



VALUE AT THE SPINDLE®

Six Flute High Performance End Mills

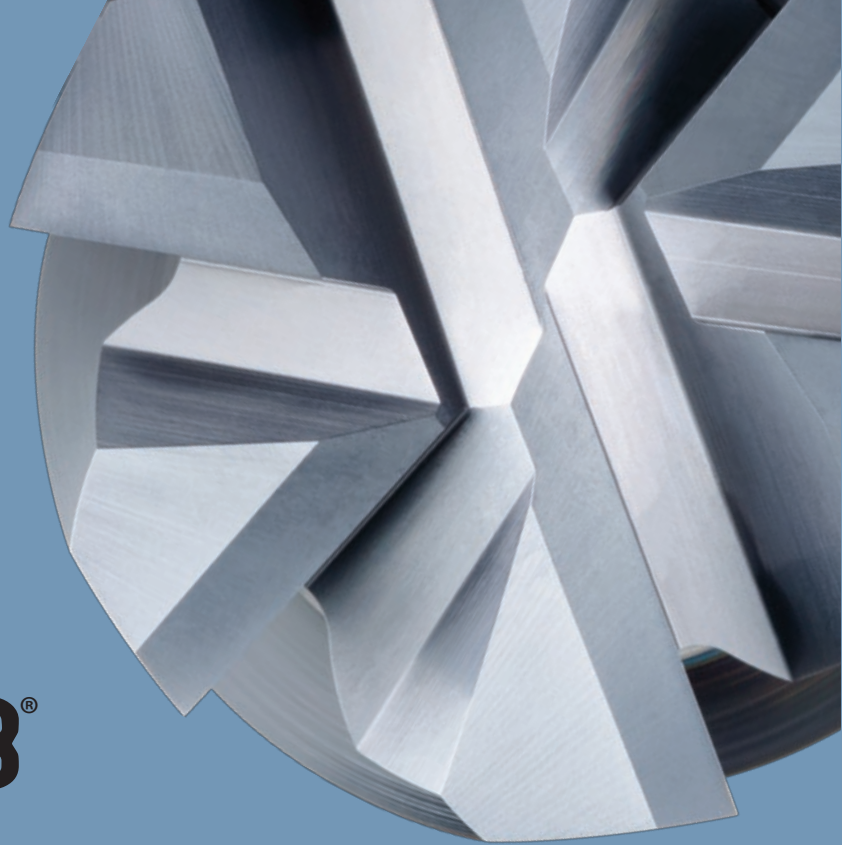


New Expanded Offering

www.kyocera-sgstool.com

ISO 9001:2015 Certified





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 series is offered in a variety of length, neck and end configuration 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

- KSPT now offers over 140 tools in the Series 51 product offering
- The T-Carb® expansion offers superior performance in a ball nose end configuration and mirrors the legacy T-Carb® portfolio
- 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



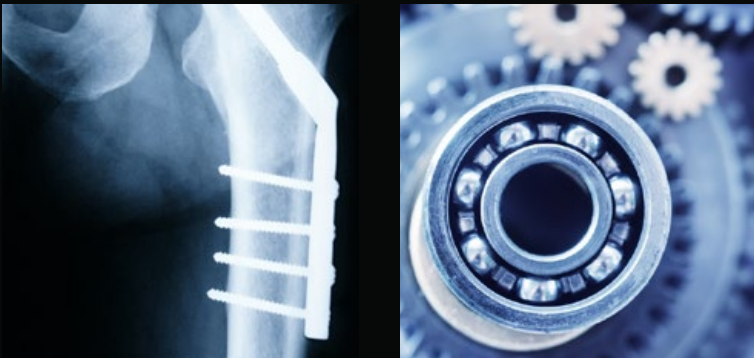
Ti-NAMITE®-X provides outstanding results in a diverse range of applications including medium-hard to very hard steels (40–65 HRC) and titanium alloys. The layered design of the coating, along with the nanocomposite grain structure provides the hardness necessary for extreme wear resistance with the toughness required to withstand interrupted cutting. Ti-NAMITE®-X allows for a broad spectrum of high-performance machining from aggressive material removal rates to high speed machining and finishing.

Hardness (HV): 3600

Oxidation Temperature: 1150°C – 2100°F

Coefficient of Friction: 0.45

Thickness: 1 – 4 Microns (based on tool diameter)



T-CARB® SERIES 51B FEATURES

END WORK

- Strengthened tip geometry results in less tip damage versus the competition
- Specialized relief provides excellent tangency which eliminates material build-up and provides superior finish

FLUTING & HELIX ANGLE

- Utilizes the original T-Carb® design featuring a 36° helix for improved chip flow in ball endmill applications
- Unequal flute indexing for vibration-free cutting at elevated rates

COATING

- Ti-NAMITE®-X coating provides superior protection for performance and tool life



LAB DATA



Lab results of aggressive contouring in Ti6Al4V Titanium have consistently demonstrated a 30% increase in tool life at up to 30% increased feed rates versus top competitors.

