition. It has outstanding cold formability in the aged condition, the alloy has high strength.	Strip,foil,sheet,forgings,bars,wire	*Airframestructures*Ducting*Honeycombs*Hydraulictubing*Springs*Fasteners*eye glass frames...
Titanium 6-2-4-2 (3.7145, R54620)	Ti-6-2-4-2 a near-alpha titanium alloy has an excellent combination of tensile strength, creep strength, toughness, and high-temperature stability for long-term application at temperatures up to 538°C.	Forgings,bars,sheet	*Gas turbine*Compressor*Blades* Discs*and Impellers*Airframe skin...
Titanium 6-2-4-6 (3.7145, R56260)	Ti 6-2-4-6 a kind of alpha-beta alloy capable of being heat tr eated to higher strengths in greater section sizes than 6AL4V alloys.Properties of this alloy Enhanced the strength,ductility, and low-cycle fatigue properties are contained in alpha-beta forged material. Beta-forged material contains the best combination of good low-cycle fatigue and fatigue-crack gr owth resistance.	Forgings,bars	*Compressor Discs *Fan blades*Airframe components*Motor racing drivetrain components*Subsea sour service...