



**MASTER SPRING
& WIRE FORM CO.**
Since 1945

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	Material	Nominal Chemistry	Tensile Properties		Torsional Properties		Maximum Operating Temperature		Rockwell Hardness	Method of Manufacture	
			Minimum Tensile Strength	Modulus of Elasticity E	Design Stress	Modulus in Torsion G	°F	°C		Chief Uses	Special Properties
			psi x 10 ³ [MPa]	psi x 10 ⁶ [MPa x 10 ³]	% Minimum Tensile	psi x 10 ⁶ [MPa x 10 ³]					
High Carbon Spring Wire	Music Wire ASTM A228	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 A227	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.	
Carbon and alloy- Specialty Spring Grade	Grade B- Carbon ASTM A 1000	C 0.55-0.75% Mn 0.60-0.90%	195-275 [1350-1897]	30 [207]	45	11.5 [79.3]	250	121	C45-49	Annealed and cold drawn or oil tempered, as specified by purchaser.	
	Grade C - Chrome Vanadium ASTM A 1000	C 0.06-0.07% Mn 0.50-0.90% Cr 0.35-0.60% V 0.10-0.50%	210-270 [1450-1860]	30 [207]	45	11.5 [79.3]	425	218	C41-55	Annealed and cold drawn or oil tempered, as specified by purchaser.	
	Grade A - Chrome Silicon ASTM A 1000	C 0.51-0.59% Mn 0.50-0.80% Cr 0.60-0.80% Si 0.20-1.60%	231-305 [1590-2100]	30 [207]	45	11.5 [79.3]	475	245	C48-55	Annealed and cold drawn or oil tempered, as specified by purchaser.	
	Grade D - Chrome Silicon Vanadium ASTM A 1000	C 0.55-0.68% Mn 0.60-0.90% Cr 0.35-0.60% Si 1.20-1.60%	245-320 [1690-2200]	30 [207]	45	11.5 [79.3]	450	230	C45-55	Annealed and cold drawn or oil tempered, as specified by purchaser.	
Alloy Steel Wire	Chrome Vanadium ASTM A 231	C 0.48-0.53% Cr 0.80-1.10% V 0.15 min%	190-300 [1310-2069]	30 [207]	45	11.5 [79.3]	425	218	C41-55	Cold drawn and heat treated before fabrication. Used for shock loads and moderately elevated temperature.	
	Chrome Vanadium Valve ASTM A232	C 0.48-0.53% Mn 0.70-0.90% Cr 0.80-1.10% V 0.15 min%	190-300 [1310-2069]	30 [207]	45	11.5 [79.3]	425	218	C41-55	Cold drawn and heat treated before fabrication. Used for shock loads and moderately elevated temperature.	
	Chrome Vanadium Valve - Modified ASTM A878	C 0.60-0.75% Mn 0.50-0.90% Cr 0.35-0.60% V 0.10-0.25%	205-290 [1414-2000]	30 [207]	45	11.5 [79.3]	430	220	C41-55	Annealed and cold drawn, hardened and tempered 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% Sil 1.20-1.60%	235-300 [1620-2069]	30 [207]	45	11.5 [79.3]	475	245	C48-55	Cold drawn and heat treated before fabrication. Used for shock loads and moderately elevated temperature.	
	Chrome Silicon Valve ASTM A877	C 0.51-0.59% Mn 0.50-0.80% Cr 0.60-0.80% Si 1.20-1.60%	245-305 [1690-2100]	30 [207]	45	11.5 [79.3]	475	245	C48-55	Cold drawn, hardened and tempered before fabrication. For shock loading and moderately higher temperature.	
Stainless Steel Wire	AISI 302/304 ASTM A 313	Cr 17.0-19.0% Ni 8.0-10.0%	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 tempered.	
	AISI 316 A 313	Cr 16.0-18.0% Ni 10.0-14.0% Mo 2.0-3.0%	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 ASTM A 313 [631]	Cr 16.0-18.0% Ni 6.50-7.50% Al 0.75-1.50%	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.	

	Material	Nominal Chemistry	Tensile Properties		Torsional Properties		Maximum Operating Temperature		Rockwell Hardness	Method of Manufacture	
			Minimum Tensile Strength	Modulus of Elasticity E	Design Stress % Minimum Tensile	Modulus in Torsion G				Chief Uses	Special Properties
							psi x 10 ³ [MPa]	psi x 10 ⁶ [MPa x 10 ³]			
Non-Ferrous Alloy Wire	Phosphor Bronze Grade A ASTM B 159	Cu 94.0-96.0% Sn 4.00-6.00%	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 98.0% Be 2.0%	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 66.0% Cu 31.5%	145-180 [1000-1241]	26 [179]	40	9.5 [65.5]	450	232	C23-32	Cold drawn. Good corrosion resistance at moderately elevated temperature.	
High Temperature Alloy Wire	Monel K 500 QQ-N-286 [Fed]	Ni 65.0% Cu 29.5%	160-200 [1103-1379]	26 [179]	40	9.5 [65.5]	550	288	C23-35	Excellent corrosion resistance at moderately elevated temperature.	