Testing Results, 51B versus Competitors: Ti6Al4V

Tool	1375 rpm 14.8 ipm		1788 rpm 19.3 ipm		2338 rpm 31.6 ipm		2673 rpm 48.1 ipm		2855 rpm 71.0 ipm	
	Radial	Axial	Radial	Axial	Radial	Axial	Radial	Axial	Radial	Axial
Competitor A	✓	✓	✓	✓	✓	✓	✓	⊗C		
Competitor A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Competitor B	✓	✓	✓	✓	✓	✓	✓	⊗C		
Competitor B	✓	✓	✓	✓	✓	✓	✓	⊗B		
Competitor B	✓	✓	✓	✓	✓	✓	✓	✓	✓	⊗B
T-Carb® 51B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
T-Carb® 51B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
T-Carb® 51B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
T-Carb® 51B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C = Chipped
B = Broke
Radial & Axial Steps = 0.050"

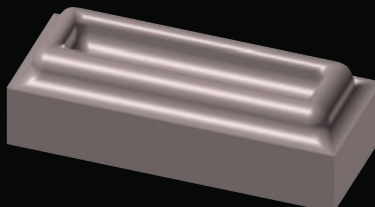
Ti-NAMITE®-X provides outstanding wear resistance results in a diverse range of applications in many difficult to machine materials such as titanium.



The 51B's optimum tip design has shown similar improvements in extensive testing in alloy steels and HTA such as 718 Inconel, PH stainless steels, and 316 stainless as shown below where the 51B outperformed top competitors in contouring easily completing the part with no damage.

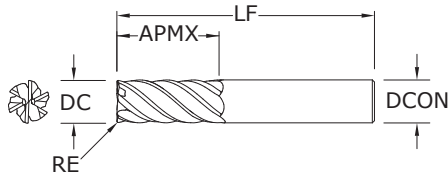
This is more than a 50% increase in tool life!

COMPETITOR A



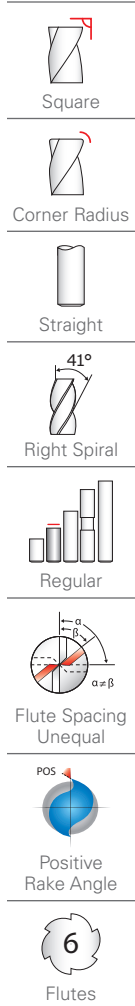
T-Carb® 51B



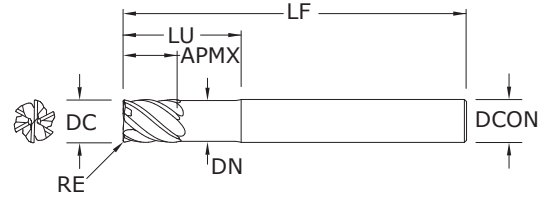


TOLERANCES (inch)		
DIAMETER	DC	DCON
1/4 - 1	+0.0000 / -0.0020	h6
CORNER RADIUS TOLERANCES (inch)		
RE = +0.0000 / -0.0020		

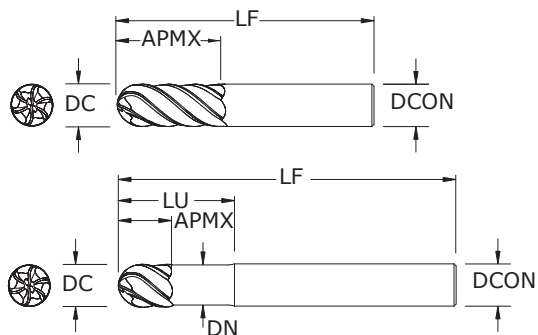
Cutting Diameter DC	Length of Cut APMX	Overall Length LF	Shank Diameter DCON	Corner Radius RE	Ti-NAMITE®-X (TX)
1/4	3/4	2-1/2	1/4	—	35100
1/4	3/4	2-1/2	1/4	.015	35112
1/4	3/4	2-1/2	1/4	.030	35150
3/8	1	2-1/2	3/8	—	35101
3/8	1	2-1/2	3/8	.015	35113
3/8	1	2-1/2	3/8	.030	35114
1/2	1-1/4	3	1/2	—	35102
1/2	1-1/4	3	1/2	.015	35151
1/2	1-1/4	3	1/2	.030	35115
1/2	1-1/4	3	1/2	.060	35152
1/2	1-1/4	3	1/2	.090	35116
1/2	1-1/4	3	1/2	.120	35117
5/8	1-5/8	3-1/2	5/8	—	35103
5/8	1-5/8	3-1/2	5/8	.015	35153
5/8	1-5/8	3-1/2	5/8	.030	35118
5/8	1-5/8	3-1/2	5/8	.060	35154
5/8	1-5/8	3-1/2	5/8	.090	35119
5/8	1-5/8	3-1/2	5/8	.120	35120
5/8	1-5/8	3-1/2	5/8	.190	35155
3/4	1-5/8	4	3/4	—	35104
3/4	1-5/8	4	3/4	.030	35121
3/4	1-5/8	4	3/4	.060	35156
3/4	1-5/8	4	3/4	.090	35122
3/4	1-5/8	4	3/4	.120	35123
3/4	1-5/8	4	3/4	.190	35157
3/4	1-5/8	4	3/4	.250	35158
1	2-5/8	6	1	—	35105
1	2-5/8	6	1	.030	35124
1	2-5/8	6	1	.060	35159
1	2-5/8	6	1	.090	35125
1	2-5/8	6	1	.120	35126
1	2-5/8	6	1	.190	35160
1	2-5/8	6	1	.250	35161



