

SHARS Single End Mill Sets

- M-42 Cobalt, HSS & TiN coated
- Supplied in wooden case or stand



6 Pc.Set



10Pc.Set



20Pc.Set

Set Desc.	Includes	No. of Flutes	Uncoated	Price	TiN Coated	Price(D)
HSS						
6 Pc. Centercutting	1/8,3/16,1/4,5/16,3/8,1/2"	3/8" shank	2	404-5909	\$14.95(D)	404-5890 \$23.95
6 Pc. Centercutting	1/8,3/16,1/4,5/16,3/8,1/2"	3/8" shank	4	404-5900	17.95(D)	404-5891 24.95
5 Pc. Centercutting	1/2, 5/8,11/16, 5/8, 3/4, 1"		4			404-5937 59.95
10 Pc. Centercutting	1/4,3/8,1/2,5/8,3/4		2 & 4			404-5902 36.95
20 Pc. Centercutting	3/16,1/4,5/16,3/8,7/16,1/2,9/16,5/8,11/16,3/4"		2 & 4	404-5910	49.40(D)	404-5901 55.95
M-42 Cobalt						
4 Pc. Centercutting	1/2,5/8,3/4,1"		4	404-5933	51.30(B)	
6 Pc. Centercutting	1/8,3/16,1/4,5/16,3/8,1/2"		2	404-5912	32.95(D)	404-5920 59.95
6 Pc. Centercutting	1/8,3/16,1/4,5/16,3/8,1/2"		4	404-5913	43.95(E)	404-5921 59.95
8 Pc. Centercutting	1/2,5/8,3/4,1"		2 & 4	404-5935	103.95(B)	
10 Pc. Centercutting	3/16,1/4,5/16,3/8,7/16,1/2,9/16,5/8,11/16,3/4"		2	404-5916	67.50(B)	
10 Pc. Centercutting	3/16,1/4,5/16,3/8,7/16,1/2,9/16,5/8,11/16,3/4"		4	404-5917	76.60(B)	
12 Pc. Centercutting	1/8,3/16,1/4,5/16,3/8,1/2"		2 & 4	404-5918	55.10(C)	
20 Pc. Centercutting	3/16,1/4,5/16,3/8,7/16,1/2,9/16,5/8,11/16,3/4"		2 & 4	404-5919	145.95(B)	

SHARS Double End Mill Sets

- M-42 Cobalt, HSS & TiN coated
- Supplied in wooden case or stand.



6Pc.Set



10Pc.Set

Set Desc.	Includes	No. of Flutes	Uncoated	Price	TiN Coated	Price(D)
HSS						
6 Pc. Centercutting	3/16,1/4,5/16,3/8,1/8,1/2"	3/8"shank	4	404-5906	\$19.00(D)	404-5930 \$24.95
6 Pc. Centercutting	3/16,1/4,5/16,3/8,1/8,1/2"	3/8"shank	2	404-5905	24.95(D)	404-5928 29.95
9Pc. Centercutting	1/16, 5/64,3/32,7/64,1/8,9/64,5/32,11/64,3/16,	3/16"shank	4	404-5932	29.95(D)	
10 Pc.Centercutting	3/16,1/4,5/16,3/8,7/16,1/2,9/16,5/8,11/16,3/4"		4	404-5922	55.40(D)	404-5929 64.44
M-42 Cobalt						
6Pc Centercutting	1/8,3/16,1/4,5/16,3/8,1/2"		2	404-5924	54.50(F)	
6Pc Centercutting	1/8,3/16,1/4,5/16,3/8,1/2"		4	404-5931	57.50(F)	
12 Pc.Centercutting	1/8,3/16,1/4,5/16,3/8,1/2"		2&4	404-5936	71.10(B)	

SHARS Self-Aligning Tap & Reamer Holder

- Eliminates tap breakage.
- Holds tool true-perfect alignment
- Hardened sleeves & jaws.
- Base guide has two 120° Vees for round parts.
- Center drill on stem for floating center.



404-7388

\$11.95(F)

- Includes**
- (1) Tapping guide.
 - (1) Tap wrench.
 - (2) set of jaws (one for #0-#80 to 1/4"-20/28 taps and another for 1/4"-20 to 1/2"-13 taps)

Replacement Jaws.....Order No 404-7422 **\$3.95**

SHARS HSS Bridgeport 6 Piece End Mill Sets



- Sets consist of 1 each:3/4, 7/8,1, 1-1/8, 1-1/4 and 1-1/2"
- Multi-Flute 3/4,7/8,1" is 4FL, 1-1/8,1-1/4,1-1/2" is 6FL
- Comes with wood stand
- Single end

Description	Order No	USA Brand	SHARS(D)
2 Flute 3/4" Shank	404-5907	\$142.00	\$74.50
Multi- Flute 3/4" Shank	404-5908	136.00	79.50



3xD Miniature Micrograin Solid Carbide End Mills(cont.)



3 x Diameter-2&4 Flute-Square & Ball End-Uncoated & ALTiN Coated

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



4 FLUTE - SQUARE END - UNCOATED



4 FLUTE - SQUARE END - ALTiN COATED



4 FLUTE - BALL NOSE - UNCOATED



4 FLUTE - BALL NOSE - ALTiN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+0.0005,-.0005"	-.0001,-.0003"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTiN COATED			UNCOATED			ALTiN COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
0.060"	0.125"	0.180"	1-1/2"	415-2230	415-2642	\$8.41	415-2284	415-2696	\$10.11	415-2338	415-2750	\$10.53	415-2392	415-2804	\$12.64
0.061	0.125	0.183	1-1/2	415-2231	415-2643	8.41	415-2285	415-2697	10.11	415-2339	415-2751	10.53	415-2393	415-2805	12.64
0.062	0.125	0.186	1-1/2	415-2232	415-2644	8.41	415-2286	415-2698	10.11	415-2340	415-2752	10.53	415-2394	415-2806	12.64
0.063	0.125	0.189	1-1/2	415-2233	415-2645	8.41	415-2287	415-2699	10.11	415-2341	415-2753	10.53	415-2395	415-2807	12.64
0.064	0.125	0.192	1-1/2	415-2234	415-2646	8.41	415-2288	415-2700	10.11	415-2342	415-2754	10.53	415-2396	415-2808	12.64
0.065	0.125	0.195	1-1/2	415-2235	415-2647	8.41	415-2289	415-2701	10.11	415-2343	415-2755	10.53	415-2397	415-2809	12.64
0.066	0.125	0.198	1-1/2	415-2236	415-2648	8.41	415-2290	415-2702	10.11	415-2344	415-2756	10.53	415-2398	415-2810	12.64
0.067	0.125	0.201	1-1/2	415-2237	415-2649	8.41	415-2291	415-2703	10.11	415-2345	415-2757	10.53	415-2399	415-2811	12.64
0.068	0.125	0.204	1-1/2	415-2238	415-2650	8.41	415-2292	415-2704	10.11	415-2346	415-2758	10.53	415-2400	415-2812	12.64
0.069	0.125	0.207	1-1/2	415-2239	415-2651	8.41	415-2293	415-2705	10.11	415-2347	415-2759	10.53	415-2401	415-2813	12.64
0.070	0.125	0.210	1-1/2	415-2240	415-2652	8.41	415-2294	415-2706	10.11	415-2348	415-2760	10.53	415-2402	415-2814	12.64
0.071	0.125	0.213	1-1/2	415-2241	415-2653	8.41	415-2295	415-2707	10.11	415-2349	415-2761	10.53	415-2403	415-2815	12.64
0.072	0.125	0.216	1-1/2	415-2242	415-2654	8.41	415-2296	415-2708	10.11	415-2350	415-2762	10.53	415-2404	415-2816	12.64
0.073	0.125	0.219	1-1/2	415-2243	415-2655	8.41	415-2297	415-2709	10.11	415-2351	415-2763	10.53	415-2405	415-2817	12.64
0.074	0.125	0.222	1-1/2	415-2244	415-2656	8.41	415-2298	415-2710	10.11	415-2352	415-2764	10.53	415-2406	415-2818	12.64
0.075	0.125	0.225	1-1/2	415-2245	415-2657	8.41	415-2299	415-2711	10.11	415-2353	415-2765	10.53	415-2407	415-2819	12.64
0.076	0.125	0.228	1-1/2	415-2246	415-2658	8.41	415-2300	415-2712	10.11	415-2354	415-2766	10.53	415-2408	415-2820	12.64
0.077	0.125	0.231	1-1/2	415-2247	415-2659	8.41	415-2301	415-2713	10.11	415-2355	415-2767	10.53	415-2409	415-2821	12.64
0.078	0.125	0.234	1-1/2	415-2248	415-2660	8.41	415-2302	415-2714	10.11	415-2356	415-2768	10.53	415-2410	415-2822	12.64
0.079	0.125	0.237	1-1/2	415-2249	415-2661	8.41	415-2303	415-2715	10.11	415-2357	415-2769	10.53	415-2411	415-2823	12.64
0.080	0.125	0.240	1-1/2	415-2250	415-2662	8.41	415-2304	415-2716	10.11	415-2358	415-2770	10.53	415-2412	415-2824	12.64
0.081	0.125	0.243	1-1/2	415-2251	415-2663	8.41	415-2305	415-2717	10.11	415-2359	415-2771	10.53	415-2413	415-2825	12.64
0.082	0.125	0.246	1-1/2	415-2252	415-2664	8.41	415-2306	415-2718	10.11	415-2360	415-2772	10.53	415-2414	415-2826	12.64
0.083	0.125	0.249	1-1/2	415-2253	415-2665	8.41	415-2307	415-2719	10.11	415-2361	415-2773	10.53	415-2415	415-2827	12.64
0.084	0.125	0.252	1-1/2	415-2254	415-2666	8.41	415-2308	415-2720	10.11	415-2362	415-2774	10.53	415-2416	415-2828	12.64
0.085	0.125	0.255	1-1/2	415-2255	415-2667	8.41	415-2309	415-2721	10.11	415-2363	415-2775	10.53	415-2417	415-2829	12.64
0.086	0.125	0.258	1-1/2	415-2256	415-2668	8.41	415-2310	415-2722	10.11	415-2364	415-2776	10.53	415-2418	415-2830	12.64
0.087	0.125	0.261	1-1/2	415-2257	415-2669	8.41	415-2311	415-2723	10.11	415-2365	415-2777	10.53	415-2419	415-2831	12.64
0.088	0.125	0.263	1-1/2	415-2258	415-2670	8.41	415-2312	415-2724	10.11	415-2366	415-2778	10.53	415-2420	415-2832	12.64
0.089	0.125	0.267	1-1/2	415-2259	415-2671	8.41	415-2313	415-2725	10.11	415-2367	415-2779	10.53	415-2421	415-2833	12.64
0.090	0.125	0.270	1-1/2	415-2260	415-2672	8.41	415-2314	415-2726	10.11	415-2368	415-2780	10.53	415-2422	415-2834	12.64
0.091	0.125	0.273	1-1/2	415-2261	415-2673	8.41	415-2315	415-2727	10.11	415-2369	415-2781	10.53	415-2423	415-2835	12.64
0.092	0.125	0.276	1-1/2	415-2262	415-2674	8.41	415-2316	415-2728	10.11	415-2370	415-2782	10.53	415-2424	415-2836	12.64
0.093	0.125	0.279	1-1/2	415-2263	415-2675	8.41	415-2317	415-2729	10.11	415-2371	415-2783	10.53	415-2425	415-2837	12.64
0.094	0.125	0.282	1-1/2	415-2264	415-2676	8.41	415-2318	415-2730	10.11	415-2372	415-2784	10.53	415-2426	415-2838	12.64
0.095	0.125	0.285	1-1/2	415-2265	415-2677	8.41	415-2319	415-2731	10.11	415-2373	415-2785	10.53	415-2427	415-2839	12.64
0.096	0.125	0.288	1-1/2	415-2266	415-2678	8.41	415-2320	415-2732	10.11	415-2374	415-2786	10.53	415-2428	415-2840	12.64
0.097	0.125	0.291	1-1/2	415-2267	415-2679	8.41	415-2321	415-2733	10.11	415-2375	415-2787	10.53	415-2429	415-2841	12.64
0.098	0.125	0.294	1-1/2	415-2268	415-2680	8.41	415-2322	415-2734	10.11	415-2376	415-2788	10.53	415-2430	415-2842	12.64
0.099	0.125	0.297	1-1/2	415-2269	415-2681	8.41	415-2323	415-2735	10.11	415-2377	415-2789	10.53	415-2431	415-2843	12.64
0.100	0.125	0.300	1-1/2	415-2270	415-2682	8.41	415-2324	415-2736	10.11	415-2378	415-2790	10.53	415-2432	415-2844	12.64
0.101	0.125	0.303	1-1/2	415-2271	415-2683	8.41	415-2325	415-2737	10.11	415-2379	415-2791	10.53	415-2433	415-2845	12.64
0.102	0.125	0.306	1-1/2	415-2272	415-2684	8.41	415-2326	415-2738	10.11	415-2380	415-2792	10.53	415-2434	415-2846	12.64
0.103	0.125	0.309	1-1/2	415-2273	415-2685	8.41	415-2327	415-2739	10.11	415-2381	415-2793	10.53	415-2435	415-2847	12.64
0.104	0.125	0.312	1-1/2	415-2274	415-2686	8.41	415-2328	415-2740	10.11	415-2382	415-2794	10.53	415-2436	415-2848	12.64
0.105	0.125	0.315	1-1/2	415-2275	415-2687	8.41	415-2329	415-2741	10.11	415-2383	415-2795	10.53	415-2437	415-2849	12.64
0.106	0.125	0.318	1-1/2	415-2276	415-2688	8.41	415-2330	415-2742	10.11	415-2384	415-2796	10.53	415-2438	415-2850	12.64
0.107	0.125	0.321	1-1/2	415-2277	415-2689	8.41	415-2331	415-2743	10.11	415-2385	415-2797	10.53	415-2439	415-2851	12.64
0.108	0.125	0.324	1-1/2	415-2278	415-2690	8.41	415-2332	415-2744	10.11	415-2386	415-2798	10.53	415-2440	415-2852	12.64
0.109	0.125	0.327	1-1/2	415-2279	415-2691	8.41	415-2333	415-2745	10.11	415-2387	415-2799	10.53	415-2441	415-2853	12.64
0.110	0.125	0.330	1-1/2	415-2280	415-2692	8.41	415-2334	415-2746	10.11	415-2388	415-2800	10.53	415-2442	415-2854	12.64
0.115	0.125	0.345	1-1/2	415-2281	415-2693	8.41	415-2335	415-2747	10.11	415-2389	415-2801	10.53	415-2443	415-2855	12.64
0.120	0.125	0.360	1-1/2	415-2282	415-2694	8.41	415-2336	415-2748	10.11	415-2390	415-2802	10.53	415-2444	415-2856	12.64



