



## Titanium Alloy Ti-6Al-4V (Grade 5)

Ti-6Al-4V (Grade 5) is the most commonly used titanium alloy, it's named because of containing 6% aluminum and 4% Vanadium.

Ti-6Al-4V is listed in ISO 5832-3 standard, same as ASTM Grade 5 (UNS R56400) in American standard, Chinese grade is TC4, it's a two phase ( $\alpha + \beta$ ) titanium alloy with good property of tensile and yield strength. It will be good work in 400-500 degree temperature. [www.castingquality.com](http://www.castingquality.com)

**Manufacture process:** Machined Graphite Mold investment casting, Ceramic Mold Investment Casting.

**Melting Temperature:** 1538-1649 (2800-3000F) [www.castingquality.com](http://www.castingquality.com)

**Density:** 4.47g/cc (0.160Lbs/cu.) [www.castingquality.com](http://www.castingquality.com)

### Ti-6Al-4V (Grade 5) Titanium Chemical Requirements:

Aluminum: 5.5-6.8 [www.castingquality.com](http://www.castingquality.com)

Vanadium: 3.5-4.5 [www.castingquality.com](http://www.castingquality.com)

Fe(Iron): 0.3 max [www.castingquality.com](http://www.castingquality.com)

Silicon: 0.15 max [www.castingquality.com](http://www.castingquality.com)

Carbon: 0.1 max [www.castingquality.com](http://www.castingquality.com)

Nitrogen: 0,05 max

Hydrogen: 0,01 max

Others: 0,5 max

Rest: Titanium

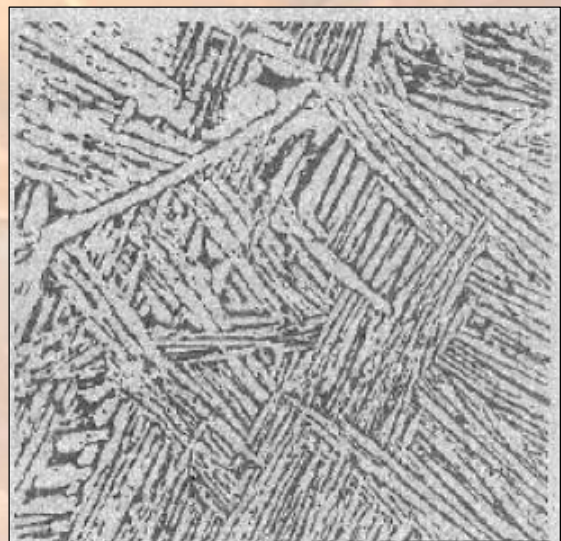


图1 ZTC4 合金的铸态组织 500x

Ti-6Al-4V (Grade 5) Alloy Casting, Cast Condition, 500X

### Ti-6Al-4V (Grade 5) Titanium Tensile Requirements in ASTM B265:

Tensile Strength, min:130Ksi (895MPa) [www.castingquality.com](http://www.castingquality.com)

Yield Strength, 0.2% offset: 120Ksi(828Mpa) [www.castingquality.com](http://www.castingquality.com)

Elongation in 2in or 50mm, min, %: 10% [www.castingquality.com](http://www.castingquality.com)

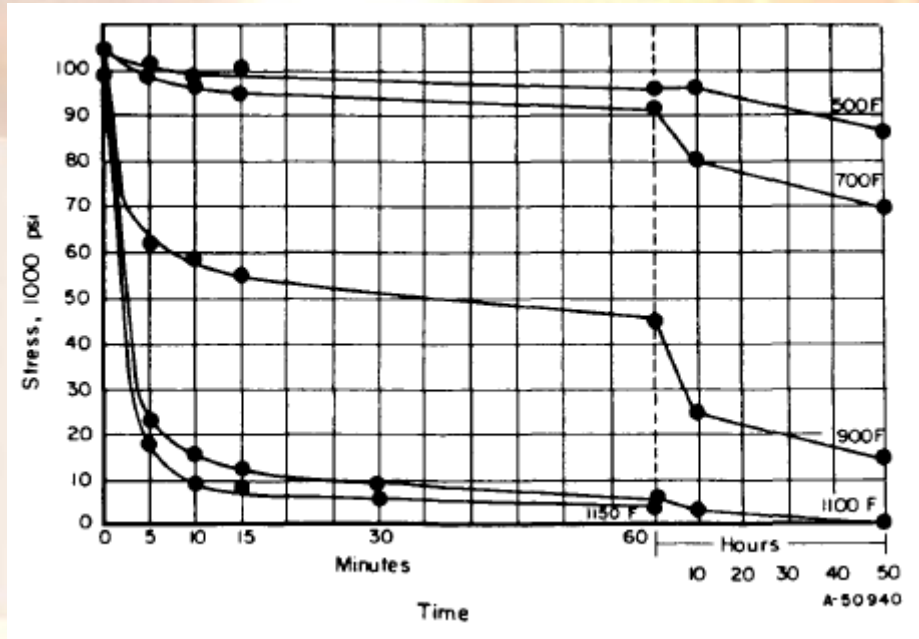
Bend Test under 0.070in in thickness: 9T; Bend Test from 0.070 to 0.187in in thickness: 10T



