TITANIUM

GRADE 1
GRADE 2

Technical Information

For its favourable relation of mechanical strength to density and its good corrosion resistance, pure titanium materials are suitable for producing weight critical construction components, reducing mass forces. Simultaneously such components benefit from the materials high corrosion resistance.
The low thermal expansion of titanium made components are resulting in lower thermal stresses in comparison to other materials.
Because of its excellent biocompatibility these materials are widely used for medical applications as well.

Titan in kristalliner Form

Foto: Heinrich Pniok

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MK METALLFOLIEN

Grade 1
R50250 (UNS) · DIN 37025 | ASTM-B265 | ASTM-F67
(DIN / VdTÜV) · Aerospace (WL / BS / SAE AMS)

Typical areas of application

In the chemical industry, titanium grade 1 is used for lining steel reactors, because of ist excellent coldforming properties. As a layer, applied by explosion- or roll claddings. Also for parts in need of good corrosion resistance but not too high mechanical strength requirements.

In the aviation industry, Grade 1 is used for structural parts or components in airframe and jet-engine construction, where high degrees of deformation are required. A well-known application in medical application is pacemaker housings and heart valves.

Standards and Specifications	
Chemical Industry	Heavy Plate/Thin Sheet, Strip: ASTM B-/ASME SB-265, DIN 17860, VdTÜV data sheet 230/1 Bar/Billet, Tube: ASTM B-/ASME SB-348, ASTM B-338, DIN 17862, DIN 17866, VdTÜV data sheet 230/3
Aerospace	Heavy Plate/Thin Sheet, Strip: WL 3.7024-1, BS TA 1, SAE AMS 4940.
Medical Applications	Heavy Plate/Thin Sheet, Strip, Bar: ASTM F 67, ISO 5832-2

Chemical Composition (in wt-%)						
Fe	**O**	**N**	**C**	**H**	**Other Elements**	**Ti**
max.	max.	max.	max.	max.	max. (total)	Balance
0,15	0,12	0,05	0,06	0,013	0,40	

Mechanical Properties					
Yield Strength (MPa)		**Tensile Strength (MPa)**		**Elongation A_5(%)**	**Hardness HBW**
RP0.2	**RP1.0**				
min.	min.	min.	max.	≥ 24 %	120
170 - 310	200	290	410		

Physical Properties				
Density (g/cm^3)	**Ø linear Thermal Expansion Coefficient (10^{-6}/°C)**	**Thermal Conductivity (W/in K)**	**Specific Electr. Resistivity (Ω mm^2/m)**	
4,5	20 °C	20 °C	20 °C	400 °C
	8.7	22,6	0,47	1,18

Processing Characteristics

Grade 1 is the softest titanium material with excellent cold forming and deep drawing capabilities. In comparison to other titanium materials, smallest bending radii are possible when bending sheets from this grade. Stress relief annealing after forming is normally not necessary.

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Grade 2
R50400 (UNS) · DIN 3.7035 | ASTM – B265 | ASTM – F67 (DIN / VdTÜV)
Aerospace (WL / BS / SAE AMS)

Typical areas of application

Grade 2 is the standard titanium material for chemical facilities and appliances. It exhibits best corrosion resistance beside the best combination of mechanical strength, weldability and formability. In aerospace industry titanium grade 2 is used for structural components in airframe and jet engine as well as for tubing systems.
Also in medical applications titanium grade 2 is broadly used, such as for fixation of bone fractures, implants for mouth, jaw and face surgery, as well as for prosthetic dentistry.

Standards and Specifications	
Chemical Industry	Strip: ASTM B-/ASME SB-265, DIN 17860, VdTÜV data sheet 230/1VdTÜV data sheet 230/3
Aerospace	Strip: WL 3.7034-1, BS 2TA2, SAE AMS 4902
Medical Applications	Strip: ASTM F 67, ISO 5832-2

Chemical Composition (in wt-%)						
Fe	**O**	**N**	**C**	**H**	**Other Elements**	**Ti**
max.	max.	max.	max.	max.	max. (total)	Balance
0,20	0,18	0,05	0,06	0,013	0,40	

Mechanical Properties					
Yield Strength (MPa)		**Tensile Strength (MPa)**		**Elongation A5 (%)**	**Hardness HBW**
RP0.2	**RP1.0**				
min.	min.	min.	max.	≥ 20 %	120
250 – 450	200	390	540		

Physical Properties						
Density (g/cm³)	**Ø linear Thermal Expansion Coefficient (10^{-6}/°C)**		**Thermal Conductivity (W/in K)**		**Specific Electr. Resistivity (Ω mm²/m)**	
	20 – 400 °C	20 – 400 °C	20 °C	400 °C	20 °C	400 °C
4,5	8,7	9,3	22,6	19,3	0,48	1,18

Processing Characteristics

Grade 2 is the most widely used titanium material of technical purity. It is exhibits good cold formability and is usable for structural components in temperature environments up to 300 °C. Stress relief annealing after forming is not necessary in most cases.
Stress relief annealing is suggested on the other hand to reduce high inner tensions from multiple layer weldings in complex constructions or at very high degree of forming.

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