2 FLUTE - BALL NOSE - UNCOATED



2 FLUTE - BALL NOSE - ALTiN COATED

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTiN COATED			UNCOATED			ALTiN COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
0.009"	0.125"	0.027"	1-1/2"	415-2017		\$17.25	415-2071		\$20.69	415-2125		\$21.56	415-2179		\$25.87
0.010	0.125	0.030	1-1/2	415-2018	415-2445	17.25	415-2072	415-2494	20.69	415-2126	415-2543	21.56	415-2180	415-2592	25.87
0.011	0.125	0.033	1-1/2	415-2019	415-2446	15.43	415-2073	415-2495	18.52	415-2127	415-2544	19.31	415-2181	415-2593	23.17
0.012	0.125	0.036	1-1/2	415-2020	415-2447	15.43	415-2074	415-2496	18.52	415-2128	415-2545	19.31	415-2182	415-2594	23.17
0.013	0.125	0.039	1-1/2	415-2021	415-2448	12.77	415-2075	415-2497	15.33	415-2129	415-2546	15.99	415-2183	415-2595	19.18
0.014	0.125	0.042	1-1/2	415-2022	415-2449	12.77	415-2076	415-2498	15.33	415-2130	415-2547	15.99	415-2184	415-2596	19.18
0.015	0.125	0.045	1-1/2	415-2023	415-2450	10.79	415-2077	415-2499	12.95	415-2131	415-2548	13.50	415-2185	415-2597	16.18
0.016	0.125	0.048	1-1/2	415-2024	415-2451	10.79	415-2078	415-2500	12.95	415-2132	415-2549	13.50	415-2186	415-2598	16.18
0.017	0.125	0.051	1-1/2	415-2025	415-2452	10.79	415-2079	415-2501	12.95	415-2133	415-2550	13.50	415-2187	415-2599	16.18
0.018	0.125	0.054	1-1/2	415-2026	415-2453	10.79	415-2080	415-2502	12.95	415-2134	415-2551	13.50	415-2188	415-2600	16.18
0.019	0.125	0.057	1-1/2	415-2027	415-2454	10.79	415-2081	415-2503	12.95	415-2135	415-2552	13.50	415-2189	415-2601	16.18
0.020	0.125	0.060	1-1/2	415-2028	415-2455	9.81	415-2082	415-2504	11.77	415-2136	415-2553	12.26	415-2190	415-2602	14.71
0.021	0.125	0.063	1-1/2	415-2029	415-2456	9.81	415-2083	415-2505	11.77	415-2137	415-2554	12.26	415-2191	415-2603	14.71
0.022	0.125	0.066	1-1/2	415-2030	415-2457	9.81	415-2084	415-2506	11.77	415-2138	415-2555	12.26	415-2192	415-2604	14.71
0.023	0.125	0.069	1-1/2	415-2031	415-2458	9.81	415-2085	415-2507	11.77	415-2139	415-2556	12.26	415-2193	415-2605	14.71
0.024	0.125	0.072	1-1/2	415-2032	415-2459	9.81	415-2086	415-2508	11.77	415-2140	415-2557	12.26	415-2194	415-2606	14.71
0.025	0.125	0.075	1-1/2	415-2033	415-2460	9.81	415-2087	415-2509	11.77	415-2141	415-2558	12.26	415-2195	415-2607	14.71
0.026	0.125	0.078	1-1/2	415-2034	415-2461	9.21	415-2088	415-2510	11.05	415-2142	415-2559	11.51	415-2196	415-2608	13.80
0.027	0.125	0.081	1-1/2	415-2035	415-2462	9.21	415-2089	415-2511	11.05	415-2143	415-2560	11.51	415-2197	415-2609	13.80
0.028	0.125	0.084	1-1/2	415-2036	415-2463	9.21	415-2090	415-2512	11.05	415-2144	415-2561	11.51	415-2198	415-2610	13.80
0.029	0.125	0.087	1-1/2	415-2037	415-2464	9.21	415-2091	415-2513	11.05	415-2145	415-2562	11.51	415-2199	415-2611	13.80
0.030	0.125	0.090	1-1/2	415-2038	415-2465	9.21	415-2092	415-2514	11.05	415-2146	415-2563	11.51	415-2200	415-2612	13.80
0.031	0.125	0.093	1-1/2	415-2039	415-2466	8.62	415-2093	415-2515	10.35	415-2147	415-2564	10.79	415-2201	415-2613	12.95
0.032	0.125	0.096	1-1/2	415-2040	415-2467	8.62	415-2094	415-2516	10.35	415-2148	415-2565	10.79	415-2202	415-2614	12.95
0.033	0.125	0.099	1-1/2	415-2041	415-2468	8.62	415-2095	415-2517	10.35	415-2149	415-2566	10.79	415-2203	415-2615	12.95
0.034	0.125	0.102	1-1/2	415-2042	415-2469	8.62	415-2096	415-2518	10.35	415-2150	415-2567	10.79	415-2204	415-2616	12.95
0.035	0.125	0.105	1-1/2	415-2043	415-2470	8.62	415-2097	415-2519	10.35	415-2151	415-2568	10.79	415-2205	415-2617	12.95
0.036	0.125	0.108	1-1/2	415-2044	415-2471	8.62	415-2098	415-2520	10.35	415-2152	415-2569	10.79	415-2206	415-2618	12.95
0.037	0.125	0.111	1-1/2	415-2045	415-2472	8.62	415-2099	415-2521	10.35	415-2153	415-2570	10.79	415-2207	415-2619	12.95
0.038	0.125	0.114	1-1/2	415-2046	415-2473	8.62	415-2100	415-2522	10.35	415-2154	415-2571	10.79	415-2208	415-2620	12.95
0.039	0.125	0.117	1-1/2	415-2047	415-2474	8.62	415-2101	415-2523	10.35	415-2155	415-2572	10.79	415-2209	415-2621	12.95
0.040	0.125	0.120	1-1/2	415-2048	415-2475	8.62	415-2102	415-2524	10.35	415-2156	415-2573	10.79	415-2210	415-2622	12.95
0.041	0.125	0.123	1-1/2	415-2049	415-2476	8.62	415-2103	415-2525	10.35	415-2157	415-2574	10.79	415-2211	415-2623	12.95
0.042	0.125	0.126	1-1/2	415-2050	415-2477	8.62	415-2104	415-2526	10.35	415-2158	415-2575	10.79	415-2212	415-2624	12.95
0.043	0.125	0.129	1-1/2	415-2051	415-2478	8.62	415-2105	415-2527	10.35	415-2159	415-2576	10.79	415-2213	415-2625	12.95
0.044	0.125	0.132	1-1/2	415-2052	415-2479	8.41	415-2106	415-2528	10.11	415-2160	415-2577	10.53	415-2214	415-2626	12.64
0.045	0.125	0.135	1-1/2	415-2053	415-2480	8.41	415-2107	415-2529	10.11	415-2161	415-2578	10.53	415-2215	415-2627	12.64
0.046	0.125	0.138	1-1/2	415-2054	415-2481	8.41	415-2108	415-2530	10.11	415-2162	415-2579	10.53	415-2216	415-2628	12.64
0.047	0.125	0.141	1-1/2	415-2055	415-2482	8.41	415-2109	415-2531	10.11	415-2163	415-2580	10.53	415-2217	415-2629	12.64
0.048	0.125	0.144	1-1/2	415-2056	415-2483	8.41	415-2110	415-2532	10.11	415-2164	415-2581	10.53	415-2218	415-2630	12.64
0.049	0.125	0.147	1-1/2	415-2057	415-2484	8.41	415-2111	415-2533	10.11	415-2165	415-2582	10.53	415-2219	415-2631	12.64
0.050	0.125	0.150	1-1/2	415-2058	415-2485	8.41	415-2112	415-2534	10.11	415-2166	415-2583	10.53	415-2220	415-2632	12.64
0.051	0.125	0.153	1-1/2	415-2059	415-2486	8.41	415-2113	415-2535	10.11	415-2167	415-2584	10.53	415-2221	415-2633	12.64
0.052	0.125	0.156	1-1/2	415-2060	415-2487	8.41	415-2114	415-2536	10.11	415-2168	415-2585	10.53	415-2222	415-2634	12.64
0.053	0.125	0.159	1-1/2	415-2061	415-2488	8.41	415-2115	415-2537	10.11	415-2169	415-2586	10.53	415-2223	415-2635	12.64
0.054	0.125	0.162	1-1/2	415-2062	415-2489	8.41	415-2116	415-2538	10.11	415-2170	415-2587	10.53	415-2224	415-2636	12.64
0.055	0.125	0.165	1-1/2	415-2063	415-2490	8.41	415-2117	415-2539	10.11	415-2171	415-2588	10.53	415-2225	415-2637	12.64
0.056	0.125	0.168	1-1/2	415-2064	415-2491	8.41	415-2118	415-2540	10.11	415-2172	415-2589	10.53	415-2226	415-2638	12.64
0.057	0.125	0.171	1-1/2	415-2065	415-2492	8.41	415-2119	415-2541	10.11	415-2173	415-2590	10.53	415-2227	415-2639	12.64
0.058	0.125	0.174	1-1/2	415-2066	415-2493	8.41	415-2120	415-2542	10.11	415-2174	415-2591	10.53	415-2228	415-2640	12.64
0.059	0.125	0.177	1-1/2	415-2229	415-2641	8.41	415-2283	415-2695	10.11	415-2337	415-2749	10.53	415-2391	415-2803	12.64

