

Series 220MA, 223MA, 230MA, 820MA, 823MA, 830MA

TOLERANCES

d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6

.0312" - .3594"
(0.792mm - 9.129mm)



TECH PAGES
262, 264

Standard Length - Square End

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

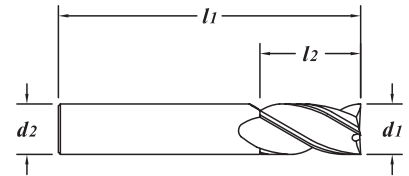
Uncoated - page 194

TiN Coating - page 196

TiCN Coating - page 197

Stub Length - page 187

Extended Length - page 223



(220MA/820MA) 2 Flute EDP#	(223MA/823MA) 3 Flute EDP#	(230MA/830MA) 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								
11017	12017	13017	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	12.72	12.17	11.61	11.06
45017	37017	46017	.0394		1.000	3.0	38	4	13.23	12.65	12.08	11.50
11027	12027	13027	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	12.72	12.17	11.61	11.06
45027	37027	46027	.0591		1.500	3.0	38	6	13.23	12.65	12.08	11.50
11037	12037	13037	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	11.98	11.46	10.94	10.42
11047	12047	13047	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	11.98	11.46	10.94	10.42
45037	37037	46037	.0787		2.000	3.0	38	8	12.44	11.90	11.36	10.82
11057	12057	13057	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	11.45	10.96	10.46	9.96
45047	37047	46047	.0984		2.500	3.0	38	12	11.91	11.40	10.88	10.36
11067	12067	13067	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	11.45	10.96	10.46	9.96
45057	37057	46057	.1181		3.000	3.0	38	12	11.19	10.70	10.22	9.73
11077	12077	13077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	10.76	10.30	9.83	9.36
45067	37067	46067	.1378		3.500	4.0	50	12	15.36	14.70	14.03	13.36
11087	12087	13087	.1406	9/64"	3.571	3/16"	2"	9/16"	14.73	14.09	13.45	12.81
11097	12097	13097	.1562	5/32"	3.967	3/16"	2"	9/16"	14.73	14.09	13.45	12.81
45077	37077	46077	.1575		4.000	4.0	50	14	14.70	14.06	13.42	12.78
11107	12107	13107	.1719	11/64"	4.366	3/16"	2"	9/16"	14.73	14.09	13.45	12.81
45087	37087	46087	.1772		4.500	5.0	50	14	18.81	18.00	17.18	16.36
11117	12117	13117	.1875	3/16"	4.763	3/16"	2"	5/8"	14.10	13.49	12.87	12.26
45097	37097	46097	.1969		5.000	5.0	65	16	19.37	18.52	17.68	16.84
11127	12127	13127	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	20.53	19.64	18.74	17.85
11137	12137	13137	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	20.53	19.64	18.74	17.85
11147	12147	13147	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	20.53	19.64	18.74	17.85
45107	37107	46107	.2362		6.000	6.0	65	19	19.83	18.96	18.10	17.24
11157	12157	13157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.12	18.29	17.46	16.63
11167	12167	13167	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	32.23	30.83	29.43	28.03
45117	37117	46117	.2756		7.000	7.0	65	22	27.84	26.63	25.42	24.21
11177	12177	13177	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	32.23	30.83	29.43	28.03
11187	12187	13187	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	32.23	30.83	29.43	28.03
11197	12197	13197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	27.30	26.11	24.93	23.74
45127	37127	46127	.3150		8.000	8.0	65	22	28.29	27.06	25.83	24.60
11207	12207	13207	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	36.77	35.17	33.57	31.97
11217	12217	13217	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	36.77	35.17	33.57	31.97
45137	37137	46137	.3543		9.000	9.0	65	22	33.35	31.90	30.45	29.00
11227	12227	13227	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	36.77	35.17	33.57	31.97

MATERIAL HARDNESS (Rc) 70 35 0

Series 220MA, 223MA, 230MA, 820MA, 823MA, 830MA (continued)

.3750" - 1.250"
(9.525mm - 31.750mm)

END MILLS

(220MA/820MA) 2 Flute EDP#	(223MA/823MA) 3 Flute EDP#	(230MA/830MA) 4 Flute EDP#		$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100
			Decimal		Metric							
11237	12237	13237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	32.12	30.72	29.33	27.93
11247	12247	13247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	43.53	41.64	39.74	37.85
45147	37147	46147	.3937		10.000	10.0	70	25	38.49	36.82	35.14	33.47
11257	12257	13257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	43.53	41.64	39.74	37.85
11267	12267	13267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	43.53	41.64	39.74	37.85
45157	37157	46157	.4331		11.000	11.0	75	25	40.08	38.34	36.59	34.85
11277	12277	13277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	38.58	36.91	35.23	33.55
11287	12287	13287	.4531	29/64"	11.509	1/2"	3"	1"	55.61	53.20	50.78	48.36
11297	12297	13297	.4688	15/32"	11.908	1/2"	3"	1"	55.61	53.20	50.78	48.36
45167	37167	46167	.4724		12.000	12.0	75	25	49.89	47.72	45.55	43.38
11307	12307	13307	.4844	31/64"	12.304	1/2"	3"	1"	55.61	53.20	50.78	48.36
11317	12317	13317	.5000	1/2"	12.700	1/2"	3"	1"	47.93	45.85	43.76	41.68
45177	37177	46177	.5512		14.000	14.0	88	32	82.93	79.32	75.72	72.11
11327	12327	13327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	79.58	76.12	72.66	69.20
11337	12337	13337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	88.25	84.41	80.58	76.74
45187	37187	46187	.6299		16.000	16.0	88	38	92.05	88.04	84.04	80.04
11347	12347	13347	.6875	11/16"	17.463	3/4"	4"	1-1/2"	140.88	134.75	128.63	122.50
45197	37197	46197	.7087		18.000	18.0	100	38	131.35	125.64	119.93	114.22
11357	12357	13357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	125.80	120.33	114.86	109.39
45207	37207	46207	.7874		20.000	20.0	100	38	170.06	162.67	155.27	147.88
45217	37217	46217	.8661		22.000	22.0	100	38	186.53	178.42	170.31	162.20
11367	12367	13367	.8750	7/8"	22.225	7/8"	4"	1-1/2"	181.59	173.69	165.80	157.90
45227	37227	46227	.9843		25.000	25.0	100	38	194.03	185.59	177.16	168.72
11377	12377	13377	1.000	1"	25.400	1"	4"	1-1/2"	187.90	179.73	171.56	163.39
-	-	13397	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	516.51	494.05	471.60	449.14

70

35

MATERIAL HARDNESS (Rc)

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End Mill Manufacturing