TOLERANCES (inch)		
DIAMETER	DC	DCON
1/4 - 1	+0.0000 / -0.0020	h6
CORNER RADIUS TOLERANCES (inch)		
RE = +0.0000 / -0.0020		



	Cutting Diameter DC	Length of Cut APMX	Overall Length LF	Shank Diameter DCON	Reach LU	Neck Diameter DN	Corner Radius RE	Ti-NAMITE®-X (TX)
Square	1/4	3/8	4	1/4	1-1/8	.237	—	35106
	1/4	3/8	4	1/4	1-1/8	.237	.015	35127
Corner Radius	1/4	3/8	4	1/4	1-1/8	.237	.030	35180
	3/8	1/2	4	3/8	2-1/8	.356	—	35107
Straight	3/8	1/2	4	3/8	2-1/8	.356	.015	35128
	3/8	1/2	4	3/8	2-1/8	.356	.030	35129
Right Spiral	1/2	5/8	4	1/2	2-1/4	.475	—	35108
	1/2	5/8	4	1/2	2-1/4	.475	.015	35181
Long Reach	1/2	5/8	4	1/2	2-1/4	.475	.030	35130
	1/2	5/8	4	1/2	2-1/4	.475	.060	35182
Flute Spacing Unequal	1/2	5/8	4	1/2	2-1/4	.475	.090	35131
	1/2	5/8	4	1/2	2-1/4	.475	.120	35132
Positive Rake Angle	5/8	3/4	5	5/8	2-1/2	.594	—	35109
	5/8	3/4	5	5/8	2-1/2	.594	.015	35183
6 Flutes	5/8	3/4	5	5/8	2-1/2	.594	.030	35133
	5/8	3/4	5	5/8	2-1/2	.594	.060	35184
	5/8	3/4	5	5/8	2-1/2	.594	.090	35134
	5/8	3/4	5	5/8	2-1/2	.594	.120	35135
	5/8	3/4	5	5/8	2-1/2	.594	.190	35185
	3/4	1	6	3/4	3-3/8	.712	—	35110
	3/4	1	6	3/4	3-3/8	.712	.030	35136
	3/4	1	6	3/4	3-3/8	.712	.060	35186
	3/4	1	6	3/4	3-3/8	.712	.090	35137
	3/4	1	6	3/4	3-3/8	.712	.120	35138
	3/4	1	6	3/4	3-3/8	.712	.190	35187
	3/4	1	6	3/4	3-3/8	.712	.250	35188
	1	1-1/4	6	1	3-3/8	.950	—	35111
	1	1-1/4	6	1	3-3/8	.950	.030	35139
	1	1-1/4	6	1	3-3/8	.950	.060	35189
	1	1-1/4	6	1	3-3/8	.950	.090	35140
	1	1-1/4	6	1	3-3/8	.950	.120	35141
	1	1-1/4	6	1	3-3/8	.950	.190	35190
	1	1-1/4	6	1	3-3/8	.950	.250	35191



TOLERANCES (inch)

DIAMETER	DC	DCON
1/4 - 3/8	+0.0000 / -0.0016	h6
1/2 - 1	+0.0000 / -0.0020	h6

CORNER RADIUS TOLERANCES (inch)

RE = +0.0000 / -0.0010

New Expanded Tools

Cutting Diameter DC	Length of Cut APMX	Overall Length LF	Shank Diameter DCON	Reach LU	Neck Diameter DN	Ti-NAMITE®-X (TX)
1/4	3/4	2-1/2	1/4	—	—	35220
1/4	3/8	4	1/4	1-1/8	.237	35221
3/8	1	2-1/2	3/8	—	—	35222
3/8	1/2	4	3/8	2-1/8	.356	35223
1/2	1-1/4	3	1/2	—	—	35224
1/2	5/8	4	1/2	2-1/4	.475	35225
5/8	1-5/8	3-1/2	5/8	—	—	35226
5/8	3/4	5	5/8	2-1/2	.594	35227
3/4	1-5/8	4	3/4	—	—	35228
3/4	1	6	3/4	3-3/8	.712	35229
1	2-5/8	6	1	—	—	35230
1	1-1/4	6	1	3-3/4	.950	35231

RE=1/2 Cutting Diameter (DC)



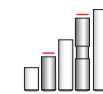
Ball



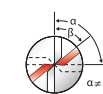
Straight



Right Spiral



Regular & Long Reach



Flute Spacing Unequal



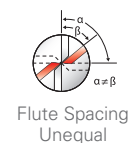
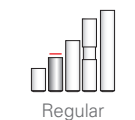
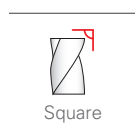
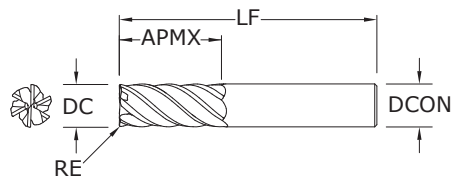
Positive Rake Angle