SHARS Solid Carbide Ball Nose End Mills



Import

- Double end
- Center cutting

Dia	Shank	Flute Length	OAL	2 Flute	4 Flute	Price(D)
1/16"	1/8"	3/16"	1-1/2"	404-5618	404-5608	\$7.15
3/32	1/8	3/8	1-1/2	404-5621	404-5622	8.30
1/8	1/8	1/2	1-1/2	404-5619	404-5609	6.75
5/32	3/16	1/2	2	404-5620	404-5610	9.25
3/16	3/16	1/2	2	404-5601	404-5611	9.25
7/32	1/4	1/2	2-1/2	404-5602	404-5612	12.75
1/4	1/4	5/8	2-1/2	404-5603	404-5613	12.95
5/16	5/16	5/8	2-1/2	404-5604	404-5614	17.50
3/8	3/8	3/4	2-1/2	404-5605	404-5615	19.50
7/16	7/16	3/4	3	404-5606	404-5616	28.75
1/2	1/2	3/4	3	404-5607	404-5617	28.75

SHARS Solid Carbide Ball Nose End Mills



Import

- Single end
- Center cutting

Dia	Shank	Flute Length	OAL	2 Flute	4 Flute	Price(B)
1/16"	1/8"	3/16"	1-1/2"	404-5748	404-5734	\$5.10
3/32	1/8	3/16	1-1/2	404-5755	404-5754	5.10
1/8	1/8	1/2	1-1/2	404-5749	404-5736	4.30
5/32	3/16	9/16	2	404-5750	404-5737	6.10
3/16	3/16	5/8	2	404-5751	404-5738	7.30
1/4	1/4	3/4	2-1/2	404-5753	404-5740	7.95
5/16	5/16	3/4	2-1/2	404-5724	404-5741	11.25
3/8	3/8	7/8	2-1/2	404-5725	404-5742	13.75
7/16	7/16	1	3	404-5726	404-5743	20.85
1/2	1/2	1	3	404-5727	404-5744	22.90
5/8	5/8	1-1/4	3-1/2	404-5728	404-5745	43.60
3/4	3/4	1-1/2	4	404-5729	404-5746	65.50
1	1	1-1/2	4	404-5730	404-5747	109.95

SHARS HSS T-Slot Cutters



Bolt Size	Cutter Dia.	Cutter Thick	Shank Dia.	OAL	Order No.	Price(D)
1/4"	9/16"	15/64"	1/2"	2-19/32"	404-1700	\$11.60
5/16	21/32	17/64	1/2	2-11/16	404-1701	13.20
3/8	25/32	21/64	3/4	3-1/4	404-1702	17.40
1/2	31/32	25/64	3/4	3-7/16	404-1703	21.95
5/8	1-1/4	31/64	1	3-15/16	404-1704	28.00
3/4	1-15/32	5/8	1	4-7/16	404-1705	31.00
1	1-27/32	53/64	1-1/4	4-13/16	404-1706	79.95
1-1/4	2-7/32	1-3/32	1-1/4	5-3/8	404-1707	117.95
1-1/2	2-21/32	1-11/32	1-1/4	5-29/32	404-1708	119.95

SHARS Carbide Serrated Edge End Mills



- Must run at a high speed with a high rate of feed.
- Removes metal with the speed of a hog mill and with the strength of carbide
- Weldon shank

Dia.	Shank	Flute Length	OAL	Flutes	Order No.	Price(B)
3/4"	3/4"	1-5/8"	4-1/8"	3	404-5760	\$33.50
3/4	3/4	1-5/8	5-1/8	3	404-5761	35.50
1	3/4	2	4-1/2	4	404-5762	42.75
1	3/4	2	6-1/2	4	404-5763	45.05
1	1	2	6-1/2	4	404-5764	46.35
1-1/4	1-1/4	2	4-3/4	4	404-5765	52.85
1-1/4	1-1/4	4	6-1/2	4	404-5766	79.00
1-3/4	1-1/4	2	4-3/4	4	404-5767	89.00
2	1-1/4	2	4-3/4	6	404-5768	90.00
2	2	2	6-3/4	6	404-5769	96.00
2	2	4	8/3/4	6	404-5770	115.95

SHARS 3xD Miniature Micrograin Solid Carbide End Mills

3 x Diameter • 2&4 Flute • Square & Ball End • Uncoated & ALTiN Coated

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FLUTE - SQUARE END - UNCOATED



2 FLUTE - BALL NOSE - UNCOATED



2 FLUTE - SQUARE END - ALTiN COATED



2 FLUTE - BALL NOSE - ALTiN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+.0005,-.0005"	-.0001,-.0003"

SIZE SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END						
			UNCOATED			ALTiN COATED			UNCOATED			ALTiN COATED			
			2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price	
0.005"	0.125"	0.015"	1-1/2"	415-2013		\$19.24	415-2067		\$23.09	415-2121		\$24.05	415-2175		\$28.87
0.006	0.125	0.018	1-1/2	415-2014		19.24	415-2068		23.09	415-2122		24.05	415-2176		28.87
0.007	0.125	0.021	1-1/2	415-2015		19.24	415-2069		23.09	415-2123		24.05	415-2177		28.87
0.008	0.125	0.024	1-1/2	415-2016		19.24	415-2070		23.09	415-2124		24.05	415-2178		28.87

END MILLS • Solid Carbide

SHARS 2 & 4 Flute 90° Point Solid Carbide & M42 Drill Mills

- Drill/Mill can be used for drilling, slotting, chamfering, and profile milling
- Made from premium submicron grain carbide
- Made in USA



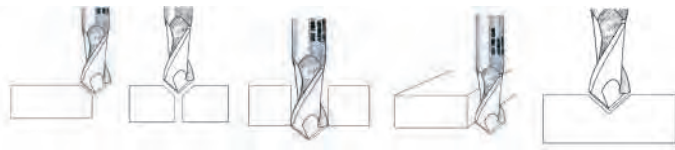
Solid Carbide

Dia	Shank	LOC	OAL	2 Flute	4 Flute	Price(B)
1/16	1/8	3/16	1-1/2	414-2558	414-2588	\$7.37
3/32	1/8	3/8	1-1/2	414-2559	414-2589	7.37
1/8	1/8	1/2	1-1/2	414-2560	414-2590	6.86
3/16	3/16	5/8	2	414-2561	414-2591	9.85
1/4	1/4	3/4	2-1/2	414-2562	414-2592	12.62
5/16	5/16	13/16	2-1/2	414-2563	414-2593	15.97
3/8	3/8	1	2-1/2	414-2564	414-2594	19.88
7/16	7/16	1	2-3/4	414-2565	414-2595	27.12
1/2	1/2	1	3	414-2566	414-2596	32.95
5/8	5/8	1-1/4	3-1/2	414-2567	414-2597	63.51
3/4	3/4	1-1/2	4	414-2568	414-2598	93.76

Carbide Cutting Diameter Tolerance +.000"/-.002"
Cobalt Cutting Diameter Tolerance +.0015"/-.0000"

M42 8% Cobalt

Dia	Shank	LOC	OAL	2 Flute	Price(B)
1/8	3/8	3/8	2-5/16	414-3749	\$14.98
1/4	3/8	5/8	2-7/16	414-3750	12.82
5/16	3/8	23/32	2-15/32	414-3751	12.82
3/8	3/8	3/4	2-1/2	414-3752	12.82
7/16	3/8	1-1/32	2-23/32	414-3753	19.44
1/2	1/2	1-1/4	3-1/4	414-3754	18.28
9/16	1/2	1-13/32	3-13/32	414-3755	24.53
5/8	5/8	1-5/8	3-3/4	414-3756	26.80
11/16	5/8	1-21/32	3-25/32	414-3757	31.11
3/4	3/4	1-11/16	3-15/16	414-3758	30.80
13/16	3/4	1-29/32	4-5/32	414-3759	40.35
7/8	3/4	1-15/16	4-3/16	414-3760	41.34
1	3/4	2	4-1/4	414-3761	46.06



Chamfer Countersink Drilling Sidemilling Spotting

- AlTiN coated drill mills also available
- Also available in 60, 82, 90, 100 and 120 degree points

SHARS 45° & 60° HSS Dovetail Cutters



- For cutting dovetails and angles in materials
- Designed to take the place of arbor & threaded hole type cutters
- Can be used in manual and CNC machinery

