SGS
Solid Carbide Tools

TCARB
Six Flute End Mills

High Speed Machining | *Trochoidal Milling*

ISO 9001 Certified Company

www.sgstool.com

T-CARB

Six Flute End Mills

T-Carb 6-Flute High Performance End Mills are ideal for aggressive high speed machining using Trochoidal and Peel Milling techniques. The additional flutes allow higher feed rates at reduced tool loads, ultimately preventing breakage and failure. The variable pitch geometry allows the T-Carb to excel in multiple operations calling for aggressive roughing and finishing, resulting in faster cycle times and lower costs. The new series is offered in a variety of length, neck and corner radius options and is coated with Ti-NAMITE-X for ultimate thermal barrier protection.

Titanium

T-CARB HIGH SPEED MACHINING END MILLS ARE **IDEAL FOR AGGRESSIVE MILLING APPLICATIONS** IN THESE TARGET MARKETS:

- Aerospace Structural and Titanium Components
- Medical Replacement Parts and Joints
- Automotive & Motorized Vehicles
- Energy and Power Generation

FEATURES & BENEFITS

- Incorporates unique 6-Flute design for High Speed Machining operations requiring high accuracy and less deflection
- Designed for aggressive ramping at high speeds where evacuation and load might be a factor
- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Exceptional performance with minimal deflection in difficult materials such as titanium alloys and stainless steels
- Eccentric relief provides superior strength and smoother surface finish
- Variable Flute Geometry maximizes productivity and tool life by reducing the harmful harmonics associated with aggressive milling
- Available in a variety of corner radius and reach options
- Exclusively coated with Ti-NAMITE-X for superior wear and increased tool life

Ti-NAMITE-X
ADVANCED TOOL COATING

T-Carb six flute end mills are exclusively coated with our proprietary advanced coating using HPPMS coating process for increased hardness offering better resistance to abrasion wear. This ultra-tough coating provides superior adhesion that is critical in high performance applications that encounter a high level of mechanical stress. With a denser, more uniform coating structure, TX allows for improved performance at higher temperatures protecting tools for an even longer tool life.

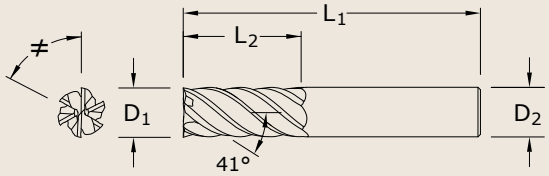
Hardness (HV): 3000
Oxidation Temperature: 900°C – 1562°F
Coefficient of Friction: 0.50
Thickness: 1 – 4 Microns (based on tool diameter)

TOLERANCES (inch)

DIAMETER	D_1	D_2
1/4 - 1	+0.000 / –0.002	h6

TOLERANCES (mm)

DIAMETER	D_1	D_2
6 - 20	+0,000 / -0,050	h6



	Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Ti-NAMITE-X EDP No.
SERIES 51 (FRACTIONAL)	1/4	3/4	2-1/2	1/4	35100
	3/8	1	2-1/2	3/8	35101
	1/2	1-1/4	3	1/2	35102
	5/8	1-5/8	3-1/2	5/8	35103
	3/4	1-5/8	4	3/4	35104
	1	2-5/8	6	1	35105

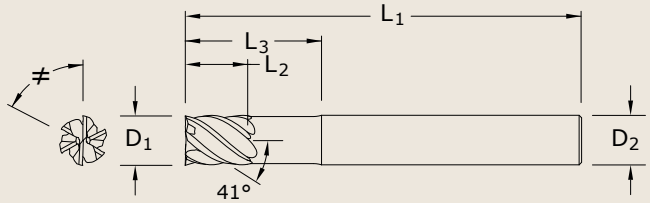
	Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Ti-NAMITE-X EDP No.
SERIES 51M (METRIC)	6	19	63	6	45100
	8	20	63	8	45101
	10	22	75	10	45102
	12	26	83	12	45103
	16	32	92	16	45104
	20	38	104	20	45105

TOLERANCES (inch)

