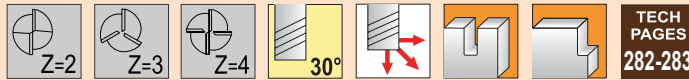


**TOLERANCES**

$d_1$	+0.00" -0.002" (+.000 -.050mm)
$d_2$	h6
$r$	+0.01" -0.001" (+.025 -.025mm)

**Series 220RA, 223RA, 230RA, 823RA, 830RA**



**TECH PAGES**  
282-283

.0625" - .3125"  
(1.588mm - 7.938mm)

**GENERAL PURPOSE END MILLS**

**Standard Length - Corner Radius**

**TiAlN Coating**

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

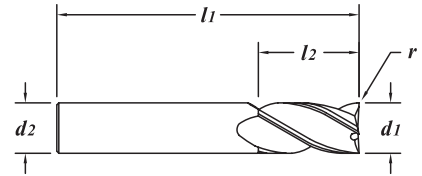
For stronger corners and part radius

Extremely versatile

Uncoated - page 222

Stub Length - page 212

Extended Length - page 244



(220RA) 2 Flute EDP#	(223RA/823RA) 3 Flute EDP#	(230RA/830RA) 4 Flute EDP#	$d_1$ † Diameter		$d_2$ Shank Diameter	$l_1$ Overall Length	$l_2$ Flute Length	$r$ Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Metric									
79587	36101	80587	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.010"	16.09	15.39	14.69	13.99
79597	36103	80597	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.015"	16.09	15.39	14.69	13.99
79607	36105	80607	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.010"	15.50	14.83	14.15	13.48
79617	36107	80617	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.015"	15.50	14.83	14.15	13.48
79627	36109	80627	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.020"	15.50	14.83	14.15	13.48
-	36111	24077	.1181		3.000	3.0	38	12	0.20	14.34	13.72	13.09	12.47
-	36113	24087	.1181		3.000	3.0	38	12	0.50	14.34	13.72	13.09	12.47
79007	36115	80007	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	14.32	13.70	13.07	12.45
79017	36117	80017	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	14.32	13.70	13.07	12.45
79027	36119	80027	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	14.32	13.70	13.07	12.45
79037	36121	80037	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"	14.32	13.70	13.07	12.45
-	-	80038	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.040"	14.32	13.70	13.07	12.45
-	36123	24097	.1575		4.000	4.0	50	14	0.30	18.78	17.96	17.15	16.33
-	36125	24107	.1575		4.000	4.0	50	14	0.50	18.78	17.96	17.15	16.33
79047	36127	80047	.1875	3/16"	4.763	3/16"	2"	5/8"	.010"	18.01	17.23	16.44	15.66
79057	36129	80057	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"	18.01	17.23	16.44	15.66
79067	36131	80067	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"	18.01	17.23	16.44	15.66
79077	36133	80077	.1875	3/16"	4.763	3/16"	2"	5/8"	.030"	18.01	17.23	16.44	15.66
-	-	24117	.1969		5.000	5.0	50	16	0.30	25.06	23.97	22.88	21.79
-	36135	24119	.1969		5.000	5.0	65	16	0.30	25.06	23.97	22.88	21.79
-	36137	24127	.1969		5.000	5.0	65	16	0.50	25.06	23.97	22.88	21.79
-	36139	24177	.2362		6.000	6.0	65	19	0.50	25.54	24.43	23.32	22.21
-	36141	24187	.2362		6.000	6.0	65	19	0.80	25.54	24.43	23.32	22.21
-	36143	24197	.2362		6.000	6.0	65	19	1.00	25.54	24.43	23.32	22.21
-	36145	24207	.2362		6.000	6.0	65	19	1.50	25.54	24.43	23.32	22.21
-	36147	24217	.2362		6.000	6.0	65	19	2.00	25.54	24.43	23.32	22.21
-	36149	80097	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	24.56	23.50	22.43	21.36
79107	36151	80107	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	24.56	23.50	22.43	21.36
79117	36153	80117	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	24.56	23.50	22.43	21.36
79127	36155	80127	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	24.56	23.50	22.43	21.36
79137	36157	80137	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.045"	24.56	23.50	22.43	21.36
79147	36159	80147	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	24.56	23.50	22.43	21.36
79167	36161	80167	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.015"	33.29	31.85	30.40	28.95
79177	36163	80177	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.020"	33.29	31.85	30.40	28.95
79187	36165	80187	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.030"	33.29	31.85	30.40	28.95
79197	36167	80197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.045"	33.29	31.85	30.40	28.95
79207	36169	80207	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.060"	33.29	31.85	30.40	28.95