China	ISO	American	Russia	France	Germany	Japan
GB/T	ISO	ASTM	TOCT	NF	DIN	JIS
TC4	TiAl6V4	Grade 5	BT6	TA6V	TiAl6V4	YATB640

### Ti-6Al-4V (Grade 5) Titanium Casting Heat Treatment Process:

- I Strength Relief Anneal:** at 500-650° C (900 F-1200 F), hold on 1-4 hours, cooling in air. Usually 1 hour in 1100F cooling in air). [www.castingquality.com](http://www.castingquality.com)



Effect of Time and Temperature on Stress Relief in Ti-6Al-4V

- I Anneal process:** 691-850 ° C (1300-1550 F), 1-8hours, slowly cooling to 1050F in furnace, then cooling in air. [www.castingquality.com](http://www.castingquality.com)

Anneal time against thickness					
Max Thickness, mm	1.5	1.6-2.0	2.1-6.0	6.0-50	Above 50
Time, min	15	20	25	60	120

- I Solution Treatment:** 815 -950 ° C (1500-1750F), 5 MIN-1hour, water quench.
- I Aging Treatment:** 485-540° C (900-1000 F), 4-8 hour, cooling in air [www.castingquality.com](http://www.castingquality.com)

### Ti-6Al-4V (Grade 5) Titanium Casting Application:

Compressor blades, discs, and rings for jet engines; airframe and space capsule components; pressure vessels; rocket engine cases; helicopter rotor hubs; fasteners.

The example in ZTC4 Titanium Casting , Annealing in vacuum annealing furnace

Titanium Grade	Anneal Temperature	Time	Heating/cooling Speed	Note
ZTC4 CASTING	750±10° C	4-10 h	40 ° C/h	Thickness >50mm

Mostly we recommend twice heat treatment, first solution then anneal:

ZTC4 Alloy Casting Heat treatment process Testing in Vacuum Furnace				
Index	Vacuity	Temperature	Time	Cooling Type



First	$1.33 \times 10^{-3} - 1.33 \times 10^{-5}$	$900 \pm 15^\circ \text{C}$	2 h	Cooling to $100^\circ \text{C}$ in furnace, then in air
Second	$1.33 \times 10^{-3} - 1.33 \times 10^{-5}$	$700 \pm 15^\circ \text{C}$	2 h	

Final Tensile Result: [www.castingquality.com](http://www.castingquality.com)

	Tensile	Yield	Elongation	Ruption
Result	984Mpa	917Mpa	7.2%	20.0%

[www.castingquality.com](http://www.castingquality.com)

### Related American standards:

ASTM B265-15 Standard Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate

ASTM B348-13 Standard Specification for Titanium and Titanium Alloy Bars and Billets

ASTM B363-14 Standard Specification for Seamless and Welded Unalloyed Titanium and Titanium Alloy Welding Fittings

ASTM B337 - 95 Specification for Seamless and Welded Titanium and Titanium Alloy Pipe (Withdrawn 1997) (REPLACED BY B861 and B862) [www.castingquality.com](http://www.castingquality.com)

ASTM B338-17 Standard Specification for Seamless Condensers and Heat Exchangers [www.castingquality.com](http://www.castingquality.com)

