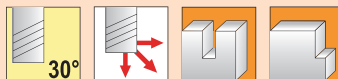


160M (860M metric) - 2 Flute

170M (870M metric) - 4 Flute

.0050" - .0787"
(0.13mm - 2.00mm)

Technical information:
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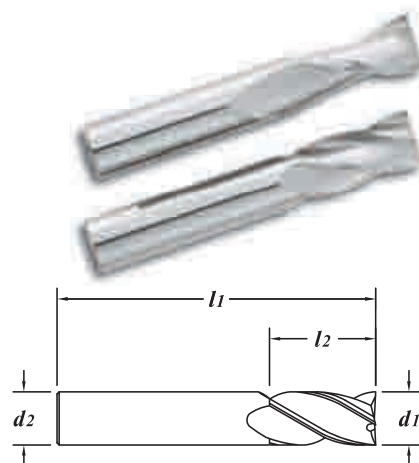


TOLERANCES

d_1	$\leq .030"$	$+0.004" - .0004" (+.0100 - .0100mm)$
	$\geq 1/32"$	$+0.000" - .002" (+.000 - .050mm)$
d_2	3mm - 6mm	$+0.000" - .0003" (-.0000 - .0075mm)$
	1/4" - 1"	$-0.001" - .0004" (-.0025 - .0100mm)$

Stub Length

Solid submicron grain carbide end mill - center cutting
Shorter flute length for rigidity
Extremely versatile
TiAlN Coated - page 120



2 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal		Metric							
01200	-	.0050	.0050"	0.13	1/8"	1-1/2"	.008"	18.50	17.70	16.89	16.09
01210	-	.0060	.0060"	0.15	1/8"	1-1/2"	.009"	18.50	17.70	16.89	16.09
01220	-	.0070	.0070"	0.18	1/8"	1-1/2"	.011"	17.41	16.65	15.89	15.14
01230	-	.0080	.0080"	0.20	1/8"	1-1/2"	.012"	17.41	16.65	15.89	15.14
01240	-	.0090	.0090"	0.23	1/8"	1-1/2"	.014"	16.43	15.71	15.01	14.29
01250	-	.0100	.0100"	0.25	1/8"	1-1/2"	.015"	16.43	15.71	15.01	14.29
01260	-	.0110	.0110"	0.28	1/8"	1-1/2"	.017"	15.22	14.55	13.89	13.23
01270	-	.0120	.0120"	0.30	1/8"	1-1/2"	.018"	15.22	14.55	13.89	13.23
01280	-	.0130	.0130"	0.33	1/8"	1-1/2"	.020"	15.13	14.48	13.81	13.16
01290	-	.0140	.0140"	0.36	1/8"	1-1/2"	.021"	15.13	14.48	13.81	13.16
01300	-	.0150	.0150"	0.38	1/8"	1-1/2"	.023"	15.13	14.48	13.81	13.16
01310	-	.0160	.0160"	0.41	1/8"	1-1/2"	.024"	14.92	14.28	13.62	12.98
01320	-	.0170	.0170"	0.43	1/8"	1-1/2"	.026"	14.92	14.28	13.62	12.98
01330	-	.0180	.0180"	0.46	1/8"	1-1/2"	.027"	14.65	14.02	13.37	12.74
01340	-	.0190	.0190"	0.48	1/8"	1-1/2"	.029"	14.65	14.02	13.37	12.74
01350	-	.0200	.0200"	0.51	1/8"	1-1/2"	.030"	14.65	14.02	13.37	12.74
01360	-	.0210	.0210"	0.53	1/8"	1-1/2"	.032"	14.65	14.02	13.37	12.74
01370	-	.0220	.0220"	0.56	1/8"	1-1/2"	.033"	14.49	13.85	13.23	12.59
01380	-	.0230	.0230"	0.58	1/8"	1-1/2"	.035"	14.49	13.85	13.23	12.59
01390	-	.0240	.0240"	0.61	1/8"	1-1/2"	.036"	14.49	13.85	13.23	12.59
01400	-	.0250	.0250"	0.64	1/8"	1-1/2"	.038"	13.66	13.06	12.47	11.88
01410	-	.0260	.0260"	0.66	1/8"	1-1/2"	.039"	13.66	13.06	12.47	11.88
01420	-	.0270	.0270"	0.69	1/8"	1-1/2"	.041"	12.25	11.72	11.19	10.65
01430	-	.0280	.0280"	0.71	1/8"	1-1/2"	.042"	12.25	11.72	11.19	10.65
01440	-	.0290	.0290"	0.74	1/8"	1-1/2"	.044"	12.25	11.72	11.19	10.65
01450	-	.0300	.0300"	0.76	1/8"	1-1/2"	.045"	12.25	11.72	11.19	10.65
01010	02010	.0312	1/32"	0.79	1/8"	1-1/2"	1/16"	8.91	8.53	8.13	7.75
01510	02510	.0394		1.00	3.0	38	2	9.36	8.95	8.55	8.14
01020	02020	.0469	3/64"	1.19	1/8"	1-1/2"	3/32"	8.91	8.53	8.13	7.75
01520	02520	.0591		1.50	3.0	38	3	9.36	8.95	8.55	8.14
01030	02030	.0625	1/16"	1.59	1/8"	1-1/2"	1/8"	7.07	6.76	6.46	6.15
01530	02530	.0787		2.00	3.0	38	4	7.44	7.11	6.79	6.47

160M (860M metric) - 2 Flute (continued)
170M (870M metric) - 4 Flute (continued)

.0938" - 1.000"
(2.38mm - 25.40mm)

END MILLS

2 Flute EDP#	4 Flute EDP#	$d1$ †			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter	Metric							
01040	02040	.0938	3/32"	2.38	1/8"	1-1/2"	3/16"	6.70	6.41	6.12	5.82
01540	02540	.0984		2.50	3.0	38	5	7.03	6.73	6.42	6.12
01550	02550	.1181		3.00	3.0	38	6	6.86	6.56	6.27	5.97
01050	02050	.1250	1/8"	3.17	1/8"	1-1/2"	1/4"	6.51	6.23	5.95	5.66
01560	02560	.1378		3.50	4.0	50	7	9.62	9.20	8.79	8.36
01060	02060	.1562	5/32"	3.97	3/16"	2"	5/16"	9.14	8.75	8.35	7.95
01570	02570	.1575		4.00	4.0	50	8	9.09	8.69	8.30	7.90
01580	02580	.1772		4.50	5.0	50	9.5	12.06	11.54	11.01	10.49
01070	02070	.1875	3/16"	4.76	3/16"	2"	3/8"	8.64	8.27	7.89	7.52
01590	02590	.1969		5.00	5.0	50	10	11.24	10.75	10.26	9.78
01080	02080	.2188	7/32"	5.56	1/4"	2"	7/16"	11.47	10.97	10.47	9.97
01600	02600	.2362		6.00	6.0	50	12	11.91	11.39	10.87	10.36
01090	02090	.2500	1/4"	6.35	1/4"	2"	1/2"	11.30	10.82	10.32	9.83
01610	02610	.2756		7.00	7.0	50	12	15.49	14.81	14.14	13.47
01100	02100	.3125	5/16"	7.94	5/16"	2"	1/2"	15.46	14.79	14.12	13.45
01620	02620	.3150		8.00	8.0	50	12	16.27	15.56	14.85	14.14
01630	02630	.3543		9.00	9.0	50	14	20.09	19.22	18.35	17.47
01110	02110	.3750	3/8"	9.52	3/8"	2"	5/8"	19.10	18.27	17.44	16.61
01640	02640	.3937		10.00	10.0	50	16	22.19	21.23	20.26	19.30
01650	02650	.4331		11.00	11.0	65	19	25.94	24.81	23.68	22.56
01120	02120	.4375	7/16"	11.11	7/16"	2-1/2"	5/8"	23.62	22.59	21.57	20.54
01660	02660	.4724		12.00	12.0	65	19	33.16	31.71	30.27	28.83
01130	02130	.5000	1/2"	12.70	1/2"	2-1/2"	5/8"	31.50	30.13	28.77	27.39
01140	02140	.6250	5/8"	15.87	5/8"	3"	3/4"	60.22	57.60	54.98	52.36
01670	02670	.6299		16.00	16.0	75	19	63.37	60.61	57.86	55.10
01150	02150	.7500	3/4"	19.05	3/4"	3"	1"	86.59	82.83	79.06	75.30
01680	02680	.7874		20.00	20.0	75	25	117.45	112.34	107.23	102.13
-	02690	.9843		25.00	25.0	75	25	133.47	127.67	121.87	116.06
-	02160	1.000	1"	25.40	1"	3"	1"	149.02	142.54	136.06	129.58

160MA (860MA metric) - 2 Flute
170MA (870MA metric) - 4 Flute

Technical information:
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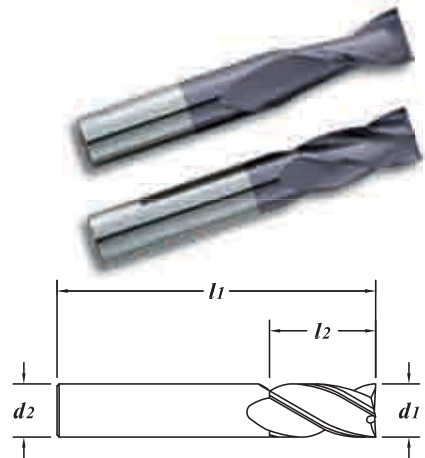


TOLERANCES

d_1	$+0.000" -0.002" (+0.000 -0.050\text{mm})$
d_2	$3\text{mm} - 6\text{mm} \quad +0.0000" -0.0003" (-0.0000 -0.0075\text{mm})$
	$1/4" - 1" \quad -0.0001" -0.0004" (-0.0025 -0.0100\text{mm})$

Stub Length - TiALN Coated

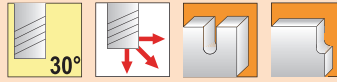
Solid submicron grain carbide end mill - center cutting
Shorter flute length for rigidity
Dry or semi-dry machining
Up to 40% faster than uncoated
Extremely versatile
Uncoated - page 118



2 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal		Metric							
01017	02017	.0312	1/32"	0.79	1/8"	1-1/2"	1/16"	11.07	10.59	10.10	9.62
01517	02517	.0394		1.00	3.0	38	2	11.51	11.01	10.51	10.02
01027	02027	.0469	3/64"	1.19	1/8"	1-1/2"	3/32"	11.07	10.59	10.10	9.62
01527	02527	.0591		1.50	3.0	38	3	11.51	11.01	10.51	10.02
01037	02037	.0625	1/16"	1.59	1/8"	1-1/2"	1/8"	9.22	8.82	8.42	8.02
01537	02537	.0787		2.00	3.0	38	4	9.59	9.17	8.76	8.34
01047	02047	.0938	3/32"	2.38	1/8"	1-1/2"	3/16"	8.84	8.46	8.07	7.69
01547	02547	.0984		2.50	3.0	38	5	9.17	8.78	8.37	7.98
01557	02557	.1181		3.00	3.0	38	6	9.01	8.61	8.23	7.83
01057	02057	.1250	1/8"	3.17	1/8"	1-1/2"	1/4"	8.64	8.27	7.89	7.52
01567	02567	.1378		3.50	4.0	50	7	11.75	11.24	10.73	10.22
01067	02067	.1562	5/32"	3.97	3/16"	2"	5/16"	11.27	10.78	10.30	9.81
01577	02577	.1575		4.00	4.0	50	8	11.24	10.75	10.26	9.78
01587	02587	.1772		4.50	5.0	50	9.5	15.40	14.74	14.06	13.40
01077	02077	.1875	3/16"	4.76	3/16"	2"	3/8"	10.80	10.33	9.86	9.39
01597	02597	.1969		5.00	5.0	50	10	14.58	13.95	13.31	12.68
01087	02087	.2188	7/32"	5.56	1/4"	2"	7/16"	14.82	14.18	13.53	12.89
01607	02607	.2362		6.00	6.0	50	12	15.25	14.58	13.93	13.26
01097	02097	.2500	1/4"	6.35	1/4"	2"	1/2"	14.65	14.02	13.37	12.74
01617	02617	.2756		7.00	7.0	50	12	20.26	19.38	18.50	17.62
01107	02107	.3125	5/16"	7.94	5/16"	2"	1/2"	20.24	19.35	18.48	17.60
01627	02627	.3150		8.00	8.0	50	12	21.05	20.13	19.22	18.30
01637	02637	.3543		9.00	9.0	50	14	24.87	23.78	22.70	21.62
01117	02117	.3750	3/8"	9.52	3/8"	2"	5/8"	23.87	22.83	21.79	20.76
01647	02647	.3937		10.00	10.0	50	16	27.61	26.42	25.21	24.01
01657	02657	.4331		11.00	11.0	65	19	33.47	32.01	30.56	29.10
01127	02127	.4375	7/16"	11.11	7/16"	2-1/2"	5/8"	31.15	29.80	28.44	27.08
01667	02667	.4724		12.00	12.0	65	19	40.67	38.91	37.14	35.37
01137	02137	.5000	1/2"	12.70	1/2"	2-1/2"	5/8"	39.02	37.33	35.63	33.94
01147	02147	.6250	5/8"	15.87	5/8"	3"	3/4"	68.94	65.95	62.95	59.95
01677	02677	.6299		16.00	16.0	75	19	72.08	68.95	65.81	62.68
01157	02157	.7500	3/4"	19.05	3/4"	3"	1"	97.04	92.82	88.61	84.39
01687	02687	.7874		20.00	20.0	75	25	133.90	128.08	122.25	116.44
-	02697	.9843		25.00	25.0	75	25	149.93	143.41	136.88	130.37
-	02167	1.000	1"	25.40	1"	3"	1"	165.50	158.30	151.10	143.90

180M (980M metric) - 2 Flute
190M (990M metric) - 4 Flute

Technical information:
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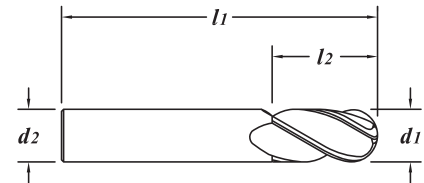


TOLERANCES

d_1	$\leq .030"$	$+0.004" - 0.004" (+.0100 - .0100\text{mm})$
	$\geq 1/32"$	$+0.000" - 0.002" (+.000 - .050\text{mm})$
d_2	3mm - 6mm	$+0.000" - 0.003" (-.0000 - .0075\text{mm})$
	1/4" - 1"	$-0.001" - 0.004" (-.0025 - .0100\text{mm})$
Ball radius		$+0.000" - 0.001" (+.000 - .025\text{mm})$

Stub Length - Ball End

Solid submicron grain carbide end mill - center cutting
Shorter flute length for rigidity
Extremely versatile
TiAlN Coated - page 122



2 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter	Metric							
03250	-	.0100	.0100"	0.25	1/8"	1-1/2"	.015"	18.89	18.06	17.24	16.42
03300	-	.0150	.0150"	0.38	1/8"	1-1/2"	.023"	18.80	17.98	17.17	16.35
03350	-	.0200	.0200"	0.51	1/8"	1-1/2"	.030"	18.30	17.50	16.71	15.91
03400	-	.0250	.0250"	0.64	1/8"	1-1/2"	.038"	17.69	16.92	16.15	15.38
03450	-	.0300	.0300"	0.76	1/8"	1-1/2"	.045"	15.24	14.57	13.92	13.25
03010	04010	.0312	1/32"	0.79	1/8"	1-1/2"	1/16"	11.30	10.82	10.32	9.83
03510	04510	.0394		1.00	3.0	38	2	11.87	11.35	10.84	10.32
03020	04020	.0469	3/64"	1.19	1/8"	1-1/2"	3/32"	11.30	10.82	10.32	9.83
03520	04520	.0591		1.50	3.0	38	3	11.87	11.35	10.84	10.32
03030	04030	.0625	1/16"	1.59	1/8"	1-1/2"	1/8"	8.32	7.96	7.59	7.24
03530	04530	.0787		2.00	3.0	38	4	8.77	8.38	8.01	7.62
03040	04040	.0938	3/32"	2.38	1/8"	1-1/2"	3/16"	7.87	7.53	7.19	6.84
03540	04540	.0984		2.50	3.0	38	5	8.27	7.90	7.55	7.19
03550	04550	.1181		3.00	3.0	38	6	8.06	7.71	7.36	7.01
03050	04050	.1250	1/8"	3.17	1/8"	1-1/2"	1/4"	7.66	7.33	7.00	6.67
03560	04560	.1378		3.50	4.0	50	7	11.29	10.81	10.32	9.82
03060	04060	.1562	5/32"	3.97	3/16"	2"	5/16"	10.73	10.26	9.80	9.33
03570	04570	.1575		4.00	4.0	50	8	10.71	10.24	9.78	9.32
03580	04580	.1772		4.50	5.0	50	9.5	14.18	13.56	12.94	12.32
03070	04070	.1875	3/16"	4.76	3/16"	2"	3/8"	10.18	9.73	9.30	8.85
03590	04590	.1969		5.00	5.0	50	10	13.34	12.76	12.18	11.61
03080	04080	.2188	7/32"	5.56	1/4"	2"	7/16"	13.50	12.92	12.32	11.74
03600	04600	.2362		6.00	6.0	50	12	14.02	13.41	12.80	12.19
03090	04090	.2500	1/4"	6.35	1/4"	2"	1/2"	13.30	12.72	12.15	11.56
03610	04610	.2756		7.00	7.0	50	12	18.35	17.54	16.75	15.95
03100	04100	.3125	5/16"	7.94	5/16"	2"	1/2"	18.18	17.39	16.60	15.81
03620	04620	.3150		8.00	8.0	50	12	19.14	18.30	17.47	16.64
03630	04630	.3543		9.00	9.0	50	14	23.65	22.62	21.59	20.56
03110	04110	.3750	3/8"	9.52	3/8"	2"	5/8"	22.46	21.49	20.51	19.53
03640	04640	.3937		10.00	10.0	50	16	26.12	24.99	23.86	22.71
03650	04650	.4331		11.00	11.0	65	19	30.05	28.74	27.44	26.12
03120	04120	.4375	7/16"	11.11	7/16"	2-1/2"	5/8"	27.78	26.57	25.37	24.16
03660	04660	.4724		12.00	12.0	65	19	38.98	37.28	35.59	33.89
03130	04130	.5000	1/2"	12.70	1/2"	2-1/2"	5/8"	37.04	35.43	33.82	32.21
03140	04140	.6250	5/8"	15.87	5/8"	3"	3/4"	70.87	67.79	64.70	61.62
03670	04670	.6299		16.00	16.0	75	19	74.58	71.33	68.09	64.85
03150	04150	.7500	3/4"	19.05	3/4"	3"	1"	101.90	97.47	93.04	88.61
03680	04680	.7874		20.00	20.0	75	25	138.17	132.16	126.16	120.15
-	04690	.9843		25.00	25.0	75	25	157.04	150.21	143.38	136.56

180MA (980MA metric) - 2 Flute
190MA (990MA metric) - 4 Flute

Technical information:
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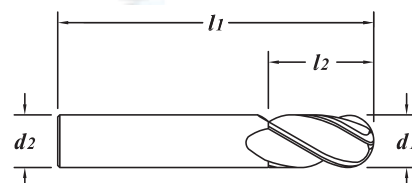


TOLERANCES

d_1	$\leq .030"$	$+0.004" - 0.004" (+0.100 - .0100mm)$
	$\geq 1/32"$	$+0.000" - 0.002" (+0.000 - .050mm)$
d_2	3mm - 6mm	$+0.0000" - 0.003" (-0.0000 - .0075mm)$
	1/4" - 1"	$-0.001" - 0.004" (-.0025 - .0100mm)$
Ball radius	$+0.000" - 0.001" (+0.000 - .025mm)$	

Stub Length - Ball End - TiAlN Coated

Solid submicron grain carbide end mill - center cutting
Shorter flute length for rigidity
Dry or semi-dry machining
Up to 40% faster than uncoated
Extremely versatile
Uncoated - page 121



2 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter	Metric							
03017	04017	.0312	1/32"	0.79	1/8"	1-1/2"	1/16"	13.46	12.88	12.28	11.70
03517	04517	.0394		1.00	3.0	38	2	14.02	13.41	12.80	12.19
03027	04027	.0469	3/64"	1.19	1/8"	1-1/2"	3/32"	13.46	12.88	12.28	11.70
03527	04527	.0591		1.50	3.0	38	3	14.02	13.41	12.80	12.19
03037	04037	.0625	1/16"	1.59	1/8"	1-1/2"	1/8"	10.46	10.00	9.56	9.10
03537	04537	.0787		2.00	3.0	38	4	10.91	10.43	9.96	9.48
03047	04047	.0938	3/32"	2.38	1/8"	1-1/2"	3/16"	10.02	9.58	9.14	8.70
03547	04547	.0984		2.50	3.0	38	5	10.42	9.96	9.52	9.06
03557	04557	.1181		3.00	3.0	38	6	10.20	9.76	9.32	8.87
03057	04057	.1250	1/8"	3.17	1/8"	1-1/2"	1/4"	9.81	9.38	8.95	8.53
03567	04567	.1378		3.50	4.0	50	7	13.45	12.86	12.28	11.69
03067	04067	.1562	5/32"	3.97	3/16"	2"	5/16"	12.86	12.30	11.74	11.19
03577	04577	.1575		4.00	4.0	50	8	12.85	12.29	11.74	11.18
03587	04587	.1772		4.50	5.0	50	9.5	17.51	16.75	16.00	15.23
03077	04077	.1875	3/16"	4.76	3/16"	2"	3/8"	12.32	11.78	11.25	10.71
03597	04597	.1969		5.00	5.0	50	10	16.68	15.95	15.24	14.51
03087	04087	.2188	7/32"	5.56	1/4"	2"	7/16"	16.85	16.12	15.38	14.65
03607	04607	.2362		6.00	6.0	50	12	17.36	16.60	15.85	15.09
03097	04097	.2500	1/4"	6.35	1/4"	2"	1/2"	16.65	15.92	15.20	14.48
03617	04617	.2756		7.00	7.0	50	12	23.12	22.11	21.11	20.10
03107	04107	.3125	5/16"	7.94	5/16"	2"	1/2"	22.95	21.95	20.96	19.96
03627	04627	.3150		8.00	8.0	50	12	23.91	22.87	21.83	20.79
03637	04637	.3543		9.00	9.0	50	14	28.41	27.18	25.94	24.71
03117	04117	.3750	3/8"	9.52	3/8"	2"	5/8"	27.24	26.05	24.87	23.68
03647	04647	.3937		10.00	10.0	50	16	31.54	30.17	28.80	27.42
03657	04657	.4331		11.00	11.0	65	19	37.56	35.93	34.30	32.67
03127	04127	.4375	7/16"	11.11	7/16"	2-1/2"	5/8"	35.31	33.77	32.24	30.70
03667	04667	.4724		12.00	12.0	65	19	46.50	44.48	42.45	40.44
03137	04137	.5000	1/2"	12.70	1/2"	2-1/2"	5/8"	44.56	42.63	40.68	38.75
03147	04147	.6250	5/8"	15.87	5/8"	3"	3/4"	79.58	76.12	72.66	69.20
03677	04677	.6299		16.00	16.0	75	19	83.31	79.70	76.07	72.45
03157	04157	.7500	3/4"	19.05	3/4"	3"	1"	112.35	107.46	102.59	97.70
03687	04687	.7874		20.00	20.0	75	25	154.63	147.91	141.18	134.46
-	04697	.9843		25.00	25.0	75	25	173.49	165.95	158.40	150.86

165M (865M metric) - 2 Flute
175M (875M metric) - 4 Flute

Technical information:
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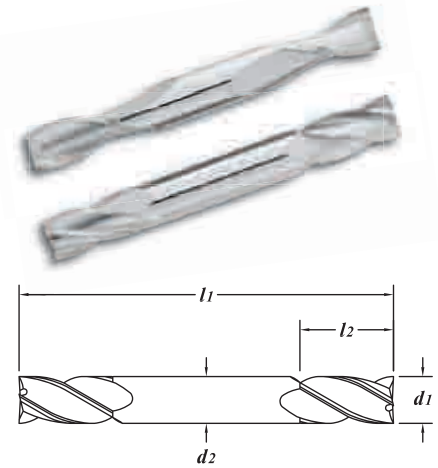


TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$3\text{mm} - 6\text{mm} \quad +.0000" - .0003" (+.0000 - .0075\text{mm})$ $1/4" - 1/2" \quad -.0001" - .0004" (-.0025 - .0100\text{mm})$

Stub Length - Double End

Solid submicron grain carbide end mill - center cutting
Shorter flute length for rigidity
Extremely versatile
TiAlN Coated - page 124



2 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter	Metric							
05010	06010	.0312	1/32"	0.79	1/8"	1-1/2"	1/16"	16.02	15.32	14.62	13.93
05510	06510	.0394		1.00	3.0	38	2	16.87	16.13	15.40	14.66
05020	06020	.0469	3/64"	1.19	1/8"	1-1/2"	3/32"	16.02	15.32	14.62	13.93
05520	06520	.0591		1.50	3.0	38	3	16.87	16.13	15.40	14.66
05030	06030	.0625	1/16"	1.59	1/8"	1-1/2"	1/8"	16.02	15.32	14.62	13.93
05530	06530	.0787		2.00	3.0	38	4	16.87	16.13	15.40	14.66
05040	06040	.0938	3/32"	2.38	1/8"	1-1/2"	3/16"	16.02	15.32	14.62	13.93
05540	06540	.0984		2.50	3.0	38	5	16.87	16.13	15.40	14.66
05550	06550	.1181		3.00	3.0	38	6	10.45	9.99	9.55	9.09
05050	06050	.1250	1/8"	3.17	1/8"	1-1/2"	1/4"	9.93	9.50	9.07	8.63
05560	06560	.1378		3.50	4.0	50	7	18.57	17.76	16.96	16.15
05060	06060	.1562	5/32"	3.97	3/16"	2"	5/16"	17.63	16.86	16.10	15.33
05570	06570	.1575		4.00	4.0	50	8	15.14	14.49	13.82	13.17
05580	06580	.1772		4.50	5.0	65	9.5	21.65	20.71	19.77	18.82
05070	06070	.1875	3/16"	4.76	3/16"	2"	3/8"	14.38	13.76	13.14	12.51
05590	06590	.1969		5.00	5.0	65	10	19.13	18.29	17.46	16.63
05080	06080	.2188	7/32"	5.56	1/4"	2-1/2"	1/2"	20.56	19.67	18.77	17.88
05600	06600	.2362		6.00	6.0	65	12	19.71	18.86	17.99	17.14
05090	06090	.2500	1/4"	6.35	1/4"	2-1/2"	1/2"	18.72	17.91	17.09	16.28
05610	06610	.2756		7.00	7.0	65	12	23.75	22.72	21.68	20.65
05100	06100	.3125	5/16"	7.94	5/16"	2-1/2"	1/2"	23.30	22.29	21.27	20.26
05620	06620	.3150		8.00	8.0	65	12	24.52	23.45	22.39	21.32
05630	06630	.3543		9.00	9.0	75	14	27.33	26.15	24.95	23.76
05110	06110	.3750	3/8"	9.52	3/8"	2-1/2"	1/2"	24.78	23.70	22.63	21.55
05640	06640	.3937		10.00	10.0	75	14	35.85	34.29	32.73	31.17
05650	06650	.4331		11.00	11.0	75	14	38.27	36.61	34.94	33.28
05120	06120	.4375	7/16"	11.11	7/16"	2-3/4"	9/16"	35.47	33.94	32.39	30.85
05660	06660	.4724		12.00	12.0	75	16	44.32	42.40	40.47	38.54
05130	06130	.5000	1/2"	12.70	1/2"	3"	5/8"	42.11	40.28	38.45	36.62

