

# Stamping Material Selection Guide

<b>Bend Rating Key:</b>		<b>Green</b>	<b>Yellow</b>	<b>Orange</b>	<b>Red</b>
ESI's Bend Rating scale measures the formability of a material based on its ability to bend or form without tearing or breaking. "Green" designates easier formability all the way through "red" as most difficult.		Easy formability	Moderate formability; possible strain	Limited formability; chance of tearing	Difficult formability; likelihood of tearing
Radii for various thicknesses, whereas "t"=times thickness.	0t to 3t	3t to 6t	6t to 9t	9t +	

## Titanium

	Summary	Recommended Finishes?	Applications	Conditions Available	Bend Rating	Magnetic?	Tensile Strength Minimum (KSI)		Elongation Minimum (% 2" Gauge)	Yield Strength Minimum (0.2% offset)		Hardness (Min-Max)	Density (lb/cu in)		Corrosion Resistance	Cost?
							KSI	MPa		KSI	MPa		(lb/in <sup>3</sup> )	(g/cm <sup>3</sup> )		
Grade 1	The first of four commercially pure titanium grades, Grade 1 Titanium is the most ductile and softest compared to the others. It also maintains high impact toughness, great corrosion resistance, and excellent formability.	Anodize, Hardcoat	Chemical processing, architecture, medical, marine, automotive, aircraft	Grade 1 Titanium Annealed	Yellow	Yes	35	241	24%	25-45	172	Rockwell B70-B120	0.163	4.506	🛡️🛡️🛡️🛡️	\$\$\$\$
Grade 2	Grade 2 Titanium shares many of the same qualities as Grade 1, while being slightly stronger. It has wide availability and varied usability, leading it to often being called the "workhorse" out of the four. Similar to Grade 1, Grade 2 Titanium is corrosion resistant.	Anodize, Hardcoat	Architecture, medical, marine, exhaust, chemical, automotive, aircraft	Grade 2 Titanium Annealed	Yellow	Yes	50	345	20%	40-65	276	Rockwell B98-200	0.163	4.506	🛡️🛡️🛡️🛡️	\$\$\$\$
Grade 3	Grade 3 Titanium is stronger and maintains higher mechanicals than Grades 1 and 2, while only being slightly less formable. It is the least used out of the four, but is still essential for many applications.	Anodize, Hardcoat	Aerospace, chemical, medical, marine	Grade 3 Titanium Annealed	Orange	Yes	65	448	18%	55-80	379	Rockwell B26-266	0.163	4.506	🛡️🛡️🛡️🛡️	\$\$\$\$
Grade 4	Grade 4 Titanium offers a range of benefits including excellent weldability, formability, and corrosion resistance. Out of the four grades of commercially pure titanium, it is the strongest one.	Anodize, Hardcoat	Medical, cryogenic, surgical equipment, heat exchange	Grade 4 Titanium Annealed	Red	Yes	80	552	15%	70-90	483	Rockwell B23-265	0.163	4.506	🛡️🛡️🛡️🛡️	\$\$\$\$

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