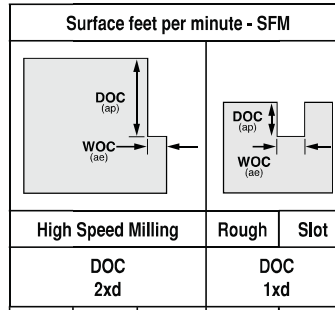


For finishing use WOC (ae) .01 up to .1xd, use SFM from .25xd column, do not increase IPT from table values



$$RPM = \frac{SFM}{d_1} \times 3.82$$

$$IPM = \text{No. of teeth} \times IPT \times RPM$$

Material	Hardness	TYPE	Surface feet per minute - SFM					Feed Rate Inch per Tooth - IPT								
			High Speed Milling			Rough		d1 End Mill Diameter								
			DOC 2xd	DOC 1xd	DOC .25xd	DOC .4 to .9xd	DOC 1xd	1/8 3.17mm	1/4 6.35mm	5/16 7.94mm	3/8 9.52mm	1/2 12.70mm	5/8 15.87mm	3/4 19.05mm	1 25.40mm	
			WOC .05xd	WOC .1xd	WOC .25xd	WOC .4 to .9xd	WOC 1xd	Multiply IPT x this factor based on WOC								
Structural + free-cutting steels, unalloyed heat-treatable + case hardened steels A283, 1151, 1215, L10, 10Lxx, 11Lxx, 12Lxx, 41Lxx, 51Lxx, 86Lxx, 86Lxx, 10xx	up to 28 HRc	2, 3, 4 Flute	840	760	640	460	400	.0005	.0010	.0013	.0016	.0021	.0027	.0030	.0044	
Free-cutting steels, unalloyed case hardened steels, nitriding steels 1151, 1215, L10, 10Lxx, 11Lxx, 12Lxx, 41Lxx, 51Lxx, 86Lxx, 86Lxx, 10xx, 11xx	28 to 38 HRc	2, 3, 4 Flute	760	680	580	425	360	.0005	.0010	.0013	.0016	.0021	.0027	.0030	.0044	
Alloyed heat-treatable, tool and high speed steels 13xx, 2340, 31xx, 32xx, 33xx, 34xx, 40xx, 41xx, 43xx, 4640, 50xx, 51xx, 61xx, 71xx, 86xx, 87xx, 92xx, 98xx, 98xx, Ax, Ox, Dx, Hxx, Lx, Wx, Mx, Tx	28 to 44 HRc	2, 3, 4 Flute	630	570	480	360	300	.0005	.0009	.0011	.0015	.0020	.0023	.0030	.0040	
Hardened Steels Carbon and Alloy Steels, Tool & Die Steels	Up to 54 HRc	2, 3, 4 Flute	230	200	160	160	115	.0003	.0005	.0007	.0009	.0012	.0016	.0019	.0024	
Stainless steel 303, 410, 420F, 430, 430F, 416	Up to 28 HRc	2, 3, 4 Flute	550	500	325	325	260	.0003	.0007	.0009	.0011	.0015	.0020	.0023	.0032	
Stainless steel 304, 304L, 420, 17-4PH, 17-7PH, 15-5PH, 13-8PH	up to 28 HRc	2, 3, 4 Flute	380	340	230	230	180	.0003	.0006	.0007	.0010	.0013	.0016	.0019	.0028	
Stainless steel 310, 316, 316B, 316L, 317, Duplex	over 28 HRc	2, 3, 4 Flute	320	290	230	230	150	.0003	.0005	.0007	.0009	.0012	.0016	.0019	.0024	
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	up to 42 HRc	2, 3, 4 Flute	270	250	165	165	130	.0002	.0004	.0005	.0007	.0009	.0012	.0015	.0020	
High-Temperature Alloys Inconel, Nimonic, Monel, Hastelloy, Waspalloy, A286, Rene 41, Udimet, Stellite	up to 42 HRc	2, 3, 4 Flute	170	150	130	130	80	.0003	.0007	.0009	.0011	.0015	.0020	.0023	.0032	
Cast iron, grey cast iron, spheroidal graphite and malleable cast iron 0.6010 EN-GJ100 (GG10), 0.6020 EN-GJL-200 (GG20), 0.7050 EN-GJS-500-7 (GGG50), 0.8535 EN-GJMW-350-4 (GTW35)	up to 240 HB 30	2, 3, 4 Flute	760	680	580	425	360	.0005	.0009	.0012	.0015	.0020	.0023	.0030	.0040	
Cast iron, grey cast iron, spheroidal graphite and malleable cast iron 0.6025 EN-GJ250 (GG25), 0.6035 EN-GJL-350 (GG35), 0.7070 EN-GJS-700-2 (GGG70), 0.8170 EN-GJMB-700-2 (GTS70)	over 240 HB 30	2, 3, 4 Flute	650	590	500	360	310	.0004	.0008	.0010	.0012	.0017	.0020	.0026	.0032	
Aluminum, Al-wrought alloys, Al-alloys 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075	up to 3% Si	2, 3, 4 Flute	2060	1860	1570	1150	980	.0008	.0015	.0020	.0024	.0033	.0039	.0049	.0064	
Aluminium-cast alloys 3.2131 G-AISI5Cu1, 3.2153 G-AISI7Cu3, 3.2573 G-AISI9, 3.2581 G-AISI12, 3.2583 G-AISI12Cu, - G-AISI12CuNiMg	over 3% Si	2, 3, 4 Flute	1100	1000	840	625	525	.0007	.0013	.0016	.0021	.0028	.0035	.0041	.0056	
Magnesium-alloys MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	—	2, 3, 4 Flute	860	780	660	690	410	.0007	.0013	.0016	.0021	.0028	.0035	.0041	.0056	
Non-ferrous metals (copper, short- or long-chipping brass or bronze)	up to 28 HRc	2, 3, 4 Flute	1210	1090	920	950	575	.0005	.0010	.0013	.0017	.0023	.0027	.0034	.0048	

