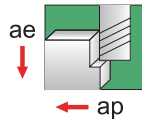


# GARR TOOL Speeds and Feeds for TMS and TMR End Mills

## Fractional

Material Type	SFM (Vc)	CHIPLOAD PER FLUTE (Fz) at 2% RADIAL ENGAGEMENT (USING PROGRAMMED CALCULATION - PG. 262)						
		1/4" (.2500)	5/16" (.3125)	3/8" (.3750)	1/2" (.5000)	5/8" (.6250)	3/4" (.7500)	1.0" (1.000)
<b>TITANIUM ALLOYS</b>								
6Al - 4V	250 - 400	.0020" - .0042"	.0030" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
5553	150 - 250	.0015" - .0028"	.0018" - .0035"	.0025" - .0043"	.0030" - .0055"	.0035" - .0065"	.0042" - .0080"	.0052" - .0095"
<b>STAINLESS STEELS</b>								
Free Machining (303)	300 - 400	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
Austenitic (304 / 304L)	225 - 350	.0017" - .0035"	.0025" - .0043"	.0030" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"
Martensitic (17-4 / 416)	200 - 250	.0015" - .0028"	.0018" - .0035"	.0025" - .0043"	.0030" - .0055"	.0035" - .0065"	.0042" - .0080"	.0052" - .0095"
<b>TOOL STEELS UNDER 40Rc</b>								
8620	250 - 400	.0017" - .0035"	.0025" - .0043"	.0030" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"
4140, D2 & S7	250 - 350	.0015" - .0028"	.0018" - .0035"	.0025" - .0043"	.0030" - .0055"	.0035" - .0065"	.0042" - .0080"	.0052" - .0095"
<b>CARBON STEELS</b>								
1000 Series, A36 & 12L14	300 - 500	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
<b>CAST MATERIALS</b>								
Steel & Iron	250 - 350	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
Aluminum	300 - 400	.0017" - .0035"	.0025" - .0043"	.0030" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"
<b>ALUMINUM</b>								
6061 - T6	300 - 500	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
<b>COPPER &amp; BRASS ALLOYS</b>								
Short Chip	250 - 350	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
Long Chip	175 - 300	.0017" - .0035"	.0025" - .0043"	.0030" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"

## SFM / RPM Conversion



ap = 2%  
ae = full flute length

SFM (Vc)	DIAMETER (d)						
	.2500"	.3125"	.3750"	.5000"	.6250"	.7500"	1.000"
	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
	RPM (n)						
100	1528	1222	1019	764	611	509	382
125	1910	1528	1273	955	764	637	478
150	2292	1834	1528	1146	917	764	573
175	2674	2139	1783	1337	1070	891	669
200	3056	2445	2037	1528	1222	1019	764
250	3820	3056	2547	1910	1528	1273	955
300	4584	3667	3056	2292	1834	1528	1146
350	5348	4278	3565	2674	2139	1783	1337
400	6112	4890	4075	3056	2445	2037	1528
450	6876	5501	4584	3438	2750	2292	1719
500	7640	6112	5093	3820	3056	2547	1910
550	8404	6723	5603	4202	3362	2801	2101
600	9168	7334	6112	4584	3667	3056	2292

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

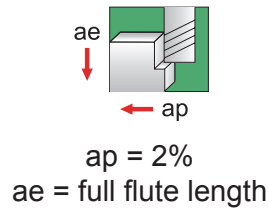
# GARR TOOL Speeds and Feeds for TMS and TMR End Mills

