

## SMC Powder Metallurgy, Inc.

### P/M Material Specifications for Structural Parts (Ferrous)

Grade	Material	Composition %	Typical Values					Recommendations	Equivalent Specifications
			Tensile Strength PSI	Yield Strength PSI	Elongation % in 1"	Density g/cc	Apparent Hardness		
I-8	Iron, Copper, Carbon	Fe: 88.1 Cu: 7.0-9.0 C: 0.6-0.9 Other: 2.0 max	55,000	50,000	<0.5	6.0-6.4	HRB 65	This material is used where maximum wear resistance is required and when heat-treating is not practical.	MPIF: FC - 0808 - 45 ASTM: B 783 - 93 DIN: SINT - C21 SAE: 864grade3,class3
I-10	Copper, Steel	Fe: 87.2 - 90.5 Cu: 9.5 - 10.5 C: 0 - 0.3 Other: 2.0 max	30,000	26,000	<1.0	6.0 - 6.4	HRB 15	Bearing grade material with high strength and good shock loading ability. Used where both structural properties and bearing characteristics are required.	MPIF FC - 1000 - 20 ASTM: B 783 - 93 SAE: 862
I-15	Iron, Copper, Carbon	Fe: 91.1 - 95.4 Cu: 4.0 - 6.0 C: 0.6-0.9 Other: 2.0 max	68,000	60,000	<0.5	6.0 - 6.4	HRB 65	Excellent all purpose grade with or without heat-treatment.	MPIF: FC - 0508-50 ASTM: B 783 - 93 DIN: SINT - C21 SAE: 864grade2,class3
I-31	Iron, Copper, Carbon	Fe: 75 - 78 Cu: 18 - 22 C: 0.4 - 0.6 Other: 2.0 max	40,000	32,000	1	6.0 - 6.4	HRB 40	Material used for both bearing & structural parts. Excellent abrasion resistance.	MPIF: FC - 2000 - 40 DIN: SINT - B20
I - 50	Iron/Nickel	Fe: 50 Ni: 50	38,000		12	6.8 - 7.2	HRB 20-25	Best material for soft magnetic applications with very low coercive forces	DIN: S Fe Ni 15
I - 65	45P	Fe: 97.8 - 99.5 P: 0.45 Other: 1.0 max	45,000	30,000	7	6.8 - 7.2	HRB 35	Very good material for soft magnetic applications.	MPIF: F - 0000 - 20 modified ASTM: B 783 - 93 DIN: SINT - D 35 SAE: 853, class1
I - 75	Iron, Nickel, Copper, Carbon	Fe: 91.00-96.41 Ni: 1.60-2.00 Mo: .5-.6 C: 0.6-0.9 Other: 2.0 max	60,000	60,000	<1	6.4-6.8	HRC 20-30	High strength, high hardness, in a sintered condition. Referred to as "sinter-hardened" material. Used for gears, sprockets and synchronizer hub.	MPIF: FLC - 4608-50HT ASTM: B 783 - 93 DIN: SINT - D 39
I - 82	Iron, Nickel, Carbon  Heat Treat Properties	Fe: 91.9 - 98.7 Ni: 1 - 3 C: 0.3 - 0.6 Other: 2.0 max	50,000  120,000	30,000	2.5  <0.5	6.8 - 7.2  6.8 - 7.2	HRB 65  HRC 30	Used for moderate strength and wear resistance, good toughness. Suitable for high strength structural parts by hardening and tempering.	MPIF: FN - 0205 - 25 ASTM: B 783 - 93 DIN: SINT - D 39