70

35

**MATERIAL HARDNESS (Rc)**

0

continued →

Series 220RA, 223RA, 230RA, 823RA, 830RA (continued)

.3150" - .6299"  
(8.000mm - 16.000mm)

70  
35  
0  
MATERIAL HARDNESS (Rc)

(220RA) 2 Flute EDP#	(223RA/823RA) 3 Flute EDP#	(230RA/830RA) 4 Flute EDP#	$d_1$ † Diameter		$d_2$ Shank Diameter	$l_1$ Overall Length	$l_2$ Flute Length	$r$ Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Metric									
-	36171	24227	.3150	8.000	8.0	65	22	0.50	34.55	33.04	31.54	30.04	
-	36173	24237	.3150	8.000	8.0	65	22	0.80	34.55	33.04	31.54	30.04	
-	36175	24247	.3150	8.000	8.0	65	22	1.00	34.55	33.04	31.54	30.04	
-	36177	24257	.3150	8.000	8.0	65	22	1.50	34.55	33.04	31.54	30.04	
-	36179	24267	.3150	8.000	8.0	65	22	2.00	34.55	33.04	31.54	30.04	
-	36181	24277	.3150	8.000	8.0	65	22	2.50	34.55	33.04	31.54	30.04	
-	36183	24287	.3150	8.000	8.0	65	22	3.00	34.55	33.04	31.54	30.04	
-	36185	80227	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	38.88	37.19	35.50	33.81
79237	36187	80237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	38.88	37.19	35.50	33.81
79247	36189	80247	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	38.88	37.19	35.50	33.81
79257	36191	80257	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	38.88	37.19	35.50	33.81
79267	36193	80267	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.045"	38.88	37.19	35.50	33.81
79277	36195	80277	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	38.88	37.19	35.50	33.81
-	36197	24297	.3937	10.000	10.0	70	25	0.50	46.94	44.90	42.86	40.82	
-	36199	24307	.3937	10.000	10.0	70	25	0.80	46.94	44.90	42.86	40.82	
-	36201	24317	.3937	10.000	10.0	70	25	1.00	46.94	44.90	42.86	40.82	
-	36203	24327	.3937	10.000	10.0	70	25	1.50	46.94	44.90	42.86	40.82	
-	36205	24337	.3937	10.000	10.0	70	25	2.00	46.94	44.90	42.86	40.82	
-	36207	24347	.3937	10.000	10.0	70	25	2.50	46.94	44.90	42.86	40.82	
-	36209	24357	.3937	10.000	10.0	70	25	3.00	46.94	44.90	42.86	40.82	
-	36211	24367	.3937	10.000	10.0	70	25	3.20	46.94	44.90	42.86	40.82	
-	36213	80279	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.010"	47.01	44.97	42.92	40.88
-	36215	80281	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.015"	47.01	44.97	42.92	40.88
-	36217	80283	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.020"	47.01	44.97	42.92	40.88
-	36219	80285	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.030"	47.01	44.97	42.92	40.88
-	36221	80287	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.045"	47.01	44.97	42.92	40.88
-	36223	80289	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.060"	47.01	44.97	42.92	40.88
-	36225	80291	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.090"	47.01	44.97	42.92	40.88
-	36227	80293	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.125"	47.01	44.97	42.92	40.88
-	36229	24377	.4724	12.000	12.0	75	25	0.50	69.13	66.12	63.12	60.11	
-	36231	24387	.4724	12.000	12.0	75	25	0.80	69.13	66.12	63.12	60.11	
-	36233	24397	.4724	12.000	12.0	75	25	1.00	69.13	66.12	63.12	60.11	
-	36235	24407	.4724	12.000	12.0	75	25	1.50	69.13	66.12	63.12	60.11	
-	36237	24417	.4724	12.000	12.0	75	25	2.00	69.13	66.12	63.12	60.11	
-	36239	24427	.4724	12.000	12.0	75	25	2.50	69.13	66.12	63.12	60.11	
-	36241	24437	.4724	12.000	12.0	75	25	3.00	69.13	66.12	63.12	60.11	
-	36243	24447	.4724	12.000	12.0	75	25	3.20	69.13	66.12	63.12	60.11	
-	36245	80297	.5000	1/2"	12.700	1/2"	3"	1"	.010"	66.32	63.44	60.55	57.67
79307	36247	80307	.5000	1/2"	12.700	1/2"	3"	1"	.015"	66.32	63.44	60.55	57.67
79317	36249	80317	.5000	1/2"	12.700	1/2"	3"	1"	.020"	66.32	63.44	60.55	57.67
79327	36251	80327	.5000	1/2"	12.700	1/2"	3"	1"	.030"	66.32	63.44	60.55	57.67
79337	36253	80337	.5000	1/2"	12.700	1/2"	3"	1"	.045"	66.32	63.44	60.55	57.67
79347	36255	80347	.5000	1/2"	12.700	1/2"	3"	1"	.060"	66.32	63.44	60.55	57.67
79357	36257	80357	.5000	1/2"	12.700	1/2"	3"	1"	.090"	66.32	63.44	60.55	57.67
79367	36259	80367	.5000	1/2"	12.700	1/2"	3"	1"	.125"	66.32	63.44	60.55	57.67
79377	36261	80377	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	105.58	100.99	96.40	91.81
-	36263	80387	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	105.58	100.99	96.40	91.81
79397	36265	80397	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	105.58	100.99	96.40	91.81
79407	36267	80407	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.045"	105.58	100.99	96.40	91.81
79417	36269	80417	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	105.58	100.99	96.40	91.81
79427	36271	80427	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	105.58	100.99	96.40	91.81
-	36273	24457	.6299	16.000	16.0	88	38	0.50	110.17	105.38	100.59	95.80	
-	36275	24467	.6299	16.000	16.0	88	38	1.00	110.17	105.38	100.59	95.80	
-	36277	24477	.6299	16.000	16.0	88	38	2.00	110.17	105.38	100.59	95.80	
-	36279	24487	.6299	16.000	16.0	88	38	2.50	110.17	105.38	100.59	95.80	
-	36281	24497	.6299	16.000	16.0	88	38	3.00	110.17	105.38	100.59	95.80	
-	36283	24507	.6299	16.000	16.0	88	38	4.00	110.17	105.38	100.59	95.80	
-	36285	24517	.6299	16.000	16.0	88	38	5.00	110.17	105.38	100.59	95.80	