DIAMETER	D_1	D_2
1/4 - 1	+0.000 / –0.002	h6

TOLERANCES (mm)

DIAMETER	D_1	D_2
6 - 20	+0,000 / -0,050	h6



SERIES 51L (FRACTIONAL)

Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Reach L_3	Ti-NAMITE-X EDP No.
1/4	3/8	4	1/4	1-1/8	35106
3/8	1/2	4	3/8	2-1/8	35107
1/2	5/8	4	1/2	2-1/4	35108
5/8	3/4	5	5/8	2-1/2	35109
3/4	1	6	3/4	3-3/8	35110
1	1-1/4	6	1	3-3/8	35111

SERIES 51ML (METRIC)

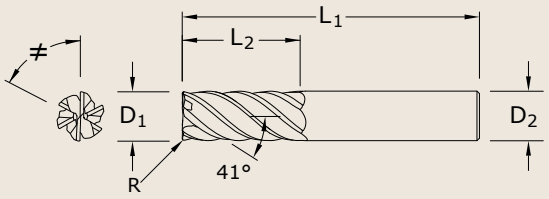
Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Reach L_3	Ti-NAMITE-X EDP No.
6	8	75	6	32	45106
8	10	75	8	32	45107
10	12	100	10	40	45108
12	15	100	12	48	45109
16	20	115	16	65	45110
20	24	150	20	80	45111

TOLERANCES (inch)

DIAMETER	D_1	D_2	R
1/4 - 1	+0.000 / –0.002	h6	+0.000 / –0.002

TOLERANCES (mm)

DIAMETER	D_1	D_2	R
6 - 20	+0,000 / -0,050	h6	+0,000 / -0,050



SERIES 51CR (FRACTIONAL)

Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Corner Radius R	Ti-NAMITE-X EDP No.
1/4	3/4	2-1/2	1/4	0.015	35112
3/8	1	2-1/2	3/8	0.015	35113
3/8	1	2-1/2	3/8	0.03	35114
1/2	1-1/4	3	1/2	0.03	35115
1/2	1-1/4	3	1/2	0.09	35116
1/2	1-1/4	3	1/2	0.12	35117
5/8	1-5/8	3-1/2	5/8	0.03	35118
5/8	1-5/8	3-1/2	5/8	0.09	35119
5/8	1-5/8	3-1/2	5/8	0.12	35120
3/4	1-5/8	4	3/4	0.03	35121
3/4	1-5/8	4	3/4	0.09	35122
3/4	1-5/8	4	3/4	0.12	35123
1	2-5/8	6	1	0.03	35124
1	2-5/8	6	1	0.09	35125
1	2-5/8	6	1	0.12	35126

SERIES 51MCR (METRIC)

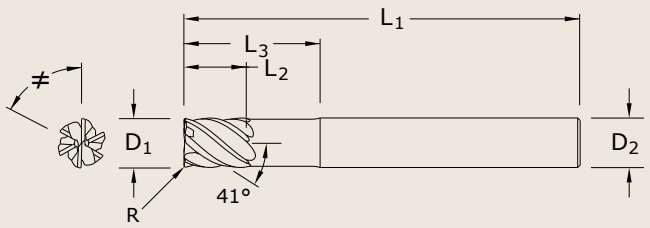
Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Corner Radius R	Ti-NAMITE-X EDP No.
6	19	63	6	0,5	45112
8	20	63	8	0,5	45113
8	20	63	8	1,0	45114
10	22	75	10	1,0	45115
10	22	75	10	1,5	45116
10	22	75	10	2,0	45117
12	26	83	12	1,0	45118
12	26	83	12	1,5	45119
12	26	83	12	2,0	45120
16	32	92	16	1,0	45121
16	32	92	16	1,5	45122
16	32	92	16	2,0	45123
20	38	104	20	1,0	45124
20	38	104	20	1,5	45125
20	38	104	20	2,0	45126

TOLERANCES (inch)

DIAMETER	D_1	D_2	R
1/4 - 1	+0.000 / –0.002	h6	+0.000 / –0.002

TOLERANCES (mm)