Cutter Dia.	Shank Dia.	OAL	Cutter	45° Model	60° Model	Price(D)
3/8"	3/8"	2-1/8"	3/16"	404-1611	404-1621	\$11.49
1/2	3/8	2-1/8	1/4	404-1612	404-1622	8.99
3/4	3/8	2-1/8	5/16	404-1613	404-1623	12.69
1-3/8	5/8	2-7/8	9/16	404-1614	404-1624	29.95
1-7/8	7/8	3-1/4	13/16	404-1615	404-1625	41.19
2-1/4	1	3-3/4	1-1/16	404-1616	404-1626	51.95
4pc.set 3/8,1/2,3/4,1-3/8"				404-1610	404-1620	63.95

SHARS 2 & 4 Flute Micrograin Solid Carbide End Mills

Center cutting • Square Nose • Single or Double End • Uncoated or TiAlN



Single End

Mill	Shank	Flute Length	OAL	Uncoated 2 Flutes	Uncoated 4 Flutes	Price(B)
1/16"	1/8"	3/16"	1-1/2"	404-5685	404-5701	\$3.50
3/32	1/8	5/16	1-1/2	404-5732	404-5733	3.10
1/8	1/8	1/2	1-1/2	404-5686	404-5702	2.95
5/32	3/16	9/16	2	404-5687	404-5703	6.10
3/16	3/16	5/8	2	404-5688	404-5704	5.50
7/32	1/4	5/8	2-1/2	404-5689	404-5705	7.45
1/4	1/4	3/4	2-1/2	404-5690	404-5706	6.50
5/16	5/16	13/16	2-1/2	404-5691	404-5707	8.30
3/8	3/8	7/8	2-1/2	404-5692	404-5708	11.50
7/16	7/16	7/8	2-1/2	404-5693	404-5709	14.35
1/2	1/2	1	3	404-5694	404-5710	17.90
5/8	5/8	1-1/4	3-1/2	404-5695	404-5711	36.50
3/4	3/4	1-1/2	4	404-5696	404-5712	55.95
1	1	1-1/2	4	404-5697	404-5713	79.95



Import

TiAlN coated, 4FL.

Single End



Dia.	Shank	LOC	OAL	TiAlN	Price(E)
1/8"	1/8"	1/2"	1-1/2"	404-9420	\$4.50
3/16	3/16	5/8	2	404-9421	6.30
1/4	1/4	3/4	2-1/2	404-9422	9.50
5/16	5/16	13/16	2-1/2	404-9423	13.10
3/8	3/8	7/8	2-1/2	404-9424	19.40
1/2	1/2	1	3	404-9425	23.95

Double End

Mill	Shank	Flute	OAL	2 Flutes	4 Flutes	Price(B)
1/16"	1/8"	1/8"	1-1/2"	404-5788	404-5714	\$5.75
1/8	1/8	1/4	1-1/2	404-5789	404-5715	5.50
5/32	3/16	5/16	2	404-5790	404-5716	7.90
3/16	3/16	3/8	2	404-5791	404-5717	7.90
7/32	1/4	1/2	2-1/2	404-5792	404-5718	9.00
1/4	1/4	1/2	2-1/2	404-5793	404-5719	9.00
5/16	5/16	1/2	2-1/2	404-5794	404-5720	13.50
3/8	3/8	1/2	2-1/2	404-5795	404-5721	14.95
7/16	1/2	5/8	3	404-5796	404-5722	23.80
1/2	1/2	5/8	3	404-5797	404-5723	27.95

SHARS Rougher Finisher High Performance Micrograin Solid Carbide End Mills

-Corner radius allows for higher feed rate
For detail speed and feed rate chart see www.shars.com

Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK	RADIUS
ALL SIZES	+0.000,-.002"	-.0001,-.0004"	+.002,-.002"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END				
				UNCOATED		RADIUS	ALTIM COATED	
				4 FL	Price		4 FL	Price
1/4"	1/4"	3/4"	2-1/2"	415-0326	\$29.95	.020"	415-0333	\$37.44
5/16	5/16	13/16	2-1/2"	415-0327	32.42	.020	415-0334	40.53
3/8	3/8	7/8	2-1/2"	415-0328	35.24	.020	415-0335	44.04
1/2	1/2	1-1/4	3	415-0329	40.73	.040	415-0336	50.92
5/8	5/8	1-5/8	3-1/2"	415-0330	81.10	.040	415-0337	101.37
3/4	3/4	1-5/8	4	415-0331	108.36	.040	415-0338	135.45
1	1	2	4	415-0332	176.83	.040	415-0339	221.05



SHARS Thread Mill High Performance Micrograin Solid Carbide End Mills

UN, NPT PIPE, NPTF PIPE, Metric Thread-Internal/External
For detail speed and feed rate chart see www.shars.com
For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



THERADMILL CUTTING DIAMETER TOLERANCE	+0.002,-.002"
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UN THREADS - ALTIM COATED

SIZE	SHANK DIA	CUTTING DIA.	THREAD LENGTH	OVERALL LENGTH	NO. OF FLUTES	INTERNAL UN	Price
6-32"	1/8"	0.115"	0.218"	2"	3	415-0340	\$56.51
8-32	1/8	0.115	0.250	2	3	415-0341	56.51
8-36	1/8	0.115	0.250	2	3	415-0342	56.51
10-24	3/16	0.120	0.312	2	3	415-0343	56.51
10-32	3/16	0.120	0.312	2	3	415-0344	56.51
1/4-20	3/16	0.180	0.500	2-1/2	3	415-0345	63.91
1/4-28	3/16	0.180	0.500	2-1/2	3	415-0346	63.91
5/16-18	1/4	0.240	0.625	2-1/2	3	415-0347	75.21
5/16-24	1/4	0.240	0.625	2-1/2	3	415-0348	75.21
3/8-16	5/16	0.290	0.750	3	4	415-0349	89.64
3/8-24	5/16	0.290	0.750	3	4	415-0350	89.64
7/16-14	3/8	0.340	0.875	3	4	415-0351	96.64
7/16-20	3/8	0.340	0.875	3	4	415-0352	96.64
1/2-13	3/8	0.350	0.875	3-1/2	4	415-0353	96.64
1/2-20	3/8	0.350	0.875	3-1/2	4	415-0354	96.64
9/16-12	1/2	0.370	0.875	3-1/2	4	415-0355	96.64
9/16-18	1/2	0.370	0.875	3-1/2	4	415-0356	96.64
5/8-11	1/2	0.470	1.250	3-1/2	5	415-0357	120.81
5/8-18	1/2	0.470	1.250	3-1/2	5	415-0358	120.81
3/4-10	1/2	0.495	1.250	3-1/2	5	415-0359	120.81
3/4-16	1/2	0.495	1.250	3-1/2	5	415-0360	120.81
7/8-9	5/8	0.620	1.250	3-1/2	5	415-0361	151.20
7/8-14	5/8	0.620	1.250	3-1/2	5	415-0362	151.20
1-8	3/4	0.620	1.375	4	5	415-0363	151.20
1-12	3/4	0.620	1.375	4	5	415-0364	151.20



NPT PIPE THERAD - ALTIM COATED

SIZE	SHANK DIA	CUTTING DIA.	THREAD LENGTH	OVERALL LENGTH	NO. OF FLUTES	INTERNAL UN	Price
1/16-27"	1/4"	0.245"	0.437"	2-1/2"	3	415-0365	\$75.21
1/8-27	5/16	0.31	0.437	2-1/2	4	415-0366	75.21
1/4-18	3/8	0.37	0.625	3	4	415-0367	85.74
3/8-18	3/8	0.37	0.625	3	4	415-0368	85.74
1/2-14	1/2	0.495	0.875	3-1/2	4	415-0369	120.81
3/4-14	1/2	0.495	0.875	3-1/2	4	415-0370	120.81
1-11-1/2	3/4	0.62	1.125	4	5	415-0371	151.20

NPTF PIPE THERAD - ALTIM COATED

SIZE	SHANK DIA	CUTTING DIA.	THREAD LENGTH	OVERALL LENGTH	NO. OF FLUTES	INTERNAL UN	Price
1/16-27"	1/4"	0.245"	0.437"	2-1/2"	3	415-0372	\$75.21
1/8-27	5/16	0.31	0.437	2-1/2	4	415-0373	75.21
1/4-18	3/8	0.37	0.625	3	4	415-0374	85.74
3/8-18	3/8	0.37	0.625	3	4	415-0375	85.74
1/2-14	1/2	0.495	0.875	3-1/2	4	415-0376	120.81
3/4-14	1/2	0.495	0.875	3-1/2	4	415-0377	120.81
1-11-1/2	3/4	0.62	1.125	4	5	415-0378	151.20

METRIC THREADS - ALTIM COATED

SIZE	SHANK DIA	CUTTING DIA.	THREAD LENGTH	OVERALL LENGTH	NO. OF FLUTES	INTERNAL UN	Price
M4-0.70"	1/8"	0.115"	0.250"	2"	3	415-0379	\$57.68
M4.5-0.75	1/8	0.12	0.250	2	3	415-0380	57.68
M5-0.80	3/16	0.12	0.312	2	3	415-0381	57.68
M6-1.00	3/16	0.17	0.500	2-1/2	3	415-0382	63.52
M8-0.75	1/4	0.235	0.625	2-1/2	3	415-0383	75.21
M8-1.00	1/4	0.235	0.625	2-1/2	3	415-0384	75.21
M8-1.25	1/4	0.235	0.625	2-1/2	3	415-0385	75.21
M10-1.25	5/16	0.3	0.750	3	4	415-0386	89.64
M10-1.50	5/16"	0.3"	0.750"	3"	4	415-0387	\$89.64
M12-1.00	3/8	0.36	0.875	3-1/2	4	415-0388	97.03
M12-1.25	3/8	0.36	0.875	3-1/2	4	415-0389	97.03
M12-1.75	3/8	0.36	0.875	3-1/2	4	415-0390	97.03
M14-1.50	3/8	0.36	0.875	3-1/2	4	415-0391	97.03
M16-2.00	1/2	0.47	1.250	3-1/2	5	415-0392	120.81
M18-2.50	1/2	0.47	1.250	3-1/2	5	415-0393	120.81
M20-3.00	5/8	0.47	1.250	3-1/2	5	415-0394	120.81

END MILLS • Solid Carbide




2 & 3 Flute 45° Helix High Performance Micrograin Solid Carbide

End Mills For Aluminum









Square End • Corner Radius • Uncoated • ZRN (Zirconium Nitride) Coated
Great for plunge, slot and profile

**USA
Made**











Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.

