

Designation	Ti	EN	UNS (ASTM)	AISI	LMSA
		3.7025	R50250	-	F160 / F161 ^[1]

^[1] F160 (Non-medical grade) / F161 (Medical grade)

Chemical composition

Ti	Fe	N	O	H ^[2]	C	Others
Balance	≤ 0.20	≤ 0.03	≤ 0.18	≤ 0.015	≤ 0.08	≤ 0.40

Values (Weight %). In order to achieve maximum homogeneity and consistent quality, the actual manufacturing tolerances are tighter and more precisely than the composition indicated.

^[2] The maximum hydrogen content for the titanium grade 1 medical is 0.0125%.

Main technical properties and features

Grade 1 Titanium is the highest purity grade commercially available. The mechanical properties of titanium are greatly influenced by impurities such as oxygen, nitrogen, hydrogen and iron content. These impurities increase the material's hardness, tensile strength and yield stress while simultaneously reducing elongation. Pure Grade 1 Titanium contains the lowest oxygen, hydrogen and iron levels, producing the material with the most cold deformability of the four ASTM commercially pure grades (ASTM grade 1 to 4). Grade 1 titanium can be used where maximum formability is required such as in dome loudspeaker, bursting discs and plate type heat exchangers. Its excellent cold deformability allows Lamineries MATTHEY to produce very thin strip, down to 5 microns.

The corrosion resistance of Titanium is based on the presence in surface of a stable, continuous and highly adherent titanium oxide layer. When damaged, it easily reforms as long as a source of oxygen is present in the environment. Grade 1 Titanium exhibits an excellent corrosion resistance in highly oxidizing to mildly reducing environments, including chlorides. It has good toughness at low temperatures. In addition, Grade 1 Titanium can be easily welded, machined, cold worked and hot worked. Moreover, it is non-magnetic. Titanium is sensitive to hydrogen embrittlement, which easily diffuses, its presence shall be avoided.

On request, Lamineries MATTHEY can deliver precision cold-rolled products on Grade 1 medical Titanium (**LMSA F161**) for surgical implants. The cold rolled-products are delivered in accordance to the ASTM F67-2017 specifications: certification of conformity of hydrogen content and metallurgical evaluation certification of the inexistence of a continuous alpha-case layer in surface.

Typical uses

Dôme loudspeaker, bursting discs, medical devices, plate type heat exchangers, detector windows, window for electron beam, etc.

Typical manufacturing range

	Thickness (mm)	Width (mm)	Length (mm)
Rolled products Strip in coils ^[1]	0.005 - 1.000	1.5 - 200.0	-
Strip as sheets ^[1]	0.005 - 1.500	10.0 - 200.0	100 - 3000

^[1] Not all our production possibilities are presented here. Other dimensions or product forms available upon request. Some combinations of thicknesses and widths are not possible.

Mechanical properties of strips

Temper			R _{p0.2} (N/mm ²)	R _m (N/mm ²)	A _{50mm} (%)	Hardness HV
R240	H80	annealed	170 - 310	240 - 420	20 min.	80 - 140
R400	H120	½ hard	350 min.	400 - 700	-	120 - 220
R650	H200	hard	500 min.	650 min.	-	200 min.

Physical properties

Modulus of elasticity	kN/mm ²	105 at 20°C, 80 at 400°C
Poisson ratio		0.37
Density	g/cm ³	4.51
Annealing temperature (typical)	°C	700
Stress relief temperature (typical)	°C	400 - 600
Melting point	°C	1670
Linear dilatation coefficient	10 ⁻⁶ /°C	8.4 (20 - 100°C); 9.3 (20 - 200°C); 9.5 (20 - 300°C) 9.7 (20 - 400°C); 9.8 (20 - 500°C); 10.0 (20 - 600°C)
Thermal conductivity at 20°C	W/m °K	16
Specific heat at 25°C	J/(kg. K)	520
Electrical resistivity	μΩcm	45
Electrical conductivity	MS/m	2.17
Electrical conductivity	% IACS	3.7
Magnetic properties		Non-magnetic

Tolerances (strip and foil)

Thickness	Thickness (mm)		EN Standard		Lamineries MATTHEY		
	≥	<	10140 Precision	10258 Precision	LMSA Standard	LMSA Precision	LMSA Extreme
	-	0.025	-	-	-	-	± 0.001
	0.025	0.050	-	-	± 0.003	± 0.002	± 0.0015
	0.050	0.065	-	± 0.003	± 0.003	± 0.0025	± 0.002
	0.065	0.100	-	± 0.004	± 0.004	± 0.0035	± 0.003
	0.100	0.125	± 0.005	± 0.006	± 0.005	± 0.004	± 0.003
	0.125	0.150	± 0.005	± 0.006	± 0.005	± 0.005	± 0.004
	0.150	0.250	± 0.010	± 0.008	± 0.008	± 0.006	± 0.004
	0.250	0.300	± 0.010	± 0.009	± 0.009	± 0.007	± 0.005
	0.300	0.400	± 0.010	± 0.010	± 0.010	± 0.007	± 0.005
	0.400	0.500	± 0.015	± 0.012	± 0.012	± 0.008	± 0.006
	0.500	0.600	± 0.015	± 0.014	± 0.014	± 0.010	± 0.007
	0.600	0.800	± 0.015	± 0.015	± 0.015	± 0.010	± 0.007
	0.800	1.000	± 0.015	± 0.018	± 0.018	± 0.012	± 0.009
	1.000	1.200	± 0.020	± 0.020	± 0.020	± 0.015	± 0.012
	1.200	1.250	± 0.020	± 0.020	± 0.020	± 0.015	± 0.012
	1.250	1.500	± 0.020	± 0.020	± 0.020	± 0.015	± 0.014
Width	Our width tolerances "Standard" is +0.2, -0.0 (or ± 0.1 mm upon request). They are available for slit widths < 125 mm and thicknesses < 1.00 mm. Special tolerances upon request.						
Camber	Width (mm)		Camber max. (mm/m)				
	>	≤	LMSA Standard		LMSA Extreme		
			≤ 0.5 mm	> 0.5 mm	≤ 0.5 mm	> 0.5 mm	
	3	6	12	-	6	-	
	6	10	8	10	4	5	
	10	20	4	6	2	3	
	20	250	2	3	1	1.5	
Surface	Special surface qualities upon request						
Flatness	Special requirement on the longitudinal or transversal flatness upon request						

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