

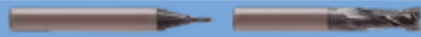
MATERIAL GROUP	HARDNESS HRC		Size (mm)									
			0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
P	13 14	< 35	v_c (m/min)	26	37	49	57	60	62	63	66	68
			n	42000	39000	39000	36000	32000	28000	25000	23500	21500
			f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
			f (mm/min)	80	85	90	105	120	135	150	155	160
H	16 16	35-45	v_c (m/min)	16	22	29	34	36	37	38	40	41
			n	25200	23400	23400	21600	19200	16800	15000	14100	12900
			f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
			f (mm/min)	48	51	54	63	72	81	90	90	96
	16 16	45-55	v_c (m/min)	11	15	20	23	24	25	25	27	27
			n	16800	15600	15600	14400	12800	11200	10000	9400	8600
			f_z	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002
			f (mm/min)	16	17	18	21	24	27	30	31	32
M	21 22 23	v_c (m/min)	13	18	25	28	30	31	31	33	34	
		n	21000	19500	19500	18000	16000	14000	12500	11750	10750	
		f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004	
		f (mm/min)	37	43	45	52	60	67	75	77	80	
K	31 32 33 34	v_c (m/min)	26	37	49	57	60	62	63	66	68	
		n	42000	39000	39000	36000	32000	28000	25000	23500	21500	
		f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004	
		f (mm/min)	80	85	90	105	120	135	150	155	160	
< HRc45			$a_p : \varnothing 0.2\text{mm} - \varnothing 1.0\text{mm} = 0.15 \times D$ $a_p : \varnothing 1.5\text{mm} - \varnothing 3.0\text{mm} = 0.2 \times D$ $a_p : \varnothing 3.5\text{mm} - \varnothing 20.0\text{mm} = 0.5 \times D$									
> HRc45			$a_p : \varnothing 0.2\text{mm} - \varnothing 1.0\text{mm} = 0.02 \times D$ $a_p : \varnothing 1.5\text{mm} - \varnothing 20.0\text{mm} = 0.05 \times D$									

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_r - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \times 1000}{\pi \times \varnothing}$

To calculate cutting speed from RPM: $v_c = \frac{n \times \pi \times \varnothing}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.



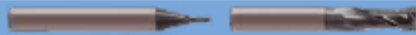
MATERIAL GROUP	HARDNESS HRc		Size (mm)								
			1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	
P	13 14	< 35	v_c (m/min)	71	73	80	84	91	95	98	99
			n	15000	11560	10240	8920	8240	7560	6930	6300
			f_z	0.008	0.008	0.01	0.012	0.015	0.02	0.022	0.025
			f (mm/min)	170	190	200	210	255	300	310	320
H	15 16	35-45	v_c (m/min)	42	48	52	52	56	58	59	59
			n	9000	7560	6560	5660	5090	4620	4200	3780
			f_z	0.008	0.008	0.01	0.013	0.016	0.019	0.022	0.025
			f (mm/min)	102	120	130	140	56	180	185	190
	16 16	45-55	v_c (m/min)	28	32	33	32	35	37	37	36
			n	6000	5040	4200	3360	3150	2940	2630	2320
			f_z	0.003	0.003	0.004	0.006	0.006	0.007	0.009	0.011
			f (mm/min)	34	35	37	40	40	40	45	50
M	21 22 23	v_c (m/min)	35	40	43	44	47	49	50	50	
		n	7500	6300	5460	4620	4250	3990	3520	3160	
		f_z	0.006	0.007	0.01	0.013	0.016	0.019	0.022	0.025	
		f (mm/min)	85	90	105	44	135	150	155	160	
K	31 32 33 34	v_c (m/min)	71	73	80	84	91	95	98	99	
		n	15000	11560	10240	8920	8240	7560	6930	6300	
		f_z	0.006	0.008	0.01	0.012	0.015	0.02	0.022	0.025	
		f (mm/min)	170	190	200	210	255	300	310	320	
< HRc45											
$a_p : \phi 0.2\text{mm} - \phi 1.0\text{mm} = 0.15 \times D$ $a_p : \phi 1.5\text{mm} - \phi 3.0\text{mm} = 0.2 \times D$ $a_p : \phi 3.5\text{mm} - \phi 20.0\text{mm} = 0.5 \times D$			$a_p : \phi 0.2\text{mm} - \phi 1.0\text{mm} = 0.02 \times D$ $a_p : \phi 1.5\text{mm} - \phi 20.0\text{mm} = 0.05 \times D$								

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_r - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \times 1000}{\pi \times \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \times \pi \times \phi}{1000}$$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.