165MA (865MA metric) - 2 Flute
175MA (875MA metric) - 4 Flute

Technical information:
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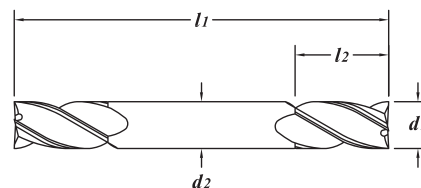


TOLERANCES

d_1	$+0.000'' - 0.002'' (+0.000 - 0.050\text{mm})$
d_2	$3\text{mm} - 6\text{mm} \quad +0.0000'' - 0.0003'' (-0.0000 - 0.0075\text{mm})$
	$1/4'' - 1/2'' \quad -0.0001'' - 0.0004'' (-0.0025 - 0.0100\text{mm})$

Stub Length - Double End - TiALN Coated

Solid submicron grain carbide end mill - center cutting
 Shorter flute length for rigidity
 Dry or semi-dry machining
 Up to 40% faster than uncoated
 Extremely versatile
 Uncoated - page 123



2 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter	Metric							
05017	06017	.0312	1/32"	0.79	1/8"	1-1/2"	1/16"	19.23	18.40	17.56	16.72
05517	06517	.0394		1.00	3.0	38	2	20.08	19.21	18.34	17.46
05027	06027	.0469	3/64"	1.19	1/8"	1-1/2"	3/32"	19.23	18.40	17.56	16.72
05527	06527	.0591		1.50	3.0	38	3	20.08	19.21	18.34	17.46
05037	06037	.0625	1/16"	1.59	1/8"	1-1/2"	1/8"	19.23	18.40	17.56	16.72
05537	06537	.0787		2.00	3.0	38	4	20.08	19.21	18.34	17.46
05047	06047	.0938	3/32"	2.38	1/8"	1-1/2"	3/16"	19.23	18.40	17.56	16.72
05547	06547	.0984		2.50	3.0	38	5	20.08	19.21	18.34	17.46
05557	06557	.1181		3.00	3.0	38	6	13.67	13.07	12.48	11.89
05057	06057	.1250	1/8"	3.17	1/8"	1-1/2"	1/4"	13.15	12.57	12.00	11.43
05567	06567	.1378		3.50	4.0	50	7	21.79	20.84	19.90	18.95
05067	06067	.1562	5/32"	3.97	3/16"	2"	5/16"	20.84	19.94	19.03	18.13
05577	06577	.1575		4.00	4.0	50	8	18.36	17.56	16.76	15.96
05587	06587	.1772		4.50	5.0	65	9.5	28.28	27.05	25.82	24.59
05077	06077	.1875	3/16"	4.76	3/16"	2"	3/8"	17.61	16.84	16.08	15.31
05597	06597	.1969		5.00	5.0	65	10	25.75	24.63	23.51	22.39
05087	06087	.2188	7/32"	5.56	1/4"	2-1/2"	1/2"	27.20	26.01	24.84	23.65
05607	06607	.2362		6.00	6.0	65	12	26.33	25.19	24.04	22.90
05097	06097	.2500	1/4"	6.35	1/4"	2-1/2"	1/2"	25.34	24.24	23.14	22.04
05617	06617	.2756		7.00	7.0	65	12	33.68	32.21	30.74	29.29
05107	06107	.3125	5/16"	7.94	5/16"	2-1/2"	1/2"	33.23	31.78	30.34	28.89
05627	06627	.3150		8.00	8.0	65	12	34.46	32.96	31.46	29.96
05637	06637	.3543		9.00	9.0	75	14	37.25	35.63	34.02	32.40
05117	06117	.3750	3/8"	9.52	3/8"	2-1/2"	1/2"	34.72	33.21	31.70	30.19
05647	06647	.3937		10.00	10.0	75	14	47.13	45.08	43.04	40.99
05657	06657	.4331		11.00	11.0	75	14	49.58	47.42	45.26	43.11
05127	06127	.4375	7/16"	11.11	7/16"	2-3/4"	9/16"	46.77	44.73	42.70	40.66
05667	06667	.4724		12.00	12.0	75	16	55.63	53.21	50.79	48.37
05137	06137	.5000	1/2"	12.70	1/2"	3"	5/8"	53.40	51.08	48.76	46.44

185M (985M metric) - 2 Flute
195M (995M metric) - 4 Flute

Technical information:
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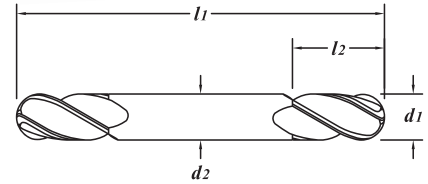


TOLERANCES

d_1	$\leq .030"$	$+0.004" - .0004" (+.0100 - .0100mm)$
	$\geq 1/32"$	$+0.000" - .002" (+.000 - .050mm)$
d_2	3mm - 6mm	$+0.0000" - .0003" (+.0000 - .0075mm)$
	1/4" - 1/2"	$-0.001" - .0004" (-.0025 - .0100mm)$
Ball radius		$+0.000" - .001" (+.000 - .025mm)$

Stub Length - Double End - Ball End

Solid submicron grain carbide end mill - center cutting
Shorter flute length for rigidity
Extremely versatile
TiALN Coated - page 126



2 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter	Metric							
07010	08010	.0312	1/32"	0.79	1/8"	1-1/2"	1/16"	18.81	17.99	17.18	16.36
07510	08510	.0394		1.00	3.0	38	2	19.80	18.94	18.08	17.22
07020	08020	.0469	3/64"	1.19	1/8"	1-1/2"	3/32"	18.81	17.99	17.18	16.36
07520	08520	.0591		1.50	3.0	38	3	19.80	18.94	18.08	17.22
07030	08030	.0625	1/16"	1.59	1/8"	1-1/2"	1/8"	18.81	17.99	17.18	16.36
07530	08530	.0787		2.00	3.0	38	4	19.80	18.94	18.08	17.22
07040	08040	.0938	3/32"	2.38	1/8"	1-1/2"	3/16"	18.81	17.99	17.18	16.36
07540	08540	.0984		2.50	3.0	38	5	19.80	18.94	18.08	17.22
07550	08550	.1181		3.00	3.0	38	6	12.29	11.76	11.22	10.69
07050	08050	.1250	1/8"	3.17	1/8"	1-1/2"	1/4"	11.67	11.16	10.65	10.15
07560	08560	.1378		3.50	4.0	50	7	21.82	20.87	19.93	18.97
07060	08060	.1562	5/32"	3.97	3/16"	2"	5/16"	20.73	19.82	18.93	18.02
07570	08570	.1575		4.00	4.0	50	8	17.83	17.05	16.28	15.50
07580	08580	.1772		4.50	5.0	65	9.5	25.46	24.36	23.24	22.14
07070	08070	.1875	3/16"	4.76	3/16"	2"	3/8"	16.93	16.19	15.45	14.73
07590	08590	.1969		5.00	5.0	65	10	22.59	21.61	20.62	19.65
07080	08080	.2188	7/32"	5.56	1/4"	2-1/2"	1/2"	24.19	23.14	22.09	21.04
07600	08600	.2362		6.00	6.0	65	12	23.19	22.18	21.17	20.17
07090	08090	.2500	1/4"	6.35	1/4"	2-1/2"	1/2"	22.03	21.07	20.11	19.16
07610	08610	.2756		7.00	7.0	65	12	28.09	26.87	25.65	24.43
07100	08100	.3125	5/16"	7.94	5/16"	2-1/2"	1/2"	27.41	26.22	25.03	23.84
07620	08620	.3150		8.00	8.0	65	12	28.87	27.61	26.36	25.11
07630	08630	.3543		9.00	9.0	75	14	31.92	30.53	29.14	27.76
07110	08110	.3750	3/8"	9.52	3/8"	2-1/2"	1/2"	29.16	27.89	26.62	25.36
07640	08640	.3937		10.00	10.0	75	14	42.44	40.60	38.75	36.91
07650	08650	.4331		11.00	11.0	75	14	44.88	42.92	40.98	39.02
07120	08120	.4375	7/16"	11.11	7/16"	2-3/4"	9/16"	41.72	39.92	38.10	36.29
07660	08660	.4724		12.00	12.0	75	16	52.17	49.90	47.63	45.36
07130	08130	.5000	1/2"	12.70	1/2"	3"	5/8"	49.55	47.39	45.24	43.09

185MA (985MA metric) - 2 Flute
195MA (995MA metric) - 4 Flute

Technical information:
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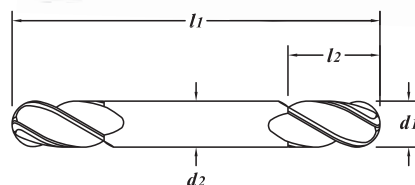


TOLERANCES

d_1	$\leq .030"$	$+0.004" - .0004" (+0.100 - .0100\text{mm})$
	$\geq 1/32"$	$+0.000" - .002" (+0.000 - .050\text{mm})$
d_2	3mm - 6mm	$+0.000" - .0003" (-0.0000 - .0075\text{mm})$
	1/4" - 1/2"	$-.0001" - .0004" (-.0025 - .0100\text{mm})$
Ball radius	$+0.000" - .001" (+.000 - .025\text{mm})$	

Stub Length - Double End - Ball End - TiAlN Coated

Solid submicron grain carbide end mill - center cutting
 Shorter flute length for rigidity
 Dry or semi-dry machining
 Up to 40% faster than uncoated
 Extremely versatile
 Uncoated - page 125

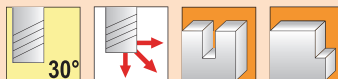


2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Metric							
07017	08017	.0312	1/32"	0.79	1/8"	1-1/2"	1/16"	22.03	21.07	20.11
07517	08517	.0394		1.00	3/8	2	23.03	22.03	21.02	20.02
07027	08027	.0469	3/64"	1.19	1/8"	1-1/2"	3/32"	22.03	21.07	20.11
07527	08527	.0591		1.50	3/8	3	23.03	22.03	21.02	20.02
07037	08037	.0625	1/16"	1.59	1/8"	1-1/2"	1/8"	22.03	21.07	20.11
07537	08537	.0787		2.00	3/8	4	23.03	22.03	21.02	20.02
07047	08047	.0938	3/32"	2.38	1/8"	1-1/2"	3/16"	22.03	21.07	20.11
07547	08547	.0984		2.50	3/8	5	23.03	22.03	21.02	20.02
07557	08557	.1181		3.00	3/8	6	15.52	14.84	14.16	13.49
07057	08057	.1250	1/8"	3.17	1/8"	1-1/2"	1/4"	14.89	14.25	13.59
07567	08567	.1378		3.50	50	7	25.03	23.94	22.86	21.77
07067	08067	.1562	5/32"	3.97	3/16"	2"	23.94	22.90	21.86	20.82
07577	08577	.1575		4.00	50	8	21.05	20.13	19.22	18.30
07587	08587	.1772		4.50	65	9.5	32.08	30.69	29.30	27.90
07077	08077	.1875	3/16"	4.76	3/16"	2"	20.16	19.28	18.40	17.52
07597	08597	.1969		5.00	65	10	29.23	27.97	26.70	25.42
07087	08087	.2188	7/32"	5.56	1/4"	2-1/2"	1/2"	30.83	29.48	28.14
07607	08607	.2362		6.00	65	12	29.82	28.52	27.23	25.93
07097	08097	.2500	1/4"	6.35	1/4"	2-1/2"	1/2"	28.67	27.42	26.18
07617	08617	.2756		7.00	65	12	38.03	36.38	34.73	33.07
07107	08107	.3125	5/16"	7.94	5/16"	2-1/2"	1/2"	37.34	35.71	34.09
07627	08627	.3150		8.00	65	12	38.80	37.12	35.43	33.74
07637	08637	.3543		9.00	75	14	41.85	40.03	38.21	36.39
07117	08117	.3750	3/8"	9.52	3/8"	2-1/2"	1/2"	39.08	37.39	35.68
07647	08647	.3937		10.00	75	14	53.74	51.40	49.07	46.73
07657	08657	.4331		11.00	75	14	56.18	53.74	51.29	48.85
07127	08127	.4375	7/16"	11.11	7/16"	2-3/4"	9/16"	53.02	50.71	48.41
07667	08667	.4724		12.00	75	16	63.46	60.70	57.94	55.18
07137	08137	.5000	1/2"	12.70	1/2"	3"	60.85	58.21	55.56	52.92

220M (820M metric) - 2 Flute
223M (823M metric) - 3 Flute
230M (830M metric) - 4 Flute
 .0050" - .0984"
 (0.13mm - 2.50mm)

Technical information:

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TOLERANCES

d_1	$\leq .030"$	$+0.004" - .0004" (+.0100 - .0100mm)$
	$\geq 1/32"$	$+0.000" - .002" (+.000 - .050mm)$
d_2	3mm - 6mm	$+0.000" - .0003" (-.0000 - .0075mm)$
	1/4" - 1-1/4"	$-.0001" - .0004" (-.0025 - .0100mm)$

Standard Length

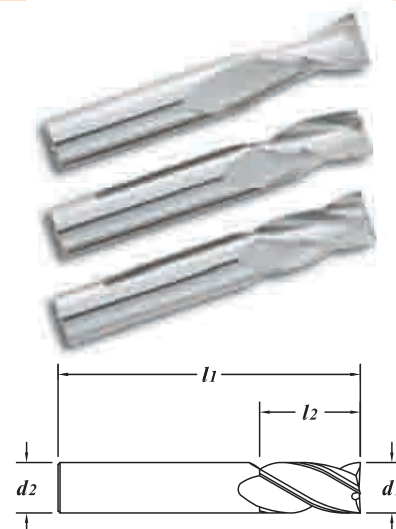
Solid submicron grain carbide end mill - center cutting

Extremely versatile

TiN Coated - page 129

TiCN Coated - page 130

TiALN Coated - page 131



END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter	Metric							
11500	-	-	.0050	.0050"	0.13	1/8"	1-1/2"	.015"	18.50	17.70	16.89	16.09
11510	-	-	.0060	.0060"	0.15	1/8"	1-1/2"	.018"	18.50	17.70	16.89	16.09
11520	-	-	.0070	.0070"	0.18	1/8"	1-1/2"	.021"	17.41	16.65	15.89	15.14
11530	-	-	.0080	.0080"	0.20	1/8"	1-1/2"	.024"	17.41	16.65	15.89	15.14
11540	-	-	.0090	.0090"	0.23	1/8"	1-1/2"	.027"	16.43	15.71	15.01	14.29
11550	-	13550	.0100	.0100"	0.25	1/8"	1-1/2"	.030"	16.43	15.71	15.01	14.29
11560	-	-	.0110	.0110"	0.28	1/8"	1-1/2"	.033"	15.22	14.55	13.89	13.23
11570	-	-	.0120	.0120"	0.30	1/8"	1-1/2"	.036"	15.22	14.55	13.89	13.23
11580	-	-	.0130	.0130"	0.33	1/8"	1-1/2"	.039"	15.13	14.48	13.81	13.16
11590	-	-	.0140	.0140"	0.36	1/8"	1-1/2"	.042"	15.13	14.48	13.81	13.16
11600	-	13600	.0150	.0150"	0.38	1/8"	1-1/2"	.045"	15.13	14.48	13.81	13.16
11610	-	-	.0160	.0160"	0.41	1/8"	1-1/2"	.048"	14.92	14.28	13.62	12.98
11620	-	-	.0170	.0170"	0.43	1/8"	1-1/2"	.051"	14.92	14.28	13.62	12.98
11630	-	-	.0180	.0180"	0.46	1/8"	1-1/2"	.054"	14.65	14.02	13.37	12.74
11640	-	-	.0190	.0190"	0.48	1/8"	1-1/2"	.057"	14.65	14.02	13.37	12.74
11650	-	13650	.0200	.0200"	0.51	1/8"	1-1/2"	.060"	14.65	14.02	13.37	12.74
11660	-	-	.0210	.0210"	0.53	1/8"	1-1/2"	.063"	14.65	14.02	13.37	12.74
11670	-	-	.0220	.0220"	0.56	1/8"	1-1/2"	.066"	14.49	13.85	13.23	12.59
11680	-	-	.0230	.0230"	0.58	1/8"	1-1/2"	.069"	14.49	13.85	13.23	12.59
11690	-	-	.0240	.0240"	0.61	1/8"	1-1/2"	.072"	14.49	13.85	13.23	12.59
11700	-	13700	.0250	.0250"	0.64	1/8"	1-1/2"	.075"	13.66	13.06	12.47	11.88
11710	-	-	.0260	.0260"	0.66	1/8"	1-1/2"	.078"	13.66	13.06	12.47	11.88
11720	-	-	.0270	.0270"	0.69	1/8"	1-1/2"	.081"	12.25	11.72	11.19	10.65
11730	-	-	.0280	.0280"	0.71	1/8"	1-1/2"	.084"	12.25	11.72	11.19	10.65
11740	-	-	.0290	.0290"	0.74	1/8"	1-1/2"	.087"	12.25	11.72	11.19	10.65
11750	-	13750	.0300	.0300"	0.76	1/8"	1-1/2"	.090"	12.25	11.72	11.19	10.65
11010	12010	13010	.0312	1/32"	0.79	1/8"	1-1/2"	3/32"	8.91	8.53	8.13	7.75
45010	37010	46010	.0394		1.00	3.0	38	4	9.36	8.95	8.55	8.14
11020	12020	13020	.0469	3/64"	1.19	1/8"	1-1/2"	1/8"	8.91	8.53	8.13	7.75
45020	37020	46020	.0591		1.50	3.0	38	6	9.36	8.95	8.55	8.14
11030	12030	13030	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	8.27	7.90	7.55	7.19
11040	12040	13040	.0781	5/64"	1.98	1/8"	1-1/2"	1/4"	8.27	7.90	7.55	7.19
45030	37030	46030	.0787		2.00	3.0	38	8	8.68	8.31	7.92	7.55
11050	12050	13050	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	7.82	7.48	7.14	6.80
45040	37040	46040	.0984		2.50	3.0	38	12	8.22	7.86	7.50	7.14

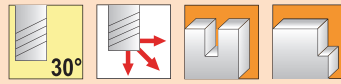
continued →

220M (820M metric) - 2 Flute (continued)**223M (823M metric) - 3 Flute (continued)****230M (830M metric) - 4 Flute (continued)**

.1094" - 1.250"

(2.78mm - 31.75mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal		Metric							
11060	12060	13060	.1094	7/64"	2.78	1/8"	1-1/2"	3/8"	7.82	7.48	7.14	6.80
45050	37050	46050	.1181		3.00	3.0	38	12	7.58	7.25	6.93	6.59
11070	12070	13070	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	7.23	6.92	6.60	6.28
45060	37060	46060	.1378		3.50	4.0	50	12	11.22	10.73	10.24	9.76
11080	12080	13080	.1406	9/64"	3.57	3/16"	2"	9/16"	10.67	10.20	9.74	9.28
11090	12090	13090	.1562	5/32"	3.97	3/16"	2"	9/16"	10.67	10.20	9.74	9.28
45070	37070	46070	.1575		4.00	4.0	50	14	10.63	10.17	9.70	9.25
11100	12100	13100	.1719	11/64"	4.37	3/16"	2"	9/16"	10.67	10.20	9.74	9.28
45080	37080	46080	.1772		4.50	5.0	50	14	13.01	12.45	11.88	11.32
11110	12110	13110	.1875	3/16"	4.76	3/16"	2"	5/8"	10.12	9.68	9.24	8.80
45090	37090	46090	.1969		5.00	5.0	65	16	12.42	11.88	11.34	10.80
11120	12120	13120	.2031	13/64"	5.16	1/4"	2-1/2"	5/8"	13.41	12.82	12.24	11.66
11130	12130	13130	.2188	7/32"	5.56	1/4"	2-1/2"	5/8"	13.41	12.82	12.24	11.66
11140	12140	13140	.2344	15/64"	5.95	1/4"	2-1/2"	3/4"	13.41	12.82	12.24	11.66
45100	37100	46100	.2362		6.00	6.0	65	19	12.81	12.25	11.70	11.14
11150	12150	13150	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	12.20	11.67	11.14	10.61
11160	12160	13160	.2656	17/64"	6.75	5/16"	2-1/2"	7/8"	21.39	20.47	19.53	18.61
45110	37110	46110	.2756		7.00	7.0	65	22	17.60	16.83	16.07	15.30
11170	12170	13170	.2812	9/32"	7.14	5/16"	2-1/2"	7/8"	21.39	20.47	19.53	18.61
11180	12180	13180	.2969	19/64"	7.54	5/16"	2-1/2"	7/8"	21.39	20.47	19.53	18.61
11190	12190	13190	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	17.12	16.37	15.63	14.88
45120	37120	46120	.3150		8.00	8.0	65	22	17.97	17.19	16.41	15.63
11200	12200	13200	.3281	21/64"	8.33	3/8"	2-1/2"	7/8"	25.34	24.24	23.14	22.04
11210	12210	13210	.3438	11/32"	8.73	3/8"	2-1/2"	7/8"	25.34	24.24	23.14	22.04
45130	37130	46130	.3543		9.00	9.0	65	22	22.38	21.40	20.44	19.46
11220	12220	13220	.3594	23/64"	9.13	3/8"	2-1/2"	7/8"	25.34	24.24	23.14	22.04
11230	12230	13230	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	21.32	20.39	19.47	18.54
11240	12240	13240	.3906	25/64"	9.92	7/16"	2-3/4"	7/8"	30.32	29.00	27.68	26.36
45140	37140	46140	.3937		10.00	10.0	70	25	25.94	24.81	23.68	22.56
11250	12250	13250	.4062	13/32"	10.32	7/16"	2-3/4"	7/8"	30.32	29.00	27.68	26.36
11260	12260	13260	.4219	27/64"	10.72	7/16"	2-3/4"	7/8"	30.32	29.00	27.68	26.36
45150	37150	46150	.4331		11.00	11.0	75	25	27.32	26.14	24.95	23.75
11270	12270	13270	.4375	7/16"	11.11	7/16"	2-3/4"	1"	26.01	24.88	23.75	22.62
11280	12280	13280	.4531	29/64"	11.51	1/2"	3"	1"	40.82	39.04	37.27	35.50
11290	12290	13290	.4688	15/32"	11.91	1/2"	3"	1"	40.82	39.04	37.27	35.50
45160	37160	46160	.4724		12.00	12.0	75	25	35.86	34.30	32.74	31.18
11300	12300	13300	.4844	31/64"	12.30	1/2"	3"	1"	40.82	39.04	37.27	35.50
11310	12310	13310	.5000	1/2"	12.70	1/2"	3"	1"	34.14	32.66	31.18	29.69
45170	37170	46170	.5512		14.00	14.0	88	32	61.22	58.56	55.90	53.24
11320	12320	13320	.5625	9/16"	14.29	9/16"	3-1/2"	1-1/4"	58.31	55.78	53.24	50.71
11330	12330	13330	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	65.84	62.98	60.11	57.25
45180	37180	46180	.6299		16.00	16.0	88	38	69.14	66.13	63.13	60.12
11340	12340	13340	.6875	11/16"	17.46	3/4"	4"	1-1/2"	109.65	104.88	100.11	95.35
45190	37190	46190	.7087		18.00	18.0	100	38	101.37	96.96	92.55	88.15
11350	12350	13350	.7500	3/4"	19.05	3/4"	4"	1-1/2"	96.53	92.33	88.14	83.94
45200	37200	46200	.7874		20.00	20.0	100	38	128.90	123.29	117.69	112.08
45210	37210	46210	.8661		22.00	22.0	100	38	143.22	136.99	130.76	124.54
11360	12360	13360	.8750	7/8"	22.22	7/8"	4"	1-1/2"	138.91	132.87	126.83	120.80
45220	37220	46220	.9843		25.00	25.0	100	38	149.74	143.23	136.72	130.21
11370	12370	13370	1.000	1"	25.40	1"	4"	1-1/2"	144.41	138.13	131.85	125.58
-	-	13390	1.250	1-1/4"	31.75	1-1/4"	4-1/2"	2"	421.64	403.30	384.97	366.64

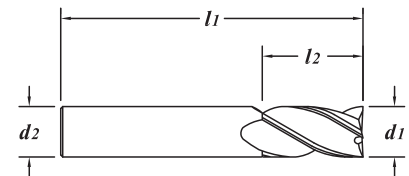


TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)

Standard Length - TiN Coated

Solid submicron grain carbide end mill - center cutting
 Improved lubricity - 10% faster than uncoated
 Extremely versatile
 Uncoated - page 127
 TiCN Coated - page 130
 TiALN Coated - page 131



2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100
		Decimal		Metric							
11073	13073	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	8.50	8.12	7.76	7.38
11113	13113	.1875	3/16"	4.76	3/16"	2"	5/8"	11.38	10.88	10.39	9.89
11153	13153	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	14.76	14.11	13.48	12.83
11193	13193	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	20.54	19.65	18.75	17.86
11233	13233	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	24.74	23.67	22.59	21.52
11273	13273	.4375	7/16"	11.11	7/16"	2-3/4"	1"	30.16	28.85	27.54	26.23
11313	13313	.5000	1/2"	12.70	1/2"	3"	1"	38.29	36.63	34.96	33.30
11333	13333	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	72.23	69.09	65.95	62.81
11353	13353	.7500	3/4"	19.05	3/4"	4"	1-1/2"	103.84	99.33	94.82	90.30
11373	13373	1.000	1"	25.04	1"	4"	1-1/2"	157.19	150.35	143.52	136.69