DIAMETER	D_1	D_2	R
6 - 20	+0,000 / -0,050	h6	+0,000 / -0,050

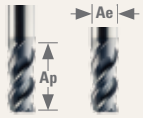


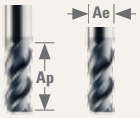
SERIES 51LC (FRACTIONAL)

Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Reach L_3	Corner Radius R	Ti-NAMITE-X EDP No.
1/4	3/8	4	1/4	1-1/8	0.015	35127
3/8	1/2	4	3/8	2-1/8	0.015	35128
3/8	1/2	4	3/8	2-1/8	0.03	35129
1/2	5/8	4	1/2	2-1/4	0.03	35130
1/2	5/8	4	1/2	2-1/4	0.09	35131
1/2	5/8	4	1/2	2-1/4	0.12	35132
5/8	3/4	5	5/8	2-1/2	0.03	35133
5/8	3/4	5	5/8	2-1/2	0.09	35134
5/8	3/4	5	5/8	2-1/2	0.12	35135
3/4	1	6	3/4	3-3/8	0.03	35136
3/4	1	6	3/4	3-3/8	0.09	35137
3/4	1	6	3/4	3-3/8	0.12	35138
1	1-1/4	6	1	3-3/8	0.03	35139
1	1-1/4	6	1	3-3/8	0.09	35140
1	1-1/4	6	1	3-3/8	0.12	35141

SERIES 51MLC (METRIC)

Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Reach L_3	Corner Radius R	Ti-NAMITE-X EDP No.
6	8	75	6	32	0,5	45127
8	10	75	8	32	0,5	45128
8	10	75	8	32	1,0	45129
10	12	100	10	40	1,0	45130
10	12	100	10	40	1,5	45131
10	12	100	10	40	2,0	45132
12	15	100	12	48	1,0	45133
12	15	100	12	48	1,5	45134
12	15	100	12	48	2,0	45135
16	20	115	16	65	1,0	45136
16	20	115	16	65	1,5	45137
16	20	115	16	65	2,0	45138
20	24	150	20	80	1,0	45139
20	24	150	20	80	1,5	45140
20	24	150	20	80	2,0	45141

Hardness BRINELL	Coolant	Series 51 / 51CR Fractonal		 Ap x D1	Ae x D1	Vc (SFM)		Diameter (inch) 1/4	3/8	1/2	5/8	3/4	1
P < 275	A / E / M	**CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536**	Profile	≤ 1	≤ 0.1	720	RPM	11002	7334	5501	4401	3667	2750
						(576-864)	Fz	0.00200	0.00350	0.00500	0.00550	0.00610	0.00710
							Feed (IPM)	132	154	165	145	134	117
			HSC	≤ 2	≤ 0.05	915	RPM	13981	9321	6991	5592	4660	3495
						(732-1098)	Fz	0.00280	0.00530	0.00700	0.00770	0.00850	0.00100
							Feed (IPM)	235	296	294	258	238	21
P < 325	A / E / M	**ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100**	Profile	≤ 1	≤ 0.1	490	RPM	7487	4991	3744	2995	2496	1872
						(392-588)	Fz	0.00150	0.00290	0.00380	0.00420	0.00460	0.00540
							Feed (IPM)	67	87	85	75	69	61
			HSC	≤ 2	≤ 0.05	620	RPM	9474	6316	4737	3789	3158	2368
						(496-744)	Fz	0.00210	0.00390	0.00520	0.00570	0.00620	0.00730
							Feed (IPM)	119	148	148	130	117	104
P < 375	A / E / M	**TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2**	Profile	≤ 1	≤ 0.1	240	RPM	3667	2445	1834	1467	1222	917
						(192-288)	Fz	0.00120	0.00230	0.00300	0.00340	0.00370	0.00430
							Feed (IPM)	26	34	33	30	27	24
			HSC	≤ 2	≤ 0.05	305	RPM	4660	3107	2330	1864	1553	1165
						(244-366)	Fz	0.00170	0.00320	0.00420	0.00460	0.00500	0.00590
							Feed (IPM)	48	60	59	51	47	41
M < 275	E	**STAINLESS STEEL (FREE MACHINING) 303, 416, 420F, 430F 440F**	Profile	≤ 1	≤ 0.1	510	RPM	7793	5195	3896	3117	2598	1948
						(459-561)	Fz	0.00150	0.00280	0.00380	0.00410	0.00450	0.00530
							Feed (IPM)	70	87	89	77	70	62
			HSC	≤ 2	≤ 0.05	650	RPM	9932	6621	4966	3973	3311	2483
						(585-715)	Fz	0.00210	0.00380	0.00510	0.00560	0.00610	0.00720
							Feed (IPM)	125	151	152	133	121	107
M < 185	E	**STAINLESS STEEL (DIFFICULT) 304, 304L,316, 316L**	Profile	≤ 1	≤ 0.1	350	RPM	5348	3565	2674	2139	1783	1337
						(315-385)	Fz	0.00120	0.00230	0.00300	0.00330	0.00360	0.00420
							Feed (IPM)	39	49	48	42	39	34
			HSC	≤ 2	≤ 0.05	450	RPM	6876	4584	3438	2750	2292	1719
						(405-495)	Fz	0.00170	0.00320	0.00420	0.00460	0.00500	0.00590
							Feed (IPM)	70	88	87	76	69	61
M < 325	E	**STAINLESS STEEL (PH) 13-8 PH,15-5PH,17-4 PH, Custom 450**	Profile	≤ 1	≤ 0.1	325	RPM	4966	3311	2483	1986	1655	1242
						(293-358)	Fz	0.00120	0.00230	0.00300	0.00330	0.00360	0.00420
							Feed (IPM)	36	46	45	39	36	31
			HSC	≤ 2	≤ 0.05	410	RPM	6265	4177	3132	2506	2088	1566
						(369-451)	Fz	0.00170	0.00320	0.00420	0.00460	0.00500	0.00590
							Feed (IPM)	64	80	79	69	63	55