Metric

TECHNICAL

Material Type	SMM (Vc)	CHIPLOAD PER FLUTE (Fz) at 2% RADIAL ENGAGEMENT (USING PROGRAMMED CALCULATION - PG. 263)					
		6.0 (.2362)	8.0 (.3150)	10.0 (.3937)	12.0 (.4724)	16.0 (.6299)	20.0 (.7874)
<b>TITANIUM ALLOYS</b>							
6Al-4V	75 - 120	.050 - .105	.075 - .130	.090 - .165	.105 - .200	.130 - .240	.165 - .365
5553	45 - 75	.035 - .070	.045 - .090	.065 - .105	.075 - .140	.090 - .165	.105 - .200
<b>STAINLESS STEELS</b>							
Free Machining (303)	90 - 120	.050 - .105	.075 - .130	.090 - .165	.105 - .200	.130 - .240	.165 - .365
Austenitic (304 / 304L)	70 - 100	.040 - .090	.065 - .110	.075 - .130	.090 - .165	.110 - .200	.130 - .240
Martensitic (17-4 / 416)	60 - 75	.035 - .070	.045 - .090	.065 - .105	.075 - .140	.090 - .165	.105 - .200
<b>TOOL STEELS UNDER 40Rc</b>							
8620	80 - 120	.040 - .090	.065 - .110	.075 - .130	.090 - .165	.110 - .200	.130 - .240
4140, D2 & S7	75 - 110	.035 - .070	.045 - .090	.065 - .105	.075 - .140	.090 - .165	.105 - .200
<b>CARBON STEELS</b>							
1000 Series, A36 & 12L14	90 - 150	.050 - .105	.075 - .130	.090 - .165	.105 - .200	.130 - .240	.165 - .365
<b>CAST MATERIALS</b>							
Steel & Iron	75 - 110	.050 - .105	.075 - .130	.090 - .165	.105 - .200	.130 - .240	.165 - .365
Aluminum	90 - 120	.040 - .090	.065 - .110	.075 - .130	.090 - .165	.110 - .200	.130 - .240
<b>ALUMINUM</b>							
6061-T6	90 - 150	.050 - .105	.075 - .130	.090 - .165	.105 - .200	.130 - .240	.165 - .365
<b>COPPER &amp; BRASS ALLOYS</b>							
Short Chip	75 - 110	.050 - .105	.075 - .130	.090 - .165	.105 - .200	.130 - .240	.165 - .365
Long Chip	60 - 90	.040 - .090	.065 - .110	.075 - .130	.090 - .165	.110 - .200	.130 - .240

## SMM / RPM Conversion



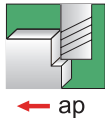
SMM (Vc)	DIAMETER (d)					
	.2362"	.3150"	.3937"	.4724"	.6299"	.7874"
	6.0	8.0	10.0	12.0	16.0	20.0
	RPM (n)					
30	1592	1194	955	796	597	477
35	1857	1393	1114	928	696	557
40	2122	1592	1273	1061	796	637
45	2387	1790	1432	1194	895	716
50	2653	1989	1592	1326	995	796
55	2918	2188	1751	1459	1094	875
60	3183	2387	1910	1592	1194	955
65	3448	2586	2069	1724	1293	1035
70	3714	2785	2228	1857	1393	1114
75	3979	2984	2387	1989	1492	1194
80	4244	3183	2546	2122	1592	1273
85	4509	3382	2706	2255	1691	1353
90	4775	3581	2865	2387	1790	1432
95	5040	3780	3024	2520	1890	1512
100	5305	3979	3183	2653	1989	1592
120	6366	4775	3820	3183	2387	1910
150	7958	5968	4775	3979	2984	2387
175	9284	6963	5570	4642	3482	2785
200	10610	7958	6366	5305	3979	3183

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

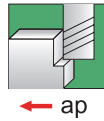
# Chip Thinning Calculations for TMS / TMR End Mills

## Fractional

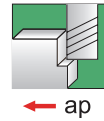
ap = 3%



ap = 2%



ap = 1%



3% Radial Engagement (.03 x d)	
Actual (CPT)	Programmed (CPT)
.0002"	.0005"
.0003"	.0010"
.0005"	.0015"
.0007"	.0020"
.0009"	.0025"
.0010"	.0030"
.0012"	.0035"
.0014"	.0040"
.0015"	.0045"
.0017"	.0050"
.0019"	.0055"
.0020"	.0060"
.0022"	.0065"
.0024"	.0070"
.0026"	.0075"
.0027"	.0080"
.0029"	.0085"
.0031"	.0090"
.0032"	.0095"
.0034"	.0100"
.0036"	.0105"
.0037"	.0110"
.0039"	.0115"
.0041"	.0120"
.0043"	.0125"
.0044"	.0130"
.0046"	.0135"
.0048"	.0140"
.0049"	.0145"
.0051"	.0150"
.0053"	.0155"
.0054"	.0160"
.0056"	.0165"
.0058"	.0170"
.0060"	.0175"
.0061"	.0180"
.0063"	.0185"
.0065"	.0190"
.0066"	.0195"
.0068"	.0200"

2% Radial Engagement (.02 x d)	
Actual (CPT)	Programmed (CPT)
.0001"	.0005"
.0003"	.0010"
.0004"	.0015"
.0006"	.0020"
.0007"	.0025"
.0008"	.0030"
.0010"	.0035"
.0011"	.0040"
.0013"	.0045"
.0014"	.0050"
.0015"	.0055"
.0017"	.0060"
.0018"	.0065"
.0020"	.0070"
.0021"	.0075"
.0022"	.0080"
.0024"	.0085"
.0025"	.0090"
.0027"	.0095"
.0028"	.0100"
.0029"	.0105"
.0031"	.0110"
.0032"	.0115"
.0034"	.0120"
.0035"	.0125"
.0036"	.0130"
.0038"	.0135"
.0039"	.0140"
.0041"	.0145"
.0042"	.0150"
.0043"	.0155"
.0045"	.0160"
.0046"	.0165"
.0048"	.0170"
.0049"	.0175"
.0050"	.0180"
.0052"	.0185"
.0053"	.0190"
.0055"	.0195"
.0056"	.0200"