# Series 220RA, 223RA, 230RA, 823RA, 830RA (continued)

.7500" - 1.000"  
(19.050mm - 25.400mm)

GENERAL PURPOSE  
END MILLS

70

35

MATERIAL HARDNESS (Rc)

0

(220RA) 2 Flute EDP#	(223RA/823RA) 3 Flute EDP#	(230RA/830RA) 4 Flute EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$r$ Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Diameter Metric									
79447	36287	80447	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	151.41	144.83	138.24	131.66
79457	36289	80457	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"	151.41	144.83	138.24	131.66
79467	36291	80467	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	151.41	144.83	138.24	131.66
79477	36293	80477	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.045"	151.41	144.83	138.24	131.66
79487	36295	80487	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	151.41	144.83	138.24	131.66
79497	36297	80497	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.090"	151.41	144.83	138.24	131.66
79507	36299	80507	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"	151.41	144.83	138.24	131.66
79637	36301	80637	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.250"	151.41	144.83	138.24	131.66
-	36303	24527	.7874		20.000	20.0	100	38	0.50	214.29	204.97	195.66	186.34
-	36305	24537	.7874		20.000	20.0	100	38	1.00	214.29	204.97	195.66	186.34
-	36307	24547	.7874		20.000	20.0	100	38	2.00	214.29	204.97	195.66	186.34
-	36309	24557	.7874		20.000	20.0	100	38	3.00	214.29	204.97	195.66	186.34
-	36311	24567	.7874		20.000	20.0	100	38	5.00	214.29	204.97	195.66	186.34
-	36313	80517	1.000	1"	25.400	1"	4"	1-1/2"	.015"	258.50	247.26	236.02	224.78
-	36315	80527	1.000	1"	25.400	1"	4"	1-1/2"	.020"	258.50	247.26	236.02	224.78
79537	36317	80537	1.000	1"	25.400	1"	4"	1-1/2"	.030"	258.50	247.26	236.02	224.78
-	36319	80547	1.000	1"	25.400	1"	4"	1-1/2"	.045"	258.50	247.26	236.02	224.78
79557	36321	80557	1.000	1"	25.400	1"	4"	1-1/2"	.060"	258.50	247.26	236.02	224.78
-	36323	80567	1.000	1"	25.400	1"	4"	1-1/2"	.090"	258.50	247.26	236.02	224.78
79577	36325	80577	1.000	1"	25.400	1"	4"	1-1/2"	.125"	258.50	247.26	236.02	224.78
79647	36327	80647	1.000	1"	25.400	1"	4"	1-1/2"	.250"	258.50	247.26	236.02	224.78



End Mill Manufacturing