	REGULAR LENGTH - 2 FLUTE - SQUARE END - 45° UNCOATED		REGULAR LENGTH - 2 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	REGULAR LENGTH - 2 FLUTE - SQUARE END - 45° UNCOATED		REGULAR LENGTH - 2 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	LONG LENGTH - 2 FLUTE - SQUARE END - 45° UNCOATED		LONG LENGTH - 2 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	LONG LENGTH - 2 FLUTE - SQUARE END - 45° UNCOATED		LONG LENGTH - 2 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED

TOLERANCES	DIAMETER	SHANK	RADIUS
1/4-1/2"	+0.00,-.002"	-.0001,-.0004"	+.002,-.002"
5/8"-1"	+0.00,-.003	-.0001,-.0004	+.002,-.002

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END				CORNER RADIUS				
				UNCOATED	Price	ZRN COATED	Price	RADIUS	UNCOATED	Price	ZRN COATED	Price
1/4"	1/4"	3/4"	2-1/2"	415-0186	\$14.92	415-0193	\$18.05	.020"	415-0200	\$16.67	415-0207	\$20.15
1/4	1/4	1-1/4	3	415-0214	20.48	415-0221	24.77	.020	415-0228	22.88	415-0235	27.65
5/16	5/16	13/16	2-1/2	415-0187	17.63	415-0194	21.32	.020	415-0201	19.68	415-0208	23.80
5/16	5/16	1-3/8	3	415-0215	26.53	415-0222	33.68	.020	415-0229	29.61	415-0236	37.60
3/8	3/8	1	2-1/2	415-0188	18.66	415-0195	22.55	.020	415-0202	20.83	415-0209	25.19
3/8	3/8	1-1/2	4	415-0216	33.22	415-0223	40.18	.020	415-0230	37.10	415-0237	44.87
1/2	1/2	1-1/4	3	415-0189	30.88	415-0196	35.83	.040	415-0203	34.48	415-0210	40.00
1/2	1/2	2	4	415-0217	46.55	415-0224	56.45	.040	415-0231	51.97	415-0238	63.03
5/8	5/8	1-5/8	3-1/2	415-0190	59.09	415-0197	71.61	.040	415-0204	63.10	415-0211	76.47
5/8	5/8	2-3/8	5	415-0218	96.53	415-0225	122.85	.040	415-0232	103.08	415-0239	131.19
3/4	3/4	1-3/4	4	415-0191	84.70	415-0198	102.86	.040	415-0205	90.45	415-0212	109.84
3/4	3/4	2-1/2	5	415-0219	106.06	415-0226	132.76	.040	415-0233	113.27	415-0240	141.79
1	1	1-3/4	4	415-0192	139.64	415-0199	169.30	.040	415-0206	149.13	415-0213	180.81
1	1	2-1/4	5	415-0220	174.36	415-0227	209.08	.040	415-0234	186.20	415-0241	223.29

	REGULAR LENGTH - 3 FLUTE - SQUARE END - 45° UNCOATED		REGULAR LENGTH - 3 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	REGULAR LENGTH - 3 FLUTE - 45° UNCOATED		REGULAR LENGTH - 3 FLUTE - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	LONG LENGTH - 3 FLUTE - SQUARE END - 45° UNCOATED		LONG LENGTH - 3 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	LONG LENGTH - 3 FLUTE - 45° UNCOATED		LONG LENGTH - 3 FLUTE - 45° ZRN (ZIRCONIUM NITRIDE) COATED

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END				CORNER RADIUS				
				UNCOATED	Price	ZRN COATED	Price	RADIUS	UNCOATED	Price	ZRN COATED	Price
1/4"	1/4"	3/4"	2-1/2"	415-0242	\$14.92	415-0249	\$18.05	.020"	415-0256	\$16.67	415-0263	\$20.15
1/4	1/4	1-1/4	3	415-0270	20.48	415-0277	24.77	.020	415-0284	22.88	415-0291	27.65
5/16	5/16	13/16	2-1/2	415-0243	17.63	415-0250	21.32	.020	415-0257	19.68	415-0264	23.80
5/16	5/16	1-3/8	3	415-0271	26.53	415-0278	33.68	.020	415-0285	29.61	415-0292	37.60
3/8	3/8	1	2-1/2	415-0244	18.66	415-0251	22.55	.020	415-0258	20.83	415-0265	25.19
3/8	3/8	1-1/2	4	415-0272	33.22	415-0279	40.18	.020	415-0286	37.10	415-0293	44.87
1/2	1/2	1-1/4	3	415-0245	30.88	415-0252	35.83	.040	415-0259	34.48	415-0266	40.00
1/2	1/2	2	4	415-0273	46.55	415-0280	56.45	.040	415-0287	51.97	415-0294	63.03
5/8	5/8	1-5/8	3-1/2	415-0246	59.09	415-0253	71.61	.040	415-0260	63.10	415-0267	76.47
5/8	5/8	2-3/8	5	415-0274	96.53	415-0281	122.85	.040	415-0288	103.08	415-0295	131.19
3/4	3/4	1-3/4	4	415-0247	84.70	415-0254	102.86	.040	415-0261	90.45	415-0268	109.84
3/4	3/4	2-1/2	5	415-0275	106.06	415-0282	132.76	.040	415-0289	113.27	415-0296	141.79
1	1	1-3/4	4	415-0248	139.64	415-0255	169.30	.040	415-0262	149.13	415-0269	180.81
1	1	2-1/4	5	415-0276	174.36	415-0283	209.08	.040	415-0290	186.20	415-0297	223.29



Variable Helix High Performance Micrograin Solid Carbide End Mills

Chatter Free • Harmonic Shift • Exceptional Finish • Corner Radius • ALTIN Coating
 Great for slotting, roughing, ramping and finishing;
 For detail speed and feed rate chart see www.shars.com



Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	ALTIN COATED	
					4 FL	Price
1/4"	1/4"	3/8"	2"	.015-.020	415-0001	\$16.53
1/4"	1/4"	3/4"	2-1/2"	.015-.020	415-0008	18.80
1/4"	1/4"	1-1/8"	3"	.015-.020	415-0015	20.23
5/16"	5/16"	1/16"	2"	.015-.020	415-0002	19.43
5/16"	5/16"	13/16"	2-1/2"	.015-.020	415-0009	21.08
5/16"	5/16"	1-1/8"	3"	.015-.020	415-0016	24.35
3/8"	3/8"	1/2"	2"	.015-.020	415-0003	24.79
3/8"	3/8"	1"	2-1/2"	.015-.020	415-0010	27.17
3/8"	3/8"	1-1/4"	3"	.015-.020	415-0017	27.52
1/2"	1/2"	5/8"	2-1/2"	.030-.035	415-0004	37.62
1/2"	1/2"	1-1/4"	3"	.030-.035	415-0011	41.97
1/2"	1/2"	2"	4"	.030-.035	415-0018	51.06
5/8*	5/8"	3/4"	3"	.030-.035	415-0005	65.31
5/8*	5/8"	1-5/8"	3-1/2"	.030-.035	415-0012	66.85
5/8*	5/8"	2-1/4"	5"	.030-.035	415-0019	86.03
3/4*	3/4"	1"	3"	.030-.035	415-0006	93.83
3/4*	3/4"	1-5/8"	4"	.030-.035	415-0013	95.83
3/4*	3/4"	2-1/4"	5"	.030-.035	415-0020	109.05
1*	1"	1-1/4"	3"	.030-.035	415-0007	154.99
1*	1"	2"	4"	.030-.035	415-0014	163.63
1*	1"	3"	6"	.030-.035	415-0021	207.98

*WITH WELDON FLATS

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+0.000,-.002	-.0001,-.0004



CORNER RADIUS
 STUB LENGTH - 4 FLUTE - VARIABLE HELIX
 ALTIN COATED



CORNER RADIUS
 REGULAR LENGTH - 4 FLUTE - VARIABLE HELIX
 ALTIN COATED



CORNER RADIUS
 LONG LENGTH - 4 FLUTE - VARIABLE HELIX
 ALTIN COATED



6 Flute 40° Helix High Performance Micrograin Solid Carbide End Mills

Radial Relief For Strength · Stronger Core · ALTIN Coating · Square End · Corner Radius
 Great for profiling



Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.

TOLERANCES	DIAMETER	SHANK	RADIUS
ALL SIZES	+0.000,-.002"	-.0001,-.0004"	+0.002,-.002"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END		ALTIN COATED		
				6FL	Price	6FL	RADIUS	Price
1/4"	1/4"	3/4"	2-1/2"	415-0022	\$31.57	415-0038	.020	\$35.24
1/4"	1/4"	1-1/8"	3"	415-0030	34.80	415-0046	.020	38.86
5/16"	5/16"	13/16"	2-1/2"	415-0023	37.49	415-0039	.020	41.86
5/16"	5/16"	1-1/8"	3"	415-0031	40.60	415-0047	.020	45.33
3/8"	3/8"	1"	2-1/2"	415-0024	40.40	415-0040	.040	45.12
3/8"	3/8"	1-1/4"	3"	415-0032	46.16	415-0048	.040	51.53
7/16"	7/16"	1"	2-3/4"	415-0025	49.41	415-0041	.040	55.17
7/16"	7/16"	2"	4"	415-0033	68.84	415-0049	.040	76.85
1/2"	1/2"	1-1/4"	3"	415-0026	54.03	415-0042	.040	60.31
1/2"	1/2"	2"	4"	415-0034	71.78	415-0050	.040	80.14
5/8"	5/8"	1-5/8"	3-1/2"	415-0027	90.02	415-0043	.040	96.14
5/8"	5/8"	2-1/4"	5"	415-0035	111.51	415-0051	.040	119.08
3/4"	3/4"	1-5/8"	4"	415-0028	113.01	415-0044	.040	120.68
3/4"	3/4"	2-1/4"	5"	415-0036	139.26	415-0052	.040	148.72
1"	1"	2"	4"	415-0029	173.08	415-0045	.040	184.84
1"	1"	3"	6"	415-0037	282.24	415-0053	.040	301.42



REGULAR LENGTH - 6 FLUTE - SQUARE END - 40°
 HELIX ALTIN COATED



LONG LENGTH - 6 FLUTE - SQUARE END - 40°
 HELIX ALTIN COATED



CORNER RADIUS
 REGULAR LENGTH - 6 FLUTE - 40°
 HELIX ALTIN COATED



CORNER RADIUS
 LONG LENGTH - 6 FLUTE - 40°
 HELIX ALTIN COATED

END MILLS • Solid Carbide



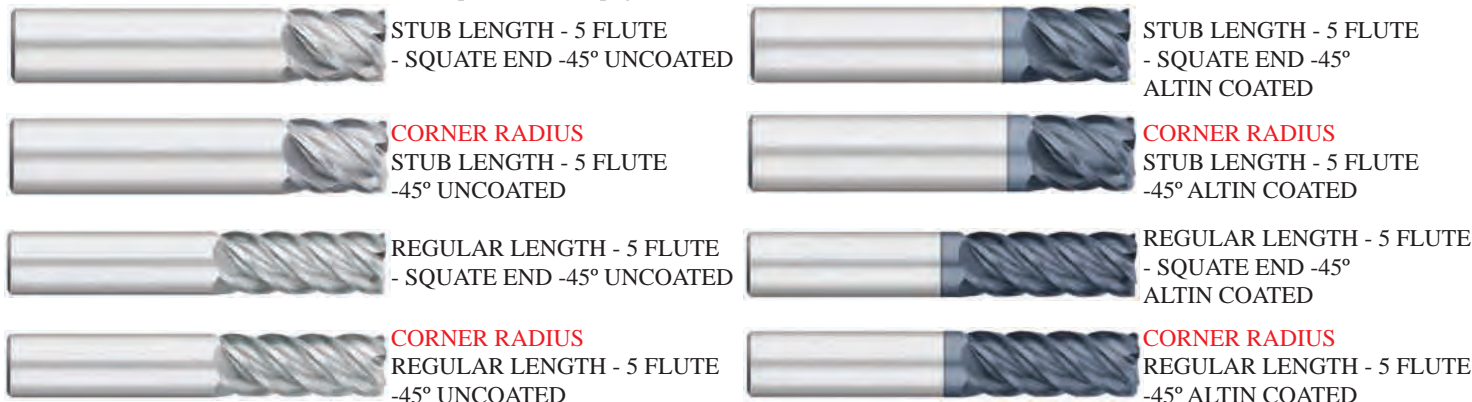
5 Flute 45° Helix High Performance Micrograin Solid Carbide End Mills