ASTM B381 - 13 Standard Specification for Titanium and Titanium Alloy Forgings

ASTM B863 - 14 Standard Specification for Titanium and Titanium Alloy Wire

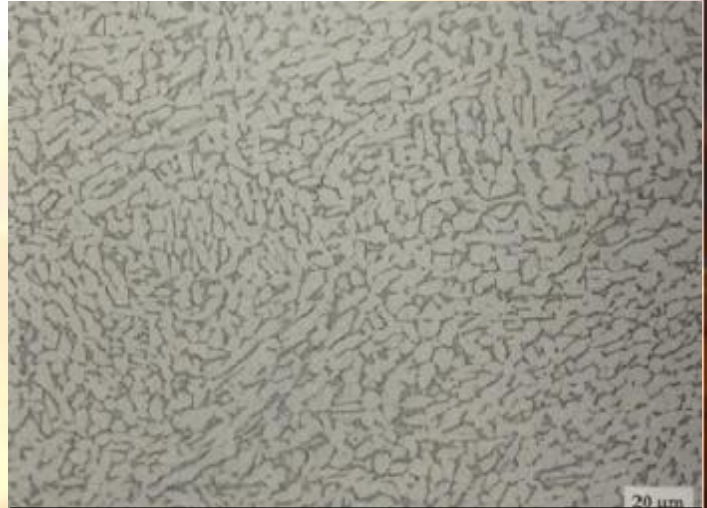
ASTM F67-13(2017) Standard Specification for Unalloyed Titanium, for Surgical Implant Applications (UNS R50250, UNS R50400, UNS R50550, UNS R50700)

ASTM F136 - 13 Standard Specification for Wrought Titanium-6Aluminum-4Vanadium ELI (Extra Low Interstitial) Alloy for Surgical Implant Applications (UNS R56401)

ASTM B861 - 14 Standard Specification for Titanium and Titanium Alloy Seamless Pipe , pipe, seamless pipe, titanium, titanium alloy, Products and Services

ASTM B862 - 14 Standard Specification for Titanium and Titanium Alloy Welded Pipe , pipe, titanium, titanium alloy, welded pipe., Products and Services

[www.castingquality.com](http://www.castingquality.com)



Ti-6-4V (Grade 5) Casting after Anneal Treatment at  $800^\circ \text{C}$ , White  $\alpha$ + Grey  $\beta$ .

As a professional casting manufacture, Qingdao Casting Quality Industrial pay much attention to the quality and technology, our products are much more casting and forging parts. We are mainly do Sand Casting, Investment Casting (Lost Wax Casting or Precision Casting) and Die Casting .Today, its products are marketed globally through many countries.

## Our Services

Casting Quality focus on Metal Parts industry, we provide professional service in Metal Casting field.

1. Sand Casting
2. Investment Casting



3. Shell Casting
4. CNC Machining
5. CAD Design
6. Tools/Mold Design

Many buyers from all over the world purchase products from China. But do you know the quality of products in China? Maybe you only pay the surface and price, but the inner quality is lost.

Housing Casting Design in Solidworks

## What makes Casting Quality the best?

### Innovation

Our engineers are more than just designers...they're pioneers. Our team use CAD/CAM to do the simulation of casting parts .Through the advanced technology, we can know the weight and structure. We also visited so many factories to know their difference and improve our products every year.

### Quality

We're obsessed with quality. Casting Quality constantly strives to exceed our customers' expectations in durability and performance. In fact, we will control the whole process from the original material to the finished parts , include the technology .Uniquely-designed Quality Control System focuses on ensuring four product goals: 1) Eligible Chemistry , 2) Hardness 3) Property and 4) Affordable Pricing. The result is the best casting products value in the industry.

### Service

We're in Qingdao,China, It has convenient transportation of road and sea. Courteous service is part of who we are, and we do it better than anyone in the industry. With Casting Quality you can expect friendly, knowledgeable, and prompt customer service.

### Fulfillment

Shipping orders complete and on-time is of paramount importance to our customers. We will count the delivery date and result before accept your order. Casting Quality consistently ranks as one of the best in speed of delivery and fill rates.

### ***SERVICE IN QINGDAO CASTING QUALITY INDUSTRIAL***

- I **SAND CASTING**
- I **INVESTMENT CASTING**
- I **SHELL CASTING**
- I **PERMANENT MOLD CASTING**
- I **CNC MACHINING**
- I **CAD/CAM DESIGN**



# Casting Quality





## Introduction

As professional supplier of castings in China, Qingdao Casting Quality Industrial Co., Ltd provide our clients perfect solution in metal industry. We focus on providing service and quality exceeding customer's expectation, at highly competitive prices.

The production process includes sand casting, investment casting, die casting, lost foam casting, centrifugal casting and permanent casting. Today, its products are marketed globally through many countries.

Why Choose Casting Quality As Your Partner?