220MC - 2 Flute
223MC - 3 Flute
230MC - 4 Flute

Technical information:
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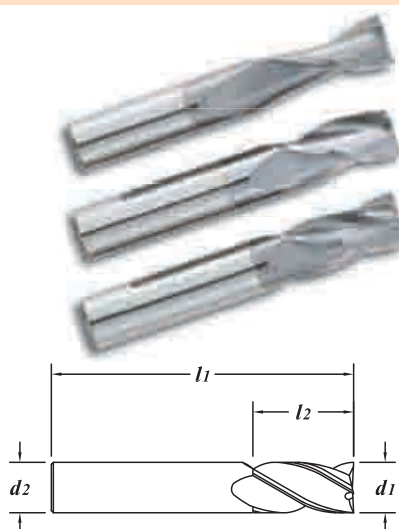


TOLERANCES

d_1	$+0.000'' - 0.002'' (+0.000 - 0.050\text{mm})$
d_2	$3\text{mm} - 6\text{mm} \quad +0.0000'' - 0.0003'' (-0.0000 - 0.0075\text{mm})$
	$1/4'' - 1-1/4'' \quad -0.0001'' - 0.0004'' (-0.0025 - 0.0100\text{mm})$

Standard Length - TiCN Coated

Solid submicron grain carbide end mill - center cutting
 Improved abrasion resistance and lubricity
 Up to 25% faster than uncoated
 Extremely versatile
 Uncoated - page 127
 TiN Coated - page 129
 TiAlN Coated - page 131



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal		Metric							
11014	12014	13014	.0312	1/32"	0.79	1/8"	1-1/2"	3/32"	10.82	10.35	9.88	9.40
11024	12024	13024	.0469	3/64"	1.19	1/8"	1-1/2"	1/8"	10.82	10.35	9.88	9.40
11034	12034	13034	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	10.17	9.72	9.29	8.84
11044	12044	13044	.0781	5/64"	1.98	1/8"	1-1/2"	1/4"	10.17	9.72	9.29	8.84
11054	12054	13054	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	9.71	9.29	8.87	8.44
11064	12064	13064	.1094	7/64"	2.78	1/8"	1-1/2"	3/8"	9.71	9.29	8.87	8.44
11074	12074	13074	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	9.11	8.72	8.32	7.92
11084	12084	13084	.1406	9/64"	3.57	3/16"	2"	9/16"	12.56	12.01	11.47	10.92
11094	12094	13094	.1562	5/32"	3.97	3/16"	2"	9/16"	12.56	12.01	11.47	10.92
11104	12104	13104	.1719	11/64"	4.37	3/16"	2"	9/16"	12.56	12.01	11.47	10.92
11114	12114	13114	.1875	3/16"	4.76	3/16"	2"	5/8"	12.01	11.49	10.97	10.44
11124	12124	13124	.2031	13/64"	5.16	1/4"	2-1/2"	5/8"	17.24	16.49	15.75	15.00
11134	12134	13134	.2188	7/32"	5.56	1/4"	2-1/2"	5/8"	17.24	16.49	15.75	15.00
11144	12144	13144	.2344	15/64"	5.95	1/4"	2-1/2"	3/4"	17.24	16.49	15.75	15.00
11154	12154	13154	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	16.04	15.34	14.64	13.95
11164	12164	13164	.2656	17/64"	6.75	5/16"	2-1/2"	7/8"	26.53	25.38	24.22	23.07
11174	12174	13174	.2812	9/32"	7.14	5/16"	2-1/2"	7/8"	26.53	25.38	24.22	23.07
11184	12184	13184	.2969	19/64"	7.54	5/16"	2-1/2"	7/8"	26.53	25.38	24.22	23.07
11194	12194	13194	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	22.25	21.28	20.31	19.34
11204	12204	13204	.3281	21/64"	8.33	3/8"	2-1/2"	7/8"	30.47	29.15	27.82	26.50
11214	12214	13214	.3438	11/32"	8.73	3/8"	2-1/2"	7/8"	30.47	29.15	27.82	26.50
11224	12224	13224	.3594	23/64"	9.13	3/8"	2-1/2"	7/8"	30.47	29.15	27.82	26.50
11234	12234	13234	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	26.45	25.29	24.15	22.99
11244	12244	13244	.3906	25/64"	9.92	7/16"	2-1/2"	7/8"	36.46	34.88	33.29	31.71
11254	12254	13254	.4062	13/32"	10.32	7/16"	2-1/2"	7/8"	36.46	34.88	33.29	31.71
11264	12264	13264	.4219	27/64"	10.72	7/16"	2-1/2"	7/8"	36.46	34.88	33.29	31.71
11274	12274	13274	.4375	7/16"	11.11	7/16"	2-3/4"	1"	32.18	30.77	29.38	27.98
11284	12284	13284	.4531	29/64"	11.51	1/2"	3"	1"	46.98	44.94	42.89	40.85
11294	12294	13294	.4688	15/32"	11.91	1/2"	3"	1"	46.98	44.94	42.89	40.85
11304	12304	13304	.4844	31/64"	12.30	1/2"	3"	1"	46.98	44.94	42.89	40.85
11314	12314	13314	.5000	1/2"	12.70	1/2"	3"	1"	40.31	38.55	36.81	35.05
11324	12324	13324	.5625	9/16"	14.29	9/16"	3-1/2"	1-1/4"	67.91	64.96	62.00	59.05
11334	12334	13334	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	75.43	72.16	68.87	65.59
11344	12344	13344	.6875	11/16"	17.46	3/4"	4"	1-1/2"	120.61	115.37	110.13	104.87
11354	12354	13354	.7500	3/4"	19.05	3/4"	4"	1-1/2"	107.49	102.82	98.14	93.48
11364	12364	13364	.8750	7/8"	22.22	7/8"	4"	1-1/2"	155.39	148.63	141.88	135.12
11374	12374	13374	1.000	1"	25.40	1"	4"	1-1/2"	160.89	153.89	146.90	139.90
-	-	13394	1.250	1-1/4"	31.75	1-1/4"	4-1/2"	2"	448.26	428.77	409.28	389.79

220MA (820MA metric) - 2 Flute
223MA (823MA metric) - 3 Flute
230MA (830MA metric) - 4 Flute
 .0312" - .3594"
 (0.79mm - 9.13mm)

Technical information:

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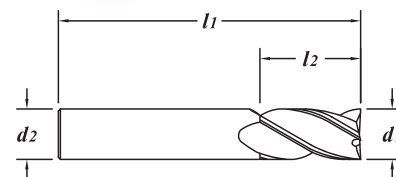


TOLERANCES

d_1	+.000" - .002" (+.000 - .050mm)	
d_2	3mm - 6mm	+.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1-1/4"	-.0001" - .0004" (-.0025 - .0100mm)

Standard Length - TiALN Coated

Solid submicron grain carbide end mill - center cutting
 Dry or semi-dry machining
 Up to 40% faster than uncoated
 Extremely versatile
 Uncoated - page 127
 TiN Coated - page 129
 TiCN Coated - page 130



END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter	Metric							
11017	12017	13017	.0312	1/32"	0.79	1/8"	1-1/2"	3/32"	11.07	10.59	10.10	9.62
45017	37017	46017	.0394		1.00	3.0	38	4	11.50	11.00	10.50	10.00
11027	12027	13027	.0469	3/64"	1.19	1/8"	1-1/2"	1/8"	11.07	10.59	10.10	9.62
45027	37027	46027	.0591		1.50	3.0	38	6	11.50	11.00	10.50	10.00
11037	12037	13037	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	10.42	9.96	9.52	9.06
11047	12047	13047	.0781	5/64"	1.98	1/8"	1-1/2"	1/4"	10.42	9.96	9.52	9.06
45037	37037	46037	.0787		2.00	3.0	38	8	10.83	10.36	9.88	9.41
11057	12057	13057	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	9.96	9.53	9.10	8.66
45047	37047	46047	.0984		2.50	3.0	38	12	10.36	9.91	9.45	9.01
11067	12067	13067	.1094	7/64"	2.78	1/8"	1-1/2"	3/8"	9.96	9.53	9.10	8.66
45057	37057	46057	.1181		3.00	3.0	38	12	9.72	9.30	8.88	8.46
11077	12077	13077	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	9.36	8.95	8.55	8.14
45067	37067	46067	.1378		3.50	4.0	50	12	13.36	12.78	12.20	11.62
11087	12087	13087	.1406	9/64"	3.57	3/16"	2"	9/16"	12.81	12.25	11.70	11.14
11097	12097	13097	.1562	5/32"	3.97	3/16"	2"	9/16"	12.81	12.25	11.70	11.14
45077	37077	46077	.1575		4.00	4.0	50	14	12.77	12.22	11.66	11.11
11107	12107	13107	.1719	11/64"	4.37	3/16"	2"	9/16"	12.81	12.25	11.70	11.14
45087	37087	46087	.1772		4.50	5.0	50	14	16.36	15.65	14.93	14.23
11117	12117	13117	.1875	3/16"	4.76	3/16"	2"	5/8"	12.26	11.73	11.19	10.66
45097	37097	46097	.1969		5.00	5.0	65	16	16.84	16.11	15.37	14.64
11127	12127	13127	.2031	13/64"	5.16	1/4"	2-1/2"	5/8"	17.85	17.07	16.30	15.52
11137	12137	13137	.2188	7/32"	5.56	1/4"	2-1/2"	5/8"	17.85	17.07	16.30	15.52
11147	12147	13147	.2344	15/64"	5.95	1/4"	2-1/2"	3/4"	17.85	17.07	16.30	15.52
45107	37107	46107	.2362		6.00	6.0	65	19	17.23	16.48	15.74	14.99
11157	12157	13157	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	16.63	15.90	15.18	14.46
11167	12167	13167	.2656	17/64"	6.75	5/16"	2-1/2"	7/8"	28.02	26.80	25.58	24.37
45117	37117	46117	.2756		7.00	7.0	65	22	24.21	23.16	22.11	21.05
11177	12177	13177	.2812	9/32"	7.14	5/16"	2-1/2"	7/8"	28.02	26.80	25.58	24.37
11187	12187	13187	.2969	19/64"	7.54	5/16"	2-1/2"	7/8"	28.02	26.80	25.58	24.37
11197	12197	13197	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	23.74	22.71	21.67	20.64
45127	37127	46127	.3150		8.00	8.0	65	22	24.61	23.54	22.46	21.39
11207	12207	13207	.3281	21/64"	8.33	3/8"	2-1/2"	7/8"	31.97	30.58	29.19	27.80
11217	12217	13217	.3438	11/32"	8.73	3/8"	2-1/2"	7/8"	31.97	30.58	29.19	27.80
45137	37137	46137	.3543		9.00	9.0	65	22	29.01	27.75	26.48	25.22
11227	12227	13227	.3594	23/64"	9.13	3/8"	2-1/2"	7/8"	31.97	30.58	29.19	27.80

continued →

220MA (820MA metric) - 2 Flute (continued)**223MA (823MA metric) - 3 Flute (continued)****230MA (830MA metric) - 4 Flute (continued)**

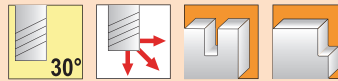
.3750" - 1.250"

(9.52mm - 31.75mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal		Metric							
11237	12237	13237	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	27.93	26.72	25.50	24.29
11247	12247	13247	.3906	25/64"	9.92	7/16"	2-3/4"	7/8"	37.85	36.20	34.56	32.91
45147	37147	46147	.3937		10.00	10.0	70	25	33.47	32.01	30.56	29.10
11257	12257	13257	.4062	13/32"	10.32	7/16"	2-3/4"	7/8"	37.85	36.20	34.56	32.91
11267	12267	13267	.4219	27/64"	10.72	7/16"	2-3/4"	7/8"	37.85	36.20	34.56	32.91
45157	37157	46157	.4331		11.00	11.0	75	25	34.84	33.32	31.81	30.30
11277	12277	13277	.4375	7/16"	11.11	7/16"	2-3/4"	1"	33.55	32.09	30.63	29.17
11287	12287	13287	.4531	29/64"	11.51	1/2"	3"	1"	48.35	46.25	44.15	42.05
11297	12297	13297	.4688	15/32"	11.91	1/2"	3"	1"	48.35	46.25	44.15	42.05
45167	37167	46167	.4724		12.00	12.0	75	25	43.38	41.50	39.60	37.72
11307	12307	13307	.4844	31/64"	12.30	1/2"	3"	1"	48.35	46.25	44.15	42.05
11317	12317	13317	.5000	1/2"	12.70	1/2"	3"	1"	41.68	39.87	38.05	36.24
45177	37177	46177	.5512		14.00	14.0	88	32	72.10	68.97	65.83	62.70
11327	12327	13327	.5625	9/16"	14.29	9/16"	3-1/2"	1-1/4"	69.20	66.20	63.18	60.17
11337	12337	13337	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	76.73	73.39	70.05	66.73
45187	37187	46187	.6299		16.00	16.0	88	38	80.04	76.55	73.08	69.60
11347	12347	13347	.6875	11/16"	17.46	3/4"	4"	1-1/2"	122.49	117.17	111.84	106.52
45197	37197	46197	.7087		18.00	18.0	100	38	114.22	109.25	104.29	99.32
11357	12357	13357	.7500	3/4"	19.05	3/4"	4"	1-1/2"	109.39	104.63	99.87	95.12
45207	37207	46207	.7874		20.00	20.0	100	38	147.88	141.45	135.02	128.59
45217	37217	46217	.8661		22.00	22.0	100	38	162.20	155.15	148.10	141.04
11367	12367	13367	.8750	7/8"	22.22	7/8"	4"	1-1/2"	157.89	151.03	144.16	137.30
45227	37227	46227	.9843		25.00	25.0	100	38	168.72	161.39	154.04	146.71
11377	12377	13377	1.000	1"	25.40	1"	4"	1-1/2"	163.39	156.29	149.19	142.08
-	-	13397	1.250	1-1/4"	31.75	1-1/4"	4-1/2"	2"	449.14	429.61	410.08	390.56

220R - 2 Flute 230R - 4 Flute

Technical information: page 192, 194



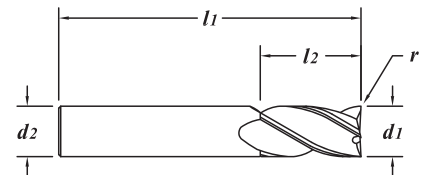
.0625" - .5000"
(1.59mm - 12.70mm)

TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
r	+.001" -.001" (+.025 -.025mm)	

Standard Length - Corner Radius

Solid submicron grain carbide end mill - center cutting
For stronger corners and part radius
Extremely versatile
TiALN Coated - page 135



	2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Metric									
NEW	79580	80580	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	.010"	10.67	10.20	9.74	9.28
	79590	80590	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	.015"	10.67	10.20	9.74	9.28
	79600	80600	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	.010"	10.20	9.76	9.32	8.87
	79610	80610	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	.015"	10.20	9.76	9.32	8.87
	79620	80620	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	.020"	10.20	9.76	9.32	8.87
	79000	80000	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	.010"	9.26	8.85	8.46	8.05
	79010	80010	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	.015"	9.26	8.85	8.46	8.05
	79020	80020	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	.020"	9.26	8.85	8.46	8.05
	79030	80030	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	.030"	9.26	8.85	8.46	8.05
	79040	80040	.1875	3/16"	4.76	3/16"	2"	5/8"	.010"	12.20	11.67	11.14	10.61
	79050	80050	.1875	3/16"	4.76	3/16"	2"	5/8"	.015"	12.20	11.67	11.14	10.61
	79060	80060	.1875	3/16"	4.76	3/16"	2"	5/8"	.020"	12.20	11.67	11.14	10.61
	79070	80070	.1875	3/16"	4.76	3/16"	2"	5/8"	.030"	12.20	11.67	11.14	10.61
	-	80090	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.010"	15.14	14.49	13.82	13.17
	79100	80100	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.015"	15.14	14.49	13.82	13.17
	79110	80110	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.020"	15.14	14.49	13.82	13.17
	79120	80120	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.030"	15.14	14.49	13.82	13.17
	79130	80130	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.045"	15.14	14.49	13.82	13.17
	79140	80140	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.060"	15.14	14.49	13.82	13.17
	79160	80160	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.015"	19.87	19.01	18.15	17.28
79170	80170	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.020"	19.87	19.01	18.15	17.28	
79180	80180	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.030"	19.87	19.01	18.15	17.28	
79190	80190	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.045"	19.87	19.01	18.15	17.28	
NEW	79200	80200	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.060"	19.87	19.01	18.15	17.28
	-	80220	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.010"	24.32	23.25	22.20	21.14
	79230	80230	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.015"	24.32	23.25	22.20	21.14
	79240	80240	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.020"	24.32	23.25	22.20	21.14
	79250	80250	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.030"	24.32	23.25	22.20	21.14
	79260	80260	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.045"	24.32	23.25	22.20	21.14
NEW	79270	80270	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.060"	24.32	23.25	22.20	21.14
	-	80290	.5000	1/2"	12.70	1/2"	3"	1"	.010"	45.27	43.31	41.33	39.36
	79300	80300	.5000	1/2"	12.70	1/2"	3"	1"	.015"	45.27	43.31	41.33	39.36
	79310	80310	.5000	1/2"	12.70	1/2"	3"	1"	.020"	45.27	43.31	41.33	39.36
	79320	80320	.5000	1/2"	12.70	1/2"	3"	1"	.030"	45.27	43.31	41.33	39.36
	79330	80330	.5000	1/2"	12.70	1/2"	3"	1"	.045"	45.27	43.31	41.33	39.36
	79340	80340	.5000	1/2"	12.70	1/2"	3"	1"	.060"	45.27	43.31	41.33	39.36
	79350	80350	.5000	1/2"	12.70	1/2"	3"	1"	.090"	45.27	43.31	41.33	39.36
79360	80360	.5000	1/2"	12.70	1/2"	3"	1"	.125"	45.27	43.31	41.33	39.36	

continued →

220R - 2 Flute (continued)

230R - 4 Flute (continued)

.6250" - 1.000"
(15.87mm - 25.40mm)

2 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
		Decimal	Metric										
79370	80370	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.015"	73.20	70.01	66.83	63.65	
79380	80380	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.020"	73.20	70.01	66.83	63.65	
79390	80390	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.030"	73.20	70.01	66.83	63.65	
79400	80400	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.045"	73.20	70.01	66.83	63.65	
79410	80410	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.060"	73.20	70.01	66.83	63.65	
79420	80420	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.090"	73.20	70.01	66.83	63.65	
79440	80440	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.015"	107.72	103.04	98.35	93.67	
79450	80450	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.020"	107.72	103.04	98.35	93.67	
79460	80460	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.030"	107.72	103.04	98.35	93.67	
79470	80470	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.045"	107.72	103.04	98.35	93.67	
79480	80480	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.060"	107.72	103.04	98.35	93.67	
79490	80490	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.090"	107.72	103.04	98.35	93.67	
79500	80500	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.125"	107.72	103.04	98.35	93.67	
NEW	79630	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.250"	107.72	103.04	98.35	93.67	
	79510	80510	1.000	1"	25.40	1"	4"	1-1/2"	.015"	186.85	178.72	170.60	162.48
	79520	80520	1.000	1"	25.40	1"	4"	1-1/2"	.020"	186.85	178.72	170.60	162.48
	79530	80530	1.000	1"	25.40	1"	4"	1-1/2"	.030"	186.85	178.72	170.60	162.48
	79540	80540	1.000	1"	25.40	1"	4"	1-1/2"	.045"	186.85	178.72	170.60	162.48
	79550	80550	1.000	1"	25.40	1"	4"	1-1/2"	.060"	186.85	178.72	170.60	162.48
	79560	80560	1.000	1"	25.40	1"	4"	1-1/2"	.090"	186.85	178.72	170.60	162.48
	79570	80570	1.000	1"	25.40	1"	4"	1-1/2"	.125"	186.85	178.72	170.60	162.48
NEW	79640	80640	1.000	1"	25.40	1"	4"	1-1/2"	.250"	186.85	178.72	170.60	162.48

220RA - 2 Flute 230RA (830RA metric) - 4 Flute

.0625" - .3125"
(1.59mm - 7.94mm)

Technical information:
page 192, 194

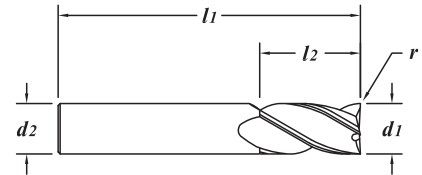


TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
r	+.001" -.001" (+.025 -.025mm)	

Standard Length - Corner Radius - TiALN Coated

Solid submicron grain carbide end mill - center cutting
Dry or semi-dry machining
Up to 40% faster than uncoated
For stronger corners and part radius
Extremely versatile
Uncoated - page 133



END MILLS

2 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
		Decimal	Diameter	Metric									
79587	80587	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	.010"	12.81	12.25	11.70	11.14	
79597	80597	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	.015"	12.81	12.25	11.70	11.14	
79607	80607	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	.010"	12.34	11.80	11.27	10.73	
79617	80617	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	.015"	12.34	11.80	11.27	10.73	
79627	80627	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	.020"	12.34	11.80	11.27	10.73	
-	24077	.1181		3.00	3.0	38	12	0.2	11.42	10.92	10.43	9.93	
-	24087	.1181		3.00	3.0	38	12	0.5	11.42	10.92	10.43	9.93	
79007	80007	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	.010"	11.40	10.90	10.41	9.91	
79017	80017	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	.015"	11.40	10.90	10.41	9.91	
79027	80027	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	.020"	11.40	10.90	10.41	9.91	
79037	80037	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	.030"	11.40	10.90	10.41	9.91	
-	24097	.1575		4.00	4.0	50	14	0.3	14.96	14.30	13.66	13.00	
-	24107	.1575		4.00	4.0	50	14	0.5	14.96	14.30	13.66	13.00	
79047	80047	.1875	3/16"	4.76	3/16"	2"	5/8"	.010"	14.34	13.72	13.09	12.47	
79057	80057	.1875	3/16"	4.76	3/16"	2"	5/8"	.015"	14.34	13.72	13.09	12.47	
79067	80067	.1875	3/16"	4.76	3/16"	2"	5/8"	.020"	14.34	13.72	13.09	12.47	
79077	80077	.1875	3/16"	4.76	3/16"	2"	5/8"	.030"	14.34	13.72	13.09	12.47	
-	24117	.1969		5.00	5.0	50	16	0.3	19.95	19.08	18.21	17.35	
-	24127	.1969		5.00	5.0	65	16	0.5	19.95	19.08	18.21	17.35	
-	24177	.2362		6.00	6.0	65	19	0.5	20.34	19.46	18.57	17.69	
-	24187	.2362		6.00	6.0	65	19	0.8	20.34	19.46	18.57	17.69	
-	24197	.2362		6.00	6.0	65	19	1.0	20.34	19.46	18.57	17.69	
-	24207	.2362		6.00	6.0	65	19	1.5	20.34	19.46	18.57	17.69	
-	24217	.2362		6.00	6.0	65	19	2.0	20.34	19.46	18.57	17.69	
NEW	-	80097	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.010"	19.56	18.71	17.86	17.01
79107	80107	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.015"	19.56	18.71	17.86	17.01	
79117	80117	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.020"	19.56	18.71	17.86	17.01	
79127	80127	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.030"	19.56	18.71	17.86	17.01	
79137	80137	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.045"	19.56	18.71	17.86	17.01	
79147	80147	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	.060"	19.56	18.71	17.86	17.01	
79167	80167	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.015"	26.50	25.34	24.19	23.05	
79177	80177	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.020"	26.50	25.34	24.19	23.05	
79187	80187	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.030"	26.50	25.34	24.19	23.05	
79197	80197	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.045"	26.50	25.34	24.19	23.05	
79207	80207	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	.060"	26.50	25.34	24.19	23.05	

continued →

220RA - 2 Flute (continued) 230RA (830RA metric) - 4 Flute (continued)

.3150" - .7500"
(8.00mm - 19.05mm)

	2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Metric									
NEW	-	24227	.3150	8.00	8.0	65	22	0.5	27.50	26.30	25.11	23.91	
	-	24237	.3150	8.00	8.0	65	22	0.8	27.50	26.30	25.11	23.91	
	-	24247	.3150	8.00	8.0	65	22	1.0	27.50	26.30	25.11	23.91	
	-	24257	.3150	8.00	8.0	65	22	1.5	27.50	26.30	25.11	23.91	
	-	24267	.3150	8.00	8.0	65	22	2.0	27.50	26.30	25.11	23.91	
	-	24277	.3150	8.00	8.0	65	22	2.5	27.50	26.30	25.11	23.91	
	-	24287	.3150	8.00	8.0	65	22	3.0	27.50	26.30	25.11	23.91	
	-	80227	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.010"	30.95	29.61	28.26	26.92
	79237	80237	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.015"	30.95	29.61	28.26	26.92
	79247	80247	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.020"	30.95	29.61	28.26	26.92
	79257	80257	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.030"	30.95	29.61	28.26	26.92
	79267	80267	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.045"	30.95	29.61	28.26	26.92
	79277	80277	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	.060"	30.95	29.61	28.26	26.92
	-	24297	.3937	10.00	10.0	70	25	0.5	37.38	35.76	34.12	32.50	
	-	24307	.3937	10.00	10.0	70	25	0.8	37.38	35.76	34.12	32.50	
	-	24317	.3937	10.00	10.0	70	25	1.0	37.38	35.76	34.12	32.50	
	-	24327	.3937	10.00	10.0	70	25	1.5	37.38	35.76	34.12	32.50	
	-	24337	.3937	10.00	10.0	70	25	2.0	37.38	35.76	34.12	32.50	
	-	24347	.3937	10.00	10.0	70	25	2.5	37.38	35.76	34.12	32.50	
	NEW	-	24357	.3937	10.00	10.0	70	25	3.0	37.38	35.76	34.12	32.50
-		24367	.3937	10.00	10.0	70	25	3.2	37.38	35.76	34.12	32.50	
-		24377	.4724	12.00	12.0	75	25	0.5	55.05	52.66	50.26	47.87	
-		24387	.4724	12.00	12.0	75	25	0.8	55.05	52.66	50.26	47.87	
-		24397	.4724	12.00	12.0	75	25	1.0	55.05	52.66	50.26	47.87	
-		24407	.4724	12.00	12.0	75	25	1.5	55.05	52.66	50.26	47.87	
-		24417	.4724	12.00	12.0	75	25	2.0	55.05	52.66	50.26	47.87	
-		24427	.4724	12.00	12.0	75	25	2.5	55.05	52.66	50.26	47.87	
-		24437	.4724	12.00	12.0	75	25	3.0	55.05	52.66	50.26	47.87	
-		24447	.4724	12.00	12.0	75	25	3.2	55.05	52.66	50.26	47.87	
-		80297	.5000	1/2"	12.70	1/2"	3"	1"	.010"	52.80	50.50	48.21	45.92
79307		80307	.5000	1/2"	12.70	1/2"	3"	1"	.015"	52.80	50.50	48.21	45.92
79317		80317	.5000	1/2"	12.70	1/2"	3"	1"	.020"	52.80	50.50	48.21	45.92
79327		80327	.5000	1/2"	12.70	1/2"	3"	1"	.030"	52.80	50.50	48.21	45.92
79337		80337	.5000	1/2"	12.70	1/2"	3"	1"	.045"	52.80	50.50	48.21	45.92
79347		80347	.5000	1/2"	12.70	1/2"	3"	1"	.060"	52.80	50.50	48.21	45.92
79357		80357	.5000	1/2"	12.70	1/2"	3"	1"	.090"	52.80	50.50	48.21	45.92
79367		80367	.5000	1/2"	12.70	1/2"	3"	1"	.125"	52.80	50.50	48.21	45.92
79377		80377	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.015"	84.08	80.42	76.77	73.11
79387		80387	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.020"	84.08	80.42	76.77	73.11
79397	80397	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.030"	84.08	80.42	76.77	73.11	
79407	80407	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.045"	84.08	80.42	76.77	73.11	
79417	80417	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.060"	84.08	80.42	76.77	73.11	
79427	80427	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	.090"	84.08	80.42	76.77	73.11	
-	24457	.6299	16.00	16.0	88	38	0.5	87.73	83.92	80.10	76.29		
-	24467	.6299	16.00	16.0	88	38	1.0	87.73	83.92	80.10	76.29		
-	24477	.6299	16.00	16.0	88	38	2.0	87.73	83.92	80.10	76.29		
-	24487	.6299	16.00	16.0	88	38	2.5	87.73	83.92	80.10	76.29		
-	24497	.6299	16.00	16.0	88	38	3.0	87.73	83.92	80.10	76.29		
-	24507	.6299	16.00	16.0	88	38	4.0	87.73	83.92	80.10	76.29		
-	24517	.6299	16.00	16.0	88	38	5.0	87.73	83.92	80.10	76.29		
79447	80447	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.015"	120.57	115.33	110.08	104.84	
79457	80457	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.020"	120.57	115.33	110.08	104.84	
79467	80467	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.030"	120.57	115.33	110.08	104.84	
79477	80477	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.045"	120.57	115.33	110.08	104.84	
79487	80487	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.060"	120.57	115.33	110.08	104.84	
79497	80497	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.090"	120.57	115.33	110.08	104.84	
79507	80507	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.125"	120.57	115.33	110.08	104.84	
NEW	79637	80637	.7500	3/4"	19.05	3/4"	4"	1-1/2"	.250"	120.57	115.33	110.08	104.84