Corner Radius - Square End
Great for profiling and finishing



Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK	RADIUS
1/4-1/2"	+0.000,-0.002"	-0.001,-0.0004"	+0.002,-0.002"
5/8"-1"	+0.000,-0.003	-0.001,-0.0004	+0.002,-0.002

				SQUARE END				CORNER RADIUS				
SIZE	SHANK	FLUTE LENGTH	OAL	UNCOATED	Price	ALTIN COATED	Price	RADIUS	UNCOATED	Price	ALTIN COATED	Price
1/8"	1/8"	1/4"	1-1/2"	415-0118	\$4.00	415-0127	\$5.05	.010	415-0136	\$4.48	415-0145	\$5.64
1/8"	1/8"	1/2	1-1/2	415-0154	8.55	415-0162	10.68	.010	415-0170	9.55	415-0178	11.93
3/16	3/16	3/8	2	415-0119	7.03	415-0128	8.41	.010	415-0137	7.84	415-0146	9.39
3/16	3/16	3/4	2	415-0155	10.75	415-0163	12.80	.010	415-0171	12.00	415-0179	14.29
1/4	1/4	1/2	2	415-0120	8.47	415-0129	10.07	.020	415-0138	9.46	415-0147	11.24
1/4	1/4	3/4	2-1/2	415-0156	11.58	415-0164	13.78	.020	415-0172	12.92	415-0180	15.39
5/16	5/16	1/2	2	415-0121	10.18	415-0130	12.71	.020	415-0139	11.37	415-0148	14.20
5/16	5/16	7/8	2-1/2	415-0157	13.96	415-0165	16.59	.020	415-0173	15.58	415-0181	18.52
3/8	3/8	5/8	2	415-0122	16.74	415-0131	19.94	.020	415-0140	18.68	415-0149	22.25
3/8	3/8	7/8	2-1/2	415-0158	18.68	415-0166	22.26	.020	415-0174	20.86	415-0182	24.85
7/16	7/16	5/8	2-1/2	415-0123	19.14	415-0132	22.79	.020	415-0141	21.38	415-0150	25.45
1/2	1/2	5/8	2-1/2	415-0124	22.11	415-0133	26.33	.040	415-0142	24.70	415-0151	29.40
1/2	1/2	1	3	415-0159	34.89	415-0167	43.40	.040	415-0175	38.95	415-0183	48.45
5/8	5/8	3/4	3	415-0125	39.27	415-0134	47.53	.040	415-0143	41.93	415-0152	50.76
5/8	5/8	1-1/4	3-1/2	415-0160	66.14	415-0168	83.90	.040	415-0176	70.63	415-0184	89.60
3/4	3/4	1	3	415-0126	52.91	415-0135	65.31	.040	415-0144	56.50	415-0153	69.73
3/4	3/4	1-1/2	4	415-0161	93.00	415-0169	114.07	.040	415-0177	99.32	415-0185	121.83



Fine Pitch High Performance Micrograin Solid Carbide End Mills

- Minimum chatter and vibration while removing maximum material
- Great for hardened steels, titanium, inconel and other space age materials

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK
1/4"-1/2"	+0.000,-0.002"	-0.001,-0.0004"
5/8"-1"	+0.000,-0.003	-0.001,-0.0004

				SQUARE END			
SIZE	SHANK	FLUTE LENGTH	OAL	UNCOATED		ALTIN COATED	
				4 FL	Price	4 FL	Price
1/4"	1/4"	3/4"	2-1/2"	415-0298	\$17.12	415-0305	\$21.41
5/16	5/16	13/16	2-1/2	415-0299	24.04	415-0306	30.06
3/8	3/8	7/8	2-1/2	415-0300	28.04	415-0307	35.06
1/2	1/2	1-1/4	3	415-0301	35.06	415-0308	43.82
5/8	5/8	1-5/8	3-1/2	415-0302	75.73	415-0309	94.65
3/4	3/4	1-5/8	4	415-0303	90.87	415-0310	113.60
1	1	2	4	415-0304	168.77	415-0311	210.95





Corner Radius Extra Long Length Micrograin Solid Carbide End Mills(cont.)

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED		ALTiN COATED	
					4FL	Price	4 FL	Price
1/4"	1/4"	1-1/2"	4"	.060"	415-1689	\$19.04	415-1768	\$23.80
1/4	1/4	1-1/2	6	.015	415-1690	25.76	415-1769	32.20
1/4	1/4	1-1/2	6	.020	415-1691	25.76	415-1770	32.20
1/4	1/4	1-1/2	6	.030	415-1692	25.76	415-1771	32.20
1/4	1/4	1-1/2	6	.045	415-1693	25.76	415-1772	32.20
1/4	1/4	1-1/2	6	.060	415-1694	25.76	415-1773	32.20
5/16	5/16	1-5/8	4	.015	415-1695	26.00	415-1774	32.49
5/16	5/16	1-5/8	4	.020	415-1696	26.00	415-1775	32.49
5/16	5/16	1-5/8	4	.030	415-1697	26.00	415-1776	32.49
5/16	5/16	1-5/8	4	.045	415-1698	26.00	415-1777	32.49
5/16	5/16	1-5/8	4	.060	415-1699	26.00	415-1778	32.49
3/8	3/8	1-3/4	4	.015	415-1700	29.51	415-1779	36.89
3/8	3/8	1-3/4	4	.020	415-1701	29.51	415-1780	36.89
3/8	3/8	1-3/4	4	.030	415-1702	29.51	415-1781	36.89
3/8	3/8	1-3/4	4	.045	415-1703	29.51	415-1782	36.89
3/8	3/8	1-3/4	4	.060	415-1704	29.51	415-1783	36.89
3/8	3/8	1-1/2	6	.015	415-1705	44.69	415-1784	55.86
3/8	3/8	1-1/2	6	.020	415-1706	44.69	415-1785	55.86
3/8	3/8	1-1/2	6	.030	415-1707	44.69	415-1786	55.86
3/8	3/8	1-1/2	6	.045	415-1708	44.69	415-1787	55.86
3/8	3/8	1-1/2	6	.060	415-1709	44.69	415-1788	55.86
1/2	1/2	1-1/2	6	.015	415-1710	68.00	415-1789	85.01
1/2	1/2	1-1/2	6	.020	415-1711	68.00	415-1790	85.01
1/2	1/2	1-1/2	6	.030	415-1712	68.00	415-1791	85.01
1/2	1/2	1-1/2	6	.045	415-1713	68.00	415-1792	85.01
1/2	1/2	1-1/2	6	.060	415-1714	68.00	415-1793	85.01
1/2	1/2	1-1/2	6	.090	415-1715	68.00	415-1794	85.01
1/2	1/2	1-1/2	6	.125	415-1716	68.00	415-1795	85.01
1/2	1/2	3	6	.015	415-1717	71.39	415-1796	89.22
1/2	1/2	3	6	.020	415-1718	71.39	415-1797	89.22
1/2	1/2	3	6	.030	415-1719	71.39	415-1798	89.22
1/2	1/2	3	6	.045	415-1720	71.39	415-1799	89.22
1/2	1/2	3	6	.060	415-1721	71.39	415-1800	89.22
1/2	1/2	3	6	.090	415-1722	71.39	415-1801	89.22
1/2	1/2	3	6	.125	415-1723	71.39	415-1802	89.22
5/8	5/8	3	6	.015	415-1724	96.73	415-1803	120.92
5/8	5/8	3	6	.020	415-1725	96.73	415-1804	120.92
5/8	5/8	3	6	.030	415-1726	96.73	415-1805	120.92
5/8	5/8	3	6	.045	415-1727	96.73	415-1806	120.92
5/8	5/8	3	6	.060	415-1728	96.73	415-1807	120.92
5/8	5/8	3	6	.090	415-1729	96.73	415-1808	120.92
3/4	3/4	3	6	.015	415-1730	143.77	415-1809	179.70
3/4	3/4	3	6	.020	415-1731	143.77	415-1810	179.70
3/4	3/4	3	6	.030	415-1732	143.77	415-1811	179.70
3/4	3/4	3	6	.045	415-1733	143.77	415-1812	179.70
3/4	3/4	3	6	.060	415-1734	143.77	415-1813	179.70
3/4	3/4	3	6	.090	415-1735	143.77	415-1814	179.70
3/4	3/4	3	6	.125	415-1736	143.77	415-1815	179.70
3/4	3/4	3	6	.125	415-1736	143.77	415-1815	179.70
3/4	3/4	4	7	.015	415-1737	246.71	415-1816	308.38
3/4	3/4	4	7	.020	415-1738	246.71	415-1817	308.38
3/4	3/4	4	7	.030	415-1739	246.71	415-1818	308.38
3/4	3/4	4	7	.045	415-1740	246.71	415-1819	308.38
3/4	3/4	4	7	.060	415-1741	246.71	415-1820	308.38
3/4	3/4	4	7	.090	415-1742	246.71	415-1821	308.38
3/4	3/4	4	7	.125	415-1743	246.71	415-1822	308.38
1	1	3	6	.015	415-1744	244.05	415-1823	305.06
1	1	3	6	.020	415-1745	244.05	415-1824	305.06
1	1	3	6	.030	415-1746	244.05	415-1825	305.06
1	1	3	6	.045	415-1747	244.05	415-1826	305.06
1	1	3	6	.060	415-1748	244.05	415-1827	305.06
1	1	3	6	.090	415-1749	244.05	415-1828	305.06
1	1	3	6	.090	415-1749	244.05	415-1828	305.06
1	1	3	6	.125	415-1750	244.05	415-1829	305.06
1	1	4	7	.015	415-1751	319.91	415-1830	399.90
1	1	4	7	.020	415-1752	319.91	415-1831	399.90
1	1	4	7	.030	415-1753	319.91	415-1832	399.90
1	1	4	7	.045	415-1754	319.91	415-1833	399.90
1	1	4	7	.060	415-1755	319.91	415-1834	399.90
1	1	4	7	.090	415-1756	319.91	415-1835	399.90
1	1	4	7	.125	415-1757	319.91	415-1836	399.90
1	1	4	7	.125	415-1757	319.91	415-1836	399.90

