High Performance Solid Carbide Milling Guide

Fractional

Type	Rc Hardness	MILLING SFM (Vc)				CHIPLOAD PER FLUTE (Fz)		
		Aluminum Series		All Other High Performance Series		1/8" - 1/4"	1/4" - 1/2"	1/2" - 1"
		Uncoated	Coated	Uncoated	X.Ceed Coated			
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	-	-	200 - 275	275 - 400	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	125 - 175	175 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	-	-	150 - 200	200 - 300	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	90 - 125	125 - 200	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	-	-	200 - 300	250 - 350	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	150 - 200	200 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
MONEL								
Monel - 65% Nickel		-	-	200 - 300	275 - 400	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-2SN-4Zr-2Mo-Si		125 - 300	250 - 400	150 - 300	250 - 400	.0005" - .0012"	.0010" - .0025"	.0015" - .0040"
5553 / Beta Titanium		-	-	100 - 200	150 - 250	.0004" - .0010"	.0008" - .0020"	.0010" - .0030"
STAINLESS STEELS								
13/8, 15/5, 17-4, pH Types	< 35	-	-	200 - 350	250 - 300	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	150 - 250	200 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
Inox, 200 Series, 300 Series	< 35	-	-	250 - 350	300 - 400	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	175 - 275	225 - 300	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
304L, 316L, Nitronic 50, Inox	< 35	-	-	125 - 200	250 - 300	.0008" - .0015"	.0010" - .0020"	.0020" - .0040"
	> 35	-	-	90 - 125	200 - 250	.0005" - .0010"	.0010" - .0015"	.0010" - .0030"
400 Series	< 35	-	-	200 - 350	250 - 300	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	150 - 250	200 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30	-	-	225 - 300	250 - 350	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	30 - 38	-	-	125 - 200	150 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
	> 38	*(SEE HIGH ROCKWELL CHART - PAGES 238-239)*						
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35	-	-	250 - 350	250 - 400	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"
	> 35	-	-	150 - 200	150 - 300	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	-	-	250 - 350	300 - 500	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"
	> 35	-	-	150 - 200	250 - 400	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
CAST MATERIAL								
Steel		-	-	175 - 250	250 - 350	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
Ductile Iron		-	-	200 - 300	250 - 400	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
Gray Iron		-	-	175 - 250	200 - 400	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
Aluminum		300 - 400	350 - 500	300 - 400	-	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
ALUMINUM								
Aircraft Grade (6061, 7075)	Standard Speed	300 - 400	300 - 600	200 - 400	300 - 500	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
	High Speed	*(SEE HIGH SPEED ALUMINUM CHART - PAGE 232)*						
MAGNESIUM								
		200 - 300	200 - 500	200 - 300	300 - 500	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
COPPER								
Copper Alloys		200 - 300	300 - 500	200 - 300	300 - 500	.0010" - .0025"	.0015" - .0035"	.0020" - .0080"
BRASS, BRONZE								
Brass, Aluminum/Bronze, Low Silicon Bronze		200 - 300	300 - 500	200 - 300	200 - 400	.0010" - .0025"	.0015" - .0035"	.0020" - .0080"

Beryllium added to any material adds hardness and some nickel content. If tool displays chatter, increase feed (IPM) up to 30% and reduce speed (RPM) by 10%.
More detailed information is available on succeeding pages regarding the following materials: Aluminum, High Rockwell Steels, Graphite, and VRX end mills

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

High Performance Solid Carbide Milling Guide

Metric

Type	Rc Hardness	MILLING M/Min. (Vc)				CHIPLOAD PER FLUTE (Fz)		
		Aluminum Series		All Other High Performance Series		3.0 - 6.0	6.0 - 12.0	12.0 - 25.0
		Uncoated	Coated	Uncoated	X.Ceed Coated			
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-4. L-605	< 35 > 35	- -	- -	60 - 80 40 - 50	80 - 120 50 - 75	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35 > 35	- -	- -	45 - 60 25 - 40	60 - 90 40 - 60	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35 > 35	- -	- -	60 - 90 45 - 60	75 - 105 60 - 75	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
MONEL								
Monel - 65% Nickel		-	-	60 - 90	80 - 120	.025 - .065	.035 - .100	.075 - .125
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-2SN-4Zr-2Mo-Si		40 - 90	75 - 120	45 - 90	75 - 120	.010 - .025	.025 - .065	.035 - .100
5553 / Beta Titanium		-	-	30 - 60	45 - 75	.008 - .020	.020 - .050	.025 - .075
STAINLESS STEELS								
13/8, 15/5, 17-4, pH Types	< 35 > 35	- -	- -	60 - 105 45 - 75	75 - 90 60 - 75	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
Inox, 200 Series, 300 Series	< 35 > 35	- -	- -	75 - 105 50 - 80	90 - 120 65 - 90	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
304L, 316L, Nitronic 50, Inox	< 35 > 35	- -	- -	40 - 60 25 - 40	75 - 90 60 - 75	.020 - .035 .010 - .025	.025 - .050 .025 - .035	.035 - .075 .025 - .050
400 Series	< 35 > 35	- -	- -	60 - 105 45 - 75	75 - 90 60 - 75	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30	-	-	65 - 90	75 - 105	.020 - .050	.025 - .075	.050 - .100
	30 - 38	-	-	40 - 60	45 - 75	.010 - .035	.025 - .050	.025 - .075
	> 38	*(SEE HIGH ROCKWELL CHART - PAGES 238-239)*						
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35 > 35	- -	- -	75 - 105 45 - 60	75 - 120 45 - 90	.025 - .065 .020 - .050	.035 - .100 .025 - .075	.075 - .125 .050 - .100
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35 > 35	- -	- -	75 - 105 45 - 60	90 - 150 75 - 120	.025 - .065 .020 - .050	.035 - .100 .025 - .075	.075 - .125 .050 - .100
CAST MATERIAL								
Steel		-	-	50 - 75	75 - 120	.035 - .100	.050 - .150	.075 - .250
Ductile Iron		-	-	60 - 90	90 - 125	.035 - .100	.050 - .150	.075 - .250
Gray Iron		-	-	50 - 75	75 - 125	.035 - .100	.050 - .150	.075 - .250
Aluminum		90 - 120	90 - 150	90 - 120	-	.035 - .100	.050 - .150	.075 - .250
ALUMINUM								
Aircraft Grade (6061, 7075)	Standard Speed	90 - 120	90 - 180	60 - 120	90 - 150	.035 - .100	.050 - .150	.075 - .250
	High Speed	*(SEE HIGH SPEED ALUMINUM CHART - PAGE 232)*						
MAGNESIUM								
		60 - 90	60 - 150	60 - 90	90 - 150	.035 - .100	.050 - .150	.075 - .250
COPPER								
Copper Alloys		60 - 90	90 - 150	60 - 90	90 - 150	.025 - .065	.040 - .090	.050 - .200
BRASS, BRONZE								
Brass, Aluminum/Bronze, Low Silicon Bronze		60 - 90	90 - 150	60 - 90	60 - 120	.025 - .065	.040 - .090	.050 - .200

Beryllium added to any material adds hardness and some nickel content. If tool displays chatter, increase feed (M/Min.) up to 30% and reduce speed (RPM) by 10%.
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