## **SPEEDS & FEEDS**

High Feed End Mills

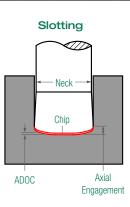
HFV / HFVC																	
	Inches Per Tooth (IPT)																
Material Guide		Hardness	SFM	1/8		3/16		1/4		3/8		1/2		5/8		3/4	
				Slot	Rgh												
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	800	.0027	.0057	.0040	.0085	.0053	.0113	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
		75 - 98 HRB 21 - 36 HRC	750 700	.0020 .0013	.0037 .0025	.0030 .0020	.0055 .0038	.0040 .0027	.0073 .0050	.0060 .0040	.0110 .0075	.0080 .0053	.0147 .0100	.0100 .0066	.0184 .0125	.0120 .0079	.0221 .0150
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	600	.0027	.0057	.0040	.0085	.0053	.0113	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
		21 - 36 HRC	550	.0027	.0047	.0040	.0070	.0053	.0093	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
		36 - 50 HRC > 50 HRC	400 350	.0020 .0013	.0033 .0020	.0030 .0020	.0050 .0030	.0040 .0027	.0067 .0040	.0060 .0040	.0100 .0060	.0080 .0053	.0133 .0080	.0100 .0066	.0166 .0100	.0120 .0079	.0199 .0120
		75 - 98 HRB	550	.0013	.0020	.0020	.0030	.0027	.0040	.0040	.0000	.0033	.0000	.0000	.0234	.0161	.0120
TOOL STEEL	A2, H13, L6, P20, S7	21 - 36 HRC	500	.0027	.0047	.0040	.0070	.0053	.0093	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
		36 - 50 HRC	450 400	.0020 .0013	.0033 .0020	.0030 .0020	.0050 .0030	.0040 .0027	.0067 .0040	.0060 .0040	.0100 .0060	.0080 .0053	.0133 .0080	.0100 .0066	.0166 .0100	.0120 .0079	.0199 .0120
		> 50 HRC < 75 HRB	400 450	.0013	.0020	.0020	.0030	.0027	.0040	.0040	.0060	.0053	.0080	.0066	.0100	.0079	.0120
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	75 - 98 HRB	500	.0027	.0060	.0040	.0090	.0053	.0120	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
		21 - 36 HRC	450	.0027	.0047	.0040	.0070	.0053	.0093	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
		36 - 50 HRC > 50 HRC	400 350	.0020 .0013	.0033 .0020	.0030 .0020	.0050 .0030	.0040 .0027	.0067 .0040	.0060 .0040	.0100 .0060	.0080 .0053	.0133 .0080	.0100 .0066	.0166 .0100	.0120 .0079	.0199 .0120
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	500	.0013	.0020	.0020	.0080	.0053	.0107	.0040	.0140	.0107	.0000	.0134	.0234	.0161	.0281
			450	.0027	.0033	.0040	.0070	.0053	.0093	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
		36 - 50 HRC	400	.0022	.0040	.0033	.0060	.0043	.0080	.0065	.0120	.0087	.0160	.0109	.0200	.0131	.0240
MARTENSITIC & FERRITIC	C 403, 410, 416, 420, 440,	75 - 98 HRB	750	.0025	.0037	.0038	.0055	.0050	.0073	.0075	.0110	.0100	.0147	.0125	.0184	.0150	.0221
STAINLESS STEEL		21 - 36 HRC	650	.0027	.0053	.0040	.0080	.0053	.0107	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	450	.0025	.0037	.0038	.0055	.0050	.0073	.0075	.0110	.0100	.0147	.0125	.0184	.0150	.0221
		36 - 50 HRC	400	.0020	.0033	.0030	.0050	.0040	.0067	.0060	.0100	.0080	.0133	.0100	.0166	.0120	.0199
GRAY CAST	RON SAE J431, ASTM A48	75 - 98 HRB	600	.0027	.0083	.0040	.0125	.0053	.0140	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