Hardness BRINELL	Coolant	Series 51 / 51CR Fractonal		Ap x D1	Ae x D1	Vc (SFM)		Diameter (inch) 1/4	3/8	1/2	5/8	3/4	1
S ≤ 300	E	NICKEL, COBALT AND IRON BASED SUPERALLOYS Inconel 601, 617, 625, Incoly 800, Monel 400	Profile	≤ 1	≤ 0.1	105	RPM	1604	1070	802	642	535	401
						(84-126)	Fz	0.00140	0.00270	0.00360	0.00390	0.00430	0.00500
							Feed (IPM)	13	17	17	15	14	12
			HSC	≤ 2	≤ 0.05	130	RPM	1986	1324	993	795	662	497
						(104-156)	Fz	0.00160	0.00360	0.00480	0.00530	0.00580	0.00670
							Feed (IPM)	19	29	29	25	23	20
S ≤ 300	E	NICKEL, COBALT AND IRON BASED SUPERALLOYS (DIFFICULT) Inconel 718, 750X, Incoly 925, Waspaloy, Hastelloy, Rene	Profile	≤ 1	≤ 0.1	80	RPM	1222	815	611	489	407	306
						(64-96)	Fz	0.00100	0.00180	0.00250	0.00270	0.00290	0.00340
							Feed (IPM)	7	9	9	8	7	6
			HSC	≤ 2	≤ 0.05	100	RPM	1528	1019	764	611	509	382
						(80-120)	Fz	0.00130	0.00250	0.00340	0.00370	0.00410	0.00470
							Feed (IPM)	12	15	16	14	13	11
S ≤ 350	E	TITANIUM BASE ALLOY Pure Ttanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	Profile	≤ 1	≤ 0.1	280	RPM	4278	2852	2139	1711	1426	1070
						(224-336)	Fz	0.00100	0.00180	0.00250	0.00270	0.00290	0.00340
							Feed (IPM)	26	31	32	28	25	22
			HSC	≤ 2	≤ 0.05	355	RPM	5424	3616	2712	2170	1808	1356
						(284-426)	Fz	0.00130	0.00250	0.00340	0.00370	0.00410	0.00470
							Feed (IPM)	42	54	55	48	44	38
S ≤ 450	E	TITANIUM BASE ALLOY (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	Profile	≤ 1	≤ 0.1	155	RPM	2368	1579	1184	947	789	592
						(124-186)	Fz	0.00100	0.00180	0.00250	0.00270	0.00290	0.00340
							Feed (IPM)	14	17	18	15	14	12
			HSC	≤ 2	≤ 0.05	200	RPM	3056	2037	1528	1222	1019	764
						(160-240)	Fz	0.00130	0.00250	0.00340	0.00370	0.00410	0.00470
							Feed (IPM)	24	31	31	27	25	22