I-83	Iron, Copper, Carbon	Fe: 94.35 Ni: 4.0 C: .6-.9	45,000	40,000	1	6.4-6.8	HRB 70-85	High tensile strength and Toughness in a sintered condition. Good for high strength structural parts where wear resistance, increased impact properties are achieved by hardening and tempering.	MPIF: 0408-35 ASTM: B 783-93
I - 84	Iron, Nickel, Carbon  Heat Treat Properties	Fe: 89.9 - 96.7 Ni: 3.0 - 5.5 C: 0.3 - 0.6 Other: 2.0 max	60,000  130,000	40,000	3  <0.5	6.8 - 7.2  6.8 - 7.2	HRB 70  HRC 30	High tensile strength and toughness in a sintered condition. Good for high strength structural parts by hardening & tempering	MPIF: FN - 0405 - 35 ASTM: B 783 - 93
I - 85	Iron, Carbon  Heat Treat Properties	Fe: 97.1-99.4 C:0.6-0.9 Other:2.0 max	57,000  85,000	40,000	1  <0.5	6.8-7.2  6.8-7.2	HRB 70  HRC 30	Suitable for general structural parts when loading is moderate. Non-machinable grade. Increased strength by hardening and tempering	MPIF: F-0008-35 ASTM B 783-93 SAE: 853, CLASS 3
I - 86	Low Alloy Steel	Fe: 94.5 - 97.5 C: 0.4 - 0.7 Ni: 1.7 - 2.0 MO: 0.4 - 0.8 Other: 2.0 max	110,000	110,000	<0.5	6.8 - 7.2	HRC 30	This material is typically used when high performance materials capable of being heat-treated are required. Provides high strength and wear resistance after hardening and tempering.	MPIF: FL -4605 - 100HT ASTM: B 783 - 93
I - 91	Low Alloy Steel	Fe: 95.9 - 98.7 C: 0.4 - 0.7 Ni: 0.35 - 0.55 MO: 0.5 - 0.85 Other: 2.0 max	110,000	110,000	<0.5	6.8 - 7.2	HRC 35	This material is typically used when high performance materials capable of being heat-treated are required. Provides high strength and wear resistance after hardening and tempering.	MPIF: FL -4205 - 100HT ASTM: B 783 - 93
I - 92	Iron, Copper, Carbon  Heat Treat Properties	Fe: 93.5-98.2 Cu: 1.5-3.9 C: 0.3-0.6 Other: 2.0 max	50,000  80,000	45,000	1  <0.5	6.4 - 6.8  6.4 - 6.8	HRB 60  HRC 30	Suitable for general structural parts when secondary machining is required.	MPIF: FC -0205 - 40 ASTM: B 783 - 93
I - 94	Iron, Nickel, Copper, Moly, Carbon	Fe: Balance Ni: 4.0 Cu: 1.5 MO: 0.50 C: 0.6 - 0.9	71,000	57,000	<1	6.4 - 6.8	HRB 80-90	Diffusion alloyed steels typically used in medium to high strength structural products. Used in high density applications require toughness than conventional P/M materials.	MPIF: FD - 0408 - 50 ASTM: B 783 - 93 DIN: SINT - D39

I-95	Iron, Nickel, Copper, Moly, Carbon	Fe: Balance Ni: 1.75 Cu: 1.5 MO: 0.53 C: 0.4	68,000	52,000	1	6.4-6.8	HRB 70-80	Diffusion alloyed steels typically used in medium to high strength structural products. Used for high density applications require good as sintered Properties	MPIF: Fd-0205-60 ASTM: B 783 - 93 DIN: SINT - D39
I - 96	Iron, Nickel, Copper, Moly, Carbon	Fe: Balance Ni: 1.80 Cu: 1.60 MO: 0.55 C: 0.6 - 0.9	75,000	50,000	2.5	6.8 - 7.2	HRB 75	Diffusion alloyed steels typically used in medium to high strength structural products. These materials may be Heat treated to increase strength and wear resistance.	MPIF: FN - 0208 - 35modified ASTM: B 783 - 93 DIN: SINT - D39
I 98	Iron, Copper, Carbon  Heat Treat Properties	Fe: 93.2 - 97.9 Cu: 1.5 - 3.9 C: 0.6 - 0.9 Other: 2.0 max	75,000  105,000	65,000	<1.0  <0.5	6.8 - 7.2  6.8 - 7.2	HRB 80  HRC 40	Material used for higher strength structural parts. Good abrasion resistance. Increased strength by hardening and tempering.	MPIF: FC - 0208 - 60 ASTM: B 783 - 93 DIN: SINT - D11 SAE: 864, grade1, class3
I - 99	Iron, Nickel, Carbon  Heat Treat Properties	Fe: 91.6 - 98.4 Cu: 1.0 - 3.0 C: 0.6 - 0.9 Other: 2.0 max	55,000  120,000	40,000	1.5  <0.5	6.8 - 7.2  6.8 - 7.2	HRB 70  HRC 30	Suitable for high strength structural parts by hardening and tempering and retaining toughness.	MPIF: FN - 0208 - 35 ASTM: B 783 - 93
I-112	85-HP	Fe: 98.30 Cu: .25 MO: .86 C: .6-.9	52,000	42,000	1	6.4-6.8	HBR 55-66	For high performance P/M applications. Enhanced properties of Material allows higher densities than conventional P/M.	MPIF: FL -4405-35 ASTM: B 783-93 Din: SINT -D39
I-125	SC 100	SC100				7		Iron Powder for Electromagnetic Application. These Materials are press ready, preinsulated iron powders engineered to be used in the as compacted condition. Application of these magnetic materials include High-efficiency electric motors, high frequency transformers and uniquely shaped electrical components.	SC - 100

NOTE: Yield and Ultimate Tensile Strength are approximately the same for heat treated material.