### **Integrity**

We will honestly inform our clients of our capacity and quality level. All clients have the right to get the actual details including production process, quality, shipment and defects. The honesty will be benefit to both parts.

### **Innovation**

Our engineers are more than just designers. They are pioneers. Our team use CAD/CAM to make the simulation of casting parts. Through the advanced technology, we can know the weight and structure. We also visit many other factories to know the differences and to improve our products every year.

### **Quality**

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### **Service**

We are located in Qingdao, China, The transportation is convenient for both road and sea. Courteous service is part of who we are, and we do it better than anyone in the industry. With Casting Quality you can expect friendly, knowledgeable and prompt customer service. Shipping orders complete and on-time is of paramount importance to our customers. We will count the delivery date and result before accepting your order .Casting Quality consistently

# INTEGRITY

# QUALITY

# INNOVATION



## Sand Casting

Sand casting is divided into many types: GREEN SAND CASTING, RESIN SAND CASTING AND SODIUM SILICATE BONDED SAND CASTING. Green sand casting is the lowest cost method to get a product, whose surface finish is not good too. Resin sand casting will get a good surface and precision dimensions, so it is widely used in automobile industry.

Casting Quality Industrial mainly cast Gray Iron, Ductile Iron, Malleable Iron, Wear Resistant Cast Iron, Carbon Steel, Stainless Steel, Brass/Bronze and Aluminum.

Unit weight range from 100g to 20tons.



## Investment Casting

As highly versatile casting process, Investment Casting has for some time been perceived as a comparatively expensive process. But when compared to alternative processes which require extensive welding or machining, an investment cast component can often dramatically reduce overall part production costs.

Casting Quality Industrial would adapt three investment casting methods to reach our clients' quality requirement: Water Glass (Colloidal Silica-sodium), Silica Sol technology; or Colloidal Silica-sodium Silicate Compound. Water Glass technology is the worst quality but cheapest. Silica Sol technology is the best quality but most expensive. We will analyze the usage and drawings tolerance to choose an economic method.

Unit weight range from 1g to 100Kgs.





## Centrifugal Casting

Centrifugal Casting mainly produce the pipes or pipe figure products , such as ductile iron pipe , cast iron soil pipe , glass roller , Furnace Roller and radiant



## Die Casting

Die casting is a metal casting process that is characterized by forcing molten metal under high pressure into a mold cavity. Die Casting is generally use to make aluminum and zinc alloy parts.



## Lost Foam Casting

Lost-foam casting (LFC) is a type of evaporative-pattern casting process that is similar to investment casting except foam is used for the pattern instead of wax. This process takes advantage of the low boiling point of foam to simplify the investment casting process by removing the need to melt the wax out of the mold. Casting Quality Industrial only supply ductile iron or steel parts by lost foam casting method, such as valve body, impeller, pipe fittings, electrode and simply figure parts .



## Permanent Casting

permanent casting and low pressure casting, Casting Quality only used to make aluminum castings, permanent casting can get a better surface and dimensions than sand castings, low pressure casting can get a stably structure which are suitable to the endure pressure parts.



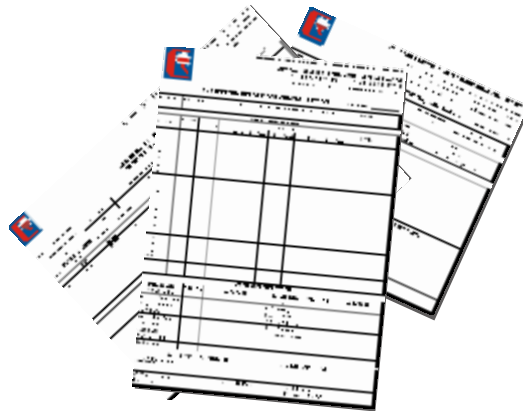




## Quality Control

Experienced inspection team of Casting Quality conducts the entire quality control procedure from raw material to finished products. All inspectors are well trained and have rich product knowledge & inspection experiences.

- \* Raw Material Control.
- \* Chemistry Spectrum Analysis
- \* Mechanical Property
- \* Metallographic Analysis
- \* Ultrasonic Testing
- \* Magnetic Testing.
- \* Radiographic Testing.
- \* Dimension Inspection.
- \* Visual Inspection
- \* Dimension Checking
- \* Chemical Analysis
- \* Penetrant Testing
- \* Leak Testing
- \* Hardness Test





**Valve & Fittings**



**Marine Fittings**



**Automobile Parts**



**Accessories**

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