220RA - 2 Flute (continued)

230RA (830RA metric) - 4 Flute (continued)

.7874" - 1.000"
(20.00mm - 25.40mm)

END MILLS

2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100
		Decimal	Metric								
-	24527	.7874	20.00	20.0	100	38	0.5	170.63	163.22	155.79	148.38
-	24537	.7874	20.00	20.0	100	38	1.0	170.63	163.22	155.79	148.38
-	24547	.7874	20.00	20.0	100	38	2.0	170.63	163.22	155.79	148.38
-	24557	.7874	20.00	20.0	100	38	3.0	170.63	163.22	155.79	148.38
-	24567	.7874	20.00	20.0	100	38	5.0	170.63	163.22	155.79	148.38
79517	80517	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99
79527	80527	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99
79537	80537	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99
79547	80547	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99
79557	80557	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99
79567	80567	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99
79577	80577	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99
NEW 79647	80647	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99



320M (920M metric) - 2 Flute
323M (923M metric) - 3 Flute
330M (930M metric) - 4 Flute
 .0100" - .2656"
 (0.25mm - 6.75mm)

Technical information:
 page 192, 194

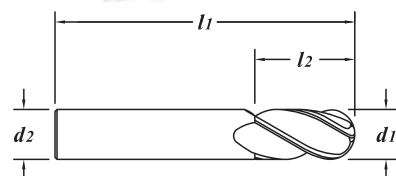


TOLERANCES

d_1	$\leq .030"$	$+.0004"-.0004" (+.0100-.0100\text{mm})$
	$\geq 1/32"$	$+.000"-.002" (+.000-.050\text{mm})$
d_2	3mm - 6mm	$+.0000"-.0003" (+.0000-.0075\text{mm})$
	1/4" - 1"	$-.0001"-.0004" (-.0025-.0100\text{mm})$
Ball radius	$+.000"-.001" (+.000-.025\text{mm})$	

Standard Length - Ball End

Solid submicron grain carbide end mill - center cutting
 Extremely versatile
 TiN Coated - page 140
 TiCN Coated - page 141
 TiALN Coated - page 142



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal		Metric							
16550	-	-	.0100	.0100"	0.25	1/8"	1-1/2"	.030"	18.89	18.06	17.24	16.42
16600	-	-	.0150	.0150"	0.38	1/8"	1-1/2"	.045"	18.80	17.98	17.17	16.35
16650	-	-	.0200	.0200"	0.51	1/8"	1-1/2"	.060"	18.30	17.50	16.71	15.91
16700	-	-	.0250	.0250"	0.64	1/8"	1-1/2"	.075"	17.69	16.92	16.15	15.38
16750	-	-	.0300	.0300"	0.76	1/8"	1-1/2"	.090"	15.24	14.57	13.92	13.25
16010	17010	18010	.0312	1/32"	0.79	1/8"	1-1/2"	3/32"	11.30	10.82	10.32	9.83
47010	38010	48010	.0394		1.00	3.0	38	4	11.87	11.35	10.84	10.32
16020	17020	18020	.0469	3/64"	1.19	1/8"	1-1/2"	1/8"	11.30	10.82	10.32	9.83
47020	38020	48020	.0591		1.50	3.0	38	6	11.87	11.35	10.84	10.32
16030	17030	18030	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	10.67	10.20	9.74	9.28
16040	17040	18040	.0781	5/64"	1.98	1/8"	1-1/2"	1/4"	10.67	10.20	9.74	9.28
47030	38030	48030	.0787		2.00	3.0	38	8	11.19	10.70	10.21	9.73
16050	17050	18050	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	10.20	9.76	9.32	8.87
47040	38040	48040	.0984		2.50	3.0	38	12	10.71	10.24	9.78	9.32
16060	17060	18060	.1094	7/64"	2.78	1/8"	1-1/2"	3/8"	10.20	9.76	9.32	8.87
47050	38050	48050	.1181		3.00	3.0	38	12	9.72	9.30	8.88	8.46
16070	17070	18070	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	9.26	8.85	8.46	8.05
47060	38060	48060	.1378		3.50	4.0	50	12	14.29	13.67	13.05	12.43
16080	17080	18080	.1406	9/64"	3.57	3/16"	2"	9/16"	13.58	12.99	12.40	11.81
16090	17090	18090	.1562	5/32"	3.97	3/16"	2"	9/16"	13.58	12.99	12.40	11.81
47070	38070	48070	.1575		4.00	4.0	50	14	12.81	12.25	11.70	11.14
16100	17100	18100	.1719	11/64"	4.37	3/16"	2"	9/16"	13.58	12.99	12.40	11.81
47080	38080	48080	.1772		4.50	5.0	50	14	16.12	15.42	14.72	14.02
16110	17110	18110	.1875	3/16"	4.76	3/16"	2"	5/8"	12.20	11.67	11.14	10.61
47090	38090	48090	.1969		5.00	5.0	65	16	15.53	14.85	14.18	13.50
16120	17120	18120	.2031	13/64"	5.16	1/4"	2-1/2"	5/8"	15.80	15.11	14.42	13.74
16130	17130	18130	.2188	7/32"	5.56	1/4"	2-1/2"	5/8"	15.80	15.11	14.42	13.74
16140	17140	18140	.2344	15/64"	5.95	1/4"	2-1/2"	3/4"	15.80	15.11	14.42	13.74
47100	38100	48100	.2362		6.00	6.0	65	19	15.92	15.23	14.54	13.84
16150	17150	18150	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	15.14	14.49	13.82	13.17
16160	17160	18160	.2656	17/64"	6.75	5/16"	2-1/2"	7/8"	23.71	22.68	21.65	20.62

320M (920M metric) - 2 Flute (continued)
323M (923M metric) - 3 Flute (continued)
330M (930M metric) - 4 Flute (continued)
.2756" - 1.000"
(7.00mm - 25.40mm)

END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter Metric							
47110	38110	48110	.2756	7.00	7.0	65	22	20.44	19.55	18.66	17.77
16170	17170	18170	.2812	9/32"	7.14	5/16"	2-1/2"	7/8"	23.71	22.68	21.65
16180	17180	18180	.2969	19/64"	7.54	5/16"	2-1/2"	7/8"	23.71	22.68	21.65
16190	17190	18190	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	19.87	19.01	18.15
47120	38120	48120	.3150	8.00	8.0	65	22	20.89	19.99	19.07	18.17
16200	17200	18200	.3281	21/64"	8.33	3/8"	2-1/2"	7/8"	28.39	27.15	25.93
16210	17210	18210	.3438	11/32"	8.73	3/8"	2-1/2"	7/8"	28.39	27.15	25.93
47130	38130	48130	.3543	9.00	9.0	65	22	25.54	24.43	23.32	22.21
16220	17220	18220	.3594	23/64"	9.13	3/8"	2-1/2"	7/8"	28.39	27.15	25.93
16230	17230	18230	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	24.32	23.25	22.20
16240	17240	18240	.3906	25/64"	9.92	7/16"	2-3/4"	7/8"	34.92	33.40	31.89
47140	38140	48140	.3937	10.00	10.0	70	25	29.85	28.55	27.25	25.96
16250	17250	18250	.4062	13/32"	10.32	7/16"	2-3/4"	7/8"	34.92	33.40	31.89
16260	17260	18260	.4219	27/64"	10.72	7/16"	2-3/4"	7/8"	34.92	33.40	31.89
47150	38150	48150	.4331	11.00	11.0	75	25	31.42	30.06	28.68	27.32
16270	17270	18270	.4375	7/16"	11.11	7/16"	2-3/4"	1"	29.92	28.62	27.32
16280	17280	18280	.4531	29/64"	11.51	1/2"	3"	1"	50.04	47.87	45.70
16290	17290	18290	.4688	15/32"	11.91	1/2"	3"	1"	50.04	47.87	45.70
47160	38160	48160	.4724	12.00	12.0	75	25	47.53	45.46	43.40	41.33
16300	17300	18300	.4844	31/64"	12.30	1/2"	3"	1"	50.04	47.87	45.70
16310	17310	18310	.5000	1/2"	12.70	1/2"	3"	1"	45.27	43.31	41.33
47170	38170	48170	.5512	14.00	14.0	88	32	69.20	66.20	63.18	60.17
16320	17320	18320	.5625	9/16"	14.29	9/16"	3-1/2"	1-1/4"	65.92	63.04	60.18
16330	17330	18330	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	73.20	70.01	66.83
47180	38180	48180	.6299	16.00	16.0	88	38	76.85	73.51	70.16	66.82
16340	17340	18340	.6875	11/16"	17.46	3/4"	4"	1-1/2"	121.85	116.55	111.25
47190	38190	48190	.7087	18.00	18.0	100	38	113.09	108.17	103.25	98.34
16350	17350	18350	.7500	3/4"	19.05	3/4"	4"	1-1/2"	107.72	103.04	98.35
47200	38200	48200	.7874	20.00	20.0	100	38	151.65	145.06	138.47	131.87
47210	38210	48210	.8661	22.00	22.0	100	38	168.47	161.15	153.82	146.49
16360	17360	18360	.8750	7/8"	22.22	7/8"	4"	1-1/2"	172.57	165.07	157.56
47220	38220	48220	.9843	25.00	25.0	100	38	176.59	168.92	161.23	153.56
16370	17370	18370	1.000	1"	25.40	1"	4"	1-1/2"	186.85	178.72	170.60

320MT - 2 Flute

330MT - 4 Flute

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TOLERANCES

d_1	+.000" - .002" (+.000 - .050mm)	
d_2	1/8" - 3/16"	+.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1"	-.0001" - .0004" (-.0025 - .0100mm)
Ball radius	+.000" - .001" (+.000 - .025mm)	

Standard Length - Ball End - TiN Coated

Solid submicron grain carbide end mill - center cutting

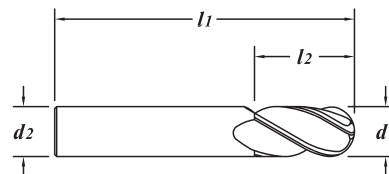
Improved lubricity - 10% faster than uncoated

Extremely versatile

Uncoated - page 138

TiCN Coated - page 141

TiALN Coated - page 142



2 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal		Metric							
16073	18073	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	10.51	10.06	9.60	9.14
16113	18113	.1875	3/16"	4.76	3/16"	2"	5/8"	13.47	12.89	12.29	11.71
16153	18153	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	17.70	16.93	16.16	15.39
16193	18193	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	23.30	22.29	21.27	20.26
16233	18233	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	27.75	26.54	25.33	24.13
16273	18273	.4375	7/16"	11.11	7/16"	2-3/4"	1"	34.07	32.59	31.11	29.63
16313	18313	.5000	1/2"	12.70	1/2"	3"	1"	49.42	47.27	45.13	42.97
16333	18333	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	79.58	76.12	72.66	69.20
16353	18353	.7500	3/4"	19.05	3/4"	4"	1-1/2"	115.02	110.02	105.02	100.02
16373	18373	1.000	1"	25.40	1"	4"	1-1/2"	199.63	190.94	182.27	173.59

320MC - 2 Flute
323MC - 3 Flute
330MC - 4 Flute

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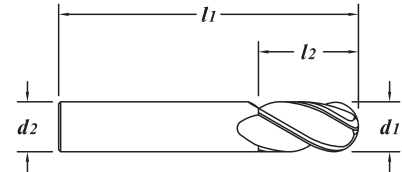


TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$1/8" - 3/16" \quad +.0000" - .0003" (-.0000 - .0075\text{mm})$
	$1/4" - 1" \quad -.0001" - .0004" (-.0025 - .0100\text{mm})$
Ball radius	$+0.000" - .001" (+.000 - .025\text{mm})$

Standard Length - Ball End - TiCN Coated

Solid submicron grain carbide end mill - center cutting
 Improved abrasion resistance and lubricity
 Up to 25% faster than uncoated
 Extremely versatile
 Uncoated - page 138
 TiN Coated - page 140
 TiAlN Coated - page 142



END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal		Metric							
16014	17014	18014	.0312	1/32"	0.79	1/8"	1-1/2"	3/32"	13.19	12.62	12.04	11.47
16024	17024	18024	.0469	3/64"	1.19	1/8"	1-1/2"	1/8"	13.19	12.62	12.04	11.47
16034	17034	18034	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	12.56	12.01	11.47	10.92
16044	17044	18044	.0781	5/64"	1.98	1/8"	1-1/2"	1/4"	12.56	12.01	11.47	10.92
16054	17054	18054	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	12.10	11.56	11.04	10.51
16064	17064	18064	.1094	7/64"	2.78	1/8"	1-1/2"	3/8"	12.10	11.56	11.04	10.51
16074	17074	18074	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	11.15	10.66	10.18	9.69
16084	17084	18084	.1406	9/64"	3.57	3/16"	2"	9/16"	15.49	14.81	14.14	13.47
16094	17094	18094	.1562	5/32"	3.97	3/16"	2"	9/16"	15.49	14.81	14.14	13.47
16104	17104	18104	.1719	11/64"	4.37	3/16"	2"	9/16"	15.49	14.81	14.14	13.47
16114	17114	18114	.1875	3/16"	4.76	3/16"	2"	5/8"	14.09	13.48	12.86	12.25
16124	17124	18124	.2031	13/64"	5.16	1/4"	2-1/2"	5/8"	19.62	18.77	17.92	17.07
16134	17134	18134	.2188	7/32"	5.56	1/4"	2-1/2"	5/8"	19.62	18.77	17.92	17.07
16144	17144	18144	.2344	15/64"	5.95	1/4"	2-1/2"	3/4"	19.62	18.77	17.92	17.07
16154	17154	18154	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	18.98	18.16	17.33	16.50
16164	17164	18164	.2656	17/64"	6.75	5/16"	2-1/2"	7/8"	28.85	27.59	26.34	25.08
16174	17174	18174	.2812	9/32"	7.14	5/16"	2-1/2"	7/8"	28.85	27.59	26.34	25.08
16184	17184	18184	.2969	19/64"	7.54	5/16"	2-1/2"	7/8"	28.85	27.59	26.34	25.08
16194	17194	18194	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	25.02	23.93	22.85	21.76
16204	17204	18204	.3281	21/64"	8.33	3/8"	2-1/2"	7/8"	33.52	32.06	30.61	29.15
16214	17214	18214	.3438	11/32"	8.73	3/8"	2-1/2"	7/8"	33.52	32.06	30.61	29.15
16224	17224	18224	.3594	23/64"	9.13	3/8"	2-1/2"	7/8"	33.52	32.06	30.61	29.15
16234	17234	18234	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	29.44	28.16	26.88	25.60
16244	17244	18244	.3906	25/64"	9.92	7/16"	2-3/4"	7/8"	41.07	39.28	37.50	35.71
16254	17254	18254	.4062	13/32"	10.32	7/16"	2-3/4"	7/8"	41.07	39.28	37.50	35.71
16264	17264	18264	.4219	27/64"	10.72	7/16"	2-3/4"	7/8"	41.07	39.28	37.50	35.71
16274	17274	18274	.4375	7/16"	11.11	7/16"	2-3/4"	1"	36.07	34.50	32.93	31.37
16284	17284	18284	.4531	29/64"	11.51	1/2"	3"	1"	56.20	53.76	51.31	48.87
16294	17294	18294	.4688	15/32"	11.91	1/2"	3"	1"	56.20	53.76	51.31	48.87
16304	17304	18304	.4844	31/64"	12.30	1/2"	3"	1"	56.20	53.76	51.31	48.87
16314	17314	18314	.5000	1/2"	12.70	1/2"	3"	1"	51.43	49.19	46.96	44.72
16324	17324	18324	.5625	9/16"	14.29	9/16"	3-1/2"	1-1/4"	75.49	72.21	68.93	65.64
16334	17334	18334	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	82.78	79.19	75.59	71.99
16344	17344	18344	.6875	11/16"	17.46	3/4"	4"	1-1/2"	132.81	127.04	121.26	115.48
16354	17354	18354	.7500	3/4"	19.05	3/4"	4"	1-1/2"	118.67	113.52	108.36	103.20
16364	17364	18364	.8750	7/8"	22.22	7/8"	4"	1-1/2"	189.04	180.82	172.60	164.38
16374	17374	18374	1.000	1"	25.40	1"	4"	1-1/2"	203.32	194.48	185.64	176.80

320MA (920MA metric) - 2 Flute
323MA (923MA metric) - 3 Flute
330MA (930MA metric) - 4 Flute
 .0312" - .3150"
 (0.79mm - 8.00mm)

Technical information:
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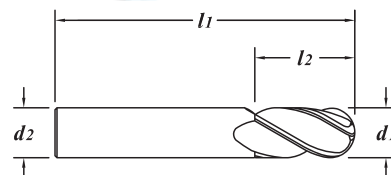


TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Standard Length - Ball End - TiALN Coated

Solid submicron grain carbide end mill - center cutting
 Dry or semi-dry machining
 Up to 40% faster than uncoated
 Extremely versatile
 Uncoated - page 138
 TiN Coated - page 140
 TiCN Coated - page 141



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter	Metric							
16017	17017	18017	.0312	1/32"	0.79	1/8"	1-1/2"	3/32"	13.45	12.86	12.28	11.69
47017	38017	48017	.0394		1.00	3.0	38	4	14.01	13.40	12.79	12.18
16027	17027	18027	.0469	3/64"	1.19	1/8"	1-1/2"	1/8"	13.45	12.86	12.28	11.69
47027	38027	48027	.0591		1.50	3.0	38	6	14.01	13.40	12.79	12.18
16037	17037	18037	.0625	1/16"	1.59	1/8"	1-1/2"	1/4"	12.81	12.25	11.70	11.14
16047	17047	18047	.0781	5/64"	1.98	1/8"	1-1/2"	1/4"	12.81	12.25	11.70	11.14
47037	38037	48037	.0787		2.00	3.0	38	8	13.33	12.75	12.18	11.60
16057	17057	18057	.0938	3/32"	2.38	1/8"	1-1/2"	3/8"	12.34	11.80	11.27	10.73
47047	38047	48047	.0984		2.50	3.0	38	12	12.85	12.29	11.74	11.18
16067	17067	18067	.1094	7/64"	2.78	1/8"	1-1/2"	3/8"	12.34	11.80	11.27	10.73
47057	38057	48057	.1181		3.00	3.0	38	12	11.87	11.35	10.84	10.32
16077	17077	18077	.1250	1/8"	3.17	1/8"	1-1/2"	1/2"	11.40	10.90	10.41	9.91
47067	38067	48067	.1378		3.50	4.0	50	12	16.42	15.70	15.00	14.28
16087	17087	18087	.1406	9/64"	3.57	3/16"	2"	9/16"	15.74	15.05	14.36	13.69
16097	17097	18097	.1562	5/32"	3.97	3/16"	2"	9/16"	15.74	15.05	14.36	13.69
47077	38077	48077	.1575		4.00	4.0	50	14	14.96	14.30	13.66	13.00
16107	17107	18107	.1719	11/64"	4.37	3/16"	2"	9/16"	15.74	15.05	14.36	13.69
47087	38087	48087	.1772		4.50	5.0	50	14	19.47	18.63	17.77	16.93
16117	17117	18117	.1875	3/16"	4.76	3/16"	2"	5/8"	14.34	13.72	13.09	12.47
47097	38097	48097	.1969		5.00	5.0	65	16	19.95	19.08	18.21	17.35
16127	17127	18127	.2031	13/64"	5.16	1/4"	2-1/2"	5/8"	20.23	19.34	18.47	17.59
16137	17137	18137	.2188	7/32"	5.56	1/4"	2-1/2"	5/8"	20.23	19.34	18.47	17.59
16147	17147	18147	.2344	15/64"	5.95	1/4"	2-1/2"	3/4"	20.23	19.34	18.47	17.59
47107	38107	48107	.2362		6.00	6.0	65	19	20.34	19.46	18.57	17.69
16157	17157	18157	.2500	1/4"	6.35	1/4"	2-1/2"	3/4"	19.56	18.71	17.86	17.01
16167	17167	18167	.2656	17/64"	6.75	5/16"	2-1/2"	7/8"	30.35	29.03	27.71	26.38
47117	38117	48117	.2756		7.00	7.0	65	22	27.04	25.86	24.69	23.51
16177	17177	18177	.2812	9/32"	7.14	5/16"	2-1/2"	7/8"	30.35	29.03	27.71	26.38
16187	17187	18187	.2969	19/64"	7.54	5/16"	2-1/2"	7/8"	30.35	29.03	27.71	26.38
16197	17197	18197	.3125	5/16"	7.94	5/16"	2-1/2"	7/8"	26.50	25.34	24.19	23.05
47127	38127	48127	.3150		8.00	8.0	65	22	27.50	26.30	25.11	23.91

320MA (920MA metric) - 2 Flute (continued)
323MA (923MA metric) - 3 Flute (continued)
330MA (930MA metric) - 4 Flute (continued)
.3281" - 1.000"
(8.33mm - 25.40mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter	Metric							
16207	17207	18207	.3281	21/64"	8.33	3/8"	2-1/2"	7/8"	35.02	33.50	31.97	30.45
16217	17217	18217	.3438	11/32"	8.73	3/8"	2-1/2"	7/8"	35.02	33.50	31.97	30.45
47137	38137	48137	.3543		9.00	9.0	65	22	32.15	30.75	29.35	27.96
16227	17227	18227	.3594	23/64"	9.13	3/8"	2-1/2"	7/8"	35.02	33.50	31.97	30.45
16237	17237	18237	.3750	3/8"	9.52	3/8"	2-1/2"	7/8"	30.95	29.61	28.26	26.92
16247	17247	18247	.3906	25/64"	9.92	7/16"	2-3/4"	7/8"	42.44	40.60	38.75	36.91
47147	38147	48147	.3937		10.00	10.0	70	25	37.38	35.76	34.12	32.50
16257	17257	18257	.4062	13/32"	10.32	7/16"	2-3/4"	7/8"	42.44	40.60	38.75	36.91
16267	17267	18267	.4219	27/64"	10.72	7/16"	2-3/4"	7/8"	42.44	40.60	38.75	36.91
47157	38157	48157	.4331		11.00	11.0	75	25	38.94	37.24	35.55	33.86
16277	17277	18277	.4375	7/16"	11.11	7/16"	2-3/4"	1"	37.45	35.82	34.20	32.56
16287	17287	18287	.4531	29/64"	11.51	1/2"	3"	1"	57.57	55.07	52.57	50.07
16297	17297	18297	.4688	15/32"	11.91	1/2"	3"	1"	57.57	55.07	52.57	50.07
47167	38167	48167	.4724		12.00	12.0	75	25	55.05	52.66	50.26	47.87
16307	17307	18307	.4844	31/64"	12.30	1/2"	3"	1"	57.57	55.07	52.57	50.07
16317	17317	18317	.5000	1/2"	12.70	1/2"	3"	1"	52.80	50.50	48.21	45.92
47177	38177	48177	.5512		14.00	14.0	88	32	80.08	76.60	73.11	69.64
16327	17327	18327	.5625	9/16"	14.29	9/16"	3-1/2"	1-1/4"	76.78	73.44	70.11	66.77
16337	17337	18337	.6250	5/8"	15.87	5/8"	3-1/2"	1-1/4"	84.08	80.42	76.77	73.11
47187	38187	48187	.6299		16.00	16.0	88	38	87.73	83.92	80.10	76.29
16347	17347	18347	.6875	11/16"	17.46	3/4"	4"	1-1/2"	134.69	128.84	122.98	117.12
47197	38197	48197	.7087		18.00	18.0	100	38	125.95	120.47	115.00	109.52
16357	17357	18357	.7500	3/4"	19.05	3/4"	4"	1-1/2"	120.57	115.33	110.08	104.84
47207	38207	48207	.7874		20.00	20.0	100	38	170.63	163.22	155.79	148.38
47217	38217	48217	.8661		22.00	22.0	100	38	187.45	179.30	171.15	163.00
16367	17367	18367	.8750	7/8"	22.22	7/8"	4"	1-1/2"	191.55	183.22	174.89	166.57
47227	38227	48227	.9843		25.00	25.0	100	38	195.57	187.06	178.57	170.06
16377	17377	18377	1.000	1"	25.40	1"	4"	1-1/2"	205.85	196.89	187.95	178.99