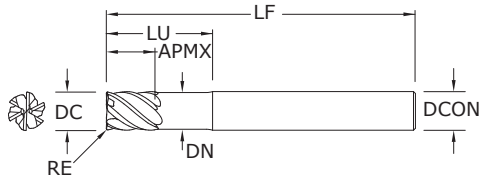
6 Flutes

TOLERANCES (mm)		
DIAMETER	DC	DCON
6,0 - 20,0	+0.0,000 / -0,050	h6

CORNER RADIUS TOLERANCES (inch)		
RE = +0,000 / -0,050		



Cutting Diameter DC	Length of Cut APMX	Overall Length LF	Shank Diameter DCON	Comer Radius RE	Ti-NAMITE®-X (TX)
6,0	19,0	63,0	6,0	–	45100
6,0	19,0	63,0	6,0	0,5	45112
6,0	19,0	63,0	6,0	1,0	45170
6,0	19,0	63,0	6,0	1,5	45171
8,0	20,0	63,0	8,0	–	45101
8,0	20,0	63,0	8,0	0,5	45113
8,0	20,0	63,0	8,0	1,0	45114
8,0	20,0	63,0	8,0	1,2	45150
8,0	20,0	63,0	8,0	1,5	45172
8,0	20,0	63,0	8,0	2,0	45173
10,0	22,0	75,0	10,0	–	45102
10,0	22,0	75,0	10,0	0,5	45174
10,0	22,0	75,0	10,0	1,0	45115
10,0	22,0	75,0	10,0	1,5	45116
10,0	22,0	75,0	10,0	2,0	45117
10,0	22,0	75,0	10,0	2,5	45175
12,0	26,0	83,0	12,0	–	45103
12,0	26,0	83,0	12,0	0,5	45176
12,0	26,0	83,0	12,0	0,76	45177
12,0	26,0	83,0	12,0	1,0	45118
12,0	26,0	83,0	12,0	1,5	45119
12,0	26,0	83,0	12,0	2,0	45120
12,0	26,0	83,0	12,0	2,5	45178
12,0	26,0	83,0	12,0	3,0	45179
16,0	32,0	92,0	16,0	–	45104
16,0	32,0	92,0	16,0	1,0	45121
16,0	32,0	92,0	16,0	1,5	45122
16,0	32,0	92,0	16,0	2,0	45123
16,0	32,0	92,0	16,0	2,5	45180
16,0	32,0	92,0	16,0	3,0	45181
16,0	32,0	92,0	16,0	4,0	45182
20,0	38,0	104,0	20,0	–	45105
20,0	38,0	104,0	20,0	1,0	45124
20,0	38,0	104,0	20,0	1,5	45125
20,0	38,0	104,0	20,0	2,0	45126
20,0	38,0	104,0	20,0	2,5	45183
20,0	38,0	104,0	20,0	3,0	45184
20,0	38,0	104,0	20,0	4,0	45185
20,0	38,0	104,0	20,0	5,0	45186



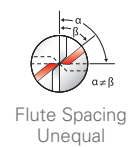
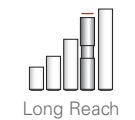
TOLERANCES (mm)

DIAMETER	DC	DCON
6,0 - 20,0	+0,000 / -0,050	h6

CORNER RADIUS TOLERANCES (mm)

