

# CRAFTSMAN CRIBSHEET

## ISO Material Groups: Stainless Steel

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Dave & Davey video

By David Wynn, Director of Technical Services, PMPA

The letter “M” is for all stainless steels in the ISO material group categories. Most manufacturers break it down into three subgroups. I have made it into five subgroups because of the tendency to put martensitic, ferritic, and precipitation hardening stainless steel into the P (steel) categories.

Stainless steels require sharp tools and low to no

dwell times. Stainless steel especially in the higher nickel alloys work hardens readily. Spending too long in the cut or pushing too much with tools with low to no rake angle can cause work hardening.

The material listings are not exhaustive but examples of materials found in that sub-group to provide context of what materials fit into that group.

M	Stainless Steel – Austenitic, Martensitic, Ferritic, PH and Duplex	Hardness (HB)	Hardness (HRC)
M1	Free Machining Austenitic Stainless – Free machining stainless steels have additives such as sulfur (S), selenium (SE) or nitrogen (N) to improve their machinability. Sometimes materials are suffixed F for >0.1 sulfur for free machining. Machinability Range: 50-75% Examples: 303, 303SE, 316SE, 316F	150-200	-
M2	Austenitic Stainless – Long stringy chips. Austenitic stainless has high nickel content (up to 15%), which will work harden. Machinability Range: 35-50% Examples: 304, 304L, 316, 316L, 321	150-200	-
M3	Duplex Stainless – Ferritic and austenitic mixture. Lower machinability than austenitic stainless. Machinability Range: 10-30% Examples: Duplex 1803, F60, F51, F55, A276	200-280	<28
M4	Ferritic Stainless – Ferritic stainless steels have carbon contents less the 0.20%. Chromium content of around 10.5-30%. Chips tend to be stringy. Little to no nickel content. Machinability Range: 40-75% Examples: 410, 420, 430, 430F	175-295	<30
M5	High-Strength Stainless – Ferritic, martensitic and precipitation hardening (PH) stainless steels that machine like harder steel grades. Due to the higher nickel content in the PH grades, you can still get work hardening effects. Machinability Range: 40-65% Examples: 17-4PH, 15-5PH, 13-8 PH, 440, 440C	340-450	35 – 45

\*Machinability is a percentage of 1,212 (1,212 = 100%).

Find a grade-specific reference in a reference manual to get surface feet per minute (SFM) with high-speed steel (HSS). Multiply the HSS number by 2-2.5 and it 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. **P**