

# Strengths of Metals

	<u>Yield Strength</u>		<u>Elongation</u> <u>at break</u>	<u>Ultimate Strength</u>		<u>Weight</u>	
	MPa	PSI		MPa	PSI	g/cc	lb/in <sup>3</sup>
<b>Unalloyed Titanium (99% Ti):</b>							
<a href="#">Titanium, Ti</a>	140.0	20,300	54%	220	31,900	4.500	0.1630
<a href="#">Titanium, Grade 1</a>	170.0	24,700	24%	240	34,800	4.500	0.1630
<a href="#">Titanium, Grade 2</a>	275.0	39,900	20%	344	49,900	4.500	0.1630
<a href="#">Titanium, Grade 3</a>	377.0	54,700	18%	440	63,800	4.500	0.1630
<a href="#">Titanium, Grade 4</a>	480.0	69,600	15%	550	79,800	4.500	0.1630
<a href="#">Titanium, Grade 7</a>	275.0	39,900	20%	344	49,900	4.500	0.1630
<a href="#">Titanium, Grade 11</a>	170.0	24,700	24%	240	34,800	4.500	0.1630
<a href="#">Titanium, Grade 12</a>	380.0	55,100	12%	450	65,300	4.500	0.1630
<b>Alloyed Titanium:</b>							
<a href="#">Titanium, Grade 5 (Ti-6Al-4V)</a>	880.0	128,000	14%	950	138,000	4.430	0.1600
<a href="#">Titanium, Grade 9 (3Al-2.5V)</a>	550.0	79,800	15%	650	94,300	4.510	0.1630
<a href="#">Titanium Ti-8Al-1Mo-1V (Ti-8-1-1)</a>	910.0	132,000	18%	937	136,000	4.370	0.1580
<a href="#">Titanium Beta C (Ti-3Al-8V-6Cr-4Mo-4Zr), (ST 815°C, Aged 425°C)</a>	1420.0	206,000	8%	1500	218,000	4.820	0.1740
<a href="#">Titanium, Ti-15Mo-5Zr, (ST 730°C, Aged 400°C)</a>	NA	NA	0%	1700	247,000	5.060	0.1830
Titanium Beta 1533 (153)	850.0	123,000	7%	950			
Titanium Beta 38644	1050.0	152,000	27%	1350			
Titanium Beta 5553 (Ti-5Al-5V-5Mo-3Cr) Solution Treated in the $\alpha$ - $\beta$ Air Cooled + Aged between 580-650°C	1170.0	169,694	6%	1240	179,846	4.670	0.1687
<b>Stainless Steel:</b>							
<a href="#">Stainless Steel, 302</a>	240.0	34,800	60%	585	84,800	7.860	0.2840
<a href="#">Stainless Steel, 304</a>	215.0	31,200	70%	505	73,200	8.000	0.2890
<a href="#">Stainless Steel, 308</a>	205.0	29,700	55%	585	84,800	8.000	0.2890
<a href="#">Stainless Steel, 316</a>	240.0	34,800	60%	550	79,800	8.000	0.2890
<a href="#">Stainless Steel, 316L</a>	205.0	29,700	60%	515	74,700	8.000	0.2890
<b>Steel:</b>							
<a href="#">ASTM A588 HSLA Steel Grade B</a>	345.0	50,000	18%	483	70,000	7.870	0.2840
<a href="#">AISI 1006 Steel, cold drawn (Low Carbon)</a>	285.0	41,300	20%	330	47,900	7.872	0.2844
<b>Aluminum:</b>							
<a href="#">Aluminum, 5052-O</a>	89.6	13,000	25%	193	28,000	2.680	0.0968
<a href="#">Aluminum, 5052-H32</a>	193.0	28,000	12%	228	33,000	2.680	0.0968

<a href="#">Aluminum, 5056-O</a>	152.0	22,000	35%	290	42,000	2.640	0.0954
<a href="#">Aluminum, 5056-H18</a>	407.0	59,000	10%	434	63,000	2.640	0.0954
<a href="#">Aluminum, 5086-O</a>	117.0	17,000	22%	262	38,000	2.660	0.0961
<a href="#">Aluminum, 5086-32</a>	207.0	3,000	12%	290	42,000	2.660	0.0961
<a href="#">Aluminum, 6061-O</a>	55.2	8,000	25%	124	18,000	2.700	0.0975
<a href="#">Aluminum, 6061-T4</a>	145.0	21,000	22%	241	35,000	2.700	0.0975
<a href="#">Aluminum, 6063-O</a>	48.3	7,000	18%	89.6	13,000	2.700	0.0975
<a href="#">Aluminum, 6063-T4</a>	89.6	13,000	22%	172	25,000	2.700	0.0975

#### **Bronze:**

<a href="#">Bronze, SAE 64</a>	125.0	18,100	29%	240	34,800	8.880	0.3210
<a href="#">Valve Metal, Copper Casting Alloy, UNS C84400</a>	105.0	15,200	26%	235	34,100	8.700	0.3140
<a href="#">Low-silicon bronze B, UNS C65100</a>	140.0	20,300	55%	310	45,000	8.750	0.3160
<a href="#">Herculoy®, High-Silicon Bronze A, UNS C65500, OSO70 Temper flat products</a>	145.0	21,000	63%	385	55,800	8.530	0.3080

#### **Cupronickel:**

<a href="#">Copper nickel 20%, UNS C71000</a>	90.0	13,100	40%	338	49,000	8.940	0.3230
<a href="#">Special Metals MONEL™ Alloy 450</a>	165.0	23,900	56%	385	55,800	8.910	0.3220

#### **Pure Metals:**

<a href="#">Lead</a>	NA	NA	NA	18	2,610	11.350	0.4100
<a href="#">Iron, FE</a>	50.0	7,250	NA	540	78300	7.870	0.2840

#### **Rare Metals:**

<a href="#">Silver, Ag</a>	NA	NA	NA	140	20,300	10.491	0.3790
<a href="#">Platinum, Pt, CP Grade, Annealed</a>	NA	NA	35%	125	18,100	21.450	0.7749
<a href="#">Gold, Au</a>	NA	NA	30%	120	17,400	19.320	0.6980

[Go here for Weight and Inertia Calculator: http://www.matweb.com/tools/weightcalculator.aspx](http://www.matweb.com/tools/weightcalculator.aspx)

[Go here for Hardness Converter: http://www.matweb.com/tools/hardness.aspx](http://www.matweb.com/tools/hardness.aspx)

**Warning! Yield strengths and other specifications are intended only as a basis for comparison. This information is not guaranteed, you should be advised to consult with an engineer.**

[Source: www.matweb.com](http://www.matweb.com)

Courtesy of Allied Titanium, Inc.  
[www.alliedtitanium.com](http://www.alliedtitanium.com)