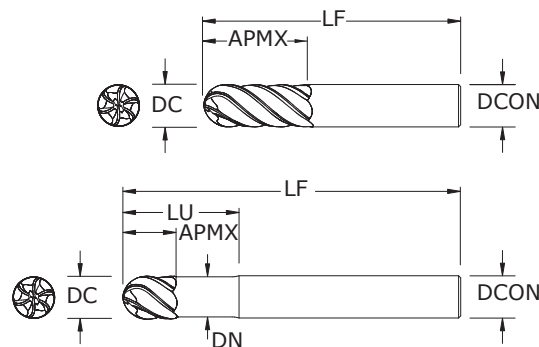
RE = +0,000 / -0,050

Cutting Diameter DC	Length of Cut APMX	Overall Length LF	Shank Diameter DCON	Reach LU	Neck Diameter DN	Corner Radius RE	Ti-NAMITE®-X (TX)
6,0	8,0	75,0	6,0	32,0	5,69	—	45106
6,0	8,0	75,0	6,0	32,0	5,69	0,5	45127
6,0	8,0	75,0	6,0	32,0	5,69	1,0	45187
6,0	8,0	75,0	6,0	32,0	5,69	1,5	45188
8,0	10,0	75,0	8,0	32,0	7,59	—	45107
8,0	10,0	75,0	8,0	32,0	7,59	0,5	45128
8,0	10,0	75,0	8,0	32,0	7,59	1,0	45129
8,0	10,0	75,0	8,0	32,0	7,59	1,5	45189
8,0	10,0	75,0	8,0	32,0	7,59	2,0	45190
10,0	12,0	100,0	10,0	40,0	9,50	—	45108
10,0	12,0	100,0	10,0	40,0	9,50	0,5	45191
10,0	12,0	100,0	10,0	40,0	9,50	1,0	45130
10,0	12,0	100,0	10,0	40,0	9,50	1,5	45131
10,0	12,0	100,0	10,0	40,0	9,50	2,0	45132
10,0	12,0	100,0	10,0	40,0	9,50	2,5	45192
12,0	15,0	100,0	12,0	48,0	11,38	—	45109
12,0	15,0	100,0	12,0	48,0	11,38	0,5	45193
12,0	15,0	100,0	12,0	48,0	11,38	0,76	45194
12,0	15,0	100,0	12,0	48,0	11,38	1,0	45133
12,0	15,0	100,0	12,0	48,0	11,38	1,5	45134
12,0	15,0	100,0	12,0	48,0	11,38	2,0	45135
12,0	15,0	100,0	12,0	48,0	11,38	2,5	45195
12,0	15,0	100,0	12,0	48,0	11,38	3,0	45196
16,0	20,0	115,0	16,0	65,0	15,19	—	45110
16,0	20,0	115,0	16,0	65,0	15,19	1,0	45136
16,0	20,0	115,0	16,0	65,0	15,19	1,5	45137
16,0	20,0	115,0	16,0	65,0	15,19	2,0	45138
16,0	20,0	115,0	16,0	65,0	15,19	2,5	45197
16,0	20,0	115,0	16,0	65,0	15,19	3,0	45198
16,0	20,0	115,0	16,0	65,0	15,19	4,0	45199
20,0	24,0	150,0	20,0	80,0	19,00	—	45111
20,0	24,0	150,0	20,0	80,0	19,00	1,0	45139
20,0	24,0	150,0	20,0	80,0	19,00	1,5	45140
20,0	24,0	150,0	20,0	80,0	19,00	2,0	45141
20,0	24,0	150,0	20,0	80,0	19,00	2,5	45200
20,0	24,0	150,0	20,0	80,0	19,00	3,0	45201
20,0	24,0	150,0	20,0	80,0	19,00	4,0	45202
20,0	24,0	150,0	20,0	80,0	19,00	5,0	45203



TOLERANCES (inch)		
DIAMETER	DC	DCON
6,0 - 10,0	+0,000 / -0,040	h6
12,0 - 20,0	+0,000 / -0,050	h6

CORNER RADIUS TOLERANCES (inch)		
RE = +0,000 / -0,025		



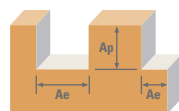
New Expanded Tools

	Cutting Diameter DC	Length of Cut APMX	Overall Length LF	Shank Diameter DCON	Reach LU	Neck Diameter DN	Ti-NAMITE®-X (TX)
Ball	6,0	19,0	63,0	6,0	—	—	45204
	6,0	8,0	75,0	6,0	32,0	5,68	45205
Straight	8,0	20,0	63,0	8,0	—	—	45206
	8,0	10,0	75,0	8,0	32,0	7,58	45207
Right Spiral	10,0	22,0	75,0	10,0	—	—	45208
	10,0	12,0	100,0	10,0	40,0	9,49	45209
Regular & Long Reach	12,0	26,0	83,0	12,0	—	—	45210
	12,0	15,0	100,0	12,0	48,0	11,37	45211
	16,0	32,0	92,0	16,0	—	—	45212
	16,0	20,0	115,0	16,0	65,0	15,18	45213
	20,0	38,0	104,0	20,0	—	—	45214
	20,0	24,0	150,0	20,0	80,0	18,99	45215

RE=1/2 Cutting Diameter (DC)



Series
51, 51CR, 51L,
51LC, 51B, 51LB
Fractional



Hardness

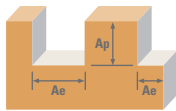
Vc
(sfm)

DC • in

1/4 3/8 1/2 5/8 3/4 1

P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.1	≤ 1	720	RPM	11002	7334	5501	4401	3667	2750
						(576-864)	Fz	0.0020	0.0035	0.0050	0.0055	0.0061	0.0071
						Feed (ipm)	132	154	165	145	134	117	
		HSM	≤ 0.05	≤ 2	915	RPM	13981	9321	6991	5592	4660	3495	
					(732-1098)	Fz	0.0028	0.0053	0.0070	0.0077	0.0085	0.0100	
						Feed (ipm)	235	296	294	258	238	210	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile	≤ 0.1	≤ 1	490	RPM	7487	4991	3744	2995	2496	1872
						(392-588)	Fz	0.0015	0.0029	0.0038	0.0042	0.0046	0.0054
						Feed (ipm)	67	87	85	75	69	61	
		HSM	≤ 0.05	≤ 2	620	RPM	9474	6316	4737	3789	3158	2368	
					(496-744)	Fz	0.0021	0.0039	0.0052	0.0057	0.0062	0.0073	
						Feed (ipm)	119	148	148	130	117	104	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.1	≤ 1	510	RPM	7793	5195	3896	3117	2598	1948
						(459-561)	Fz	0.0015	0.0028	0.0038	0.0041	0.0045	0.0053
						Feed (ipm)	70	87	89	77	70	62	
		HSM	≤ 0.05	≤ 2	650	RPM	9932	6621	4966	3973	3311	2483	
					(585-715)	Fz	0.0021	0.0038	0.0051	0.0056	0.0061	0.0072	
						Feed (ipm)	125	151	152	133	121	107	
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.1	≤ 1	350	RPM	5348	3565	2674	2139	1783	1337
						(315-385)	Fz	0.0012	0.0023	0.0030	0.0033	0.0036	0.0042
						Feed (ipm)	39	49	48	42	39	34	
		HSM	≤ 0.05	≤ 2	450	RPM	6876	4584	3438	2750	2292	1719	
					(405-495)	Fz	0.0017	0.0032	0.0042	0.0046	0.0050	0.0059	
						Feed (ipm)	70	88	87	76	69	61	
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile	≤ 0.1	≤ 1	325	RPM	4966	3311	2483	1986	1655	1242
						(293-358)	Fz	0.0012	0.0023	0.0030	0.0033	0.0036	0.0042
						Feed (ipm)	36	46	45	39	36	31	
		HSM	≤ 0.05	≤ 2	410	RPM	6265	4177	3132	2506	2088	1566	
					(369-451)	Fz	0.0017	0.0032	0.0042	0.0046	0.0050	0.0059	
						Feed (ipm)	64	80	79	69	63	55	

