

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

TOLERANCES

d1	+0.000" -0.002" (+0.000 -0.050mm)
d2	h6

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



TECH
PAGES
268,270

Standard Length - Square End

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

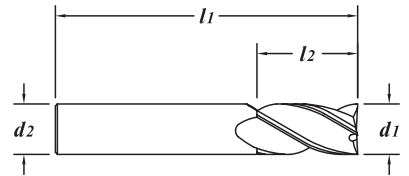
Uncoated - page 202

TiN Coating - page 204

TiCN Coating - page 205

Stub Length - page 191

Extended Length - page 233



MATERIAL HARDNESS (Rc)

70

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(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								
11017	12017	13017	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	13.35	12.77	12.19	11.61
45017	37017	46017	.0394		1.000	3.0	38	4	13.89	13.29	12.68	12.08
11027	12027	13027	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	13.35	12.77	12.19	11.61
45027	37027	46027	.0591		1.500	3.0	38	6	13.89	13.29	12.68	12.08
11037	12037	13037	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	12.58	12.03	11.49	10.94
11047	12047	13047	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	12.58	12.03	11.49	10.94
45037	37037	46037	.0787		2.000	3.0	38	8	13.06	12.50	11.93	11.36
11057	12057	13057	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	12.03	11.51	10.98	10.46
45047	37047	46047	.0984		2.500	3.0	38	12	12.51	11.97	11.42	10.88
11067	12067	13067	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	12.03	11.51	10.98	10.46
45057	37057	46057	.1181		3.000	3.0	38	12	11.75	11.24	10.73	10.22
11077	12077	13077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	11.30	10.81	10.32	9.83
45067	37067	46067	.1378		3.500	4.0	50	12	16.13	15.43	14.73	14.03
11087	12087	13087	.1406	9/64"	3.571	3/16"	2"	9/16"	15.47	14.80	14.12	13.45
11097	12097	13097	.1562	5/32"	3.967	3/16"	2"	9/16"	15.47	14.80	14.12	13.45
45077	37077	46077	.1575		4.000	4.0	50	14	15.43	14.76	14.09	13.42
11107	12107	13107	.1719	11/64"	4.366	3/16"	2"	9/16"	15.47	14.80	14.12	13.45
45087	37087	46087	.1772		4.500	5.0	50	14	19.76	18.90	18.04	17.18
11117	12117	13117	.1875	3/16"	4.763	3/16"	2"	5/8"	14.80	14.16	13.51	12.87
NEW 92077	93077	94077	.1969		5.000	5.0	50	16	19.12	18.29	17.46	16.63
45097	37097	46097	.1969		5.000	5.0	65	16	20.33	19.45	18.56	17.68
11127	12127	13127	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	21.55	20.61	19.68	18.74
11137	12137	13137	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	21.55	20.61	19.68	18.74
11147	12147	13147	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	21.55	20.61	19.68	18.74
45107	37107	46107	.2362		6.000	6.0	65	19	20.82	19.91	19.01	18.10
11157	12157	13157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.08	19.21	18.33	17.46
11167	12167	13167	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	33.84	32.37	30.90	29.43
45117	37117	46117	.2756		7.000	7.0	65	22	29.23	27.96	26.69	25.42
11177	12177	13177	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	33.84	32.37	30.90	29.43
11187	12187	13187	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	33.84	32.37	30.90	29.43
11197	12197	13197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	28.67	27.42	26.18	24.93
45127	37127	46127	.3150		8.000	8.0	65	22	29.70	28.41	27.12	25.83
11207	12207	13207	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	38.61	36.93	35.25	33.57
11217	12217	13217	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	38.61	36.93	35.25	33.57
45137	37137	46137	.3543		9.000	9.0	65	22	35.02	33.50	31.97	30.45
11227	12227	13227	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	38.61	36.93	35.25	33.57

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"	33.73	32.26	30.80	29.33
11247	12247	13247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	45.70	43.71	41.73	39.74
45147	37147	46147	.3937		10.000	10.0	70	25	40.41	38.65	36.90	35.14
11257	12257	13257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	45.70	43.71	41.73	39.74
11267	12267	13267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	45.70	43.71	41.73	39.74
45157	37157	46157	.4331		11.000	11.0	75	25	42.08	40.25	38.42	36.59
11277	12277	13277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	40.51	38.75	36.99	35.23
11287	12287	13287	.4531	29/64"	11.509	1/2"	3"	1"	58.40	55.86	53.32	50.78
11297	12297	13297	.4688	15/32"	11.908	1/2"	3"	1"	58.40	55.86	53.32	50.78
45167	37167	46167	.4724		12.000	12.0	75	25	52.38	50.11	47.83	45.55
11307	12307	13307	.4844	31/64"	12.304	1/2"	3"	1"	58.40	55.86	53.32	50.78
11317	12317	13317	.5000	1/2"	12.700	1/2"	3"	1"	50.32	48.14	45.95	43.76
45177	37177	46177	.5512		14.000	14.0	88	32	87.08	83.29	79.51	75.72
11327	12327	13327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	83.56	79.93	76.29	72.66
11337	12337	13337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	92.67	88.64	84.61	80.58
45187	37187	46187	.6299		16.000	16.0	88	38	96.65	92.44	88.24	84.04
11347	12347	13347	.6875	11/16"	17.463	3/4"	4"	1-1/2"	147.92	141.49	135.06	128.63
45197	37197	46197	.7087		18.000	18.0	100	38	137.92	131.92	125.93	119.93
11357	12357	13357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	132.09	126.35	120.60	114.86
45207	37207	46207	.7874		20.000	20.0	100	38	178.56	170.80	163.03	155.27
45217	37217	46217	.8661		22.000	22.0	100	38	195.86	187.34	178.83	170.31
11367	12367	13367	.8750	7/8"	22.225	7/8"	4"	1-1/2"	190.67	182.38	174.09	165.80
45227	37227	46227	.9843		25.000	25.0	100	38	203.73	194.88	186.02	177.16
11377	12377	13377	1.000	1"	25.400	1"	4"	1-1/2"	197.29	188.72	180.14	171.56
-	-	13397	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	542.34	518.76	495.18	471.60

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MATERIAL HARDNESS (Rc)

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End Mill Manufacturing