*Maximum recommended depth shown
*Finish cuts typically require reduced Feed and Cutting Speeds; also the Radial Width of Cut recommended is not more than 2% x D1
*Reduce Speed & Feed for materials harder than listed
*Above recommendations are based on ideal conditions; For smaller taper machining centers or less rigid conditions please adjust parameters accordingly
*A - Air, E - Emulsion, M - Mist, HSC - High Speed Cutting

Hardness BRINELL	Coolant	Series M51 / 51MCR Metric		Ap x D1	Ae x D1	Vc (m/min)		Diameter (inch) 6	8	10	12	16	20
P < 275	A / E / M	**CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536**	Profile	≤ 1	≤ 0.1	219	RPM	11633	8725	6980	5816	4362	3490
						(176-263)	Fz	0.04800	0.08100	0.10100	0.12100	0.14200	0.15800
							Feed (mm/min)	3350	4240	4230	4223	3717	3308
			HSC	≤ 2	≤ 0.05	279	RPM	14784	11088	8870	7392	5544	4435
						(223-335)	Fz	0.06600	0.11300	0.14100	0.16900	0.19700	0.22000
							Feed (mm/min)	5854	7517	7504	7495	6553	5854
P < 325	A / E / M	**ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100**	Profile	≤ 1	≤ 0.1	149	RPM	7917	5938	4750	3958	2969	2375
						(119-179)	Fz	0.03600	0.06100	0.07700	0.09200	0.10700	0.11900
							Feed (mm/min)	1710	2173	2195	2185	1906	1696
			HSC	≤ 2	≤ 0.05	189	RPM	10017	7513	6010	5009	3756	3005
						(151-227)	Fz	0.04900	0.08300	0.10400	0.12500	0.14600	0.16300
							Feed (mm/min)	2945	3741	3750	3756	3291	2939
P < 375	A / E / M	**TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2**	Profile	≤ 1	≤ 0.1	73	RPM	3878	2908	2327	1939	1454	1163
						(59-88)	Fz	0.02900	0.04900	0.06100	0.07300	0.08600	0.09600
							Feed (mm/min)	675	855	852	849	750	670
			HSC	≤ 2	≤ 0.05	93	RPM	4928	3696	2957	2464	1848	1478
						(74-112)	Fz	0.04000	0.06900	0.08600	0.10300	0.12000	0.13400
							Feed (mm/min)	1183	1530	1526	1523	1331	1189
M < 275	E	**STAINLESS STEEL (FREE MACHINING) 303, 416, 420F, 430F 440F**	Profile	≤ 1	≤ 0.1	155	RPM	8240	6180	4944	4120	3090	2472
						(140-171)	Fz	0.03500	0.06000	0.07500	0.09000	0.10500	0.11700
							Feed (mm/min)	1730	2225	2225	2225	1947	1735
			HSC	≤ 2	≤ 0.05	198	RPM	10502	7877	6301	5251	3938	3151
						(178-218)	Fz	0.04800	0.08200	0.10200	0.12200	0.14300	0.15900
							Feed (mm/min)	3025	3875	3856	3844	3379	3006
M < 185	E	**STAINLESS STEEL (DIFFICULT) 304, 304L,316, 316L**	Profile	≤ 1	≤ 0.1	107	RPM	5655	4241	3393	2827	2121	1696
						(96-117)	Fz	0.02900	0.04900	0.06100	0.07300	0.08600	0.09600
							Feed (mm/min)	984	1247	1242	1238	1094	977
			HSC	≤ 2	≤ 0.05	137	RPM	7271	5453	4362	3635	2726	2181
						(123-151)	Fz	0.04000	0.06900	0.08600	0.10300	0.12000	0.13400
							Feed (mm/min)	1745	2258	2251	2247	1963	1754
M < 325	E	**STAINLESS STEEL (PH) 13-8 PH,15-5PH,17-4 PH, Custom 450**	Profile	≤ 1	≤ 0.1	99	RPM	5251	3938	3151	2626	1969	1575
						(89-109)	Fz	0.02900	0.04900	0.06100	0.07300	0.08600	0.09600
							Feed (mm/min)	914	1158	1153	1150	1016	907
			HSC	≤ 2	≤ 0.05	125	RPM	6624	4968	3975	3312	2484	1987
						(112-137)	Fz	0.04000	0.06900	0.08600	0.10300	0.12000	0.13400
							Feed (mm/min)	1590	2057	2051	2047	1789	1598