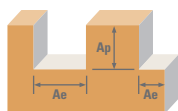
continued on next page

Series 51, 51CR, 51L, 51LC, 51B, 51LB Fractional		Hardness			Vc (sfm)	DC • in							
			Ae x DC	Ap x DC		1/4	3/8	1/2	5/8	3/4	1		
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRC		≤ 0.1	≤ 1	105	RPM	1604	1070	802	642	535	401
						(84-126)	Fz	0.0014	0.0027	0.0036	0.0039	0.0043	0.0050
						Feed (ipm)	13	17	17	15	14	12	
				≤ 0.05	≤ 2	130	RPM	1986	1324	993	795	662	497
						(104-156)	Fz	0.0016	0.0036	0.0048	0.0053	0.0058	0.0067
						Feed (ipm)	19	29	29	25	23	20	
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRC		≤ 0.1	≤ 1	80	RPM	1222	815	611	489	407	306
						(64-96)	Fz	0.0010	0.0018	0.0025	0.0027	0.0029	0.0034
						Feed (ipm)	7	9	9	8	7	6	
				≤ 0.05	≤ 2	100	RPM	1528	1019	764	611	509	382
						(80-120)	Fz	0.0013	0.0025	0.0034	0.0037	0.0041	0.0047
						Feed (ipm)	12	15	16	14	13	11	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRC		≤ 0.1	≤ 1	280	RPM	4278	2852	2139	1711	1426	1070
						(224-336)	Fz	0.0010	0.0018	0.0025	0.0027	0.0029	0.0034
						Feed (ipm)	26	31	32	28	25	22	
				≤ 0.05	≤ 2	355	RPM	5424	3616	2712	2170	1808	1356
						(284-426)	Fz	0.0013	0.0025	0.0034	0.0037	0.0041	0.0047
						Feed (ipm)	42	54	55	48	44	38	
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRC		≤ 0.1	≤ 1	155	RPM	2368	1579	1184	947	789	592
						(124-186)	Fz	0.0010	0.0018	0.0025	0.0027	0.0029	0.0034
						Feed (ipm)	14	17	18	15	14	12	
				≤ 0.05	≤ 2	200	RPM	3056	2037	1528	1222	1019	764
						(160-240)	Fz	0.0013	0.0025	0.0034	0.0037	0.0041	0.0047
						Feed (ipm)	24	31	31	27	25	22	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRC		≤ 0.1	≤ 1	240	RPM	3667	2445	1834	1467	1222	917
						(192-288)	Fz	0.0012	0.0023	0.0030	0.0034	0.0037	0.0043
						Feed (ipm)	26	34	33	30	27	24	
				≤ 0.05	≤ 2	305	RPM	4660	3107	2330	1864	1553	1165
						(244-366)	Fz	0.0017	0.0032	0.0042	0.0046	0.0050	0.0059
						Feed (ipm)	48	60	59	51	47	41	

Note:

- Bhn (Brinell) HRc (Rockwell C) HSM (High Speed Machining)
- rpm = Vc x 3.82 / DC
- ipm = Fz x 6 x rpm
- reduce speed and feed for materials harder than listed
- reduce feed and Ae when finish milling (.02 x DC maximum)
- feed rates listed have chip thinning adjustments included where applicable
- refer to the SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)

Series
51M, 51MCR,
51ML, 51MLC,
51MB, 51MLB
Metric



Hardness

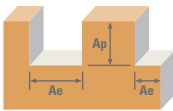
Vc
(m/min)