IRON		21 - 36 HRC 75 - 98 HRB	550 550	.0027	.0063 .0056	.0040	.0095 .0084	.0053	.0127 .0111	.0080	.0140 .0140	.0107 .0107	.0187 .0187	.0134 .0134	.0234	.0161 .0161	.0281 .0281
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	21 - 36 HRC	450	.0027	.0056	.0040	.0060	.0053	.0080	.0080	.0140	.0107	.0167	.0134	.0234	.0161	.0261
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	500	.0027	.0056	.0040	.0084	.0053	.0111	.0080	.0140	.0107	.0187	.0134	.0234	.0161	.0281
		21 - 36 HRC 36 - 50 HRC	450 400	.0027 .0013	.0040 .0020	.0040 .0020	.0060 .0030	.0053 .0027	.0080 .0040	.0080 .0040	.0120 .0060	.0107 .0053	.0160 .0080	.0134 .0066	.0200 .0100	.0161 .0079	.0240 .0120
PURE		36 - 50 HRC < 75 HRB	400 600	.0013	.0020	.0020	.0030	.0027	.0040	.0040	.0060	.0053	.0080	.0066	.0100	.0079	.0120
NICKEL	Nickel 200, Nickel 201	75 - 98 HRB	550	.0027	.0043	.0040	.0065	.0053	.0087	.0080	.0130	.0107	.0172	.0134	.0214	.0161	.0256
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	200	.0027	.0038	.0040	.0056	.0053	.0075	.0080	.0113	.0107	.0150	.0134	.0187	.0161	.0224
		21 - 36 HRC	180	.0027	.0033	.0040	.0049	.0053	.0066	.0080	.0098	.0107	.0130	.0134	.0162	.0161	.0194
		36 - 50 HRC	150	.0022	.0028	.0033	.0042	.0043	.0056	.0065	.0084	.0087	.0112	.0109	.0140	.0131	.0168
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB 75 - 98 HRB	350 400	.0027 .0027	.0047 .0042	.0040 .0040	.0070 .0063	.0053 .0053	.0094 .0084	.0080 .0080	.0140 .0127	.0107 .0107	.0187 .0168	.0134 .0134	.0234 .0209	.0161 .0161	.0281 .0250
		21 - 36 HRB	400 325	.0027	.0042	.0040	.0063	.0053	.0084	.0080	.0127	.0107	.0168	.0134	.0209	.0161	.0250
TITANIUM	Ti 3Al-2.5V, Ti 6Al-4V,	21 - 36 HRC	300	.0027	.0033	.0040	.0049	.0053	.0066	.0080	.0098	.0107	.0130	.0134	.0162	.0161	.0194
ALLOY	Ti 10V-2Fe-3Al	36 - 50 HRC	250	.0025	.0023	.0038	.0035	.0050	.0047	.0075	.0070	.0100	.0093	.0125	.0116	.0150	.0139
COBALT	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB 21 - 36 HRC	225 150	.0020 .0027	.0023 .0035	.0030 .0040	.0035 .0053	.0040 .0053	.0047 .0070	.0060 .0080	.0070 .0105	.0080 .0107	.0093 .0140	.0100 .0134	.0116 .0175	.0120 .0161	.0139 .0210
ALLOY		36 - 50 HRC	90	.0027	.0033	.0040	.0035	.0033	.0070	.0060	.0103	.0080	.0093	.0104	.0116	.0120	.0139

Milling Process	Hardness	ADOC	RDOC			
Clot (Full Clotting)	< 35 HRC	3.00%-5.00% Diameter	100% Diameter			
Slot (Full Slotting)	≥ 35 HRC	2.50%-4.00% Diameter	100% Diameter			
Rgh (Traditional	< 35 HRC	3.00%-5.00% Diameter	Up to 65% Diameter			
Roughing)	≥ 35 HRC	2.75%-4.25% Diameter	Up to 65% Diameter			

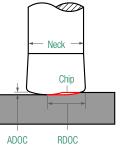
## NOTES:

IPT values shown are for 3xD reach tools, and should be adjusted for longer or shorter reaches. For tools with reaches greater than 3xD, IPT should be reduced.

Please note for slotting applications, axial engagement will increase while axial stepdown (ADOC) remains the same.



## Roughing



HFV