222M - 2 Flute - Square End
234M - 4 Flute - Square End
322M - 2 Flute - Ball End
334M - 4 Flute - Ball End

Technical information:
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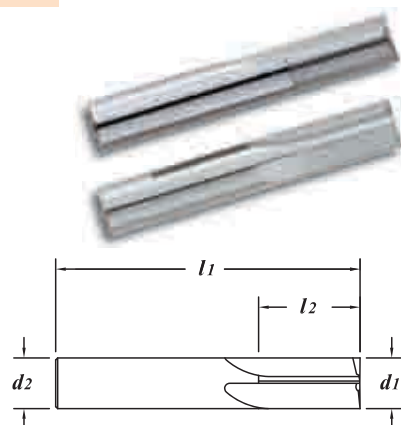


TOLERANCES

d_1	+0.000" -0.002" (+0.000 -0.050mm)	
d_2	1/8" - 3/16"	+0.0000" -0.0003" (-0.0000 -0.0075mm)
	1/4" - 1"	-0.0001" -0.0004" (-0.0025 -0.0100mm)
Ball radius	+0.000" -0.001" (+0.000 -0.025mm)	

Standard Length - Straight Flute

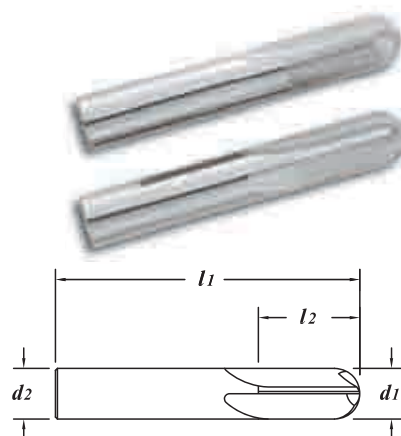
Solid submicron grain carbide end mill - center cutting
For cutting high Rc materials
Helps to hold perpendicularity



222M EDP#	234M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter Metric							
81070	82070	.1250	1/8"	3.17	1/8"	1-1/2"	8.02	7.66	7.32	6.97
81110	82110	.1875	3/16"	4.76	3/16"	2"	11.24	10.75	10.26	9.78
81150	82150	.2500	1/4"	6.35	1/4"	2-1/2"	13.56	12.97	12.39	11.79
81190	82190	.3125	5/16"	7.94	5/16"	2-1/2"	19.00	18.18	17.35	16.53
81230	82230	.3750	3/8"	9.52	3/8"	2-1/2"	23.69	22.66	21.63	20.60
81270	82270	.4375	7/16"	11.11	7/16"	2-3/4"	28.89	27.63	26.37	25.13
81310	82310	.5000	1/2"	12.70	1/2"	3"	37.90	36.25	34.60	32.96
81330	82330	.6250	5/8"	15.87	5/8"	3-1/2"	73.16	69.98	66.80	63.62
81350	82350	.7500	3/4"	19.05	3/4"	4"	107.26	102.60	97.93	93.27
81370	82370	1.000	1"	25.04	1"	4"	176.48	168.80	161.13	153.46

Standard Length - Straight Flute - Ball End

Solid submicron grain carbide end mill - center cutting
For cutting high Rc materials
Helps to hold perpendicularity



322M EDP#	334M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter Metric							
83070	84070	.1250	1/8"	3.17	1/8"	1-1/2"	10.28	9.83	9.38	8.93
83110	84110	.1875	3/16"	4.76	3/16"	2"	13.56	12.97	12.39	11.79
83150	84150	.2500	1/4"	6.35	1/4"	2-1/2"	16.82	16.09	15.35	14.62
83190	84190	.3125	5/16"	7.94	5/16"	2-1/2"	22.08	21.12	20.16	19.20
83230	84230	.3750	3/8"	9.52	3/8"	2-1/2"	27.02	25.84	24.67	23.49
83270	84270	.4375	7/16"	11.11	7/16"	2-3/4"	33.26	31.81	30.37	28.92
83310	84310	.5000	1/2"	12.70	1/2"	3"	50.30	48.12	45.93	43.74
83330	84330	.6250	5/8"	15.87	5/8"	3-1/2"	81.34	77.80	74.27	70.73
83350	84350	.7500	3/4"	19.05	3/4"	4"	119.69	114.49	109.28	104.08
83370	84370	1.000	1"	25.04	1"	4"	207.60	198.58	189.55	180.52

273M - 3 Flute - Square end 373M - 3 Flute - Ball end

Technical information:
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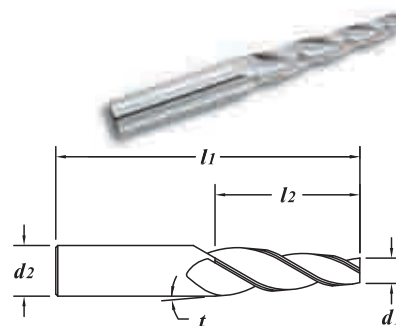


TOLERANCES

d_1	$+0.003" -0.000" (+0.075 -0.000\text{mm})$
d_2	$-0.0001" -0.0004" (-0.0025 -0.0100\text{mm})$
r	$+0.003" -0.000" (+0.075 -0.000\text{mm})$

Standard Length - Tapered

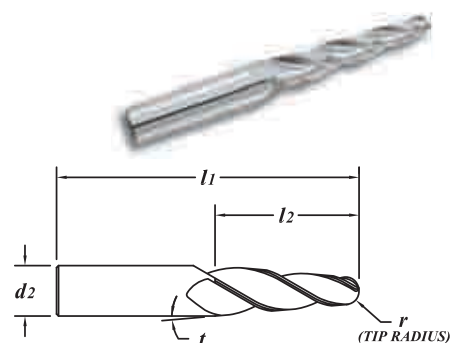
Solid submicron grain carbide end mill - center cutting
Excellent for holding draft angles in mold and die applications



273M EDP#	d_2 Shank Diameter	t Taper Per Side	d_1 † Tip Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Metric						
49010	1/4"	1°	.1250	1/8"	3.17	3"	1-1/2"	26.29	25.15	24.00
49020	1/4"	1° 30'	.1250	1/8"	3.17	3"	1-1/2"	26.29	25.15	24.00
49030	1/4"	2°	.1250	1/8"	3.17	3"	1"	26.29	25.15	24.00
49040	1/4"	3°	.1250	1/8"	3.17	3"	1"	26.29	25.15	24.00
49050	1/4"	5°	.1250	1/8"	3.17	3"	3/4"	26.29	25.15	24.00
49060	1/4"	7°	.1250	1/8"	3.17	3"	1/2"	26.29	25.15	24.00
49070	3/8"	1°	.1875	3/16"	4.76	3-1/2"	1-3/4"	39.48	37.76	36.05
49080	3/8"	1° 30'	.1875	3/16"	4.76	3-1/2"	1-3/4"	39.48	37.76	36.05
49090	3/8"	2°	.1875	3/16"	4.76	3-1/2"	1-3/4"	39.48	37.76	36.05
49100	3/8"	3°	.1562	5/32"	3.97	3-1/2"	1-3/4"	39.48	37.76	36.05
49110	3/8"	5°	.1250	1/8"	3.17	3-1/2"	1-1/2"	39.48	37.76	36.05
49120	3/8"	7°	.1562	5/32"	3.97	3-1/2"	3/4"	39.48	37.76	36.05
49130	1/2"	3°	.2500	1/4"	6.35	4"	2"	54.38	52.02	49.65
49140	1/2"	5°	.2500	1/4"	6.35	4"	1-1/4"	54.38	52.02	49.65
49150	1/2"	7°	.1875	3/16"	4.76	4"	1-1/4"	54.38	52.02	49.65

Standard Length - Tapered - Ball End

Solid submicron grain carbide end mill - center cutting
Excellent for holding draft angles in mold and die applications



373M EDP#	d_2 Shank Diameter	t Taper Per Side	r † Tip Radius		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Metric						
50010	1/4"	1°	.0620	.062"	1.57	3"	1-1/2"	29.16	27.89	26.62
50020	1/4"	1° 30'	.0620	.062"	1.57	3"	1-1/2"	29.16	27.89	26.62
50030	1/4"	2°	.0620	.062"	1.57	3"	1"	29.16	27.89	26.62
50040	1/4"	3°	.0620	.062"	1.57	3"	1"	29.16	27.89	26.62
50050	1/4"	5°	.0620	.062"	1.57	3"	3/4"	29.16	27.89	26.62
50060	1/4"	7°	.0620	.062"	1.57	3"	1/2"	29.16	27.89	26.62
50070	3/8"	1°	.0930	.093"	2.36	3-1/2"	1-3/4"	43.84	41.93	40.02
50080	3/8"	1° 30'	.0930	.093"	2.36	3-1/2"	1-3/4"	43.84	41.93	40.02
50090	3/8"	2°	.0930	.093"	2.36	3-1/2"	1-3/4"	43.84	41.93	40.02
50100	3/8"	3°	.0780	.078"	1.98	3-1/2"	1-3/4"	43.84	41.93	40.02
50110	3/8"	5°	.0620	.062"	1.57	3-1/2"	1-1/2"	43.84	41.93	40.02
50120	3/8"	7°	.0780	.078"	1.98	3-1/2"	3/4"	43.84	41.93	40.02
50130	1/2"	3°	.1250	.125"	3.18	4"	2"	62.50	59.79	57.06
50140	1/2"	5°	.1250	.125"	3.18	4"	1-1/4"	62.50	59.79	57.06
50150	1/2"	7°	.0930	.093"	2.36	4"	1-1/4"	62.50	59.79	57.06

280M - 2 Flute - Square End
290M - 4 Flute - Square End
380M - 2 Flute - Ball End
390M - 4 Flute - Ball End

Technical information:
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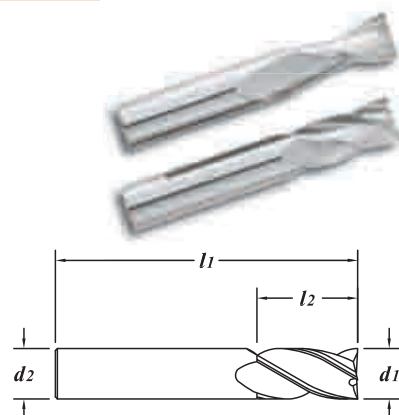


TOLERANCES

d_1	+.001" -.000" (+.025 -.000mm)	
d_2	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Standard Length - N/C Tolerance

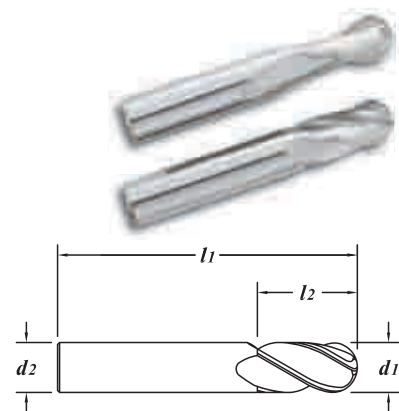
Solid submicron grain carbide end mill - center cutting
Excellent for keyways
Tight tolerance for precision machining
For use when matching tools are necessary



280M EDP#	290M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter Metric							
25010	26010	.0625	1/16"	1.59	1/8"	1-1/2"	11.74	11.23	10.72	10.21
25020	26020	.0938	3/32"	2.38	1/8"	1-1/2"	11.13	10.64	10.16	9.67
25030	26030	.1250	1/8"	3.17	1/8"	1-1/2"	10.80	10.33	9.86	9.39
25040	26040	.1875	3/16"	4.76	3/16"	2"	14.36	13.74	13.11	12.49
25050	26050	.2500	1/4"	6.35	1/4"	2-1/2"	16.52	15.80	15.08	14.36
25060	26060	.3125	5/16"	7.94	5/16"	2-1/2"	23.65	22.62	21.59	20.56
25070	26070	.3750	* 3/8"	9.53	3/8"	2-1/2"	30.35	29.03	27.71	26.38
25080	26080	.4375	* 7/16"	11.11	7/16"	2-3/4"	37.01	35.40	33.80	32.19
25090	26090	.5000	* 1/2"	12.70	1/2"	3"	48.59	46.48	44.37	42.26
25100	26100	.6250	* 5/8"	15.87	5/8"	3-1/2"	86.52	82.75	79.00	75.23
25110	26110	.7500	* 3/4"	19.05	3/4"	4"	129.38	123.75	118.12	112.50
25120	26120	1.000	* 1"	25.40	1"	4"	219.72	210.16	200.62	191.06

Standard Length - N/C Tolerance - Ball End

Solid submicron grain carbide end mill - center cutting
Excellent for keyways
Tight tolerance for precision machining
For use when matching tools are necessary
Radius tolerance +.0005" -.0000" (+.0127mm -.0000mm)



380M EDP#	390M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter Metric							
27010	28010	.0625	1/16"	1.59	1/8"	1-1/2"	13.52	12.93	12.34	11.75
27020	28020	.0938	3/32"	2.38	1/8"	1-1/2"	12.81	12.25	11.70	11.14
27030	28030	.1250	1/8"	3.17	1/8"	1-1/2"	12.42	11.88	11.34	10.80
27040	28040	.1875	3/16"	4.76	3/16"	2"	16.52	15.80	15.08	14.36
27050	28050	.2500	1/4"	6.35	1/4"	2-1/2"	19.00	18.18	17.35	16.53
27060	28060	.3125	5/16"	7.94	5/16"	2-1/2"	27.18	25.99	24.81	23.63
27070	28070	.3750	* 3/8"	9.53	3/8"	2-1/2"	34.90	33.38	31.87	30.35
27080	28080	.4375	* 7/16"	11.11	7/16"	2-3/4"	42.56	40.71	38.85	37.00
27090	28090	.5000	* 1/2"	12.70	1/2"	3"	55.90	53.47	51.04	48.61
27100	28100	.6250	* 5/8"	15.87	5/8"	3-1/2"	99.52	95.19	90.86	86.54
27110	28110	.7500	* 3/4"	19.05	3/4"	4"	148.78	142.31	135.84	129.38
27120	28120	1.000	* 1"	25.40	1"	4"	252.68	241.70	230.70	219.72

* - Tools with weldon flats

425M - 2 Flute
435M - 4 Flute
425MA - 2 Flute
435MA - 4 Flute

Technical information:
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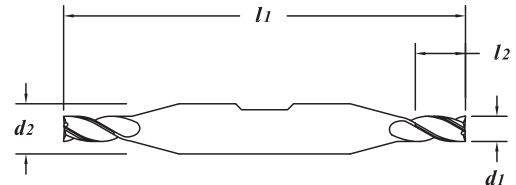


TOLERANCES

d_1	$+0.000" -0.002" (+0.000 -0.050\text{mm})$
d_2	$-0.0001" -0.0004" (-0.0025 -0.0100\text{mm})$

Standard Length - Double End - 3/8" Shank

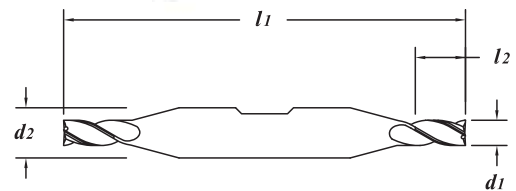
Solid submicron grain carbide end mill - center cutting
Common 3/8" diameter shank with weldon flat
For strength and adaptability when converting from high speed steel



425M EDP#	435M EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
33010	34010	.1250	1/8"	3.17	3/8"	3"	3/8"	31.42	30.06	28.68	27.32
33020	34020	.1562	5/32"	3.97	3/8"	3"	7/16"	31.42	30.06	28.68	27.32
33030	34030	.1875	3/16"	4.76	3/8"	3"	1/2"	31.42	30.06	28.68	27.32
33040	34040	.2188	7/32"	5.56	3/8"	3"	9/16"	31.42	30.06	28.68	27.32
33050	34050	.2500	1/4"	6.35	3/8"	3"	5/8"	31.42	30.06	28.68	27.32
33060	34060	.2812	9/32"	7.14	3/8"	4"	11/16"	36.10	34.53	32.96	31.39
33070	34070	.3125	5/16"	7.94	3/8"	4"	3/4"	36.10	34.53	32.96	31.39
33080	34080	.3438	11/32"	8.73	3/8"	4"	3/4"	36.10	34.53	32.96	31.39
33090	34090	.3750	3/8"	9.52	3/8"	4"	3/4"	36.10	34.53	32.96	31.39

Standard Length - Double End - 3/8" Shank - TiALN Coated

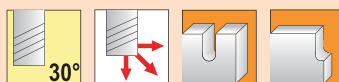
Solid submicron grain carbide end mill - center cutting
Common 3/8" diameter shank with weldon flat
For strength and adaptability when converting from high speed steel
Dry or semi-dry machining
Up to 40% faster than uncoated



425MA EDP#	435MA EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal		Metric							
33017	34017	.1250	1/8"	3.17	3/8"	3"	3/8"	41.36	39.56	37.76	35.96
33027	34027	.1562	5/32"	3.97	3/8"	3"	7/16"	41.36	39.56	37.76	35.96
33037	34037	.1875	3/16"	4.76	3/8"	3"	1/2"	41.36	39.56	37.76	35.96
33047	34047	.2188	7/32"	5.56	3/8"	3"	9/16"	41.36	39.56	37.76	35.96
33057	34057	.2500	1/4"	6.35	3/8"	3"	5/8"	41.36	39.56	37.76	35.96
33067	34067	.2812	9/32"	7.14	3/8"	4"	11/16"	48.70	46.58	44.47	42.35
33077	34077	.3125	5/16"	7.94	3/8"	4"	3/4"	48.70	46.58	44.47	42.35
33087	34087	.3438	11/32"	8.73	3/8"	4"	3/4"	48.70	46.58	44.47	42.35
33097	34097	.3750	3/8"	9.52	3/8"	4"	3/4"	48.70	46.58	44.47	42.35

525M - 2 Flute
535M - 4 Flute
525MA - 2 Flute
535MA - 4 Flute

Technical information: page 192, 194

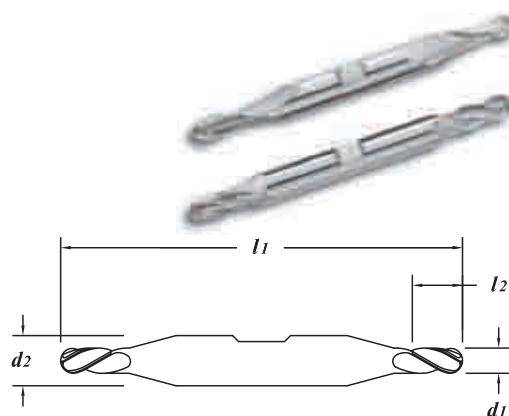


TOLERANCES

d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	-0.0001" -0.0004" (-0.0025 -0.0100mm)
Ball radius	+0.000" -0.001" (+0.000 -0.025mm)

Standard Length - Double End - 3/8" Shank - Ball End

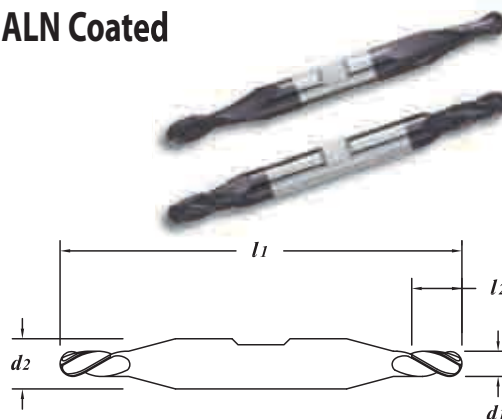
Solid submicron grain carbide end mill - center cutting
 Common 3/8" diameter shank with weldon flat
 For strength and adaptability when converting from high speed steel



525M EDP#	535M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
35010	36010	.1250	1/8"	3.17	3/8"	3"	3/8"	36.96	35.35	33.75	32.14
35020	36020	.1562	5/32"	3.97	3/8"	3"	7/16"	36.96	35.35	33.75	32.14
35030	36030	.1875	3/16"	4.76	3/8"	3"	1/2"	36.96	35.35	33.75	32.14
35040	36040	.2188	7/32"	5.56	3/8"	3"	9/16"	36.96	35.35	33.75	32.14
35050	36050	.2500	1/4"	6.35	3/8"	3"	5/8"	36.96	35.35	33.75	32.14
35060	36060	.2812	9/32"	7.14	3/8"	4"	11/16"	42.46	40.61	38.77	36.92
35070	36070	.3125	5/16"	7.94	3/8"	4"	3/4"	42.46	40.61	38.77	36.92
35080	36080	.3438	11/32"	8.73	3/8"	4"	3/4"	42.46	40.61	38.77	36.92
35090	36090	.3750	3/8"	9.52	3/8"	4"	3/4"	42.46	40.61	38.77	36.92

Standard Length - Double End - 3/8" Shank - Ball End - TiAlN Coated

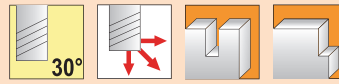
Solid submicron grain carbide end mill - center cutting
 Common 3/8" diameter shank with weldon flat
 For strength and adaptability when converting from high speed steel
 Dry or semi-dry machining
 Up to 40% faster than uncoated



525MA EDP#	535MA EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
35017	36017	.1250	1/8"	3.17	3/8"	3"	3/8"	46.88	44.84	42.81	40.77
35027	36027	.1562	5/32"	3.97	3/8"	3"	7/16"	46.88	44.84	42.81	40.77
35037	36037	.1875	3/16"	4.76	3/8"	3"	1/2"	46.88	44.84	42.81	40.77
35047	36047	.2188	7/32"	5.56	3/8"	3"	9/16"	46.88	44.84	42.81	40.77
35057	36057	.2500	1/4"	6.35	3/8"	3"	5/8"	46.88	44.84	42.81	40.77
35067	36067	.2812	9/32"	7.14	3/8"	4"	11/16"	55.08	52.69	50.28	47.89
35077	36077	.3125	5/16"	7.94	3/8"	4"	3/4"	55.08	52.69	50.28	47.89
35087	36087	.3438	11/32"	8.73	3/8"	4"	3/4"	55.08	52.69	50.28	47.89
35097	36097	.3750	3/8"	9.52	3/8"	4"	3/4"	55.08	52.69	50.28	47.89

420M - 2 Flute
430M (450M metric) - 4 Flute

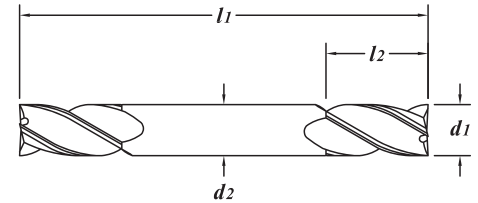
Technical information: page 192, 194



TOLERANCES		
d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1/2"	-.0001" -.0004" (-.0025 -.0100mm)

Standard Length - Double End

Solid submicron grain carbide end mill - center cutting
 Extremely versatile
 TiALN Coated - page 150



2 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter	Metric							
29010	30010	.0312	1/32"	0.79	1/8"	2"	3/32"	19.02	18.19	17.37	16.54
-	30510	.0394		1.00	3.0	50	4	20.02	19.15	18.28	17.41
29020	30020	.0469	3/64"	1.19	1/8"	2"	1/8"	19.02	18.19	17.37	16.54
-	30520	.0591		1.50	3.0	50	5	20.02	19.15	18.28	17.41
29030	30030	.0625	1/16"	1.59	1/8"	2"	3/16"	19.02	18.19	17.37	16.54
-	30530	.0787		2.00	3.0	50	6	20.02	19.15	18.28	17.41
29040	30040	.0938	3/32"	2.38	1/8"	2"	1/4"	19.02	18.19	17.37	16.54
-	30540	.0984		2.50	3.0	50	7	20.02	19.15	18.28	17.41
-	30550	.1181		3.00	3.0	50	8	14.46	13.83	13.20	12.57
29050	30050	.1250	1/8"	3.17	1/8"	2"	3/8"	13.74	13.15	12.54	11.95
-	30560	.1378		3.50	4.0	65	9.5	20.66	19.77	18.87	17.97
29060	30060	.1562	5/32"	3.97	3/16"	2-1/2"	7/16"	19.64	18.78	17.93	17.08
-	30570	.1575		4.00	4.0	65	10	17.30	16.55	15.79	15.04
-	30580	.1772		4.50	5.0	65	12	23.03	22.03	21.02	20.02
29070	30070	.1875	3/16"	4.76	3/16"	2-1/2"	1/2"	16.43	15.71	15.01	14.29
-	30590	.1969		5.00	5.0	65	12	20.07	19.20	18.32	17.45
29080	30080	.2188	7/32"	5.56	1/4"	2-1/2"	9/16"	21.87	20.92	19.97	19.02
-	30600	.2362		6.00	6.0	65	16	20.97	20.05	19.15	18.23
29090	30090	.2500	1/4"	6.35	1/4"	2-1/2"	5/8"	19.92	19.05	18.18	17.32
-	30610	.2756		7.00	7.0	88	19	26.34	25.20	24.06	22.91
29100	30100	.3125	5/16"	7.94	5/16"	3-1/2"	3/4"	26.01	24.88	23.75	22.62
-	30620	.3150		8.00	8.0	88	19	27.37	26.19	24.99	23.81
-	30630	.3543		9.00	9.0	88	19	35.37	33.83	32.29	30.75
29110	30110	.3750	3/8"	9.52	3/8"	3-1/2"	3/4"	33.59	32.14	30.67	29.21
-	30640	.3937		10.00	10.0	88	19	47.01	44.96	42.92	40.87
-	30650	.4331		11.00	11.0	100	22	50.24	48.06	45.87	43.69
29120	30120	.4375	7/16"	11.11	7/16"	4"	7/8"	47.74	45.66	43.59	41.51
-	30660	.4724		12.00	12.0	100	25	56.47	54.02	51.56	49.11
29130	30130	.5000	1/2"	12.70	1/2"	4"	1"	53.64	51.31	48.97	46.64

420MA - 2 Flute 430MA (450MA metric) - 4 Flute

Technical information:
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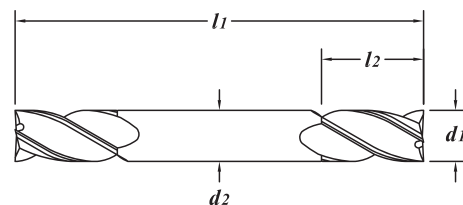


TOLERANCES

d_1	$+0.000^{\circ} - 0.002^{\circ} (+0.000 - 0.050\text{mm})$
d_2	$3\text{mm} - 6\text{mm} \quad +0.000^{\circ} - 0.003^{\circ} (-0.0000 - 0.0075\text{mm})$
	$1/4^{\circ} - 1/2^{\circ} \quad -0.001^{\circ} - 0.004^{\circ} (-0.0025 - 0.100\text{mm})$