Hardness BRINELL	Coolant	Series M51 / 51MCR Metric		Ap x D1	Ae x D1	Vc (m/min)		Diameter (inch) 6	8	10	12	16	20
S ≤ 300	E	NICKEL, COBALT AND IRON BASED SUPERALLOYS Inconel 601, 617, 625, Incoly 800, Monel 400	Profile	≤ 1	≤ 0.1	32	RPM	1696	1272	1018	848	636	509
						(26-38)	Fz	0.03400	0.05700	0.07100	0.08500	0.10000	0.11000
							Feed (mm/min)	346	435	434	433	382	336
			HSC	≤ 2	≤ 0.05	40	RPM	2100	1575	1260	1050	788	630
						(32-48)	Fz	0.04600	0.07700	0.09700	0.12000	0.14000	0.15000
							Feed (mm/min)	580	728	733	756	662	567
S ≤ 300	E	NICKEL, COBALT AND IRON BASED SUPERALLOYS (DIFFICULT) Inconel 718, 750X, Incoly 925, Waspaloy, Hastelloy, Rene	Profile	≤ 1	≤ 0.1	24	RPM	1293	969	776	646	485	388
						(20-29)	Fz	0.02300	0.03900	0.04900	0.05900	0.06800	0.07700
							Feed (mm/min)	178	227	228	229	198	179
			HSC	≤ 2	≤ 0.05	30	RPM	1616	1212	969	808	606	485
						(24-37)	Fz	0.03200	0.05400	0.06800	0.08100	0.09500	0.11000
							Feed (mm/min)	310	393	396	393	345	320
S ≤ 350	E	TITANIUM BASE ALLOY Pure Ttanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	Profile	≤ 1	≤ 0.1	85	RPM	4524	3393	2714	2262	1696	1357
						(68-102)	Fz	0.02300	0.03900	0.04900	0.05900	0.06800	0.07700
							Feed (mm/min)	624	794	798	801	692	627
			HSC	≤ 2	≤ 0.05	108	RPM	5736	4302	3441	2868	2151	1721
						(87-130)	Fz	0.03200	0.05400	0.06800	0.08100	0.09500	0.11000
							Feed (mm/min)	1101	1394	1404	1394	1226	1136
S ≤ 450	E	TITANIUM BASE ALLOY (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	Profile	≤ 1	≤ 0.1	47	RPM	2504	1878	1503	1252	939	751
						(38-57)	Fz	0.02300	0.03900	0.04900	0.05900	0.06800	0.07700
							Feed (mm/min)	346	440	442	443	383	347
			HSC	≤ 2	≤ 0.05	61	RPM	3231	2424	1939	1616	1212	969
						(49-73)	Fz	0.03200	0.05400	0.06800	0.08100	0.09500	0.11000
							Feed (mm/min)	620	785	791	785	691	640

*Maximum recommended depth shown
*Finish cuts typically require reduced Feed and Cutting Speeds; also the Radial Width of Cut recommended is not more than 2% x D1
*Reduce Speed & Feed for materials harder than listed
*Above recommendations are based on ideal conditions; For smaller taper machining centers or less rigid conditions please adjust parameters accordingly
*A - Air, E - Emulsion, M - Mist, HSC - High Speed Cutting

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