DC • mm

6 8 10 12 16 20

						DC • mm						
						6	8	10	12	16	20	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536		≤ 0.1	≤ 1	219	RPM	11633	8725	6980	5816	4362	3490
					(176-263)	Fz	0.048	0.081	0.101	0.121	0.142	0.158
					Feed (mm/min)	3350	4240	4230	4223	3717	3308	
			≤ 0.05	≤ 2	279	RPM	14784	11088	8870	7392	5544	4435
					(223-335)	Fz	0.066	0.113	0.141	0.169	0.197	0.220
					Feed (mm/min)	5854	7517	7504	7495	6553	5854	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100		≤ 0.1	≤ 1	149	RPM	7917	5938	4750	3958	2969	2375
					(119-179)	Fz	0.036	0.061	0.077	0.092	0.107	0.119
					Feed (mm/min)	1710	2173	2195	2185	1906	1696	
			≤ 0.05	≤ 2	189	RPM	10017	7513	6010	5009	3756	3005
					(151-227)	Fz	0.049	0.083	0.104	0.125	0.146	0.163
					Feed (mm/min)	2945	3741	3750	3756	3291	2939	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 0.1	≤ 1	155	RPM	8240	6180	4944	4120	3090	2472
					(140-171)	Fz	0.035	0.060	0.075	0.090	0.105	0.117
					Feed (mm/min)	1730	2225	2225	2225	1947	1735	
			≤ 0.05	≤ 2	198	RPM	10502	7877	6301	5251	3938	3151
					(178-218)	Fz	0.048	0.082	0.102	0.122	0.143	0.159
					Feed (mm/min)	3025	3875	3856	3844	3379	3006	
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L		≤ 0.1	≤ 1	107	RPM	5655	4241	3393	2827	2121	1696
					(96-117)	Fz	0.029	0.049	0.061	0.073	0.086	0.096
					Feed (mm/min)	984	1247	1242	1238	1094	977	
			≤ 0.05	≤ 2	137	RPM	7271	5453	4362	3635	2726	2181
					(123-151)	Fz	0.040	0.069	0.086	0.103	0.120	0.134
					Feed (mm/min)	1745	2258	2251	2247	1963	1754	
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450		≤ 0.1	≤ 1	99	RPM	5251	3938	3151	2626	1969	1575
					(89-109)	Fz	0.029	0.049	0.061	0.073	0.086	0.096
					Feed (mm/min)	914	1158	1153	1150	1016	907	
			≤ 0.05	≤ 2	125	RPM	6624	4968	3975	3312	2484	1987
					(112-137)	Fz	0.040	0.069	0.086	0.103	0.120	0.134
					Feed (mm/min)	1590	2057	2051	2047	1789	1598	

continued on next page

Series 51M, 51MCR, 51ML, 51MLC, 51MB, 51MLB Metric		Hardness			Vc (m/min)	DC • mm							
			Ae x DC	Ap x DC		6	8	10	12	16	20		
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRC		≤ 0.1	≤ 1	32	RPM	1696	1272	1018	848	636	509
						(26-38)	Fz	0.034	0.057	0.071	0.085	0.100	0.110
						Feed (mm/min)	346	435	434	433	382	336	
			≤ 0.05	≤ 2	40	RPM	2100	1575	1260	1050	788	630	
					(32-48)	Fz	0.046	0.077	0.097	0.120	0.140	0.150	
					Feed (mm/min)	580	728	733	756	662	567		
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRC		≤ 0.1	≤ 1	24	RPM	1293	969	776	646	485	388
						(20-29)	Fz	0.023	0.039	0.049	0.059	0.068	0.077
						Feed (mm/min)	178	227	228	229	198	179	
			≤ 0.05	≤ 2	30	RPM	1616	1212	969	808	606	485	
					(24-37)	Fz	0.032	0.054	0.068	0.081	0.095	0.110	
					Feed (mm/min)	310	393	396	393	345	320		
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRC		≤ 0.1	≤ 1	85	RPM	4524	3393	2714	2262	1696	1357
						(68-102)	Fz	0.023	0.039	0.049	0.059	0.068	0.077
						Feed (mm/min)	624	794	798	801	692	627	
			≤ 0.05	≤ 2	108	RPM	5736	4302	3441	2868	2151	1721	
					(87-130)	Fz	0.032	0.054	0.068	0.081	0.095	0.110	
					Feed (mm/min)	1101	1394	1404	1394	1226	1136		
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRC		≤ 0.1	≤ 1	47	RPM	2504	1878	1503	1252	939	751
						(38-57)	Fz	0.023	0.039	0.049	0.059	0.068	0.077
						Feed (mm/min)	346	440	442	443	383	347	
			≤ 0.05	≤ 2	61	RPM	3231	2424	1939	1616	1212	969	
					(49-73)	Fz	0.032	0.054	0.068	0.081	0.095	0.110	
					Feed (mm/min)	620	785	791	785	691	640		
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRC		≤ 0.1	≤ 1	73	RPM	3878	2908	2327	1939	1454	1163
						(59-88)	Fz	0.029	0.049	0.061	0.073	0.086	0.096
						Feed (mm/min)	675	855	852	849	750	670	
			≤ 0.05	≤ 2	93	RPM	4928	3696	2957	2464	1848	1478	
					(74-112)	Fz	0.040	0.069	0.086	0.103	0.120	0.134	
					Feed (mm/min)	1183	1530	1526	1523	1331	1189		

Note:

- Bhn (Brinell) HRc (Rockwell C) HSM (High Speed Machining)
- rpm = (Vc x 1000) / (DC x 3.14)
- mm/min = Fz x 6 x rpm
- reduce speed and feed for materials harder than listed
- reduce feed and Ae when finish milling (.02 x DC maximum)
- feed rates listed have chip thinning adjustments included where applicable
- refer to the SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)

SOLUTIONS AROUND THE GLOBE

KYOCERA SGS Precision Tools is an ISO 9001:2015 Certified leader of round solid carbide cutting tool technology for the aerospace, metalworking, and automotive industries with manufacturing sites in the United States and United Kingdom. Our global network of Sales Representatives, Industrial Distributors, and Agents blanket the world selling into more than 60 countries.

