ION HEAT
Advanced Process Technologies

[Titanium]

Industrial Classification, Alloy Grades, and Engineering Applications

ALLOY TYPE	ASTM GRADE	ALLOYING ELEMENT	CHARACTERISTICS	LIMITATIONS	TYPICAL APPLICATIONS	HEAT TREATMENT
COMMERCIALLY PURE TITANIUM (α) **CP TITANIUM (α)**	GRADE 2	Oxygen (plus traces of Fe, N, C)	Excellent oxidation resistance. Good performance at elevated temperatures.	Lower tensile and fatigue strength compared to alloys.	Cold-formed parts or components exposed to constant heat without cyclic loading. Common in molds, housings, heat exchangers, and chemical plant structures where hardening is not required.	Not heat-treatable (does not respond to quenching or
BETA (β)	GRADES 19, 20, 21, 38	Vanadium, Molybdenum, Chromium, Niobium	High hot-workability. Good response to	Lower corrosion resistance. Higher density. Limited availability and relatively higher cost.	For complex forming and subsequent heat treatment: anchors, structural supports, and parts requiring hardening	Heat-treatable (responds to quenching and aging).
ALPHA-BETA (α+β)	GRADE 5 (TI-6AL-4V) GRADE 23 (TI-6AL-4V ELI)	Aluminum, Vanadium, or other β-stabilizers	Balanced combination of strength, toughness, and machinability. High resistance to heavy loads and cyclic stresses. Good corrosion resistance, even in biological or marine environments.	Expensive	Versatile choice for critical components requiring machining, cyclic load resistance, and surface treatments—such as fasteners, wear parts, and nitrided components.	Suitable for surface treatments, including plasma nitriding.