Properties of Common Spring Materials

	Material	Nominal Analysis	Tensile Properties: Minimum Tensile Strength psi x 10^3 (MPa)	Tensile Properties: Modulus of Elasticity E psi x 10^6 (MPa x 10^3)	Torsional Properties: Design Stress % Minimum Tensile	Torsional Properties: Modulus in Torsion G psi x 10^6 (MPa x 10^3)	Maximum Operating Temperature °F	Maximum Operating Temperature °C	Rockwell Hardness	Method of Manufacture Chief Uses Special Properties
High Carbon Spring Wire	Music Wire ASTM A 228	C 0.70-1.00% Mn 0.20-0.60%	230-399 (1586-2751)	30 (207)	45	11.5 (79.3)	250	121	C41-60	Cold drawn high and uniform tensile. High quality springs and wire forms. Suitable for cyclic applications.
	Hard Drawn ASTM A 227	C 0.45-0.85% Mn 0.60-1.30%	CLI 147-283 (1014-1951) CLII 171-324 (1179-2234)	30 (207)	40	11.5 (79.3)	250	121	C31-52	Cold drawn. Average stress applications. Lower cost springs and wire forms.
	High Tensile Hard Drawn ASTM A 679	C 0.65-1.00% Mn 0.20-1.30%	238-350 (1641-2413)	30 (207)	45	11.5 (79.3)	250	121	C41-60	Cold drawn. Higher quality springs and wire forms.
	Oil Tempered ASTM A 229	C 0.55-0.85% Mn 0.60-1.20%	CLI 165-293 (1138-2020) CLII 191-324 (1317-2234)	30 (207)	45	11.5 (79.3)	250	121	C42-55	Cold drawn and heat treated before fabrication. General purpose spring wire.
	Carbon Valve ASTM A 230	C 0.60-0.75% Mn 0.60-0.90%	215-240 (1482-1655)	30 (207)	45	11.5 (79.3)	250	121	C45-49	Cold drawn and heat treated before fabrication. Good surface condition and uniform tensile. Suitable for cyclic applications.
Alloy Steel Wire	Chrome Vanadium ASTM A 231	C 0.48-0.53% Cr 0.80-1.10% Si 0.15 Min%	190-300 (1310-2069)	30 (207)	45	11.5 (79.3)	425	218.5	C41-55	Cold drawn and heat treated before fabrication. Used for shock loads and moderately elevated temperature.
	Chrome Silicon ASTM A 401	C 0.51-0.59% Cr 0.60-0.80% Si 1.20-1.60%	235-300 (1620-2069)	30 (207)	45	11.5 (79.3)	475	246	C48-55	Cold drawn and heat treated before fabrication. Used for shock loads and moderately elevated temperature.
Stainless Steel Wire	AISI 302/304 ASTM A 313	Cr 17.-19.% Ni 8.-10.%	125-325 (862-2241)	28 (193)	35	10 (69.0)	550	288	C35-45	Cold drawn general purpose corrosion and heat resistant. Magnetic in spring temper.
	AISI 316 ASTM A 313	Cr 16.-18.% Ni 10.-14.% Mo 2.-3.%	110-245 (758-1689)	28 (193)	40	10 (69.0)	550	288	C35-45	Cold drawn. Heat resistant and better corrosion resistance than 302. Magnetic in spring temper.
	17-7 PH ASTMA A 313 (631)	Cr 16.-18.% Ni 6.5-7.5% A1 0.75-1.5%	Cond CH 235-335 (1620-2310)	29.5 (203)	45	11 (75.8)	650	343	C38-57	Cold drawn and precipitation hardened after fabrication. High strength and general purpose corrosion resistance. Slightly magnetic in spring temper.
Non-Ferrous Alloy Wire	Phosphor Bronze Grade A ASTM B 159	Cu 94.-96.% Sn 4.-6.%	105-145 (724-1000)	15 (103)	40	6.25 (43.1)	200	93.3	B98-104	Cold drawn. Good corrosion resistance and electrical conductivity.
	Beryllium Copper ASTM B 197	Cu 98% Be 2%	150-230 (1034-1586)	18.5 (128)	45	7.0 (48.3)	400	204	C35-42	Cold drawn and may be mill hardened before fabrication. Good corrosion resistance and electrical conductivity. High physicals.
	Monel 400 AMS 7233	Ni 66% Cu 31.5% C/Fe	145-180 (1000-1241)	26 (179)	40	9.5 (65.5)	450	232	C23-32	Cold drawn. Good corrosion resistance at moderately elevated temperature.
	Model K 500 QQ-N 286	Ni 65.0% Cu 29.5% C/Fe/A1/Ti	160-200 (1103-1379)	26 (179)	40	9.5 (65.5)	550	288	C23-35	Excellent corrosion resistance at moderately elevated temperature.
High Temperature Alloy Wire	A 286 Alloy	Ni 26.% Cr 15.% Fe 53%	160-200 (1103-1379)	29 (200)	35	10.4 (71.7)	950	510	C35-45	Cold drawn and precipitation hardened after fabrication. Good corrosion resistance at elevated temperature.
	Inconel 600 QQ – W – 390	Ni 76.% Cr 15.8% Fe 7.2%	170-230 (1172-1586)	31 (214)	40	11.0 (75.8)	700	371	C35-45	Cold drawn and precipitation hardened at elevated temperature.
	Inconel 718	Ni 52.5% Cr 18.6% Fe 18.5%	210-250 (1448-1724)	29 (200)	40	11.2 (77.2)	1100	593	C45-50	Cold drawn and precipitation hardened after fabrication. Good corrosion resistance at elevated temperature.
	Inconel x 750 ASM 5698, 5699	Ni 73.% Cr 15.% Fe 6.75%	No. IT 155 Min. (1069) Spg. T 190-230 (1310-1586)	31 (214)	40	12 (82.7)	750-1100	399-593	C34-39 C42-48	Cold drawn and precipitation hardened after fabrication. Good corrosion resistance at elevated temperature.

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