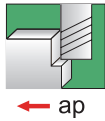
1% Radial Engagement (.01 x d)	
Actual (CPT)	Programmed (CPT)
.0001"	.0005"
.0002"	.0010"
.0003"	.0015"
.0004"	.0020"
.0005"	.0025"
.0006"	.0030"
.0007"	.0035"
.0008"	.0040"
.0009"	.0045"
.0010"	.0050"
.0011"	.0055"
.0012"	.0060"
.0013"	.0065"
.0014"	.0070"
.0015"	.0075"
.0016"	.0080"
.0017"	.0085"
.0018"	.0090"
.0019"	.0095"
.0020"	.0100"
.0021"	.0105"
.0022"	.0110"
.0023"	.0115"
.0024"	.0120"
.0025"	.0125"
.0026"	.0130"
.0027"	.0135"
.0028"	.0140"
.0029"	.0145"
.0030"	.0150"
.0031"	.0155"
.0032"	.0160"
.0033"	.0165"
.0034"	.0170"
.0035"	.0175"
.0036"	.0180"
.0037"	.0185"
.0038"	.0190"
.0039"	.0195"
.0040"	.0200"

CPT = CHIPLOAD PER TOOTH (Fz)

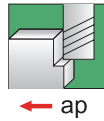
# Chip Thinning Calculations for TMS / TMR End Mills

## Metric

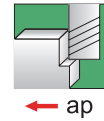
ap = 3%



ap = 2%



ap = 1%



3% Radial Engagement (.03 x d)	
Actual (CPT)	Programmed (CPT)
.0043	.0127
.0086	.0254
.0130	.0381
.0173	.0508
.0216	.0635
.0259	.0762
.0302	.0889
.0345	.1016
.0389	.1143
.0432	.1270
.0475	.1397
.0518	.1524
.0561	.1651
.0605	.1778
.0648	.1905
.0691	.2032
.0734	.2159
.0777	.2286
.0820	.2413
.0864	.2540
.0907	.2667
.0950	.2794
.0993	.2921
.1036	.3048
.1080	.3175
.1123	.3302
.1166	.3429
.1209	.3556
.1252	.3683
.1295	.3810
.1339	.3937
.1382	.4064
.1425	.4191
.1468	.4318
.1511	.4445
.1554	.4572
.1598	.4699
.1641	.4826
.1684	.4953
.1727	.5080

2% Radial Engagement (.02 x d)	
Actual (CPT)	Programmed (CPT)
.0036	.0127
.0071	.0254
.0107	.0381
.0142	.0508
.0178	.0635
.0213	.0762
.0249	.0889
.0284	.1016
.0320	.1143
.0356	.1270
.0391	.1397
.0427	.1524
.0462	.1651
.0498	.1778
.0533	.1905
.0569	.2032
.0605	.2159
.0640	.2286
.0676	.2413
.0711	.2540
.0747	.2667
.0782	.2794
.0818	.2921
.0853	.3048
.0889	.3175
.0925	.3302
.0960	.3429
.0996	.3556
.1031	.3683
.1067	.3810
.1102	.3937
.1138	.4064
.1173	.4191
.1209	.4318
.1245	.4445
.1280	.4572
.1316	.4699
.1351	.4826
.1387	.4953
.1422	.5080

1% Radial Engagement (.01 x d)	
Actual (CPT)	Programmed (CPT)
.0025	.0127
.0051	.0254
.0076	.0381
.0102	.0508
.0127	.0635
.0152	.0762
.0178	.0889
.0203	.1016
.0229	.1143
.0254	.1270
.0279	.1397
.0305	.1524
.0330	.1651
.0356	.1778
.0381	.1905
.0406	.2032
.0432	.2159
.0457	.2286
.0483	.2413
.0508	.2540
.0533	.2667
.0559	.2794
.0584	.2921
.0610	.3048
.0635	.3175
.0660	.3302
.0686	.3429
.0711	.3556
.0737	.3683
.0762	.3810
.0787	.3937
.0813	.4064
.0838	.4191
.0864	.4318
.0889	.4445
.0914	.4572
.0940	.4699
.0965	.4826
.0991	.4953
.1016	.5080

CPT = CHIPLOAD PER TOOTH (Fz)