

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

**TOLERANCES**

$d_1$	+0.000" -0.002" (+0.000 -0.050mm)
$d_2$	h6

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



TECH  
PAGES  
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## Standard Length - Square End

### TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

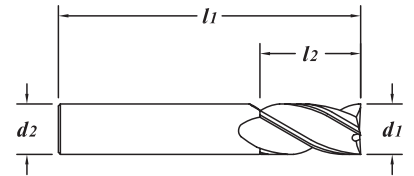
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(220MA/820MA) 2 Flute EDP#	(223MA/823MA) 3 Flute EDP#	(230MA/830MA) 4 Flute EDP#	$d_1$ † Diameter		$d_2$ Shank Diameter	$l_1$ Overall Length	$l_2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
11017	12017	13017	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	13.88	13.28	12.67	12.07
45017	37017	46017	.0394		1.000	3.0	38	4	14.44	13.82	13.19	12.56
11027	12027	13027	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	13.88	13.28	12.67	12.07
45027	37027	46027	.0591		1.500	3.0	38	6	14.44	13.82	13.19	12.56
11037	12037	13037	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	13.09	12.52	11.95	11.38
11047	12047	13047	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	13.09	12.52	11.95	11.38
45037	37037	46037	.0787		2.000	3.0	38	8	13.58	12.99	12.40	11.81
11057	12057	13057	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	12.51	11.97	11.42	10.88
45047	37047	46047	.0984		2.500	3.0	38	12	13.02	12.45	11.89	11.32
11067	12067	13067	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	12.51	11.97	11.42	10.88
45057	37057	46057	.1181		3.000	3.0	38	12	12.22	11.69	11.16	10.63
11077	12077	13077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	11.75	11.24	10.73	10.22
45067	37067	46067	.1378		3.500	4.0	50	12	16.78	16.05	15.32	14.59
11087	12087	13087	.1406	9/64"	3.571	3/16"	2"	9/16"	16.09	15.39	14.69	13.99
11097	12097	13097	.1562	5/32"	3.967	3/16"	2"	9/16"	16.09	15.39	14.69	13.99
45077	37077	46077	.1575		4.000	4.0	50	14	16.05	15.36	14.66	13.96
11107	12107	13107	.1719	11/64"	4.366	3/16"	2"	9/16"	16.09	15.39	14.69	13.99
45087	37087	46087	.1772		4.500	5.0	50	14	20.55	19.66	18.76	17.87
11117	12117	13117	.1875	3/16"	4.763	3/16"	2"	5/8"	15.39	14.72	14.05	13.38
92077	93077	94077	.1969		5.000	5.0	50	16	19.90	19.03	18.17	17.30
45097	37097	46097	.1969		5.000	5.0	65	16	21.15	20.23	19.31	18.39
11127	12127	13127	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	22.41	21.44	20.46	19.49
11137	12137	13137	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	22.41	21.44	20.46	19.49
11147	12147	13147	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	22.41	21.44	20.46	19.49
45107	37107	46107	.2362		6.000	6.0	65	19	21.64	20.70	19.76	18.82
11157	12157	13157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.88	19.98	19.07	18.16
11167	12167	13167	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	35.20	33.67	32.14	30.61
45117	37117	46117	.2756		7.000	7.0	65	22	30.41	29.08	27.76	26.44
11177	12177	13177	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	35.20	33.67	32.14	30.61
11187	12187	13187	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	35.20	33.67	32.14	30.61
11197	12197	13197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	29.82	28.52	27.23	25.93
45127	37127	46127	.3150		8.000	8.0	65	22	30.89	29.55	28.20	26.86
11207	12207	13207	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	40.15	38.40	36.66	34.91
11217	12217	13217	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	40.15	38.40	36.66	34.91
45137	37137	46137	.3543		9.000	9.0	65	22	36.42	34.84	33.25	31.67
11227	12227	13227	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	40.15	38.40	36.66	34.91

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MATERIAL HARDNESS (Rc)

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

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

GENERAL PURPOSE  
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"	35.08	33.55	32.03	30.50
11247	12247	13247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	47.53	45.46	43.40	41.33
45147	37147	46147	.3937		10.000	10.0	70	25	42.03	40.21	38.38	36.55
11257	12257	13257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	47.53	45.46	43.40	41.33
11267	12267	13267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	47.53	45.46	43.40	41.33
45157	37157	46157	.4331		11.000	11.0	75	25	43.76	41.86	39.95	38.05
11277	12277	13277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	42.14	40.30	38.47	36.64
11287	12287	13287	.4531	29/64"	11.509	1/2"	3"	1"	60.73	58.09	55.45	52.81
11297	12297	13297	.4688	15/32"	11.908	1/2"	3"	1"	60.73	58.09	55.45	52.81
45167	37167	46167	.4724		12.000	12.0	75	25	54.48	52.11	49.74	47.37
11307	12307	13307	.4844	31/64"	12.304	1/2"	3"	1"	60.73	58.09	55.45	52.81
11317	12317	13317	.5000	1/2"	12.700	1/2"	3"	1"	52.34	50.06	47.79	45.51
45177	37177	46177	.5512		14.000	14.0	88	32	90.56	86.63	82.69	78.75
11327	12327	13327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	86.91	83.13	79.35	75.57
11337	12337	13337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	96.37	92.18	87.99	83.80
45187	37187	46187	.6299		16.000	16.0	88	38	100.51	96.14	91.77	87.40
11347	12347	13347	.6875	11/16"	17.463	3/4"	4"	1-1/2"	153.85	147.16	140.47	133.78
45197	37197	46197	.7087		18.000	18.0	100	38	143.44	137.20	130.97	124.73
11357	12357	13357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	137.37	131.40	125.42	119.45
45207	37207	46207	.7874		20.000	20.0	100	38	185.70	177.63	169.55	161.48
45217	37217	46217	.8661		22.000	22.0	100	38	203.69	194.83	185.98	177.12
11367	12367	13367	.8750	7/8"	22.225	7/8"	4"	1-1/2"	198.29	189.67	181.05	172.43
45227	37227	46227	.9843		25.000	25.0	100	38	211.89	202.68	193.46	184.25
11377	12377	13377	1.000	1"	25.400	1"	4"	1-1/2"	205.18	196.26	187.34	178.42
-	-	13397	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	564.03	539.51	514.98	490.46

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MATERIAL HARDNESS (Rc)

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End Mill Manufacturing