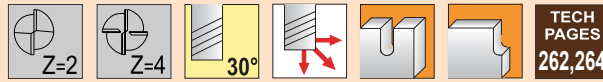


TOLERANCES

<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



Stub Length - Ball End

TiALN Coating

Solid submicron grain carbide end mill - center cutting

Shorter flute length for rigidity

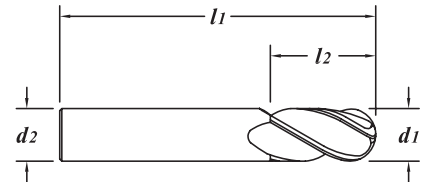
Dry or semi-dry machining

Extremely versatile

Uncoated - page 188

Standard Length - page 209

Extended length - page 234



(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"	15.48	14.81	14.13	13.46
03517	04517	.0394		1.000	3.0	38	2	16.12	15.42	14.72	14.02
03027	04027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	15.48	14.81	14.13	13.46
03527	04527	.0591		1.500	3.0	38	3	16.12	15.42	14.72	14.02
03037	04037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	12.04	11.52	10.99	10.47
03537	04537	.0787		2.000	3.0	38	4	12.54	11.99	11.45	10.90
03047	04047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	11.51	11.01	10.51	10.01
03547	04547	.0984		2.500	3.0	38	5	11.98	11.46	10.94	10.42
03557	04557	.1181		3.000	3.0	38	6	11.73	11.22	10.71	10.20
03057	04057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	11.28	10.79	10.30	9.81
03567	04567	.1378		3.500	4.0	50	7	15.46	14.78	14.11	13.44
03067	04067	.1562	5/32"	3.967	3/16"	2"	5/16"	14.80	14.16	13.51	12.87
03577	04577	.1575		4.000	4.0	50	8	14.79	14.15	13.50	12.86
03587	04587	.1772		4.500	5.0	50	9.5	20.14	19.26	18.39	17.51
03077	04077	.1875	3/16"	4.763	3/16"	2"	3/8"	14.17	13.55	12.94	12.32
03597	04597	.1969		5.000	5.0	50	10	19.19	18.36	17.52	16.69
03087	04087	.2188	7/32"	5.558	1/4"	2"	7/16"	19.38	18.54	17.69	16.85
03607	04607	.2362		6.000	6.0	50	12	19.95	19.09	18.22	17.35
03097	04097	.2500	1/4"	6.350	1/4"	2"	1/2"	19.15	18.32	17.48	16.65
03617	04617	.2756		7.000	7.0	50	12	26.59	25.43	24.28	23.12
03107	04107	.3125	5/16"	7.938	5/16"	2"	1/2"	26.39	25.25	24.10	22.95
03627	04627	.3150		8.000	8.0	50	12	27.50	26.30	25.11	23.91
03637	04637	.3543		9.000	9.0	50	14	32.68	31.26	29.84	28.42
03117	04117	.3750	3/8"	9.525	3/8"	2"	5/8"	31.31	29.95	28.59	27.23
03647	04647	.3937		10.000	10.0	50	16	36.26	34.68	33.11	31.53
03657	04657	.4331		11.000	11.0	65	19	43.21	41.33	39.45	37.57
03127	04127	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	40.61	38.84	37.08	35.31
03667	04667	.4724		12.000	12.0	65	19	53.49	51.16	48.84	46.51
03137	04137	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	51.24	49.02	46.79	44.56
-	04147	.6250	5/8"	15.875	5/8"	3"	3/4"	91.52	87.54	83.56	79.58
-	04157	.7500	3/4"	19.050	3/4"	3"	1"	129.21	123.60	117.98	112.36
-	04687	.7874		20.000	20.0	75	25	177.82	170.09	162.36	154.63

70

35

MATERIAL HARDNESS (Rc)

0