	A 286 Alloy [No spring specification]	Ni 26.0% Cr 15.0% Fe 53.0%	160-200 [1103-1379]	29 [200]	35	10.4 [71.7]	950	510	C35-42	Cold drawn and precipitation hardened after fabrication. Good corrosion resistance at elevated temperature.	
	Inconel 600 ASTM B 166	Ni 76.0% Cr 15.8% Fe 7.20%	100-230 [1172-1586]	31 [214]	40	11.0 [75.8]	700	371	C35-45	Cold drawn. Good corrosion resistance at elevated temperature.	
	Inconel 718 [No spring specification]	Ni 52.5% Cr 18.6% Fe 18.50%	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.	
Special Purpose Alloys - Wire	Inconel x 750 AMS 5698, 5699	Ni 73.0% Cr 15.0% 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.	
	Elgiloy [R30003] AMS 5833	Co 39.0-41.0% Cr 19.0-21.0% Ni 15.0-16.0% Mo 6.0-8.0% Fe Bal	270-330 [1862-2275]	32 [221]	45	12 [82.8]	850	454	C40-60	Cold drawn and aged. Excellent corrosion resistance in sour environments. Non-magnetic.	
	MP35N [R30035] AMS 5844	Co Bal Ni 33.0-37.0% Cr 19.0-21.0% Mo 9.0-10.5%	260 [1793]	34 [235]	45	11.7 [80.7]	750	399	C35-55	Cold drawn and aged. Excellent corrosion resistance in sour environments.	
	NiSpan C [N09902]	Fe Bal Ni 41.0-43.5% Cr 4.9-5.75% Ti 2.2-2.75% Al 0.3-0.8%	150-190 [1034-1310]	24-29 [166-200]	40	9-10 [62-69]	150	66		Precipitation hardenable. Constant modulus alloy which is heat treatment dependent.	
	C276 [N10276] ASTM B574	Ni Bal Cr 14.5-16.5% Mo 15.0-17.0% W 3.0-4.5% Fe 4.0-7.0%	100-200 [690-1379]	30.7 [210]	40	11.8 [81.4]	700	371		High corrosion resistance. Higher temperature possible with lower stresses.	
	C22 [N06022] ASTM B574	Ni Bal Cr 20.0-22.5% Mo 12.5-14.5% W 2.5-3.5% Fe 2.0-6.0%	100-200 [690-1379]	30.8 [212]	40	11.8 [81.4]	700	371		High corrosion resistance. Higher temperature possible with lower stresses.	
	Rene 41 [N07041]	Ni Bal Cr 18.0-20.0% Mo 9.0-10.5% Co 10.0-12.0% Ti 3.0-3.3% Al 1.4-1.6%	135-200 [931-1379]	31.6 [218]	40	12.1 [83.4]	1800	982		High temperature applications possible with good corrosion/ oxidation resistance	
Ti 3-8-6-4-4 [R58640] 4957	AMS Ti 7.5-8.5% Al 3.0-4.0% V 5.5-6.5% Mo 3.5-4.5% Zr 3.5-4.5%	180-210 [1241-1448]	15.4 [106]	40	5.9 [40.7]	600	316		Cold drawn and aged for best spring characteristics. Non-magnetic. Good strength/ weight ratio. Low modulus.		
Cold Rolled Carbon Steel Strip	Medium Carbon ASTM A 682 1050	AISI C 0.47-0.55% Mn 0.60-0.90%	160-280 [1103-1931]	30 [207]			250	121	B85 Max. Annld. C38-50 Temp.	Cold rolled annealed or tempered. General purpose applications.	
	Regular Carbon ASTM A 682 1074	AISI C 0.69-0.80% Mn 0.58-0.80%	160-320 [1103-2206]	30 [207]			250	121	B85 Max. Annld. C38-50 Temp.	Cold rolled annealed or tempered. Most popular for flat springs.	
	High Carbon ASTM A 682 AISI 1095	AISI C 0.90-1.04% Mn 0.30-0.50%	180-340 [1241-2344]	30 [207]			250	121	B88 Max. Annld. C40-52 Temp.	Cold rolled annealed or tempered. High stress flat springs.	

	Material	Nominal Chemistry	Tensile Properties		Torsional Properties		Maximum Operating Temperature		Rockwell Hardness	Method of Manufacture	
			Minimum Tensile Strength	Modulus of Elasticity E	Design Stress % Minimum Tensile	Modulus in Torsion G	°F	°C		Chief Uses	Special Properties
			psi x 10 ³ [MPa]	psi x 10 ⁶ [MPa x 10 ³]		psi x 10 ⁶ [MPa x 10 ³]					
Stainless Steel Strip	ASTM A 666	Cr 16.0-18.0% Ni 6.0-8.0%	240-270 [1655-1862]	28 [193]			300	149	C48-52	Cold rolled to high yield strength. Magnetic in spring tempered.	
	ASTM A 666	Cr 17.0-19.0% Ni 8.0-10.0%	185-230 [1276-1586]	28 [193]			550	288	C42-48	Cold rolled. General purpose corrosion and heat resistant. Magnetic in spring tempered.	
