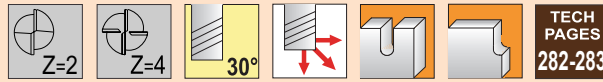


**TOLERANCES**

<i>d1</i>	+0.000" -0.002" (+0.000 -0.050mm)
<i>d2</i>	h6
ball radius	+0.000" -0.001" (+0.000 -0.025mm)

**Series 180MA, 190MA, 980MA, 990MA**

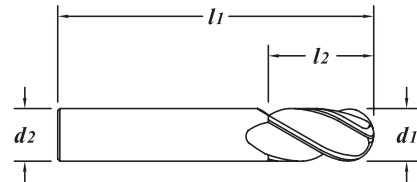


GENERAL PURPOSE  
END MILLS

**Stub Length - Ball End**

**TiALN Coating**

- Solid submicron grain carbide end mill - center cutting
- Shorter flute length for rigidity
- Dry or semi-dry machining
- Extremely versatile
- Uncoated - page 214
- Standard Length - page 232
- Extended length - page 250



(180MA/980MA) 2 Flute EDP#	(190MA/990MA) 4 Flute EDP#	<i>d1</i> †		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter Metric								
03017	04017	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	16.91	16.17	15.44	14.70
03517	04517	.0394		1.000	3.0	38	2	17.61	16.84	16.08	15.31
03027	04027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	16.91	16.17	15.44	14.70
03527	04527	.0591		1.500	3.0	38	3	17.61	16.84	16.08	15.31
03037	04037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	13.14	12.57	12.00	11.43
03537	04537	.0787		2.000	3.0	38	4	13.70	13.10	12.51	11.91
03047	04047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	12.57	12.02	11.48	10.93
03547	04547	.0984		2.500	3.0	38	5	13.09	12.52	11.95	11.38
03557	04557	.1181		3.000	3.0	38	6	12.81	12.25	11.70	11.14
03057	04057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	12.32	11.78	11.25	10.71
03567	04567	.1378		3.500	4.0	50	7	16.87	16.14	15.40	14.67
03067	04067	.1562	5/32"	3.967	3/16"	2"	5/16"	16.16	15.46	14.75	14.05
03577	04577	.1575		4.000	4.0	50	8	16.15	15.44	14.74	14.04
03587	04587	.1772		4.500	5.0	50	9.5	22.00	21.04	20.09	19.13
03077	04077	.1875	3/16"	4.763	3/16"	2"	3/8"	15.48	14.81	14.13	13.46
03597	04597	.1969		5.000	5.0	50	10	20.95	20.04	19.13	18.22
03087	04087	.2188	7/32"	5.558	1/4"	2"	7/16"	21.16	20.24	19.32	18.40
03607	04607	.2362		6.000	6.0	50	12	21.79	20.85	19.90	18.95
03097	04097	.2500	1/4"	6.350	1/4"	2"	1/2"	20.91	20.00	19.09	18.18
03617	04617	.2756		7.000	7.0	50	12	29.04	27.78	26.51	25.25
03107	04107	.3125	5/16"	7.938	5/16"	2"	1/2"	28.82	27.57	26.31	25.06
03627	04627	.3150		8.000	8.0	50	12	30.03	28.72	27.42	26.11
03637	04637	.3543		9.000	9.0	50	14	35.68	34.13	32.58	31.03
03117	04117	.3750	3/8"	9.525	3/8"	2"	5/8"	34.19	32.70	31.22	29.73
03647	04647	.3937		10.000	10.0	50	16	39.59	37.87	36.15	34.43
03657	04657	.4331		11.000	11.0	65	19	47.18	45.13	43.08	41.03
03127	04127	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	44.34	42.42	40.49	38.56
03667	04667	.4724		12.000	12.0	65	19	58.41	55.87	53.33	50.79
03137	04137	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	55.96	53.53	51.09	48.66
-	04147	.6250	5/8"	15.875	5/8"	3"	3/4"	99.94	95.59	91.25	86.90
-	04157	.7500	3/4"	19.050	3/4"	3"	1"	141.11	134.97	128.84	122.70
-	04687	.7874		20.000	20.0	75	25	194.18	185.74	177.29	168.85

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MATERIAL HARDNESS (Rc)

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