TiAl6V4 (Grade 5) I TiAl6V4 I 3.7165 I High Performance Alloys Data Sheet

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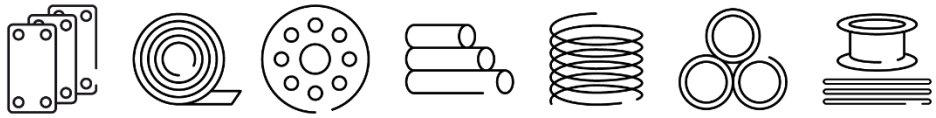

TiAl6V4 (Grade 5)
is a high strength Titanium alloy providing a very good strength-to-density ratio. Compared to other Titanium alloys bar and flat products are readily available.
Also under wet conditions the TiAl6V4 shows excellent fatigue strength and resistance against crack initiation and crack propagation.

TiAl6V4 ELI (Extra-Low-Interstitial) is available for surgical implant applications.

Due to the formation of a dense oxide layer TiAl6V4 provides good corrosion resistance in an oxidizing environment. In case of damage the new growth of the oxide layer occurs immediately, if oxygen is present. The alloy is amongst others for the use for structural parts in the aircraft industry.

It shows a very good biological compatibility with human tissues and bones. This is the explanation for the increasing demand of TiAl6V4 in medical applications and the jewelry industry.

Applications

- Surgical implants
- Aerospace-components
- Jewelry industry
- Offshore-technology
- Ultrasonic sonotrodes and many other applications

Further information under:
https://www.zapp.com/en-us/materials/high-performance-alloys-ni-co-ti

Specifications

DIN-Designation	TiAl6V4
Din Base Material-Number	3.7165
Aerospace-Datasheet-Number	3.7164
VdTÜV-Datasheet	-
UNS	R56400
DIN	17851, 17860, 17862, 17864
ASTM	B 265, B 348, B 367, B 381, B 382, F 136, F 467, F 468
ASME	SB 265, SB 348, SB 381
MIL	MIL-T-9046, MIL-T-9047, MIL-T-81556, MIL-T-81915, MIL-F-83142
SAE	AMS 4905, AMS 4906, AMS 4907, AMS 4911, AMS 4920, AMS 4928, AMS 4930, AMS 4931, AMS 4934, AMS 4935, AMS 4954, AMS 4965, AMS 4967, AMS 4985, AMS 4991, AMS 4993, AMS 4996, AMS 4998
ISO	5832-3

Forms of Delivery

Sheet*	hot rolled, annealed, pickled
Plate*	hot rolled, descaled or pickled
Bar	rolled or forged, annealed machined
Wire	rolled or drawn, annealed
Forging	as-worked, annealed, rough-machined or finished size
Welding filler metal	rod, wire

* VCF (Vacuum Creep Flattened) if requested

Please feel free to contact our technical, engineers if you need more specified or other product forms, details or if there are any questions left.

Fabrication

TiAl6V4 is mainly hot formed. Strong spring-back during cold forming may occur. This is caused by low modulus of elasticity and the high strength of the alloy. Machining can be done by use of conventional methods.
Please ask for our detailed processing instructions.

Heat Treatment

Preferable electrically heated furnace in an inert gas atmosphere or vacuum. In other cases the annealing atmosphere should be adjusted slightly oxidizing to neutral.

Recrystallization annealing:	approx. 730 °C
Stress relieve annealing:	approx. 500 – 650 °C

We recommend consulting our technical engineers regarding heat treatment.

Welding

TiAl6V4 is welded with matching filler metal or those of commercially pure Titanium. Suitable welding techniques are gas tungsten arc (GTAW) and gas metal arc (GMAW).
For example Argon of 99,999 % purity should be used. Other possible procedures are plasma, laser and electron beam welding. Base and filler metals have to be dry and free of impurities and oxides.
Full inert gas protection including the backside of the weld is required. Titanium shows a high affinity to atmospheric gases at temperatures higher or equal 250 °C.
This leads to oxidation and surface embrittlement. Oxidized ends of filler metal rod/wire need to be removed before welding. The use of weld chambers is suitable for smaller components.

Chemical Composition*

	Fe	C	N	O	H
TiAl6V4	≤ 0.30	≤ 0.08	≤ 0.05	≤ 0.20	≤ 0.015
TiAl6V4 ELI	≤ 0.25	≤ 0.08	≤ 0.05	≤ 0.13	≤ 0.012
	Al	**V**	**Ti**		
TiAl6V4	5.50 – 6.75	3.50 – 4.50	Bal.		
TiAl6V4 ELI	5.50 – 6.50	3.50 – 4.50	Bal.		

* weight %

Physical Properties

Melting temperature range	1,630–1,650 [°C]
Density*	4,420 [kg · m^{-3}]
Modulus of elasticity* (approximately)	114 [GPa]
Specific heat*	526 [J · kg^{-1} · K^{-1}]
Thermal conductivity*	6.6 [W · m^{-1} · K^{-1}]
Coefficient of thermal expansion 20-100°C	9.0 x 10^{-6} [K^{-1}]
Specific electrical resistivity*	1.7 [Ω · mm^2 · m^{-1}]

* at room temperature

Mechanical Properties at Room Temperature ASTM

Product form with longitudinal/ transverse position	YS* at 0.2 % offset [MPa]	UTS** [MPa]	Elongation A min. [%]
Sheet, strip, plate, bar, forgings	≥ 828	≥ 895	≥ 10

* Yield Strength (YS)

** Ultimate Tensile Strength (UTS)

Mechanical Properties at Elevated Temperatures*

Temperature	315 °C	425 °C	540 °C
YS at 0.2 % offset [MPa]	620	516	413
UTS [MPa]	689	620	482

* approximate values

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Further information regarding our products and locations are available in our image brochure and under www.zapp.com

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