END MILLS • Solid Carbide



Corner Radius Long Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



CORNER RADIUS

LONG LENGTH 4 FLUTE - 30°- UNCOATED

TOLERANCES	DIAMETER	SHANK	RADIUS
1/8"-1/2"	+0.00,-.002"	-.0001,-.0004"	+0.002,-.002"
5/8"-1"	+0.00,-.003	-.0001,-.0004	+0.002,-.002



CORNER RADIUS

LONG LENGTH 4 FLUTE - 30°- ALTIN COATED



SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED		ALTIN COATED	
					4FL	Price	4 FL	Price
1/8"	1/8"	3/4"	2-1/4"	.015"	415-1549	\$11.09	415-1614	\$13.86
1/8"	1/8"	3/4"	2-1/4"	.020	415-1550	11.09	415-1615	13.86
1/8"	1/8"	3/4"	2-1/4"	.030	415-1551	11.09	415-1616	13.86
3/16	3/16	3/4"	2-1/2"	.015	415-1552	13.02	415-1617	16.27
3/16	3/16	3/4"	2-1/2"	.020	415-1553	13.02	415-1618	16.27
3/16	3/16	3/4"	2-1/2"	.030	415-1554	13.02	415-1619	16.27
1/4"	1/4"	1-1/8"	3	.015	415-1555	18.63	415-1620	23.30
1/4"	1/4"	1-1/8"	3	.020	415-1556	18.63	415-1621	23.30
1/4"	1/4"	1-1/8"	3	.030	415-1557	18.63	415-1622	23.30
1/4"	1/4"	1-1/8"	3	.045	415-1558	18.63	415-1623	23.30
1/4"	1/4"	1-1/8"	3	.060	415-1559	18.63	415-1624	23.30
1/4"	1/4"	1	4	.015	415-1560	19.63	415-1625	24.54
1/4"	1/4"	1	4	.020	415-1561	19.63	415-1626	24.54
1/4"	1/4"	1	4	.030	415-1562	19.63	415-1627	24.54
1/4"	1/4"	1	4	.045	415-1563	19.63	415-1628	24.54
1/4"	1/4"	1	4	.060	415-1564	19.63	415-1629	24.54
5/16	5/16	1-1/8"	3	.015	415-1565	21.03	415-1630	26.28
5/16	5/16	1-1/8"	3	.020	415-1566	21.03	415-1631	26.28
5/16	5/16	1-1/8"	3	.030	415-1567	21.03	415-1632	26.28
5/16	5/16	1-1/8"	3	.045	415-1568	21.03	415-1633	26.28
5/16	5/16	1-1/8"	3	.060	415-1569	21.03	415-1634	26.28
3/8	3/8	1-1/8"	3	.015	415-1570	24.12	415-1635	30.16
3/8	3/8	1-1/8"	3	.020	415-1571	24.12	415-1636	30.16
3/8	3/8	1-1/8"	3	.030	415-1572	24.12	415-1637	30.16
3/8	3/8	1-1/8"	3	.045	415-1573	24.12	415-1638	30.16
3/8	3/8	1-1/8"	3	.060	415-1574	24.12	415-1639	30.16
3/8	3/8	1	4	.015	415-1575	28.17	415-1640	35.21
3/8	3/8	1	4	.020	415-1576	28.17	415-1641	35.21
3/8	3/8	1	4	.030	415-1577	28.17	415-1642	35.21
3/8	3/8	1	4	.045	415-1578	28.17	415-1643	35.21
3/8	3/8	1	4	.060	415-1579	28.17	415-1644	35.21
1/2	1/2	1	4	.015	415-1580	41.15	415-1645	51.44
1/2	1/2	1	4	.020	415-1581	41.15	415-1646	51.44

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED		ALTIN COATED	
					4FL	Price	4 FL	Price
1/2"	1/2"	1"	4"	.030"	415-1582	\$41.15	415-1647	\$51.44
1/2"	1/2"	1	4	.045	415-1583	41.15	415-1648	51.44
1/2"	1/2"	1	4	.060	415-1584	41.15	415-1649	51.44
1/2"	1/2"	1	4	.090	415-1585	41.15	415-1650	51.44
1/2"	1/2"	1	4	.125	415-1586	41.15	415-1651	51.44
1/2"	1/2"	2	4	.015	415-1587	43.61	415-1652	54.50
1/2"	1/2"	2	4	.020	415-1588	43.61	415-1653	54.50
1/2"	1/2"	2	4	.030	415-1589	43.61	415-1654	54.50
1/2"	1/2"	2	4	.045	415-1590	43.61	415-1655	54.50
1/2"	1/2"	2	4	.060	415-1591	43.61	415-1656	54.50
1/2"	1/2"	2	4	.090	415-1592	43.61	415-1657	54.50
1/2"	1/2"	2	4	.125	415-1593	43.61	415-1658	54.50
5/8	5/8	2-1/4"	5	.015	415-1594	89.63	415-1659	112.04
5/8	5/8	2-1/4"	5	.020	415-1595	89.63	415-1660	112.04
5/8	5/8	2-1/4"	5	.030	415-1596	89.63	415-1661	112.04
5/8	5/8	2-1/4"	5	.045	415-1597	89.63	415-1662	112.04
5/8	5/8	2-1/4"	5	.060	415-1598	89.63	415-1663	112.04
5/8	5/8	2-1/4"	5	.090	415-1599	89.63	415-1664	112.04
3/4	3/4	2-1/4"	5	.015	415-1600	123.80	415-1665	154.74
3/4	3/4	2-1/4"	5	.020	415-1601	123.80	415-1666	154.74
3/4	3/4	2-1/4"	5	.030	415-1602	123.80	415-1667	154.74
3/4	3/4	2-1/4"	5	.045	415-1603	123.80	415-1668	154.74
3/4	3/4	2-1/4"	5	.060	415-1604	123.80	415-1669	154.74
3/4	3/4	2-1/4"	5	.090	415-1605	123.80	415-1670	154.74
3/4	3/4	2-1/4"	5	.125	415-1606	123.80	415-1671	154.74
1	1	2-1/4"	5	.015	415-1607	169.50	415-1672	211.88
1	1	2-1/4"	5	.020	415-1608	169.50	415-1673	211.88
1	1	2-1/4"	5	.030	415-1609	169.50	415-1674	211.88
1	1	2-1/4"	5	.045	415-1610	169.50	415-1675	211.88
1	1	2-1/4"	5	.060	415-1611	169.50	415-1676	211.88
1	1	2-1/4"	5	.090	415-1612	169.50	415-1677	211.88
1	1	2-1/4"	5	.125	415-1613	169.50	415-1678	211.88



Corner Radius Extra Long Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



CORNER RADIUS

EXTRA LONG LENGTH 4 FLUTE - 30°- UNCOATED

TOLERANCES	DIAMETER	SHANK	RADIUS
1/8"-1/2"	+0.00,-.002"	-.0001,-.0004"	+0.002,-.002"
5/8"-1"	+0.00,-.003	-.0001,-.0004	+0.002,-.002



CORNER RADIUS

EXTRA LONG LENGTH 4 FLUTE - 30°- ALTIN COATED



SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED		ALTIN COATED	
					4FL	Price	4 FL	Price
1/8"	1/8"	1"	3"	.015"	415-1679	\$12.39	415-1758	\$15.48
1/8"	1/8"	1	3	.020	415-1680	12.39	415-1759	15.48
1/8"	1/8"	1	3	.030	415-1681	12.39	415-1760	15.48
3/16	3/16	1-1/8"	3	.015	415-1682	13.48	415-1761	16.86
3/16	3/16	1-1/8"	3	.020	415-1683	13.48	415-1762	16.86
3/16	3/16	1-1/8"	3	.030	415-1684	13.48	415-1763	16.86
1/4"	1/4"	1-1/2"	4	.015	415-1685	19.04	415-1764	23.80
1/4"	1/4"	1-1/2"	4	.020	415-1686	19.04	415-1765	23.80
1/4"	1/4"	1-1/2"	4	.030	415-1687	19.04	415-1766	23.80
1/4"	1/4"	1-1/2"	4	.045	415-1688	19.04	415-1767	23.80



Corner Radius Regular Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



CORNER RADIUS
2 FLUTE - 30°- UNCOATED



CORNER RADIUS
4 FLUTE - 30°- UNCOATED



CORNER RADIUS
2 FLUTE - 30°- ALTIN COATED



CORNER RADIUS
4 FLUTE - 30°- ALTIN COATED

TOLERANCES	DIAMETER	SHANK	RADIUS
1/8"-1/2"	+0.00,-.002"	-.0001,-.0004"	+0.002,-.002"
5/8"-1"	+0.00,-.003	-.0001,-.0004	+0.002,-.002