UNI-PRO Ball Nose (4-Flute) - Inch - Standard Length



center cutting



Standard



No. Flutes



Helix angle



Radius



Rake Angle



Slotting



Roughing



Ramping



Helix



Plunging



Copy Milling

Tool material

Surface finish



HA



HA

Solid Carbide

bright

FIREX®

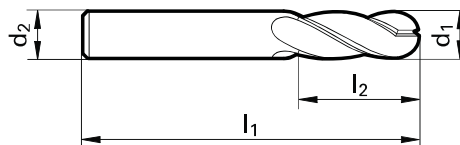
Series

3161

3165

Application group	Material examples	Ideal for
P	Steel	●
M	Stainless steel	●
K	Cast iron	●
N	Aluminum	●
S	Ni / Ti alloys	○
H	Hardened steel	--
●=Optimal ○=Secondary		

Speed and Feed data found on page 297



d1 h10	d2 h6	l1	l2	No. of Flutes	Code no.	EDP Number	
inch	inch	inch	inch				
1/16	1/8	1 1/2	3/16	4	1.590	9031610015900	9031650015900
5/64	1/8	1 1/2	9/32	4	1.980	9031610019800	9031650019800
3/32	1/8	1 1/2	1/4	4	2.380	9031610023800	9031650023800
7/64	1/8	1 1/2	3/8	4	2.780	9031610027800	9031650027800
1/8	1/8	1 1/2	3/8	4	3.170	9031610031700	9031650031700
9/64	3/16	2	1/2	4	3.570	9031610035700	9031650035700
5/32	3/16	2	1/2	4	3.970	9031610039700	9031650039700
11/64	3/16	2	5/8	4	4.370	9031610043700	9031650043700
3/16	3/16	2	5/8	4	4.760	9031610047600	9031650047600
13/64	1/4	2 1/2	5/8	4	5.160	9031610051600	9031650051600
7/32	1/4	2 1/2	5/8	4	5.560	9031610055600	9031650055600
15/64	1/4	2 1/2	3/4	4	5.950	9031610059500	9031650059500
1/4	1/4	2 1/2	3/4	4	6.350	9031610063500	9031650063500
17/64	5/16	2 1/2	3/4	4	6.750	9031610067500	9031650067500
9/32	5/16	2 1/2	3/4	4	7.140	9031610071400	9031650071400
19/64	5/16	2 1/2	13/16	4	7.540	9031610075400	9031650075400
5/16	5/16	2 1/2	13/16	4	7.940	9031610079400	9031650079400
21/64	3/8	2 1/2	1	4	8.330	9031610083300	9031650083300
11/32	3/8	2 1/2	1	4	8.730	9031610087300	9031650087300
23/64	3/8	2 1/2	1	4	9.130	9031610091300	9031650091300
3/8	3/8	2 1/2	1	4	9.520	9031610095200	9031650095200
25/64	7/16	2 3/4	1	4	9.920	9031610099200	9031650099200
13/32	7/16	2 3/4	1	4	10.320	9031610103200	9031650103200
27/64	7/16	2 3/4	1	4	10.720	9031610107200	9031650107200
7/16	7/16	2 3/4	1	4	11.110	9031610111100	9031650111100
29/64	1/2	3	1	4	11.510	9031610115100	9031650115100
15/32	1/2	3	1	4	11.910	9031610119100	9031650119100
31/64	1/2	3	1	4	12.300	9031610123000	9031650123000
1/2	1/2	3	1	4	12.700	9031610127000	9031650127000
9/16	9/16	3 1/2	1 1/8	4	14.290	9031610142900	9031650142900
5/8	5/8	3 1/2	1 1/4	4	15.870	9031610158700	9031650158700
3/4	3/4	4	1 1/2	4	19.050	9031610190500	9031650190500
1	1	4	1 1/2	4	25.400	9031610254000	9031650254000