ESI ENGINEERING SPECIALTIES, INC

Stamping Material Selection Guide

Bend Rating Key:

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.

Green	Yellow	Orange	Red
Easy formability	Moderate formability; possible strain	Limited formability; chance of tearing	Difficult formability; likelihood of tearing
			
0t to 3t	3t to 6t	6t to 9t	9t +

Radii for various thicknesses, whereas "t"=times thickness.

Stainless Steel

	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)	Density (g/cm^3)	Corrosion Resistance	Cost?
							KSI	MPa		KSI	MPa					
201	201 can be substituted for stainless steel type 301 in applications with mild environments and offers a higher yield strength than the 300 series, but is less resistant to corrosion. It must be hardened by cold working, not heat treatment.	Passivation	Springs, fasteners, clamps, display racks, food service applications (cooking utensils, sinks, appliances)	201 Annealed	Green	Slightly if work hardened	75	517	40%	38	262	Rockwell B91 Max	0.283	7.833	2	$$$$
				201 1/4 Hard	Yellow	Slightly if work hardened	125	862	25%	75	517	Rockwell C25-C30	0.283	7.833	2	$$$$
				201 1/2 Hard	Orange	Slightly if work hardened	150	1034	18%	110	758	Rockwell C30-C35	0.283	7.833	2	$$$$
				201 3/4 Hard	Red	Slightly if work hardened	175	1207	12%	135	931	Rockwell C35-C40	0.283	7.833	2	$$$$
				201 Full Hard	Red	Slightly if work hardened	185	1276	9%	145	1000	Rockwell C40-C45	0.283	7.833	2	$$$$
301	301 has great corrosion resistance, high strength, and ductility. It must be hardened by cold working, not heat treatment.	Passivation, Electro-polish	Gaskets, automotive parts, aerospace components, electrical components, fasteners, blades	301 Annealed	Green	Slightly if work hardened	110	758	60%	40	276	Rockwell B87 Max	0.285	7.889	2	$$$$
				301 1/4 Hard	Yellow	Slightly if work hardened	125	862	25%	75	517	Rockwell C25-C30	0.285	7.889	2	$$$$
				301 1/2 Hard	Orange	Slightly if work hardened	150	1034	18%	110	758	Rockwell C30-C35	0.285	7.889	2	$$$$
				301 3/4 Hard	Red	Slightly if work hardened	175	1207	12%	135	931	Rockwell C35-C40	0.285	7.889	1	$$$$
				301 Full Hard	Red	Slightly if work hardened	185	1276	8%	140	965	Rockwell C40-C45	0.285	7.889	2	$$$$
302	302 is resistant to oxidation, easy to clean and fabricate, and offers high strength with low weight.	Passivation, Electro-polish	Utensils, cookware, and stainless flatware	302 Annealed	Green	Slightly if work hardened	75	517	40%	30	207	Rockwell B87 Max	0.284	7.861	2	$$$$
				302 1/4 Hard	Yellow	Slightly if work hardened	125	862	10%	75	517	Rockwell C25-C30	0.284	7.861	1	$$$$
				302 1/2 Hard	Orange	Slightly if work hardened	150	1034	9%	110	758	Rockwell C30-C35	0.284	7.861	2	$$$$
				302 3/4 Hard	Red	Slightly if work hardened	165	1138	6%	125	862	Rockwell C35-C40	0.284	7.861	2	$$$$
				302 Full Hard	Red	Slightly if work hardened	185	1276	3%	140	965	Rockwell C40-C45	0.284	7.861	1	$$$$
304	304 is resistant to food processing environments, withstands ordinary rusting in architecture, and resists dyestuffs, organic chemicals, and a variety of inorganic chemicals.	Passivation, Electro-polish	Sinks, appliances, chemical containers, food processing equipment	304 Annealed	Green	Slightly if work hardened	75	517	40%	30	207	Rockwell B87 Max	0.289	7.999	2	$$$$
				304 1/4 Hard	Yellow	Slightly if work hardened	125	862	10%	75	517	Rockwell C25-C30	0.289	7.999	1	$$$$
				304 1/2 Hard	Orange	Slightly if work hardened	150	1034	9%	110	758	Rockwell C30-C35	0.289	7.999	1	$$$$
				304 3/4 Hard	Red	Slightly if work hardened	175	1207	8%	135	931	Rockwell C35-C40	0.289	7.999	1	$$$$
				304 Full Hard	Red	Slightly if work hardened	185	1276	7%	140	965	Rockwell C40-C45	0.289	7.999	2	$$$$
316	316 contains more nickel than 304, offering better resistance to corrosion, especially in chloride environments that cause pitting. It has superior creep strength, close tolerances, good pitting resistance, and is easy to maintain.	Passivation, Electro-polish	Valve and pump parts, chemical processing equipment, tanks, jet engine parts, pharmaceutical components	316	Green	Slightly if work hardened	75	517	40%	30	207	Rockwell B95 Max	0.289	7.999	3	$$$$
				316L	Green	Slightly if work hardened	70	483	40%	25	172	Rockwell B95 Max	0.289	7.999	3	$$$$
410	410 is corrosion and heat resistant, has high impact strength, is easily welded, and resists scaling and oxidation. It's hardenable to HRc 40-45.	Passivation, Electro-polish	Medical/dental instruments, valves, turbine blades, petroleum structures	410 Annealed	Yellow	Yes	65	448	20%	30	207	Rockwell B95 Max	0.276	7.640	2	$$$$
				410 Hardened	Red	Yes	205	1413	8%	185	1276	Rockwell C40-C45	0.276	7.640	1	$$$$
420	420 is extremely durable, offers excellent corrosion resistance, and is hardenable to 500 BHN.	Passivation, Electro-polish	Medical/dental instruments, hospital equipment, gears, molds, dies, knife blades, valve parts	420 Annealed	Yellow	Yes	95	655	25%	345	2379	Rockwell B96 Max	0.278	7.695	2	$$$$
430	420 has lower alloy content than 304. It's used for highly polished trim applications in mild atmospheres. 420 has good thermal conductivity, ductility, formability, low work hardening, and an attractive finish. It's corrosion resistant, oxidation resistant, and excellent for drawing.	Passivation, Electro-polish	Food processing, appliances, automotive trim	430	Orange	Yes	75	517	22%	310	2137	Rockwell B85 Max	0.282	7.806	2	$$$$
				430F	Yellow	Yes	80	552	25%	279	1924	Rockwell C28 Max	0.282	7.806	2	$$$$
17-7	17-7 is a precipitation hardening stainless steel that has excellent corrosion resistance, minimum distortion upon heat treatment, high strength and hardness, formability, and good fatigue properties. It offers valuable property combinations that are ideal for aerospace applications.	Passivation	Aerospace components, chemical processing equipment, food processing equipment, petroleum refining equipment	17-7 Condition A (Annealed)	Green	Yes	130	896	35%	40	276	Rockwell B92 Max	0.282	7.806	3	$$$$
				17-7 Condition C (Hard Rolled)	Red	Yes	200	1379	1%	175	1207	Rockwell C41 Min	0.282	7.806	3	$$$$
Monel 400	Monel 400 is a solid-solution alloy that hardens only through cold working. It has high strength and toughness over an expansive temperature range and excellent resistance to corrosive environments.	Passivation	Chemical processing, valves, pumps, marine equipment, pump and propeller shafts, tanks	Annealed	Green	Slightly	70	483	35%	25	172	Rockwell B68 Max	0.318	8.802	4	$$$$
				Spring Temper	Red	Slightly	100	689	2.00%	90	621	Rockwell B98 Min	0.318	8.802	4	$$$$

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