	AISI 316	Cr 16.0-18.0% Ni 10.0-14.0% Mo 2.0-3.0%	170-230 [1172-1586]	28 [193]			550	288	C38-48	Cold rolled heat resistant and better corrosion resistance than 302. Magnetic in spring tempered.	
	17-7 PH ASTM A 693 [631] AMS 5529	Cr 16.0-18.0% Ni 6.5-7.5% Al 0.75-1.5%	Cond CH 240 Min. [1655]	29 [200]			650	343	C46 Min.	Cold rolled and precipitation hardened after fabrication. High strength and general purpose corrosion resistance. Magnetic in spring tempered.	
Alloy Steel Strip	Chrome Vanadium AMS 6455	C 0.48-0.53% Cr 0.80-1.10% V 0.15% Min.	200-250 [1379-1724]	30 [207]			425	218.5	C42-48	Cold rolled and heat treated after fabrication. Used for shock loads and moderately elevated temperature.	
	Chrome Silicon 9254	AIS C 0.51-0.59% Cr 0.50-0.80% Si 1.20-1.60%	250-325 [1724-2241]	30 [207]			475	246	C47-51	Cold rolled and heat treated after fabrication. Used for shock loads and moderately elevated temperature.	
Non - Ferrous Alloy Strip	Phosphor Bronze Grade A ASTM B103	Cu 94.0-96.0% Sn 4.0-6.0%	95-110 [655-758]	15 [103]			200	93.3	B94-98	Cold rolled. Good corrosion resistance and electrical conductivity.	
	Beryllium Copper ASTM B194	Cu 98.0% Be 2.0%	180-200 [1241-1379]	16-18.5 [111-128]			400	204	C39	Cold rolled and may be mill hardened before fabrication. Good corrosion resistance and electrical conductivity. High physicals.	
	Monel 400 AMS 4544	Ni 66.0% Cu 31.5%	100-140 [690-765]	26 [179]			450	232	B98 Min.	Cold rolled. Good corrosion resistance at moderately elevated temperature.	
	Monel K 500 QQ - N - 286	Ni 65.0% Cu 29.5% C/Fe/Al/Ti	170-200 [1172-1379]	26 [179]			550	288	C34 Min.	Excellent corrosion resistance at moderately elevated temperature.	
High Temperature Alloy Strip	A 286 Alloy AMS 5525	Ni 26.0% Cr 15.0% Fe 53.0%	160-200 [1103-1379]	29 [200]			950	510	C30-40	Cold rolled and precipitation hardened after fabrication. Good corrosion resistance at moderately elevated temperature.	
	Inconel 600 5540 ASTM B 168	Ni 76.0% Cr 15.8% Fe 7.2%	145-170 [1000-1172]	31 [218]			700	371	C30 Min.	Good corrosion resistance at elevated temperature.	
	Inconel 718 5596, 5597	Ni 52.5% Cr 18.6% Fe 18.5%	180-204 [1241-1407]	29 [200]			1100	593	C36	Cold rolled and precipitation hardened after fabrication. Good corrosion resistance at elevated temperature.	
	Inconel x 750 5542	Ni 73.0% Cr 15.0% Fe 6.75%	150 [1034]	31 [214]			750-1100	399-593	C30 Min.	Cold rolled and precipitation hardened after fabrication. Good corrosion resistance at elevated temperature.	
Special Purpose Alloys - Strip	Elgiloy [R30003] AMS 5875	Co 39.0-41.0% Cr 19.0-21.0% Ni 15.0-16.0% Mo 6.0-8.0% Fe Bal	170-325 [1172-2241]	32 [221]	45	12.0 [82.8]	850	454	C40-58	Cold drawn and aged. Excellent corrosion resistance in sour environment. Non-magnetic.	
	MP35N [R30035]	Co Bal Ni 33.0-37.0% Cr 19.0-21.0% Mo 9.0-10.5%	200 [1379]	34 [235]	45	11.7 [80.7]	750	399	C35-50	Cold drawn and aged. Excellent corrosion resistance in sour environment.	
	NiSpan C [N09902] AMS 5521 AMS 5223 5525	AMS Fe Bal Ni 41.0-43.5% Cr 4.9-5.75% Ti 2.2-2.75% Al 0.3-0.8%	150-190 [1034-1310]	24-29 [166-200]	40	9-10 [62-69]	150	66		Precipitation hardenable. Constant modulus alloy which is heat treatment dependent.	
	C276 [N10276] ASTM B575	Ni Bal Cr 14.5-16.5% Mo 15.0-17.0% W 3.0-4.5% Fe 4.0-7.0%	100-200 [690-1379]	30.7 [210]	40	11.8 [81.4]	700	371		High corrosion resistance. Higher temperature possible with lower stresses.	
	C22 [N06022] ASTM B575	Ni Bal Cr 20.0-22.5% Mo 12.5-14.5% W 2.5-3.5% Fe 2.0-6.0%	100-200 [690-1379]	30.8 [212]	40	11.8 [81.4]	700	371		High corrosion resistance. Higher temperature possible with lower stresses.	