MATERIAL GROUP	HARDNESS HRC		Size (mm)								
			6.0	6.5	7.0	8.0	8.5	9.0	9.5	10.0	
P	13 14	< 35	v_c (m/min)	105	107	107	108	108	105	104	102
			n	5560	5220	4880	4200	3965	3730	3495	3280
			f_z	0.031	0.034	0.037	0.045	0.046	0.048	0.049	0.051
			f (mm/min)	350	355	365	380	365	355	340	330
H	15 15	35-45	v_c (m/min)	63	64	65	63	64	64	64	63
			n	3380	3150	2940	2520	2390	2260	2130	2000
			f_z	0.033	0.034	0.036	0.04	0.04	0.04	0.04	0.04
			f (mm/min)	220	215	210	200	190	180	170	160
	15 15	45-55	v_c (m/min)	38	39	40	42	43	43	43	43
			n	2000	1920	1840	1680	1600	1520	1440	1380
			f_z	0.014	0.016	0.018	0.022	0.022	0.021	0.021	0.022
			f (mm/min)	55	60	65	75	70	65	60	60
M	21 22 23	v_c (m/min)	54	54	54	53	53	53	53	53	
		n	2840	2655	2470	2100	1995	1890	1785	1680	
		f_z	0.032	0.034	0.036	0.043	0.044	0.045	0.046	0.048	
		f (mm/min)	180	180	180	180	175	170	165	160	
K	31 32 33 34	v_c (m/min)	105	107	107	108	108	105	104	102	
		n	5560	5220	4880	4200	3965	3730	3495	3280	
		f_z	0.031	0.034	0.037	0.045	0.046	0.048	0.049	0.051	
		f (mm/min)	350	355	365	380	365	355	340	330	
< HRc45			$a_p : \varnothing 0.2\text{mm} - \varnothing 1.0\text{mm} = 0.15 \times D$ $a_p : \varnothing 1.5\text{mm} - \varnothing 3.0\text{mm} = 0.2 \times D$ $a_p : \varnothing 3.5\text{mm} - \varnothing 20.0\text{mm} = 0.5 \times D$								
							$a_p : \varnothing 0.2\text{mm} - \varnothing 1.0\text{mm} = 0.02 \times D$ $a_p : \varnothing 1.5\text{mm} - \varnothing 20.0\text{mm} = 0.05 \times D$				

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \times 1000}{\pi \times \varnothing}$

To calculate cutting speed from RPM: $v_c = \frac{n \times \pi \times \varnothing}{1000}$



MATERIAL GROUP	HARDNESS HRC		Size (mm)								
			10.5	11.0	12.0	13.0	14.0	15.0	16.0	20.0	
P	13 14	< 35	v_c (m/min)	103	104	103	106	109	110	111	106
			n	3130	3000	2740	2605	2470	2335	2200	1680
			f_z	0.05	0.051	0.051	0.051	0.051	0.05	0.05	0.051
			f (mm/min)	315	305	280	265	250	235	220	170
H	16 16	35-45	v_c (m/min)	63	64	63	65	67	68	68	67
			n	1920	1840	1680	1600	1520	1440	1360	1060
			f_z	0.039	0.039	0.039	0.039	0.039	0.04	0.04	0.038
			f (mm/min)	150	145	130	125	120	115	110	80
	16 16	45-55	v_c (m/min)	43	44	44	45	45	45	45	43
			n	1310	1280	1160	1095	1030	965	0.022	680
			f_z	0.022	0.022	0.024	0.014	0.023	0.022	900	0.022
			f (mm/min)	58	55	55	52	47	43	40	30
M	21 22 23		v_c (m/min)	53	53	51	52	53	53	23	53
			n	1600	1520	1380	1285	1210	1135	1060	840
			f_z	0.047	0.018	0.048	0.049	0.05	0.051	0.052	0.048
			f (mm/min)	150	145	130	125	120	115	110	80
K	31 32 33 34		v_c (m/min)	103	104	103	106	109	110	111	106
			n	3130	3000	2740	2605	2470	2335	2200	1680
			f_z	0.05	0.051	0.051	0.051	0.051	0.05	0.05	0.051
			f (mm/min)	315	305	280	265	250	235	220	170
< HRC45											
$a_p : \varnothing 0.2\text{mm} - \varnothing 1.0\text{mm} = 0.15 \times D$ $a_p : \varnothing 1.5\text{mm} - \varnothing 3.0\text{mm} = 0.2 \times D$ $a_p : \varnothing 3.5\text{mm} - \varnothing 20.0\text{mm} = 0.5 \times D$			$a_p : \varnothing 0.2\text{mm} - \varnothing 1.0\text{mm} = 0.02 \times D$ $a_p : \varnothing 1.5\text{mm} - \varnothing 20.0\text{mm} = 0.05 \times D$								

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
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 z - No. of teeth
 a_p - axial depth of cut
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To calculate RPM from cutting speed: $n = \frac{v_c \times 1000}{\pi \times \varnothing}$

To calculate cutting speed from RPM: $v_c = \frac{n \times \pi \times \varnothing}{1000}$