LEADERS IN SOLID CARBIDE TOOL TECHNOLOGY

Brand names such as Z-Carb, S-Carb®, V-Carb, Hi-PerCarb®, Multi-Carb have become synonymous with high performance tooling in the machining and metalworking industry.

We're proud to have pioneered some of the world's most advanced cutting technology right here on our Northeast Ohio manufacturing campus. KSPT high performance end mills, drills and routers are increasing productivity and reducing cost around the world.

EXCEEDING CUSTOMER EXPECTATIONS

As the world's manufacturing needs change, so does KSPT. It's all about the science, starting with our lab inspected substrate materials to our tool designs and coatings. Our exceptional team of researchers, engineers, and machinists are dedicated to developing the absolute best and delivering the ultimate Value at the Spindle®.

- Incredible batch-to-batch consistency
- Metallurgical lab dedicated to testing and rigorous quality control
- ISO 9001:2015 Certified quality procedures
- Patented geometries that extend tool life, reduce chatter, cut cycle times, and improve part quality—even at extreme parameters
- Specialists in extreme and demanding product applications
- Comprehensive tooling services
- Experienced Field Sales Engineers who work to optimize a tool for your particular application
- Dedicated multi-lingual customer service representatives

SGS PRODUCTS ARE DISTRIBUTED BY:



www.kyocera-sgstool.com



VALUE AT THE SPINDLE®

UNITED STATES OF AMERICA

KYOCERA SGS Precision Tools
150 Marc Drive
Cuyahoga Falls, Ohio 44223 U.S.A.
customer service -
US and Canada: (330) 686-5700
fax - US & Canada: (800) 447-4017
international fax: (330) 686-2146
orders: sales@kyocera-sgstool.com
web: www.kyocera-sgstool.com

UNITED KINGDOM

KYOCERA SGS Precision Tools Europe Ltd.
10 Ashville Way
Wokingham, Berkshire
RG41 2PL England
phone: (44) 1189-795-200
fax: (44) 1189-795-295
e-mail: SalesEU@kyocera-sgstool.com
web: www.kyocera-sgstool.co.uk

JAPAN

KYOCERA Corporation
International Sales Dept.
6 Takeda Tobadono-cho,
Fushimi-ku, Kyoto 612-8501, Japan
phone: +81-75-604-3473
fax: +81-75-604-3472
web: global.kyocera.com/prdct/tool/index.html

COMMERCIAL OFFICES

EASTERN EUROPE

SINTCOM
Sintcom Tools
95 Arsenalski Blvd.
1421 Sofia, Bulgaria
phone: (359) 283-64421
fax: (359) 286-52493
e-mail: sintcom@sintcomtools.com

FRANCE

DOGA USINAGE
8, Avenue Gutenberg CS 50510
78317 Maurepas Cedex, France
phone: +33 1 30 66041 41
e-mail: usinage-outils@dogaf.fr
web: www.dogaf.fr

GERMANY

KADIGO Tool Systems GmbH
Walramster. 27
65510 Idstein, Germany
phone: +49-212-645573-0
fax: +49-212-38089693
e-mail: info@kadigo-ts.com

INDIA

KYOCERA Asia Pacific India Pvt. Ltd
Plot No.51, Phase-I,
Udyog Vihar Gurgaon 122016,
Haryana, India
phone: +91-124-4025022
fax: +91-124-4025001

KOREA

KYOCERA Precision Tools Korea Co., Ltd.
2LT 69BL, Namdong Industrial Estate,
638-1, Kozan-Dong, Namdong Incheon,
Korea
phone: +82-32-821-8365
fax: +82-32-821-8369
web: www.kptk.co.kr/

POLAND

KYOCERA SGS Precision Tools
phone: +48 530 432 002
e-mail: SalesEU@kyocera-sgstool.com

RUSSIA

HALTEC
phone: (7) 495-252-05-00
e-mail: info@haltecr.ru
web: www.haltecr.ru

SPAIN

KYOCERA SGS Precision Tools IBERICA
e-mail: SalesEU@kyocera-sgstool.com

THAILAND

KYOCERA Asia Pacific (Thailand) Co., Ltd.
1 Capital Work Place Building
7th Floor, Soi Chamchan, Sukhumvit
55 Road, Klongton Nua, Wattana,
Bangkok 10110, Thailand
phone: +66-2-030-6688
fax: +66-2-030-6600

SINGAPORE

KYOCERA Asia Pacific Pte. Ltd.
298 Tiong Bahru Road, #13-03/05 Central Plaza,
Singapore 168730
phone: +65-6373-6700
fax: +65-6271-0600
web: asia.kyocera.com/products/cuttingtools/index.html

CHINA

KYOCERA (China) Sales & Trading Corporation
Room 140, Building A3, Daning Central Square,
No. 700 Wanrong Road,
Zhabei District, Shanghai, 200072,
P.R. China
phone: +86-21-3660-7711
fax: +86-21-568-6200
web: www.kyocera.com.cn/prdct/cuttingtool