Standard Length - Double End - TiALN Coated

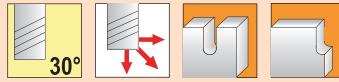
Solid submicron grain carbide end mill - center cutting
Dry or semi-dry machining
Up to 40% faster than uncoated
Extremely versatile
Uncoated - page 149



2 Flute EDP#	4 Flute EDP#	$d_1^{\dagger}$ Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
29017	30017	.0312	1/32"	0.79	1/8"	2"	3/32"	22.25	21.28	20.31	19.34
-	30517	.0394		1.00	3.0	50	4	23.25	22.25	21.24	20.22
29027	30027	.0469	3/64"	1.19	1/8"	2"	1/8"	22.25	21.28	20.31	19.34
-	30527	.0591		1.50	3.0	50	5	23.25	22.25	21.24	20.22
29037	30037	.0625	1/16"	1.59	1/8"	2"	3/16"	22.25	21.28	20.31	19.34
-	30537	.0787		2.00	3.0	50	6	23.25	22.25	21.24	20.22
29047	30047	.0938	3/32"	2.38	1/8"	2"	1/4"	22.25	21.28	20.31	19.34
-	30547	.0984		2.50	3.0	50	7	23.25	22.25	21.24	20.22
-	30557	.1181		3.00	3.0	50	8	17.68	16.91	16.14	15.37
29057	30057	.1250	1/8"	3.17	1/8"	2"	3/8"	16.96	16.22	15.49	14.75
-	30567	.1378		3.50	4.0	65	9.5	25.68	24.56	23.44	22.33
29067	30067	.1562	5/32"	3.97	3/16"	2-1/2"	7/16"	24.65	23.58	22.51	21.43
-	30577	.1575		4.00	4.0	65	10	22.30	21.33	20.36	19.39
-	30587	.1772		4.50	5.0	65	12	29.65	28.36	27.07	25.78
29077	30077	.1875	3/16"	4.76	3/16"	2-1/2"	1/2"	21.44	20.51	19.58	18.65
-	30597	.1969		5.00	5.0	65	12	26.70	25.53	24.38	23.21
29087	30087	.2188	7/32"	5.56	1/4"	2-1/2"	9/16"	28.50	27.26	26.02	24.78
-	30607	.2362		6.00	6.0	65	16	27.59	26.40	25.19	23.99
29097	30097	.2500	1/4"	6.35	1/4"	2-1/2"	5/8"	26.56	25.41	24.25	23.10
-	30617	.2756		7.00	7.0	88	19	38.97	37.27	35.58	33.88
29107	30107	.3125	5/16"	7.94	5/16"	3-1/2"	3/4"	38.62	36.94	35.26	33.58
-	30627	.3150		8.00	8.0	88	19	39.98	38.24	36.50	34.77
-	30637	.3543		9.00	9.0	88	19	47.98	45.88	43.80	41.71
29117	30117	.3750	3/8"	9.52	3/8"	3-1/2"	3/4"	46.22	44.21	42.20	40.19
-	30647	.3937		10.00	10.0	88	19	61.62	58.94	56.26	53.58
-	30657	.4331		11.00	11.0	100	22	64.85	62.04	59.22	56.40
29127	30127	.4375	7/16"	11.11	7/16"	4"	7/8"	62.35	59.63	56.93	54.22
-	30667	.4724		12.00	12.0	100	25	71.09	68.01	64.92	61.82
29137	30137	.5000	1/2"	12.70	1/2"	4"	1"	68.26	65.29	62.32	59.35

520M - 2 Flute
530M - 4 Flute

Technical information:
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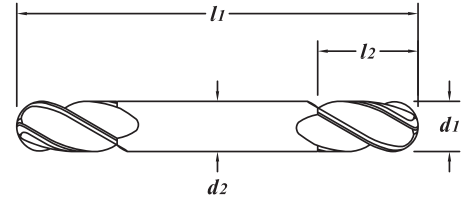


TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1/2"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Standard Length - Double End - Ball End

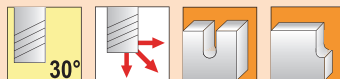
Solid submicron grain carbide end mill - center cutting
Extremely versatile
TiALN Coated - page 152



2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
31010	32010	.0312	1/32"	0.79	1/8"	2"	3/32"	21.89	20.94	19.99	19.03
31020	32020	.0469	3/64"	1.19	1/8"	2"	1/8"	21.89	20.94	19.99	19.03
31030	32030	.0625	1/16"	1.59	1/8"	2"	3/16"	21.89	20.94	19.99	19.03
31040	32040	.0938	3/32"	2.38	1/8"	2"	1/4"	21.89	20.94	19.99	19.03
31050	32050	.1250	1/8"	3.17	1/8"	2"	3/8"	15.79	15.10	14.41	13.73
31060	32060	.1562	5/32"	3.97	3/16"	2-1/2"	7/16"	22.58	21.60	20.61	19.64
31070	32070	.1875	3/16"	4.76	3/16"	2-1/2"	1/2"	19.34	18.50	17.66	16.82
31080	32080	.2188	7/32"	5.56	1/4"	2-1/2"	9/16"	25.15	24.06	22.96	21.87
31090	32090	.2500	1/4"	6.35	1/4"	2-1/2"	5/8"	22.95	21.95	20.96	19.96
31100	32100	.3125	5/16"	7.94	5/16"	3-1/2"	3/4"	29.91	28.61	27.31	26.01
31110	32110	.3750	3/8"	9.52	3/8"	3-1/2"	3/4"	38.67	36.98	35.31	33.62
31120	32120	.4375	7/16"	11.11	7/16"	4"	7/8"	54.90	52.51	50.13	47.74
31130	32130	.5000	1/2"	12.70	1/2"	4"	1"	61.69	59.01	56.33	53.64

520MA - 2 Flute
530MA - 4 Flute

Technical information: page 192, 194

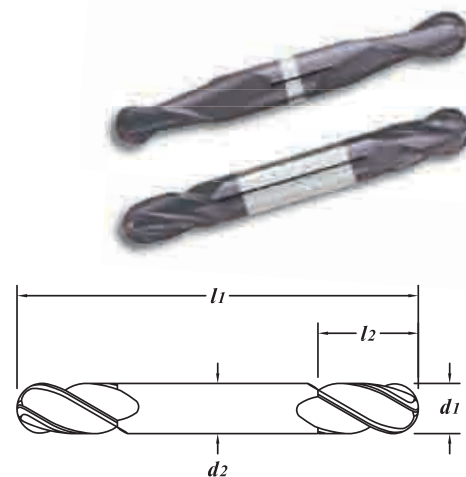


TOLERANCES

d_1	$+0.000'' -0.002'' (+0.000 -0.050\text{mm})$
d_2	$+0.0000'' -0.0003'' (-0.0000 -0.0075\text{mm})$
d_2	$+0.0001'' -0.0004'' (-0.0025 -0.0100\text{mm})$
Ball radius	$+0.000'' -0.001'' (+0.000 -0.025\text{mm})$

Standard Length - Double End - Ball End - TiALN Coated

Solid submicron grain carbide end mill - center cutting
 Dry or semi-dry machining
 Up to 40% faster than uncoated
 Extremely versatile
 Uncoated - page 151



2 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal		Metric							
31017	32017	.0312	1/32"	0.79	1/8"	2"	3/32"	25.11	24.01	22.92	21.83
31027	32027	.0469	3/64"	1.19	1/8"	2"	1/8"	25.11	24.01	22.92	21.83
31037	32037	.0625	1/16"	1.59	1/8"	2"	3/16"	25.11	24.01	22.92	21.83
31047	32047	.0938	3/32"	2.38	1/8"	2"	1/4"	25.11	24.01	22.92	21.83
31057	32057	.1250	1/8"	3.17	1/8"	2"	3/8"	19.00	18.18	17.35	16.53
31067	32067	.1562	5/32"	3.97	3/16"	2-1/2"	7/16"	27.59	26.40	25.19	23.99
31077	32077	.1875	3/16"	4.76	3/16"	2-1/2"	1/2"	24.35	23.29	22.22	21.17
31087	32087	.2188	7/32"	5.56	1/4"	2-1/2"	9/16"	31.79	30.41	29.03	27.64
31097	32097	.2500	1/4"	6.35	1/4"	2-1/2"	5/8"	29.59	28.30	27.02	25.73
31107	32107	.3125	5/16"	7.94	5/16"	3-1/2"	3/4"	42.53	40.67	38.82	36.98
31117	32117	.3750	3/8"	9.52	3/8"	3-1/2"	3/4"	51.27	49.05	46.81	44.58
31127	32127	.4375	7/16"	11.11	7/16"	4"	7/8"	69.51	66.49	63.47	60.44
31137	32137	.5000	1/2"	12.70	1/2"	4"	1"	76.30	72.99	69.67	66.35

620M (640M metric) - 2 Flute
623M (643M metric) - 3 Flute
630M (650M metric) - 4 Flute
 .1181" - .3150"
 (3.00mm - 8.00mm)

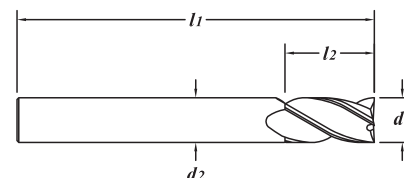
Technical information: page 192, 194



TOLERANCES		
d_1	+.000" - .002" (+.000 - .050mm)	
d_2	3mm - 6mm	+.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1-1/4"	-.0001" - .0004" (-.0025 - .0100mm)

Extra Length

Solid submicron grain carbide end mill - center cutting
 Extended reach
 Can be modified with a neck within 48 hours
 Extremely versatile
 TiCN Coated - page 155
 TiAlN Coated - page 156



END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter Metric							
92010	93010	94010	.1181	3.00	3.0	50	16	10.12	9.68	9.24	8.80
92020	93020	94020	.1181	3.00	3.0	75	20	17.20	16.45	15.70	14.96
92030	93030	94030	.1181	3.00	3.0	75	25	17.20	16.45	15.70	14.96
41010	54510	42010	.1250	1/8"	3.17	1/8"	2"	10.60	10.14	9.67	9.21
41020	54520	42020	.1250	1/8"	3.17	1/8"	3"	16.34	15.63	14.91	14.21
41030	54530	42030	.1250	1/8"	3.17	1/8"	1"	16.34	15.63	14.91	14.21
92040	93040	94040	.1575	4.00	4.0	50	16	10.63	10.17	9.70	9.25
92050	93050	94050	.1575	4.00	4.0	75	20	17.60	16.83	16.07	15.30
92060	93060	94060	.1575	4.00	4.0	75	25	17.60	16.83	16.07	15.30
41040	54540	42040	.1875	3/16"	4.76	3/16"	3"	18.03	17.25	16.46	15.68
41050	54550	42050	.1875	3/16"	4.76	3/16"	1-1/8"	18.03	17.25	16.46	15.68
41060	54560	42060	.1875	3/16"	4.76	3/16"	4"	19.91	19.04	18.18	17.31
92070	93070	94070	.1969	5.00	5.0	50	16	12.50	11.96	11.41	10.87
92080	93080	94080	.1969	5.00	5.0	75	20	18.98	18.16	17.33	16.50
92090	93090	94090	.1969	5.00	5.0	75	25	18.98	18.16	17.33	16.50
92100	93100	94100	.2362	6.00	6.0	75	25	22.00	21.04	20.08	19.13
92110	93110	94110	.2362	6.00	6.0	100	25	23.20	22.19	21.18	20.18
92120	93120	94120	.2362	6.00	6.0	100	32	23.20	22.19	21.18	20.18
92130	93130	94130	.2362	6.00	6.0	150	38	31.40	30.04	28.66	27.30
41070	54570	42070	.2500	1/4"	6.35	1/4"	3"	20.88	19.98	19.06	18.16
41080	54580	42080	.2500	1/4"	6.35	1/4"	4"	22.04	21.08	20.12	19.17
41090	54590	42090	.2500	1/4"	6.35	1/4"	1-1/2"	22.04	21.08	20.12	19.17
41100	54600	42100	.2500	1/4"	6.35	1/4"	6"	29.82	28.52	27.23	25.93
41110	54610	42110	.3125	5/16"	7.94	5/16"	3"	25.77	24.65	23.54	22.41
41120	54620	42120	.3125	5/16"	7.94	5/16"	4"	28.78	27.53	26.27	25.02
41130	54630	42130	.3125	5/16"	7.94	5/16"	1-5/8"	28.78	27.53	26.27	25.02
41140	54640	42140	.3125	5/16"	7.94	5/16"	6"	42.66	40.81	38.95	37.10
92140	93140	94140	.3150	8.00	8.0	75	25	27.13	25.96	24.77	23.60
92150	93150	94150	.3150	8.00	8.0	100	25	30.27	28.95	27.64	26.32
92160	93160	94160	.3150	8.00	8.0	100	41	30.27	28.95	27.64	26.32
92170	93170	94170	.3150	8.00	8.0	150	50	43.75	41.85	39.95	38.04

continued →

620M (640M metric) - 2 Flute (continued)**623M (643M metric) - 3 Flute (continued)****630M (650M metric) - 4 Flute (continued)**

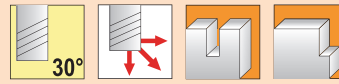
.3750" - 1.250"

(9.52mm - 31.75mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter	Metric							
41150	54650	42150	.3750	3/8"	9.52	3/8"	3"	1"	29.00	27.74	26.48	25.21
41160	54660	42160	.3750	3/8"	9.52	3/8"	4"	1"	31.83	30.45	29.07	27.68
41170	54670	42170	.3750	3/8"	9.52	3/8"	4"	2"	31.83	30.45	29.07	27.68
41180	54680	42180	.3750	3/8"	9.52	3/8"	6"	1-1/2"	46.39	44.38	42.36	40.34
41190	54690	42190	.3750	3/8"	9.52	3/8"	6"	3"	46.39	44.38	42.36	40.34
92180	93180	94180	.3937		10.00	10.0	75	25	31.48	30.11	28.75	27.37
92190	93190	94190	.3937		10.00	10.0	100	25	40.58	38.81	37.06	35.29
92200	93200	94200	.3937		10.00	10.0	100	50	40.58	38.81	37.06	35.29
92210	93210	94210	.3937		10.00	10.0	150	38	53.37	51.05	48.73	46.42
92220	93220	94220	.3937		10.00	10.0	150	75	53.37	51.05	48.73	46.42
41200	54700	42200	.4375	7/16"	11.11	7/16"	4"	1"	43.80	41.90	40.00	38.10
41210	54710	42210	.4375	7/16"	11.11	7/16"	4"	2"	43.80	41.90	40.00	38.10
41220	54720	42220	.4375	7/16"	11.11	7/16"	6"	1-1/2"	58.25	55.71	53.19	50.65
41230	54730	42230	.4375	7/16"	11.11	7/16"	6"	3"	58.25	55.71	53.19	50.65
92230	93230	94230	.4724		12.00	12.0	100	25	49.42	47.27	45.13	42.97
92240	93240	94240	.4724		12.00	12.0	100	50	49.42	47.27	45.13	42.97
92250	93250	94250	.4724		12.00	12.0	150	50	67.39	64.46	61.53	58.60
92260	93260	94260	.4724		12.00	12.0	150	75	67.39	64.46	61.53	58.60
41240	54740	42240	.5000	1/2"	12.70	1/2"	4"	1"	46.61	44.58	42.56	40.53
41250	54750	42250	.5000	1/2"	12.70	1/2"	4"	2"	46.61	44.58	42.56	40.53
41260	54760	42260	.5000	1/2"	12.70	1/2"	6"	1-1/2"	67.39	64.46	61.53	58.60
41270	54770	42270	.5000	1/2"	12.70	1/2"	6"	3"	67.39	64.46	61.53	58.60
92270	93270	94270	.5512		14.00	14.0	100	25	67.85	64.90	61.95	59.00
92280	93280	94280	.5512		14.00	14.0	100	50	67.85	64.90	61.95	59.00
92290	93290	94290	.5512		14.00	14.0	150	50	88.45	84.60	80.76	76.92
92300	93300	94300	.5512		14.00	14.0	150	75	88.45	84.60	80.76	76.92
41280	54780	42280	.5625	9/16"	14.29	9/16"	6"	2"	88.47	84.62	80.78	76.93
41290	54790	42290	.5625	9/16"	14.29	9/16"	6"	3"	88.47	84.62	80.78	76.93
41300	54800	42300	.6250	5/8"	15.87	5/8"	6"	2"	96.06	91.88	87.71	83.53
41310	54810	42310	.6250	5/8"	15.87	5/8"	6"	3"	96.06	91.88	87.71	83.53
92310	93310	94310	.6299		16.00	16.0	150	50	96.06	91.88	87.71	83.53
92320	93320	94320	.6299		16.00	16.0	150	75	96.06	91.88	87.71	83.53
92330	93330	94330	.7087		18.00	18.0	150	50	144.41	138.13	131.85	125.58
92340	93340	94340	.7087		18.00	18.0	150	75	144.41	138.13	131.85	125.58
41320	54820	42320	.7500	3/4"	19.05	3/4"	6"	2"	153.02	146.36	139.71	133.06
41330	54830	42330	.7500	3/4"	19.05	3/4"	6"	3"	153.02	146.36	139.71	133.06
92350	93350	94350	.7874		20.00	20.0	150	50	161.20	154.19	147.18	140.17
92360	93360	94360	.7874		20.00	20.0	150	75	161.20	154.19	147.18	140.17
92370	93370	94370	.9843		25.00	25.0	150	50	248.39	237.60	226.79	216.00
92380	93380	94380	.9843		25.00	25.0	150	75	248.39	237.60	226.79	216.00
41340	54840	42340	1.000	1"	25.40	1"	6"	2"	260.15	248.83	237.53	226.21
41350	54850	42350	1.000	1"	25.40	1"	6"	3"	260.15	248.83	237.53	226.21
-	-	42360	1.000	1"	25.40	1"	6"	4"	273.82	261.91	250.01	238.11
-	-	42390	1.250	1-1/4"	31.75	1-1/4"	6"	3"	551.92	527.92	503.92	479.93

620MC - 2 Flute
623MC - 3 Flute
630MC - 4 Flute

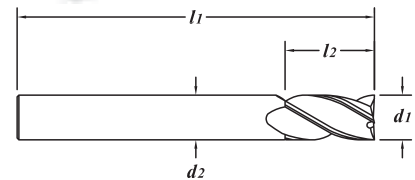
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TOLERANCES		
d_1	+.000" -.002" (+.000 -.050mm)	
d_2	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1-1/4"	-.0001" -.0004" (-.0025 -.0100mm)

Extra Length - TiCN Coated

Solid submicron grain carbide end mill - center cutting
 Extended reach
 Improved abrasion resistance and lubricity
 Up to 25% faster than uncoated
 Can be modified with a neck within 48 hours
 Extremely versatile
 Uncoated - page 153
 TiAlN Coated - page 156



END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal		Metric							
41014	54514	42014	.1250	1/8"	3.17	1/8"	2"	5/8"	12.47	11.93	11.39	10.85
41024	54524	42024	.1250	1/8"	3.17	1/8"	3"	3/4"	18.65	17.84	17.02	16.21
41034	54534	42034	.1250	1/8"	3.17	1/8"	3"	1"	18.65	17.84	17.02	16.21
41044	54544	42044	.1875	3/16"	4.76	3/16"	3"	1"	20.70	19.79	18.90	17.99
41054	54554	42054	.1875	3/16"	4.76	3/16"	3"	1-1/8"	20.70	19.79	18.90	17.99
41064	54564	42064	.1875	3/16"	4.76	3/16"	4"	1"	22.97	21.98	20.98	19.98
41074	54574	42074	.2500	1/4"	6.35	1/4"	3"	1"	24.72	23.65	22.57	21.50
41084	54584	42084	.2500	1/4"	6.35	1/4"	4"	1"	26.20	25.05	23.92	22.78
41094	54594	42094	.2500	1/4"	6.35	1/4"	4"	1-1/2"	26.20	25.05	23.92	22.78
41104	54604	42104	.2500	1/4"	6.35	1/4"	6"	1-1/2"	37.00	35.39	33.79	32.18
41114	54614	42114	.3125	5/16"	7.94	5/16"	3"	1"	30.91	29.57	28.23	26.87
41124	54624	42124	.3125	5/16"	7.94	5/16"	4"	1"	35.13	33.60	32.07	30.54
41134	54634	42134	.3125	5/16"	7.94	5/16"	4"	1-5/8"	35.13	33.60	32.07	30.54
41144	54644	42144	.3125	5/16"	7.94	5/16"	6"	1-1/2"	51.26	49.04	46.80	44.57
41154	54654	42154	.3750	3/8"	9.52	3/8"	3"	1"	34.12	32.64	31.16	29.67
41164	54664	42164	.3750	3/8"	9.52	3/8"	4"	1"	38.22	36.56	34.89	33.24
41174	54674	42174	.3750	3/8"	9.52	3/8"	4"	2"	38.22	36.56	34.89	33.24
41184	54684	42184	.3750	3/8"	9.52	3/8"	6"	1-1/2"	55.01	52.61	50.22	47.83
41194	54694	42194	.3750	3/8"	9.52	3/8"	6"	3"	55.01	52.61	50.22	47.83
41204	54704	42204	.4375	7/16"	11.11	7/16"	4"	1"	51.50	49.26	47.02	44.78
41214	54714	42214	.4375	7/16"	11.11	7/16"	4"	2"	51.50	49.26	47.02	44.78
41224	54724	42224	.4375	7/16"	11.11	7/16"	6"	1-1/2"	69.14	66.13	63.13	60.12
41234	54734	42234	.4375	7/16"	11.11	7/16"	6"	3"	69.14	66.13	63.13	60.12
41244	54744	42244	.5000	1/2"	12.70	1/2"	4"	1"	54.29	51.93	49.57	47.21
41254	54754	42254	.5000	1/2"	12.70	1/2"	4"	2"	54.29	51.93	49.57	47.21
41264	54764	42264	.5000	1/2"	12.70	1/2"	6"	1-1/2"	78.28	74.88	71.47	68.07
41274	54774	42274	.5000	1/2"	12.70	1/2"	6"	3"	78.28	74.88	71.47	68.07
41284	54784	42284	.5625	9/16"	14.29	9/16"	6"	2"	101.90	97.47	93.04	88.61
41294	54794	42294	.5625	9/16"	14.29	9/16"	6"	3"	101.90	97.47	93.04	88.61
41304	54804	42304	.6250	5/8"	15.87	5/8"	6"	2"	109.49	104.73	99.96	95.21
41314	54814	42314	.6250	5/8"	15.87	5/8"	6"	3"	109.49	104.73	99.96	95.21
41324	54824	42324	.7500	3/4"	19.05	3/4"	6"	2"	168.37	161.04	153.72	146.40
41334	54834	42334	.7500	3/4"	19.05	3/4"	6"	3"	168.37	161.04	153.72	146.40
41344	54844	42344	1.000	1"	25.40	1"	6"	2"	281.86	269.61	257.35	245.10
41354	54854	42354	1.000	1"	25.40	1"	6"	3"	281.86	269.61	257.35	245.10
-	-	42364	1.000	1"	25.40	1"	6"	4"	295.54	282.68	269.84	256.99
-	-	42394	1.250	1-1/4"	31.75	1-1/4"	6"	3"	582.00	556.70	531.40	506.10

620MA (640MA metric) - 2 Flute
623MA (643MA metric) - 3 Flute
630MA (650MA metric) - 4 Flute
 .1181" - .3150"
 (3.00mm - 8.00mm)

Technical information:
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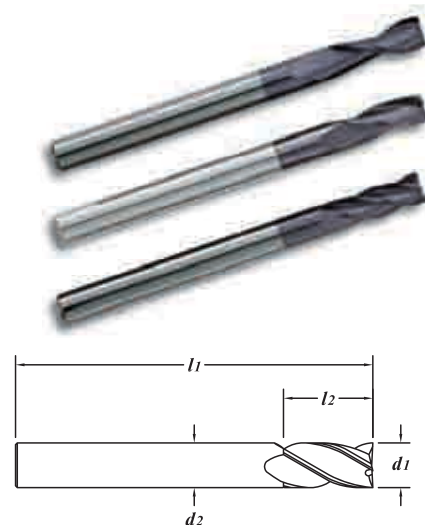


TOLERANCES

d_1	$+0.000^{\circ} - .002^{\circ} (+.000 - .050\text{mm})$
d_2	$3\text{mm} - 6\text{mm} \quad +.0000^{\circ} - .0003^{\circ} (-.0000 - .0075\text{mm})$
	$1/4^{\circ} - 1-1/4^{\circ} \quad -.0001^{\circ} - .0004^{\circ} (-.0025 - .0100\text{mm})$

Extra Length - TiALN Coated

Solid submicron grain carbide end mill - center cutting
 Extended reach
 Dry or semi-dry machining
 Up to 40% faster than uncoated
 Can be modified with a neck within 48 hours
 Extremely versatile
 Uncoated - page 153
 TiCN Coated - page 155



