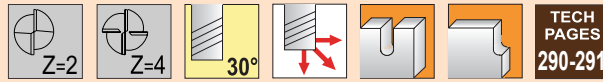


TOLERANCES

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

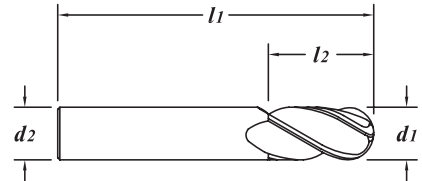
Dry or semi-dry machining

Extremely versatile

Bright Finish - page 226

Standard Length - page 244

Extended length - page 262



(180MA/980MA) 2 Flute EDP#	(190MA/990MA) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	
		Decimal	Metric				
03017	04017	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"
03517	04517	.0394		1.000	3.0	38	2
03027	04027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"
03527	04527	.0591		1.500	3.0	38	3
03037	04037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"
03537	04537	.0787		2.000	3.0	38	4
03047	04047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"
03547	04547	.0984		2.500	3.0	38	5
03557	04557	.1181		3.000	3.0	38	6
03057	04057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
03567	04567	.1378		3.500	4.0	50	7
03067	04067	.1562	5/32"	3.967	3/16"	2"	5/16"
03577	04577	.1575		4.000	4.0	50	8
03587	04587	.1772		4.500	5.0	50	9.5
03077	04077	.1875	3/16"	4.763	3/16"	2"	3/8"
03597	04597	.1969		5.000	5.0	50	10
03087	04087	.2188	7/32"	5.558	1/4"	2"	7/16"
03607	04607	.2362		6.000	6.0	50	12
03097	04097	.2500	1/4"	6.350	1/4"	2"	1/2"
03617	04617	.2756		7.000	7.0	50	12
03107	04107	.3125	5/16"	7.938	5/16"	2"	1/2"
03627	04627	.3150		8.000	8.0	50	12
03637	04637	.3543		9.000	9.0	50	14
03117	04117	.3750	3/8"	9.525	3/8"	2"	5/8"
03647	04647	.3937		10.000	10.0	50	16
03657	04657	.4331		11.000	11.0	65	19
03127	04127	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"
03667	04667	.4724		12.000	12.0	65	19
03137	04137	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"
-	04147	.6250	5/8"	15.875	5/8"	3"	3/4"
-	04157	.7500	3/4"	19.050	3/4"	3"	1"
-	04687	.7874		20.000	20.0	75	25

70

35

MATERIAL HARDNESS (Rc)

0