ISO Material Groups: Steel

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The letter "P" is for all steels in the ISO material group categories. Within that category there are subgroups. Most manufacturers break it into a range of four to seven categories. I find they are often broken down into five categories. Some manufacturers break it down as a range of machinability with P05 being the most free cutting to P40 being the most difficult. A few manufacturers who use seven groups include martensitic stainless steel as categories P5 and P6. I don't like this in practice because I think stainless steel tends to be its own animal. Some manufacturers use a two number coding system rather than the single number seen below. The chart that will help you interpret where to find your material. The material listings are not exhaustive, but examples of materials found in that subgroup to provide understanding of what materials fit into that group.

P	**Steel** – Free Cutting Steels, Carbon Steels, Alloy Steel	Hardness (HB)	Hardness (HRC)
P0	**Low Carbon** – Ductile materials with longer chips. Straight steel with carbon content less than .30% by weight. The lower the carbon content the more stringy the chips. **Machinability Range:** 50% – 80% **Examples**: 1008, 1010, 1018, 1020, 1026	<125	-
P1	**Low Carbon Free Machining** – Leaded steels, rephosphorized and resulphurized materials. Free Machining steels break the chip alloying for higher cutting speeds and feeds. **Machinability Range:** 70% - 220% **Examples:** 12L14, 1215, 10L18, 1117	<125	-
P2	**Medium Carbon Steels** – Carbon content of 0.30 - 0.50 **Machinability Range:** 50% – 80% **Examples:** 1035, 1045, 10L45, 1050, 1144, 1525, 1545	<253	<25
P3	**Alloys and High Carbon Steels** – Carbon content of 0.50 and above and low allow steels. **Machinability Range:** 40% – 70% **Examples:** 4130, 4140, 41L40, 8620, A572	<330	<35
P4	**Hard Alloys** – Heat Treated Steels, harder materials with RC 35 – 48 **Machinability Range:** 20% – 50% **Examples:** 4140 ASTM A193 Grade B7 Alloy, E52100	330-451~	35-48

Find a grade-specific reference in a reference manual to get SFM with HSS. That will provide a reference point for what SFM you should use with the carbide. The SFM guidelines given based on material groups above can vary greatly, which can be seen in the machinability range. Machinability is calculated as a percentage of 1212 (1212 = 100%).