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter Metric							
92017	93017	94017	.1181	3.00	3.0	50	16	11.81	11.30	10.78	10.28
92027	93027	94027	.1181	3.00	3.0	75	20	19.34	18.50	17.66	16.82
92037	93037	94037	.1181	3.00	3.0	75	25	19.34	18.50	17.66	16.82
41017	54517	42017	.1250	1/8"	3.17	1/8"	2"	12.74	12.19	11.63	11.08
41027	54527	42027	.1250	1/8"	3.17	1/8"	3"	18.97	18.15	17.32	16.49
41037	54537	42037	.1250	1/8"	3.17	1/8"	3"	18.97	18.15	17.32	16.49
92047	93047	94047	.1575	4.00	4.0	50	16	12.77	12.22	11.66	11.11
92057	93057	94057	.1575	4.00	4.0	75	20	20.91	20.01	19.09	18.19
92067	93067	94067	.1575	4.00	4.0	75	25	20.91	20.01	19.09	18.19
41047	54547	42047	.1875	3/16"	4.76	3/16"	3"	21.37	20.45	19.51	18.58
41057	54557	42057	.1875	3/16"	4.76	3/16"	3"	21.37	20.45	19.51	18.58
41067	54567	42067	.1875	3/16"	4.76	3/16"	4"	23.81	22.77	21.74	20.70
92077	93077	94077	.1969	5.00	5.0	50	16	15.84	15.15	14.47	13.77
92087	93087	94087	.1969	5.00	5.0	75	20	23.39	22.37	21.35	20.34
92097	93097	94097	.1969	5.00	5.0	75	25	23.39	22.37	21.35	20.34
92107	93107	94107	.2362	6.00	6.0	75	25	26.41	25.26	24.11	22.96
92117	93117	94117	.2362	6.00	6.0	100	25	28.39	27.15	25.93	24.69
92127	93127	94127	.2362	6.00	6.0	100	32	28.39	27.15	25.93	24.69
92137	93137	94137	.2362	6.00	6.0	150	38	38.70	37.01	35.33	33.65
41077	54577	42077	.2500	1/4"	6.35	1/4"	3"	25.30	24.20	23.10	22.01
41087	54587	42087	.2500	1/4"	6.35	1/4"	4"	27.24	26.05	24.87	23.68
41097	54597	42097	.2500	1/4"	6.35	1/4"	4"	27.24	26.05	24.87	23.68
41107	54607	42107	.2500	1/4"	6.35	1/4"	6"	37.14	35.53	33.90	32.29
41117	54617	42117	.3125	5/16"	7.94	5/16"	3"	32.40	30.99	29.58	28.17
41127	54627	42127	.3125	5/16"	7.94	5/16"	4"	37.17	35.56	33.94	32.32
41137	54637	42137	.3125	5/16"	7.94	5/16"	4"	37.17	35.56	33.94	32.32
41147	54647	42147	.3125	5/16"	7.94	5/16"	6"	54.18	51.82	49.47	47.11
92147	93147	94147	.3150	8.00	8.0	75	25	33.74	32.27	30.80	29.34
92157	93157	94157	.3150	8.00	8.0	100	25	38.69	37.00	35.33	33.64
92167	93167	94167	.3150	8.00	8.0	100	41	38.69	37.00	35.33	33.64
92177	93177	94177	.3150	8.00	8.0	150	50	55.28	52.87	50.47	48.07

620MA (640MA metric) - 2 Flute (continued)**623MA (643MA metric) - 3 Flute (continued)****630MA (650MA metric) - 4 Flute (continued)**

.3750" - 1.250"

(9.52mm - 31.75mm)

END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter	Metric							
41157	54657	42157	.3750	3/8"	9.52	3/8"	3"	1"	35.63	34.08	32.53	30.98
41167	54667	42167	.3750	3/8"	9.52	3/8"	4"	1"	40.26	38.51	36.75	35.01
41177	54677	42177	.3750	3/8"	9.52	3/8"	4"	2"	40.26	38.51	36.75	35.01
41187	54687	42187	.3750	3/8"	9.52	3/8"	6"	1-1/2"	57.91	55.39	52.87	50.36
41197	54697	42197	.3750	3/8"	9.52	3/8"	6"	3"	57.91	55.39	52.87	50.36
92187	93187	94187	.3937		10.00	10.0	75	25	39.00	37.30	35.61	33.91
92197	93197	94197	.3937		10.00	10.0	100	25	50.33	48.14	45.95	43.76
92207	93207	94207	.3937		10.00	10.0	100	50	50.33	48.14	45.95	43.76
92217	93217	94217	.3937		10.00	10.0	150	38	67.08	64.17	61.25	58.33
92227	93227	94227	.3937		10.00	10.0	150	75	67.08	64.17	61.25	58.33
41207	54707	42207	.4375	7/16"	11.11	7/16"	4"	1"	53.56	51.23	48.90	46.57
41217	54717	42217	.4375	7/16"	11.11	7/16"	4"	2"	53.56	51.23	48.90	46.57
41227	54727	42227	.4375	7/16"	11.11	7/16"	6"	1-1/2"	71.95	68.82	65.69	62.57
41237	54737	42237	.4375	7/16"	11.11	7/16"	6"	3"	71.95	68.82	65.69	62.57
92237	93237	94237	.4724		12.00	12.0	100	25	59.16	56.59	54.01	51.44
92247	93247	94247	.4724		12.00	12.0	100	50	59.16	56.59	54.01	51.44
92257	93257	94257	.4724		12.00	12.0	150	50	81.09	77.56	74.04	70.51
92267	93267	94267	.4724		12.00	12.0	150	75	81.09	77.56	74.04	70.51
41247	54747	42247	.5000	1/2"	12.70	1/2"	4"	1"	56.36	53.90	51.46	49.00
41257	54757	42257	.5000	1/2"	12.70	1/2"	4"	2"	56.36	53.90	51.46	49.00
41267	54767	42267	.5000	1/2"	12.70	1/2"	6"	1-1/2"	81.09	77.56	74.04	70.51
41277	54777	42277	.5000	1/2"	12.70	1/2"	6"	3"	81.09	77.56	74.04	70.51
92277	93277	94277	.5512		14.00	14.0	100	25	78.73	75.31	71.88	68.46
92287	93287	94287	.5512		14.00	14.0	100	50	78.73	75.31	71.88	68.46
92297	93297	94297	.5512		14.00	14.0	150	50	104.62	100.08	95.52	90.98
92307	93307	94307	.5512		14.00	14.0	150	75	104.62	100.08	95.52	90.98
41287	54787	42287	.5625	9/16"	14.29	9/16"	6"	2"	104.62	100.08	95.52	90.98
41297	54797	42297	.5625	9/16"	14.29	9/16"	6"	3"	104.62	100.08	95.52	90.98
41307	54807	42307	.6250	5/8"	15.87	5/8"	6"	2"	112.24	107.36	102.48	97.59
41317	54817	42317	.6250	5/8"	15.87	5/8"	6"	3"	112.24	107.36	102.48	97.59
92317	93317	94317	.6299		16.00	16.0	150	50	112.24	107.36	102.48	97.59
92327	93327	94327	.6299		16.00	16.0	150	75	112.24	107.36	102.48	97.59
92337	93337	94337	.7087		18.00	18.0	150	50	163.13	156.04	148.95	141.86
92347	93347	94347	.7087		18.00	18.0	150	75	163.13	156.04	148.95	141.86
41327	54827	42327	.7500	3/4"	19.05	3/4"	6"	2"	171.75	164.28	156.81	149.34
41337	54837	42337	.7500	3/4"	19.05	3/4"	6"	3"	171.75	164.28	156.81	149.34
92357	93357	94357	.7874		20.00	20.0	150	50	185.50	177.43	169.37	161.31
92367	93367	94367	.7874		20.00	20.0	150	75	185.50	177.43	169.37	161.31
92377	93377	94377	.9843		25.00	25.0	150	50	272.70	260.84	248.99	237.13
92387	93387	94387	.9843		25.00	25.0	150	75	272.70	260.84	248.99	237.13
41347	54847	42347	1.000	1"	25.40	1"	6"	2"	284.44	272.07	259.71	247.34
41357	54857	42357	1.000	1"	25.40	1"	6"	3"	284.44	272.07	259.71	247.34
-	-	42367	1.000	1"	25.40	1"	6"	4"	298.13	285.17	272.20	259.24
-	-	42397	1.250	1-1/4"	31.75	1-1/4"	6"	3"	583.07	557.71	532.37	507.02

630R - 4 Flute

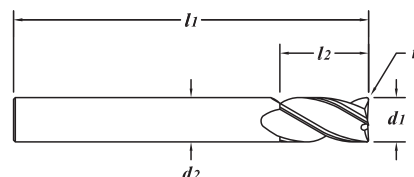
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.1250" - .3125"
(3.17mm - 7.94mm)**TOLERANCES**

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
r	+.001" -.001" (+.025 -.025mm)	

Extra Length - Corner Radius

Solid submicron grain carbide end mill - center cutting
 Extended reach
 For stronger corners and part radius
 Can be modified with a neck within 48 hours
 Extremely versatile
 TiAlN Coated - page 161



EDP#	d_1 †			d_2	l_1	l_2	r	1-11	12-24	25-49	50-100
	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius				
20100	.1250	1/8"	3.17	1/8"	3"	1"	.010"	19.23	18.40	17.56	16.72
20110	.1250	1/8"	3.17	1/8"	3"	1"	.015"	19.23	18.40	17.56	16.72
20120	.1250	1/8"	3.17	1/8"	3"	1"	.020"	19.23	18.40	17.56	16.72
20130	.1250	1/8"	3.17	1/8"	3"	1"	.030"	19.23	18.40	17.56	16.72
20140	.1250	1/8"	3.17	1/8"	3"	1"	.045"	19.23	18.40	17.56	16.72
20150	.1875	3/16"	4.76	3/16"	3"	1"	.010"	21.21	20.28	19.36	18.44
20160	.1875	3/16"	4.76	3/16"	3"	1"	.015"	21.21	20.28	19.36	18.44
20170	.1875	3/16"	4.76	3/16"	3"	1"	.020"	21.21	20.28	19.36	18.44
20180	.1875	3/16"	4.76	3/16"	3"	1"	.030"	21.21	20.28	19.36	18.44
20190	.1875	3/16"	4.76	3/16"	3"	1"	.045"	21.21	20.28	19.36	18.44
20200	.1875	3/16"	4.76	3/16"	3"	1"	.060"	21.21	20.28	19.36	18.44
20210	.1875	3/16"	4.76	3/16"	4"	1"	.010"	22.83	21.84	20.84	19.85
20220	.1875	3/16"	4.76	3/16"	4"	1"	.015"	22.83	21.84	20.84	19.85
20230	.1875	3/16"	4.76	3/16"	4"	1"	.020"	22.83	21.84	20.84	19.85
20240	.1875	3/16"	4.76	3/16"	4"	1"	.030"	22.83	21.84	20.84	19.85
20250	.1875	3/16"	4.76	3/16"	4"	1"	.045"	22.83	21.84	20.84	19.85
20260	.1875	3/16"	4.76	3/16"	4"	1"	.060"	22.83	21.84	20.84	19.85
20270	.2500	1/4"	6.35	1/4"	3"	1"	.010"	24.55	23.48	22.42	21.35
20280	.2500	1/4"	6.35	1/4"	3"	1"	.020"	24.55	23.48	22.42	21.35
20290	.2500	1/4"	6.35	1/4"	3"	1"	.030"	24.55	23.48	22.42	21.35
20300	.2500	1/4"	6.35	1/4"	3"	1"	.045"	24.55	23.48	22.42	21.35
20310	.2500	1/4"	6.35	1/4"	3"	1"	.060"	24.55	23.48	22.42	21.35
20320	.2500	1/4"	6.35	1/4"	4"	1"	.010"	25.83	24.71	23.59	22.46
20330	.2500	1/4"	6.35	1/4"	4"	1"	.020"	25.83	24.71	23.59	22.46
20340	.2500	1/4"	6.35	1/4"	4"	1"	.030"	25.83	24.71	23.59	22.46
20350	.2500	1/4"	6.35	1/4"	4"	1"	.045"	25.83	24.71	23.59	22.46
20360	.2500	1/4"	6.35	1/4"	4"	1"	.060"	25.83	24.71	23.59	22.46
20370	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.010"	33.58	32.13	30.66	29.20
20380	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.020"	33.58	32.13	30.66	29.20
20390	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.030"	33.58	32.13	30.66	29.20
20400	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.045"	33.58	32.13	30.66	29.20
20410	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.060"	33.58	32.13	30.66	29.20
20420	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.010"	33.85	32.38	30.91	29.43
20430	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.020"	33.85	32.38	30.91	29.43
20440	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.030"	33.85	32.38	30.91	29.43
20450	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.045"	33.85	32.38	30.91	29.43
20460	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.060"	33.85	32.38	30.91	29.43
20470	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.090"	33.85	32.38	30.91	29.43
20480	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.125"	33.85	32.38	30.91	29.43

630R - 4 Flute (continued)

.3750" - .7500"
(9.52mm - 19.05mm)

END MILLS

EDP#	d_1 † Diameter		Metric	d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100
	Decimal										
20490	.3750	3/8"	9.52	3/8"	4"	1"	.010"	37.45	35.82	34.20	32.56
20500	.3750	3/8"	9.52	3/8"	4"	1"	.020"	37.45	35.82	34.20	32.56
20510	.3750	3/8"	9.52	3/8"	4"	1"	.030"	37.45	35.82	34.20	32.56
20520	.3750	3/8"	9.52	3/8"	4"	1"	.045"	37.45	35.82	34.20	32.56
20530	.3750	3/8"	9.52	3/8"	4"	1"	.060"	37.45	35.82	34.20	32.56
20540	.3750	3/8"	9.52	3/8"	4"	1"	.090"	37.45	35.82	34.20	32.56
20550	.3750	3/8"	9.52	3/8"	4"	1"	.125"	37.45	35.82	34.20	32.56
20560	.3750	3/8"	9.52	3/8"	4"	2"	.010"	37.45	35.82	34.20	32.56
20570	.3750	3/8"	9.52	3/8"	4"	2"	.020"	37.45	35.82	34.20	32.56
20580	.3750	3/8"	9.52	3/8"	4"	2"	.030"	37.45	35.82	34.20	32.56
20590	.3750	3/8"	9.52	3/8"	4"	2"	.045"	37.45	35.82	34.20	32.56
20600	.3750	3/8"	9.52	3/8"	4"	2"	.060"	37.45	35.82	34.20	32.56
20610	.3750	3/8"	9.52	3/8"	4"	2"	.090"	37.45	35.82	34.20	32.56
20620	.3750	3/8"	9.52	3/8"	4"	2"	.125"	37.45	35.82	34.20	32.56
20630	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.010"	51.42	49.18	46.95	44.71
20640	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.020"	51.42	49.18	46.95	44.71
20650	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.030"	51.42	49.18	46.95	44.71
20660	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.045"	51.42	49.18	46.95	44.71
20670	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.060"	51.42	49.18	46.95	44.71
20680	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.090"	51.42	49.18	46.95	44.71
20690	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.125"	51.42	49.18	46.95	44.71
20700	.5000	1/2"	12.70	1/2"	4"	1"	.015"	52.64	50.36	48.07	45.78
20710	.5000	1/2"	12.70	1/2"	4"	1"	.020"	52.64	50.36	48.07	45.78
20720	.5000	1/2"	12.70	1/2"	4"	1"	.030"	52.64	50.36	48.07	45.78
20730	.5000	1/2"	12.70	1/2"	4"	1"	.045"	52.64	50.36	48.07	45.78
20740	.5000	1/2"	12.70	1/2"	4"	1"	.060"	52.64	50.36	48.07	45.78
20750	.5000	1/2"	12.70	1/2"	4"	1"	.090"	52.64	50.36	48.07	45.78
20760	.5000	1/2"	12.70	1/2"	4"	1"	.125"	52.64	50.36	48.07	45.78
20770	.5000	1/2"	12.70	1/2"	4"	2"	.015"	52.64	50.36	48.07	45.78
20780	.5000	1/2"	12.70	1/2"	4"	2"	.020"	52.64	50.36	48.07	45.78
20790	.5000	1/2"	12.70	1/2"	4"	2"	.030"	52.64	50.36	48.07	45.78
20800	.5000	1/2"	12.70	1/2"	4"	2"	.045"	52.64	50.36	48.07	45.78
20810	.5000	1/2"	12.70	1/2"	4"	2"	.060"	52.64	50.36	48.07	45.78
20820	.5000	1/2"	12.70	1/2"	4"	2"	.090"	52.64	50.36	48.07	45.78
20830	.5000	1/2"	12.70	1/2"	4"	2"	.125"	52.64	50.36	48.07	45.78
20840	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.015"	74.57	71.32	68.08	64.84
20850	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.020"	74.57	71.32	68.08	64.84
20860	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.030"	74.57	71.32	68.08	64.84
20870	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.045"	74.57	71.32	68.08	64.84
20880	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.060"	74.57	71.32	68.08	64.84
20890	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.090"	74.57	71.32	68.08	64.84
20900	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.125"	74.57	71.32	68.08	64.84
20910	.6250	5/8"	15.87	5/8"	6"	2"	.010"	109.65	104.88	100.11	95.35
20920	.6250	5/8"	15.87	5/8"	6"	2"	.015"	109.65	104.88	100.11	95.35
20930	.6250	5/8"	15.87	5/8"	6"	2"	.020"	109.65	104.88	100.11	95.35
20940	.6250	5/8"	15.87	5/8"	6"	2"	.030"	109.65	104.88	100.11	95.35
20950	.6250	5/8"	15.87	5/8"	6"	2"	.045"	109.65	104.88	100.11	95.35
20960	.6250	5/8"	15.87	5/8"	6"	2"	.060"	109.65	104.88	100.11	95.35
20970	.6250	5/8"	15.87	5/8"	6"	2"	.090"	109.65	104.88	100.11	95.35
20980	.6250	5/8"	15.87	5/8"	6"	2"	.125"	109.65	104.88	100.11	95.35
20990	.7500	3/4"	19.05	3/4"	6"	3"	.015"	179.94	172.12	164.29	156.47
21000	.7500	3/4"	19.05	3/4"	6"	3"	.020"	179.94	172.12	164.29	156.47
21010	.7500	3/4"	19.05	3/4"	6"	3"	.030"	179.94	172.12	164.29	156.47
21020	.7500	3/4"	19.05	3/4"	6"	3"	.045"	179.94	172.12	164.29	156.47
21030	.7500	3/4"	19.05	3/4"	6"	3"	.060"	179.94	172.12	164.29	156.47
21040	.7500	3/4"	19.05	3/4"	6"	3"	.090"	179.94	172.12	164.29	156.47
21050	.7500	3/4"	19.05	3/4"	6"	3"	.125"	179.94	172.12	164.29	156.47
NEW 21140	.7500	3/4"	19.05	3/4"	6"	3"	.250"	179.94	172.12	164.29	156.47

continued →

630R - 4 Flute (continued)

1.000"
(25.40mm)

END MILLS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
21060	1.000	1"	25.40	1"	6"	3"	.015"	306.00	292.70	279.39	266.08
21070	1.000	1"	25.40	1"	6"	3"	.020"	306.00	292.70	279.39	266.08
21080	1.000	1"	25.40	1"	6"	3"	.030"	306.00	292.70	279.39	266.08
21090	1.000	1"	25.40	1"	6"	3"	.045"	306.00	292.70	279.39	266.08
21100	1.000	1"	25.40	1"	6"	3"	.060"	306.00	292.70	279.39	266.08
21110	1.000	1"	25.40	1"	6"	3"	.090"	306.00	292.70	279.39	266.08
21120	1.000	1"	25.40	1"	6"	3"	.125"	306.00	292.70	279.39	266.08
NEW 21130	1.000	1"	25.40	1"	6"	3"	.250"	306.00	292.70	279.39	266.08

TOLERANCES

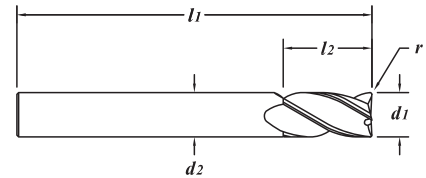
d_1	+.000" - .002" (+.000 - .050mm)	
d_2	1/8" - 3/16"	+.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1"	-.0001" - .0004" (-.0025 - .0100mm)
r	+.001" - .001" (+.025 - .025mm)	

.1250" - .3125"
(3.17mm - 7.94mm)



Extra Length - Corner Radius - TiALN Coated

Solid submicron grain carbide end mill - center cutting
Extended reach
For stronger corners and part radius
Dry or semi-dry machining
Up to 40% faster than uncoated
Can be modified with a neck within 48 hours
Extremely versatile
Uncoated - page 158



EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100
	Decimal	Diameter	Metric								
20107	.1250	1/8"	3.17	1/8"	3"	1"	.010"	21.85	20.90	19.95	19.00
20117	.1250	1/8"	3.17	1/8"	3"	1"	.015"	21.85	20.90	19.95	19.00
20127	.1250	1/8"	3.17	1/8"	3"	1"	.020"	21.85	20.90	19.95	19.00
20137	.1250	1/8"	3.17	1/8"	3"	1"	.030"	21.85	20.90	19.95	19.00
20147	.1250	1/8"	3.17	1/8"	3"	1"	.045"	21.85	20.90	19.95	19.00
20157	.1875	3/16"	4.76	3/16"	3"	1"	.010"	24.54	23.47	22.41	21.34
20167	.1875	3/16"	4.76	3/16"	3"	1"	.015"	24.54	23.47	22.41	21.34
20177	.1875	3/16"	4.76	3/16"	3"	1"	.020"	24.54	23.47	22.41	21.34
20187	.1875	3/16"	4.76	3/16"	3"	1"	.030"	24.54	23.47	22.41	21.34
20197	.1875	3/16"	4.76	3/16"	3"	1"	.045"	24.54	23.47	22.41	21.34
20207	.1875	3/16"	4.76	3/16"	3"	1"	.060"	24.54	23.47	22.41	21.34
20217	.1875	3/16"	4.76	3/16"	4"	1"	.010"	26.72	25.55	24.40	23.23
20227	.1875	3/16"	4.76	3/16"	4"	1"	.015"	26.72	25.55	24.40	23.23
20237	.1875	3/16"	4.76	3/16"	4"	1"	.020"	26.72	25.55	24.40	23.23
20247	.1875	3/16"	4.76	3/16"	4"	1"	.030"	26.72	25.55	24.40	23.23
20257	.1875	3/16"	4.76	3/16"	4"	1"	.045"	26.72	25.55	24.40	23.23
20267	.1875	3/16"	4.76	3/16"	4"	1"	.060"	26.72	25.55	24.40	23.23
20277	.2500	1/4"	6.35	1/4"	3"	1"	.010"	28.97	27.72	26.46	25.20
20287	.2500	1/4"	6.35	1/4"	3"	1"	.020"	28.97	27.72	26.46	25.20
20297	.2500	1/4"	6.35	1/4"	3"	1"	.030"	28.97	27.72	26.46	25.20
20307	.2500	1/4"	6.35	1/4"	3"	1"	.045"	28.97	27.72	26.46	25.20
20317	.2500	1/4"	6.35	1/4"	3"	1"	.060"	28.97	27.72	26.46	25.20
20327	.2500	1/4"	6.35	1/4"	4"	1"	.010"	31.02	29.67	28.33	26.98
20337	.2500	1/4"	6.35	1/4"	4"	1"	.020"	31.02	29.67	28.33	26.98
20347	.2500	1/4"	6.35	1/4"	4"	1"	.030"	31.02	29.67	28.33	26.98
20357	.2500	1/4"	6.35	1/4"	4"	1"	.045"	31.02	29.67	28.33	26.98
20367	.2500	1/4"	6.35	1/4"	4"	1"	.060"	31.02	29.67	28.33	26.98
20377	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.010"	40.89	39.11	37.34	35.56
20387	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.020"	40.89	39.11	37.34	35.56
20397	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.030"	40.89	39.11	37.34	35.56
20407	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.045"	40.89	39.11	37.34	35.56
20417	.2500	1/4"	6.35	1/4"	6"	1-1/2"	.060"	40.89	39.11	37.34	35.56
20427	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.010"	42.27	40.42	38.59	36.75
20437	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.020"	42.27	40.42	38.59	36.75
20447	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.030"	42.27	40.42	38.59	36.75
20457	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.045"	42.27	40.42	38.59	36.75
20467	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.060"	42.27	40.42	38.59	36.75
20477	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.090"	42.27	40.42	38.59	36.75
20487	.3125	5/16"	7.94	5/16"	4"	1-5/8"	.125"	42.27	40.42	38.59	36.75

continued →

630RA - 4 Flute (continued)

.3750" - .7500"
(9.52mm - 19.05mm)

END MILLS

EDP#	d_1 † Diameter		Metric	d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100
	Decimal										
20497	.3750	3/8"	9.52	3/8"	4"	1"	.010"	45.85	43.86	41.87	39.87
20507	.3750	3/8"	9.52	3/8"	4"	1"	.020"	45.85	43.86	41.87	39.87
20517	.3750	3/8"	9.52	3/8"	4"	1"	.030"	45.85	43.86	41.87	39.87
20527	.3750	3/8"	9.52	3/8"	4"	1"	.045"	45.85	43.86	41.87	39.87
20537	.3750	3/8"	9.52	3/8"	4"	1"	.060"	45.85	43.86	41.87	39.87
20547	.3750	3/8"	9.52	3/8"	4"	1"	.090"	45.85	43.86	41.87	39.87
20557	.3750	3/8"	9.52	3/8"	4"	1"	.125"	45.85	43.86	41.87	39.87
20567	.3750	3/8"	9.52	3/8"	4"	2"	.010"	45.85	43.86	41.87	39.87
20577	.3750	3/8"	9.52	3/8"	4"	2"	.020"	45.85	43.86	41.87	39.87
20587	.3750	3/8"	9.52	3/8"	4"	2"	.030"	45.85	43.86	41.87	39.87
20597	.3750	3/8"	9.52	3/8"	4"	2"	.045"	45.85	43.86	41.87	39.87
20607	.3750	3/8"	9.52	3/8"	4"	2"	.060"	45.85	43.86	41.87	39.87
20617	.3750	3/8"	9.52	3/8"	4"	2"	.090"	45.85	43.86	41.87	39.87
20627	.3750	3/8"	9.52	3/8"	4"	2"	.125"	45.85	43.86	41.87	39.87
20637	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.010"	63.48	60.73	57.96	55.20
20647	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.020"	63.48	60.73	57.96	55.20
20657	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.030"	63.48	60.73	57.96	55.20
20667	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.045"	63.48	60.73	57.96	55.20
20677	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.060"	63.48	60.73	57.96	55.20
20687	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.090"	63.48	60.73	57.96	55.20
20697	.3750	3/8"	9.52	3/8"	6"	1-1/2"	.125"	63.48	60.73	57.96	55.20
20707	.5000	1/2"	12.70	1/2"	4"	1"	.015"	62.41	59.70	56.98	54.27
20717	.5000	1/2"	12.70	1/2"	4"	1"	.020"	62.41	59.70	56.98	54.27
20727	.5000	1/2"	12.70	1/2"	4"	1"	.030"	62.41	59.70	56.98	54.27
20737	.5000	1/2"	12.70	1/2"	4"	1"	.045"	62.41	59.70	56.98	54.27
20747	.5000	1/2"	12.70	1/2"	4"	1"	.060"	62.41	59.70	56.98	54.27
20757	.5000	1/2"	12.70	1/2"	4"	1"	.090"	62.41	59.70	56.98	54.27
20767	.5000	1/2"	12.70	1/2"	4"	1"	.125"	62.41	59.70	56.98	54.27
20777	.5000	1/2"	12.70	1/2"	4"	2"	.015"	62.41	59.70	56.98	54.27
20787	.5000	1/2"	12.70	1/2"	4"	2"	.020"	62.41	59.70	56.98	54.27
20797	.5000	1/2"	12.70	1/2"	4"	2"	.030"	62.41	59.70	56.98	54.27
20807	.5000	1/2"	12.70	1/2"	4"	2"	.045"	62.41	59.70	56.98	54.27
20817	.5000	1/2"	12.70	1/2"	4"	2"	.060"	62.41	59.70	56.98	54.27
20827	.5000	1/2"	12.70	1/2"	4"	2"	.090"	62.41	59.70	56.98	54.27
20837	.5000	1/2"	12.70	1/2"	4"	2"	.125"	62.41	59.70	56.98	54.27
20847	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.015"	88.26	84.43	80.59	76.75
20857	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.020"	88.26	84.43	80.59	76.75
20867	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.030"	88.26	84.43	80.59	76.75
20877	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.045"	88.26	84.43	80.59	76.75
20887	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.060"	88.26	84.43	80.59	76.75
20897	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.090"	88.26	84.43	80.59	76.75
20907	.5000	1/2"	12.70	1/2"	6"	1-1/2"	.125"	88.26	84.43	80.59	76.75
20917	.6250	5/8"	15.87	5/8"	6"	2"	.010"	125.81	120.34	114.87	109.40
20927	.6250	5/8"	15.87	5/8"	6"	2"	.015"	125.81	120.34	114.87	109.40
20937	.6250	5/8"	15.87	5/8"	6"	2"	.020"	125.81	120.34	114.87	109.40
20947	.6250	5/8"	15.87	5/8"	6"	2"	.030"	125.81	120.34	114.87	109.40
20957	.6250	5/8"	15.87	5/8"	6"	2"	.045"	125.81	120.34	114.87	109.40
20967	.6250	5/8"	15.87	5/8"	6"	2"	.060"	125.81	120.34	114.87	109.40
20977	.6250	5/8"	15.87	5/8"	6"	2"	.090"	125.81	120.34	114.87	109.40
20987	.6250	5/8"	15.87	5/8"	6"	2"	.125"	125.81	120.34	114.87	109.40
20997	.7500	3/4"	19.05	3/4"	6"	3"	.015"	198.67	190.03	181.40	172.75
21007	.7500	3/4"	19.05	3/4"	6"	3"	.020"	198.67	190.03	181.40	172.75
21017	.7500	3/4"	19.05	3/4"	6"	3"	.030"	198.67	190.03	181.40	172.75
21027	.7500	3/4"	19.05	3/4"	6"	3"	.045"	198.67	190.03	181.40	172.75
21037	.7500	3/4"	19.05	3/4"	6"	3"	.060"	198.67	190.03	181.40	172.75
21047	.7500	3/4"	19.05	3/4"	6"	3"	.090"	198.67	190.03	181.40	172.75
21057	.7500	3/4"	19.05	3/4"	6"	3"	.125"	198.67	190.03	181.40	172.75
NEW 21147	.7500	3/4"	19.05	3/4"	6"	3"	.250"	198.67	190.03	181.40	172.75

