

**Cast Titanium Alloys - Mechanical Properties (typical)**

	QT-Ti-1A	QT-Ti-2A	QT-Ti-2B
Average UTS (ksi)	151.1	141.2	173.9
Average Elongation (%)	10.5	13	4.8

**Materials by Design® Background**

QuesTek computationally designed and developed three castable titanium alloys under U.S. Army-funded SBIR Phase I and II programs to incorporate lower-cost raw materials and exhibit greater strength and/or ductility than Ti-6-4.

**Description**

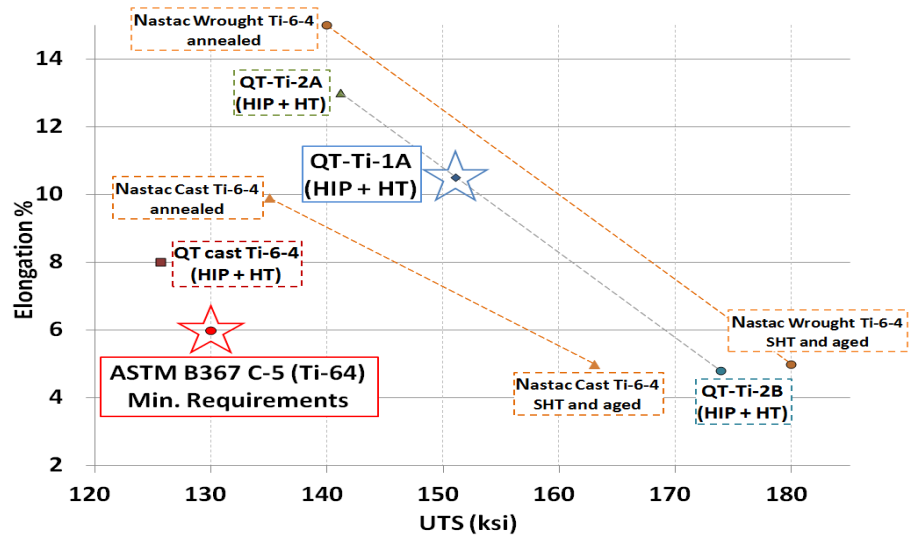
Three new titanium alloys tentatively named QT-Ti-1A, QT-Ti-2A, and QT-Ti-2B were designed for both performance and economy, by:

- i. capturing the benefits of near-net-shape casting for manufacturing;
- ii. containing less vanadium than Ti-6-4;
- iii. having higher tolerance to oxygen and iron than Ti-6-4; and
- iv. being able to use significant amounts of Ti-6-4 scrap as input stock.

QT-Ti-1A (see blue star below) offers ~25 ksi greater UTS and ~2.5% greater elongation than cast Ti-6-4 (i.e. to “QT cast Ti-6-4” which was produced in the same manner as the three new alloys). QT-Ti-1A is expected to be the first of these alloys to be commercialized, and can be considered for example to:

- i. replace cast Ti-6-4 to increase a part’s durability or reduce its weight;
- ii. replace wrought Ti-6-4 to reduce costs; or
- iii. replace Ti-6242 in high-temperature applications to reduce costs.

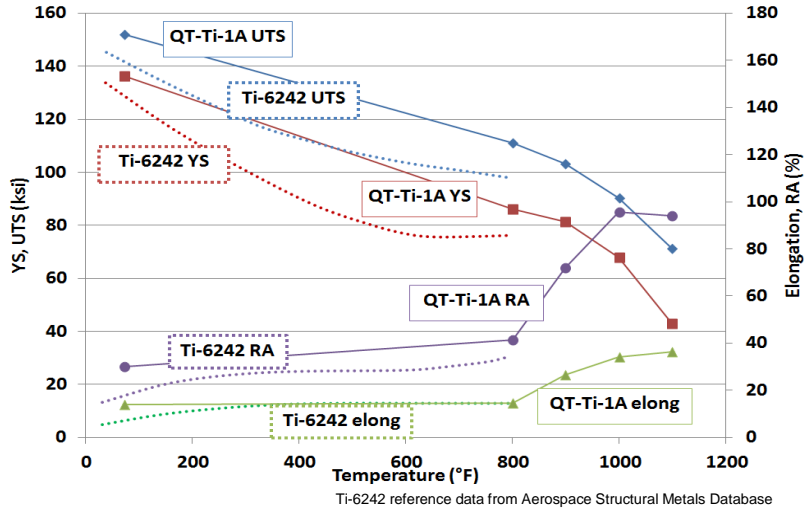
**RT Strength – Elongation Comparison (data from prototype wedge castings)**



Reference data from: Nastac, L. et al, "Advances in investment casting of Ti-6Al-4V alloy: a review", *Int. J. of Cast Metals Research*, 2006 Vol. 19 No. 2

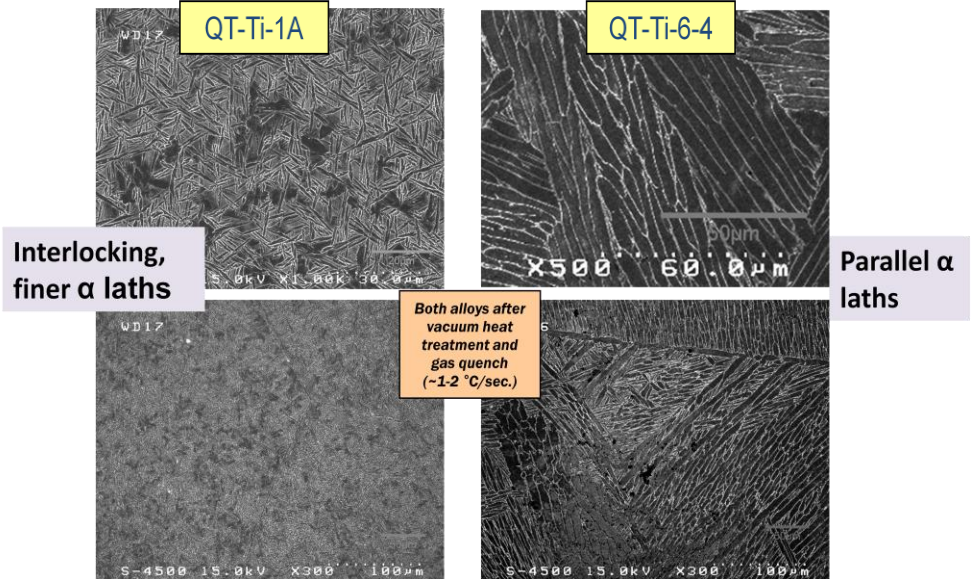
### High Temperature Strength - Elongation Comparison

QT-Ti-1A exhibits higher strength and elongation than Ti-6242 up to 800°F.



### Key Design Features

The new alloys utilize a refined, interweaving  $\alpha/\beta$  microstructure which can be achieved at cooling rates representative of conventional commercial processes. This microstructure yields higher strength/toughness characteristics than the parallel  $\alpha$  laths found in Ti-6-4.



### Material and Licensing Availability

QuesTek is currently seeking initial product applications for QT-Ti-1A, and is also in discussions with potential production/sales licensees.

Please contact QuesTek to obtain custom ingots for use in making initial product applications, or for more information. Patent pending.