630RA - 4 Flute (continued)

1.000"
(25.40mm)

END MILLS

EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100
	Decimal		Metric								
21067	1.000	1"	25.40	1"	6"	3"	.015"	330.31	315.95	301.59	287.23
21077	1.000	1"	25.40	1"	6"	3"	.020"	330.31	315.95	301.59	287.23
21087	1.000	1"	25.40	1"	6"	3"	.030"	330.31	315.95	301.59	287.23
21097	1.000	1"	25.40	1"	6"	3"	.045"	330.31	315.95	301.59	287.23
21107	1.000	1"	25.40	1"	6"	3"	.060"	330.31	315.95	301.59	287.23
21117	1.000	1"	25.40	1"	6"	3"	.090"	330.31	315.95	301.59	287.23
21127	1.000	1"	25.40	1"	6"	3"	.125"	330.31	315.95	301.59	287.23
NEW 21137	1.000	1"	25.40	1"	6"	3"	.250"	330.31	315.95	301.59	287.23



720M (740M metric) - 2 Flute
723M (743M metric) - 3 Flute
730M (750M metric) - 4 Flute
 .1181" - .3150"
 (3.00mm - 8.00mm)

Technical information:
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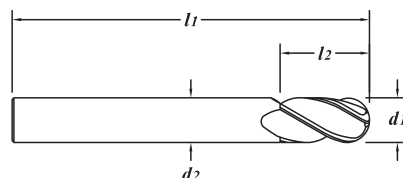


TOLERANCES

d_1	+.000" - .002" (+.000 - .050mm)	
d_2	3mm - 6mm	+.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1"	-.0001" - .0004" (-.0025 - .0100mm)
Ball radius	+.000" - .001" (+.000 - .025mm)	

Extra Length - Ball End

Solid submicron grain carbide end mill - center cutting
 Extended reach
 Can be modified with a neck within 48 hours
 Extremely versatile
 TiCN Coated - page 166
 TiAlN Coated - page 167



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter Metric							
97010	98010	99010	.1181	3.00	3.0	50	16	12.29	11.76	11.22	10.69
97020	98020	99020	.1181	3.00	3.0	75	20	20.24	19.35	18.48	17.60
97030	98030	99030	.1181	3.00	3.0	75	25	20.24	19.35	18.48	17.60
43010	55510	44010	.1250	1/8"	3.17	1/8"	2"	12.46	11.92	11.38	10.84
43020	55520	44020	.1250	1/8"	3.17	1/8"	3"	19.23	18.40	17.56	16.72
43030	55530	44030	.1250	1/8"	3.17	1/8"	1"	19.23	18.40	17.56	16.72
97040	98040	99040	.1575	4.00	4.0	50	16	12.81	12.25	11.70	11.14
97050	98050	99050	.1575	4.00	4.0	75	20	20.66	19.77	18.87	17.97
97060	98060	99060	.1575	4.00	4.0	75	25	20.66	19.77	18.87	17.97
43040	55540	44040	.1875	3/16"	4.76	3/16"	3"	21.21	20.28	19.36	18.44
43050	55550	44050	.1875	3/16"	4.76	3/16"	3"	21.21	20.28	19.36	18.44
43060	55560	44060	.1875	3/16"	4.76	3/16"	4"	22.83	21.84	20.84	19.85
97070	98070	99070	.1969	5.00	5.0	50	16	14.82	14.18	13.53	12.89
97080	98080	99080	.1969	5.00	5.0	75	20	22.32	21.35	20.37	19.41
97090	98090	99090	.1969	5.00	5.0	75	25	22.32	21.35	20.37	19.41
97100	98100	99100	.2362	6.00	6.0	75	25	25.84	24.72	23.60	22.47
97110	98110	99110	.2362	6.00	6.0	100	25	27.20	26.01	24.84	23.65
97120	98120	99120	.2362	6.00	6.0	100	32	27.20	26.01	24.84	23.65
97130	98130	99130	.2362	6.00	6.0	150	38	35.35	33.81	32.27	30.74
43070	55570	44070	.2500	1/4"	6.35	1/4"	3"	24.55	23.48	22.42	21.35
43080	55580	44080	.2500	1/4"	6.35	1/4"	4"	25.83	24.71	23.59	22.46
43090	55590	44090	.2500	1/4"	6.35	1/4"	4"	25.83	24.71	23.59	22.46
43100	55600	44100	.2500	1/4"	6.35	1/4"	6"	33.58	32.13	30.66	29.20
43110	55610	44110	.3125	5/16"	7.94	5/16"	3"	30.33	29.01	27.68	26.37
43120	55620	44120	.3125	5/16"	7.94	5/16"	4"	33.85	32.38	30.91	29.43
43130	55630	44130	.3125	5/16"	7.94	5/16"	4"	33.85	32.38	30.91	29.43
43140	55640	44140	.3125	5/16"	7.94	5/16"	6"	50.21	48.03	45.84	43.66
97140	98140	99140	.3150	8.00	8.0	75	25	31.92	30.53	29.14	27.76
97150	98150	99150	.3150	8.00	8.0	100	25	35.63	34.08	32.53	30.98
97160	98160	99160	.3150	8.00	8.0	100	41	35.63	34.08	32.53	30.98
97170	98170	99170	.3150	8.00	8.0	150	50	51.52	49.29	47.04	44.80

720M (740M metric) - 2 Flute (continued)
723M (743M metric) - 3 Flute (continued)
730M (750M metric) - 4 Flute (continued)

.3750" - 1.000"
(9.52mm - 25.40mm)

END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	$d1$ †			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter	Metric							
43150	55650	44150	.3750	3/8"	9.52	3/8"	3"	1"	34.12	32.64	31.16	29.67
43160	55660	44160	.3750	3/8"	9.52	3/8"	4"	1"	37.45	35.82	34.20	32.56
43170	55670	44170	.3750	3/8"	9.52	3/8"	4"	2"	37.45	35.82	34.20	32.56
43180	55680	44180	.3750	3/8"	9.52	3/8"	6"	1-1/2"	51.97	49.71	47.44	45.19
43190	55690	44190	.3750	3/8"	9.52	3/8"	6"	3"	51.97	49.71	47.44	45.19
97180	98180	99180	.3937		10.00	10.0	75	25	36.87	35.27	33.66	32.06
97190	98190	99190	.3937		10.00	10.0	100	25	48.32	46.22	44.12	42.02
97200	98200	99200	.3937		10.00	10.0	100	50	48.32	46.22	44.12	42.02
97210	98210	99210	.3937		10.00	10.0	150	38	62.16	59.46	56.75	54.05
97220	98220	99220	.3937		10.00	10.0	150	75	62.16	59.46	56.75	54.05
43200	55700	44200	.4375	7/16"	11.11	7/16"	4"	1"	51.55	49.31	47.07	44.82
43210	55710	44210	.4375	7/16"	11.11	7/16"	4"	2"	51.55	49.31	47.07	44.82
43220	55720	44220	.4375	7/16"	11.11	7/16"	6"	1-1/2"	67.00	64.08	61.17	58.26
43230	55730	44230	.4375	7/16"	11.11	7/16"	6"	3"	67.00	64.08	61.17	58.26
97230	98230	99230	.4724		12.00	12.0	100	25	55.47	53.06	50.65	48.24
97240	98240	99240	.4724		12.00	12.0	100	50	55.47	53.06	50.65	48.24
97250	98250	99250	.4724		12.00	12.0	150	50	74.56	71.31	68.08	64.83
97260	98260	99260	.4724		12.00	12.0	150	75	74.56	71.31	68.08	64.83
43240	55740	44240	.5000	1/2"	12.70	1/2"	4"	1"	52.64	50.36	48.07	45.78
43250	55750	44250	.5000	1/2"	12.70	1/2"	4"	2"	52.64	50.36	48.07	45.78
43260	55760	44260	.5000	1/2"	12.70	1/2"	6"	1-1/2"	74.57	71.32	68.08	64.84
43270	55770	44270	.5000	1/2"	12.70	1/2"	6"	3"	74.57	71.32	68.08	64.84
97270	98270	99270	.5512		14.00	14.0	100	25	76.67	73.33	70.00	66.66
97280	98280	99280	.5512		14.00	14.0	100	50	76.67	73.33	70.00	66.66
97290	98290	99290	.5512		14.00	14.0	150	50	104.06	99.54	95.01	90.49
97300	98300	99300	.5512		14.00	14.0	150	75	104.06	99.54	95.01	90.49
43280	55780	44280	.5625	9/16"	14.29	9/16"	6"	2"	104.05	99.53	95.00	90.48
43290	55790	44290	.5625	9/16"	14.29	9/16"	6"	3"	104.05	99.53	95.00	90.48
43300	55800	44300	.6250	5/8"	15.87	5/8"	6"	2"	109.65	104.88	100.11	95.35
43310	55810	44310	.6250	5/8"	15.87	5/8"	6"	3"	109.65	104.88	100.11	95.35
97310	98310	99310	.6299		16.00	16.0	150	50	109.64	104.87	100.10	95.34
97320	98320	99320	.6299		16.00	16.0	150	75	109.64	104.87	100.10	95.34
97330	98330	99330	.7087		18.00	18.0	150	50	168.66	161.32	153.99	146.66
97340	98340	99340	.7087		18.00	18.0	150	75	168.66	161.32	153.99	146.66
43320	55820	44320	.7500	3/4"	19.05	3/4"	6"	2"	179.94	172.12	164.29	156.47
43330	55830	44330	.7500	3/4"	19.05	3/4"	6"	3"	179.94	172.12	164.29	156.47
97350	98350	99350	.7874		20.00	20.0	150	50	185.44	177.38	169.31	161.25
97360	98360	99360	.7874		20.00	20.0	150	75	185.44	177.38	169.31	161.25
97370	98370	99370	.9843		25.00	25.0	150	50	294.25	281.46	268.66	255.87
97380	98380	99380	.9843		25.00	25.0	150	75	294.25	281.46	268.66	255.87
43340	55840	44340	1.000	1"	25.40	1"	6"	2"	306.00	292.70	279.39	266.08
43350	55850	44350	1.000	1"	25.40	1"	6"	3"	306.00	292.70	279.39	266.08

720MC - 2 Flute
723MC - 3 Flute
730MC - 4 Flute

Technical information:
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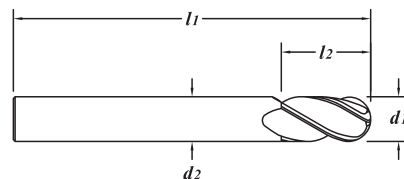


TOLERANCES

d_1	+.000" - .002" (+.000 - .050mm)	
d_2	1/8" - 3/16"	+.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1"	-.0001" - .0004" (-.0025 - .0100mm)
Ball radius	+.000" - .001" (+.000 - .025mm)	

Extra Length - Ball End - TiCN Coated

Solid submicron grain carbide end mill - center cutting
 Extended reach
 Improved abrasion resistance and lubricity
 Up to 25% faster than uncoated
 Can be modified with a neck within 48 hours
 Extremely versatile
 Uncoated - page 164
 TiALN Coated - page 167



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal		Metric							
43014	55514	44014	.1250	1/8"	3.17	1/8"	2"	5/8"	14.34	13.72	13.09	12.47
43024	55524	44024	.1250	1/8"	3.17	1/8"	3"	3/4"	21.54	20.60	19.67	18.73
43034	55534	44034	.1250	1/8"	3.17	1/8"	3"	1"	21.54	20.60	19.67	18.73
43044	55544	44044	.1875	3/16"	4.76	3/16"	3"	1"	23.85	22.81	21.78	20.74
43054	55554	44054	.1875	3/16"	4.76	3/16"	3"	1-1/8"	23.85	22.81	21.78	20.74
43064	55564	44064	.1875	3/16"	4.76	3/16"	4"	1"	25.90	24.77	23.64	22.52
43074	55574	44074	.2500	1/4"	6.35	1/4"	3"	1"	28.39	27.15	25.93	24.69
43084	55584	44084	.2500	1/4"	6.35	1/4"	4"	1"	29.98	28.68	27.37	26.07
43094	55594	44094	.2500	1/4"	6.35	1/4"	4"	1-1/2"	29.98	28.68	27.37	26.07
43104	55604	44104	.2500	1/4"	6.35	1/4"	6"	1-1/2"	40.75	38.98	37.20	35.43
43114	55614	44114	.3125	5/16"	7.94	5/16"	3"	1"	35.47	33.94	32.39	30.85
43124	55624	44124	.3125	5/16"	7.94	5/16"	4"	1"	40.22	38.47	36.72	34.98
43134	55634	44134	.3125	5/16"	7.94	5/16"	4"	1-5/8"	40.22	38.47	36.72	34.98
43144	55644	44144	.3125	5/16"	7.94	5/16"	6"	1-1/2"	58.81	56.25	53.70	51.14
43154	55654	44154	.3750	3/8"	9.52	3/8"	3"	1"	39.25	37.54	35.84	34.13
43164	55664	44164	.3750	3/8"	9.52	3/8"	4"	1"	43.83	41.92	40.02	38.11
43174	55674	44174	.3750	3/8"	9.52	3/8"	4"	2"	43.83	41.92	40.02	38.11
43184	55684	44184	.3750	3/8"	9.52	3/8"	6"	1-1/2"	60.58	57.95	55.31	52.68
43194	55694	44194	.3750	3/8"	9.52	3/8"	6"	3"	60.58	57.95	55.31	52.68
43204	55704	44204	.4375	7/16"	11.11	7/16"	4"	1"	59.24	56.66	54.09	51.51
43214	55714	44214	.4375	7/16"	11.11	7/16"	4"	2"	59.24	56.66	54.09	51.51
43224	55724	44224	.4375	7/16"	11.11	7/16"	6"	1-1/2"	77.89	74.50	71.12	67.72
43234	55734	44234	.4375	7/16"	11.11	7/16"	6"	3"	77.89	74.50	71.12	67.72
43244	55744	44244	.5000	1/2"	12.70	1/2"	4"	1"	60.34	57.72	55.09	52.47
43254	55754	44254	.5000	1/2"	12.70	1/2"	4"	2"	60.34	57.72	55.09	52.47
43264	55764	44264	.5000	1/2"	12.70	1/2"	6"	1-1/2"	85.46	81.74	78.02	74.31
43274	55774	44274	.5000	1/2"	12.70	1/2"	6"	3"	85.46	81.74	78.02	74.31
43284	55784	44284	.5625	9/16"	14.29	9/16"	6"	2"	117.50	112.39	107.29	102.17
43294	55794	44294	.5625	9/16"	14.29	9/16"	6"	3"	117.50	112.39	107.29	102.17
43304	55804	44304	.6250	5/8"	15.87	5/8"	6"	2"	123.08	117.73	112.38	107.03
43314	55814	44314	.6250	5/8"	15.87	5/8"	6"	3"	123.08	117.73	112.38	107.03
43324	55824	44324	.7500	3/4"	19.05	3/4"	6"	2"	195.29	186.80	178.31	169.82
43334	55834	44334	.7500	3/4"	19.05	3/4"	6"	3"	195.29	186.80	178.31	169.82
43344	55844	44344	1.000	1"	25.40	1"	6"	2"	327.71	313.47	299.22	284.97
43354	55854	44354	1.000	1"	25.40	1"	6"	3"	327.71	313.47	299.22	284.97

720MA (740MA metric) - 2 Flute
723MA (743MA metric) - 3 Flute
730MA (750MA metric) - 4 Flute
 .1181" - .3150"
 (3.00mm - 8.00mm)

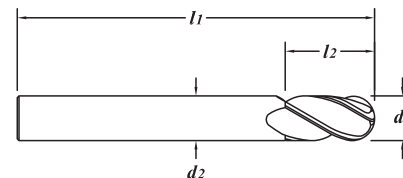
Technical information:
 page 192, 194



TOLERANCES		
d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Extra Length - Ball End - TiALN Coated

Solid submicron grain carbide end mill - center cutting
 Extended reach
 Dry or semi-dry machining
 Up to 40% faster than uncoated
 Can be modified with a neck within 48 hours
 Extremely versatile
 Uncoated - page 164
 TiCN Coated - page 166



END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter Metric							
97017	98017	99017	.1181	3.00	3.0	50	16	14.00	13.38	12.78	12.17
97027	98027	99027	.1181	3.00	3.0	75	20	22.38	21.40	20.44	19.46
97037	98037	99037	.1181	3.00	3.0	75	25	22.38	21.40	20.44	19.46
43017	55517	44017	.1250	1/8"	3.17	1/8"	2"	14.59	13.96	13.32	12.69
43027	55527	44027	.1250	1/8"	3.17	1/8"	3"	21.85	20.90	19.95	19.00
43037	55537	44037	.1250	1/8"	3.17	1/8"	1"	21.85	20.90	19.95	19.00
97047	98047	99047	.1575	4.00	4.0	50	16	14.96	14.30	13.66	13.00
97057	98057	99057	.1575	4.00	4.0	75	20	24.01	22.97	21.92	20.88
97067	98067	99067	.1575	4.00	4.0	75	25	24.01	22.97	21.92	20.88
43047	55547	44047	.1875	3/16"	4.76	3/16"	1"	24.54	23.47	22.41	21.34
43057	55557	44057	.1875	3/16"	4.76	3/16"	1-1/8"	24.54	23.47	22.41	21.34
43067	55567	44067	.1875	3/16"	4.76	3/16"	4"	26.72	25.55	24.40	23.23
97077	98077	99077	.1969	5.00	5.0	50	16	18.16	17.37	16.58	15.79
97087	98087	99087	.1969	5.00	5.0	75	20	26.74	25.57	24.41	23.25
97097	98097	99097	.1969	5.00	5.0	75	25	26.74	25.57	24.41	23.25
97107	98107	99107	.2362	6.00	6.0	75	25	30.26	28.94	27.63	26.31
97117	98117	99117	.2362	6.00	6.0	100	25	32.38	30.97	29.56	28.15
97127	98127	99127	.2362	6.00	6.0	100	32	32.38	30.97	29.56	28.15
97137	98137	99137	.2362	6.00	6.0	150	38	42.65	40.80	38.94	37.09
43077	55577	44077	.2500	1/4"	6.35	1/4"	1"	28.97	27.72	26.46	25.20
43087	55587	44087	.2500	1/4"	6.35	1/4"	4"	31.02	29.67	28.33	26.98
43097	55597	44097	.2500	1/4"	6.35	1/4"	1-1/2"	31.02	29.67	28.33	26.98
43107	55607	44107	.2500	1/4"	6.35	1/4"	6"	40.89	39.11	37.34	35.56
43117	55617	44117	.3125	5/16"	7.94	5/16"	1"	36.96	35.35	33.75	32.14
43127	55627	44127	.3125	5/16"	7.94	5/16"	4"	42.27	40.42	38.59	36.75
43137	55637	44137	.3125	5/16"	7.94	5/16"	1-5/8"	42.27	40.42	38.59	36.75
43147	55647	44147	.3125	5/16"	7.94	5/16"	1-1/2"	61.71	59.03	56.35	53.66
97147	98147	99147	.3150	8.00	8.0	75	25	38.52	36.85	35.17	33.50
97157	98157	99157	.3150	8.00	8.0	100	25	44.02	42.11	40.20	38.28
97167	98167	99167	.3150	8.00	8.0	100	41	44.02	42.11	40.20	38.28
97177	98177	99177	.3150	8.00	8.0	150	50	63.03	60.29	57.55	54.81

continued →

720MA (740MA metric) - 2 Flute (continued)**723MA (743MA metric) - 3 Flute (continued)****730MA (750MA metric) - 4 Flute (continued)**

.3750" - 1.000"

(9.52mm - 25.40mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	$d1$ †			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100
			Decimal	Diameter	Metric							
43157	55657	44157	.3750	3/8"	9.52	3/8"	3"	1"	40.75	38.98	37.20	35.43
43167	55667	44167	.3750	3/8"	9.52	3/8"	4"	1"	45.85	43.86	41.87	39.87
43177	55677	44177	.3750	3/8"	9.52	3/8"	4"	2"	45.85	43.86	41.87	39.87
43187	55687	44187	.3750	3/8"	9.52	3/8"	6"	1-1/2"	63.48	60.73	57.96	55.20
43197	55697	44197	.3750	3/8"	9.52	3/8"	6"	3"	63.48	60.73	57.96	55.20
97187	98187	99187	.3937		10.00	10.0	76	25	44.41	42.47	40.55	38.62
97197	98197	99197	.3937		10.00	10.0	100	25	58.05	55.53	53.01	50.48
97207	98207	99207	.3937		10.00	10.0	100	50	58.05	55.53	53.01	50.48
97217	98217	99217	.3937		10.00	10.0	150	38	75.84	72.54	69.24	65.95
97227	98227	99227	.3937		10.00	10.0	150	75	75.84	72.54	69.24	65.95
43207	55707	44207	.4375	7/16"	11.11	7/16"	4"	1"	61.31	58.65	55.97	53.31
43217	55717	44217	.4375	7/16"	11.11	7/16"	4"	2"	61.31	58.65	55.97	53.31
43227	55727	44227	.4375	7/16"	11.11	7/16"	6"	1-1/2"	80.69	77.19	73.67	70.17
43237	55737	44237	.4375	7/16"	11.11	7/16"	6"	3"	80.69	77.19	73.67	70.17
97237	98237	99237	.4724		12.00	12.0	100	25	65.21	62.37	59.54	56.70
97247	98247	99247	.4724		12.00	12.0	100	50	65.21	62.37	59.54	56.70
97257	98257	99257	.4724		12.00	12.0	150	50	88.26	84.43	80.59	76.75
97267	98267	99267	.4724		12.00	12.0	150	75	88.26	84.43	80.59	76.75
43247	55747	44247	.5000	1/2"	12.70	1/2"	4"	1"	62.41	59.70	56.98	54.27
43257	55757	44257	.5000	1/2"	12.70	1/2"	4"	2"	62.41	59.70	56.98	54.27
43267	55767	44267	.5000	1/2"	12.70	1/2"	6"	1-1/2"	88.26	84.43	80.59	76.75
43277	55777	44277	.5000	1/2"	12.70	1/2"	6"	3"	88.26	84.43	80.59	76.75
97277	98277	99277	.5512		14.00	14.0	100	25	87.56	83.75	79.94	76.14
97287	98287	99287	.5512		14.00	14.0	100	50	87.56	83.75	79.94	76.14
97297	98297	99297	.5512		14.00	14.0	150	50	120.22	114.99	109.77	104.54
97307	98307	99307	.5512		14.00	14.0	150	75	120.22	114.99	109.77	104.54
43287	55787	44287	.5625	9/16"	14.29	9/16"	6"	2"	120.22	114.99	109.77	104.54
43297	55797	44297	.5625	9/16"	14.29	9/16"	6"	3"	120.22	114.99	109.77	104.54
43307	55807	44307	.6250	5/8"	15.87	5/8"	6"	2"	125.81	120.34	114.87	109.40
43317	55817	44317	.6250	5/8"	15.87	5/8"	6"	3"	125.81	120.34	114.87	109.40
97317	98317	99317	.6299		16.00	16.0	150	50	125.81	120.34	114.87	109.40
97327	98327	99327	.6299		16.00	16.0	150	75	125.81	120.34	114.87	109.40
97337	98337	99337	.7087		18.00	18.0	150	50	187.39	179.24	171.09	162.95
97347	98347	99347	.7087		18.00	18.0	150	75	187.39	179.24	171.09	162.95
43327	55827	44327	.7500	3/4"	19.05	3/4"	6"	2"	198.67	190.03	181.40	172.75
43337	55837	44337	.7500	3/4"	19.05	3/4"	6"	3"	198.67	190.03	181.40	172.75
97357	98357	99357	.7874		20.00	20.0	150	50	209.77	200.65	191.53	182.41
97367	98367	99367	.7874		20.00	20.0	150	75	209.77	200.65	191.53	182.41
97377	98377	99377	.9843		25.00	25.0	150	50	318.55	304.70	290.85	277.00
97387	98387	99387	.9843		25.00	25.0	150	75	318.55	304.70	290.85	277.00
43347	55847	44347	1.000	1"	25.40	1"	6"	2"	330.31	315.95	301.59	287.23
43357	55857	44357	1.000	1"	25.40	1"	6"	3"	330.31	315.95	301.59	287.23