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED			ALTIN COATED		
					2 FL	4 FL	Price	2 FL	4 FL	Price
1/8"	1/8"	1/2"	2-1/2"	.015"	415-1357	415-1453	\$6.55	415-1405	415-1501	\$10.19
1/8"	1/8"	1/2"	2-1/2"	.020	415-1358	415-1454	6.55	415-1406	415-1502	10.19
1/8"	1/8"	1/2"	2-1/2"	.030	415-1359	415-1455	6.55	415-1407	415-1503	10.18
3/16	3/16	5/8"	2	.015	415-1360	415-1456	6.55	415-1408	415-1504	10.19
3/16	3/16	5/8"	2	.020	415-1361	415-1457	6.55	415-1409	415-1505	10.19
3/16	3/16	5/8"	2	.030	415-1362	415-1458	6.55	415-1410	415-1506	10.19
1/4	1/4	3/4	2-1/2"	.015	415-1363	415-1459	9.55	415-1411	415-1507	13.99
1/4	1/4	3/4	2-1/2"	.020	415-1364	415-1460	9.55	415-1412	415-1508	13.99
1/4	1/4	3/4	2-1/2"	.030	415-1365	415-1461	9.55	415-1413	415-1509	13.99
1/4	1/4	3/4	2-1/2"	.045	415-1366	415-1462	9.55	415-1414	415-1510	13.99
1/4	1/4	3/4	2-1/2"	.060	415-1367	415-1463	9.55	415-1415	415-1511	13.99
5/16	5/16	13/16	2-1/2"	.015	415-1368	415-1464	14.64	415-1416	415-1512	20.12
5/16	5/16	13/16	2-1/2"	.020	415-1369	415-1465	14.64	415-1417	415-1513	20.12
5/16	5/16	13/16	2-1/2"	.030	415-1370	415-1466	14.64	415-1418	415-1514	20.12
5/16	5/16	13/16	2-1/2"	.045	415-1371	415-1467	14.64	415-1419	415-1515	20.12
5/16	5/16	13/16	2-1/2"	.060	415-1372	415-1468	14.64	415-1420	415-1516	20.12
3/8	3/8	1	2-1/2"	.015	415-1373	415-1469	19.60	415-1421	415-1517	21.80
3/8	3/8	1	2-1/2"	.020	415-1374	415-1470	19.60	415-1422	415-1518	21.80
3/8	3/8	1	2-1/2"	.030	415-1375	415-1471	19.60	415-1423	415-1519	21.80
3/8	3/8	1	2-1/2"	.045	415-1376	415-1472	19.60	415-1424	415-1520	21.80
3/8	3/8	1	2-1/2"	.060	415-1377	415-1473	19.60	415-1425	415-1521	21.80
1/2	1/2	1	3	.015	415-1378	415-1474	33.73	415-1426	415-1522	36.51
1/2	1/2	1	3	.020	415-1379	415-1475	33.73	415-1427	415-1523	36.51
1/2	1/2	1	3	.030	415-1380	415-1476	33.73	415-1428	415-1524	36.51
1/2	1/2	1	3	.045	415-1381	415-1477	33.73	415-1429	415-1525	36.51
1/2	1/2	1	3	.060	415-1382	415-1478	33.73	415-1430	415-1526	36.51
1/2	1/2	1	3	.090	415-1383	415-1479	33.73	415-1431	415-1527	36.51
1/2	1/2	1	3	.125	415-1384	415-1480	33.73	415-1432	415-1528	36.51
5/8	5/8	1-1/4	3-1/2"	.015	415-1385	415-1481	47.71	415-1433	415-1529	52.54
5/8	5/8	1-1/4	3-1/2"	.020	415-1386	415-1482	47.71	415-1434	415-1530	52.54
5/8	5/8	1-1/4	3-1/2"	.030	415-1387	415-1483	47.71	415-1435	415-1531	52.54
5/8	5/8	1-1/4	3-1/2"	.045	415-1388	415-1484	47.71	415-1436	415-1532	52.54
5/8	5/8	1-1/4	3-1/2"	.060	415-1389	415-1485	47.71	415-1437	415-1533	52.54
5/8	5/8	1-1/4	3-1/2"	.090	415-1390	415-1486	47.71	415-1438	415-1534	52.54
3/4	3/4	1-1/2	4	.015	415-1391	415-1487	70.59	415-1439	415-1535	73.77
3/4	3/4	1-1/2	4	.020	415-1392	415-1488	70.59	415-1440	415-1536	73.77
3/4	3/4	1-1/2	4	.030	415-1393	415-1489	70.59	415-1441	415-1537	73.77
3/4	3/4	1-1/2	4	.045	415-1394	415-1490	70.59	415-1442	415-1538	73.77
3/4	3/4	1-1/2	4	.060	415-1395	415-1491	70.59	415-1443	415-1539	73.77
3/4	3/4	1-1/2	4	.090	415-1396	415-1492	70.59	415-1444	415-1540	73.77
3/4	3/4	1-1/2	4	.125	415-1397	415-1493	70.59	415-1445	415-1541	73.77
1	1	1-1/2	4	.015	415-1398	415-1494	133.56	415-1446	415-1542	153.97
1	1	1-1/2	4	.020	415-1399	415-1495	133.56	415-1447	415-1543	153.97
1	1	1-1/2	4	.030	415-1400	415-1496	133.56	415-1448	415-1544	153.97
1	1	1-1/2	4	.045	415-1401	415-1497	133.56	415-1449	415-1545	153.97
1	1	1-1/2	4	.060	415-1402	415-1498	133.56	415-1450	415-1546	153.97
1	1	1-1/2	4	.090	415-1403	415-1499	133.56	415-1451	415-1547	153.97
1	1	1-1/2	4	.125	415-1404	415-1500	133.56	415-1452	415-1548	153.97

END MILLS • Solid Carbide



Long and Extra Long Micrograin Solid Carbide End Mills



TOLERANCES	DIAMETER	SHANK
1/8"-1/2"	+0.000,-.002"	-.0001,-.0004"
5/8"-1"	+0.000,-.003	-.0001,-.0004

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTIM COATED			UNCOATED			ALTIM COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
1/8"	1/8"	3/4"	2-1/4"	415-1078	415-0680	\$7.31	415-1092	415-0694	\$11.032	415-1273	415-0879	\$8.69	415-1287	415-0893	\$11.17
1/8	1/8	1	3	415-1120	415-0722	8.16	415-1134	415-0738	11.242	415-1315	415-0921	9.73	415-1329	415-0937	13.13
3/16	3/16	3/4	2-1/2	415-1079	415-0681	8.58	415-1093	415-0695	15.834	415-1274	415-0880	10.00	415-1288	415-0994	12.85
3/16	3/16	1-1/8	3	415-1121	415-0723	8.89	415-1135	415-0739	16.17	415-1316	415-0922	10.65	415-1330	415-0938	13.71
1/4	1/4	1-1/8	3	415-1080	415-0682	12.28	415-1094	415-0696	16.688	415-1275	415-0881	14.07	415-1289	415-0895	18.10
1/4	1/4	1-1/2	4	415-1122	415-0724	12.54	415-1136	415-0740	21.826	415-1317	415-0923	14.38	415-1331	415-0939	18.49
1/4	1/4	1	4	415-1081	415-0683	12.94	415-1095	415-0697	18.718	415-1276	415-0882	15.53	415-1290	415-0896	20.01
1/4	1/4	1-1/2	6	415-1123	415-0725	16.98	415-1137	415-0741	22.106	415-1318	415-0924	17.37	415-1332	415-0940	22.34
5/16	5/16	1-1/8	3	415-1082	415-0684	13.86	415-1096	415-0698	21.462	415-1277	415-0883	16.53	415-1291	415-0897	22.33
5/16	5/16	1-1/8	4	415-1124	415-0726	17.14	415-1138	415-0742	24.92	415-1319	415-0925	20.66	415-1333	415-0941	26.68
3/8	3/8	1-1/8	3	415-1083	415-0685	15.90	415-1097	415-0699	23.898	415-1278	415-0884	19.10	415-1292	415-0898	25.79
3/8	3/8	1	4	415-1084	415-0686	18.56	415-1098	415-0700	32.578	415-1279	415-0885	23.38	415-1293	415-0899	30.39
3/8	3/8	1-1/2	6	415-1126	415-0728	29.46	415-1140	415-0744	50.876	415-1321	415-0927	31.35	415-1335	415-0943	39.10
3/8	3/8	1-3/4	4	415-1125	415-0727	19.46	415-1139	415-0743	37.968	415-1320	415-0926	22.26	415-1334	415-0942	28.43
7/16	7/16	2	4	415-1085	415-0687	25.06	415-1099	415-0701	34.944	415-1280	415-0886	31.99	415-1294	415-0900	41.58
7/16	7/16	3	6	415-1127	415-0729	39.66	415-1141	415-0745	55.636	415-1322	415-0928	47.05	415-1336	415-0944	60.41
1/2	1/2	1	4	415-1086	415-0688	27.13	415-1100	415-0702	36.876	415-1281	415-0887	32.75	415-1295	415-0901	41.65
1/2	1/2	2	4	415-1087	415-0689	28.74	415-1101	415-0703	79.478	415-1282	415-0888	33.07	415-1296	415-0902	41.97
1/2	1/2	1-1/2	6	415-1128	415-0730	44.83	415-1142	415-0746	57.862	415-1323	415-0929	49.91	415-1337	415-0945	63.91
1/2	1/2	3	6	415-1129	415-0731	47.05	415-1143	415-0747	85.204	415-1324	415-0930	50.23	415-1338	415-0946	64.86
5/8	5/8	2-1/4	5	415-1088	415-0690	64.22	415-1102	415-0704	114.45	415-1283	415-0889	75.35	415-1297	415-0903	95.70
5/8	5/8	3	6	415-1130	415-0732	69.31	415-1144	415-0748	126.532	415-1325	415-0931	79.17	415-1339	415-0947	97.29
3/4	3/4	2-1/4	5	415-1089	415-0691	88.70	415-1103	415-0705	198.702	415-1284	415-0890	104.92	415-1298	415-0904	132.90
3/4	3/4	3	6	415-1131	415-0733	103.01	415-1145	415-0749	143.66	415-1326	415-0932	112.27	415-1340	415-0948	151.56
3/4	3/4	4	7		415-0734	176.76		415-0750	212.058		415-0933	167.87		415-0949	209.83
7/8	7/8	2-1/4	5	415-1090	415-0692	168.14	415-1104	415-0706	156.744	415-1285	415-0891	180.36	415-1299	415-0905	221.63
7/8	7/8	3	6	415-1132	415-0735	183.43	415-1146	415-0751	229.278	415-1327	415-0934	198.70	415-1341	415-0950	247.62
1	1	2-1/4	5	415-1091	415-0693	121.45	415-1105	415-0707	11.032	415-1286	415-0892	207.61	415-1300	415-0906	255.30
1	1	3	6	415-1133	415-0736	174.86	415-1147	415-0752	214.886	415-1328	415-0935	200.30	415-1342	415-0951	257.87
1	1	4	7		415-0737	229.24		415-0753	281.372		415-0936	242.27		415-0952	288.53



Corner Radius Regular Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium

USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK	RADIUS
1/8"-1/2"	+0.000,-.002"	-.0001,-.0004"	+0.002,-.002"
5/8"-1"	+0.000,-.003	-.0001,-.0004	+0.002,-.002



CORNER RADIUS
2 FLUTE - 30°- UNCOATED



CORNER RADIUS
4 FLUTE - 30°- UNCOATED



CORNER RADIUS
2 FLUTE - 30°- ALTIM COATED



CORNER RADIUS
4 FLUTE - 30°- ALTIM COATED

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED			ALTIM COATED		
					2 FL	4 FL	Price	2 FL	4 FL	Price
1/8"	1/8"	1/2"	2-1/2"	.015"	415-1357	415-1453	\$6.55	415-1405	415-1501	\$10.19
1/8	1/8	1/2	2-1/2	.020	415-1358	415-1454	6.55	415-1406	415-1502	10.19
1/8	1/8	1/2	2-1/2	.030	415-1359	415-1455	6.55	415-1407	415-1503	10.18
3/16	3/16	5/8	2	.015	415-1360	415-1456	6.55	415-1408	415-1504	10.19
3/16	3/16	5/8	2	.020	415-1361	415-1457	6.55	415-1409	415-1505	10.19
3/16	3/16	5/8	2	.030	415-1362	415-1458	6.55	415-1410	415-1506	10.19
1/4	1/4	3/4	2-1/2	.015	415-1363	415-1459	9.55	415-1411	415-1507	13.99
1/4	1/4	3/4	2-1/2	.020	415-1364	415-1460	9.55	415-1412	415-1508	13.99
1/4	1/4	3/4	2-1/2	.030	415-1365	415-1461	9.55	415-1413	415-1509	13.99
1/4	1/4	3/4	2-1/2	.045	415-1366	415-1462	9.55	415-1414	415-1510	13.99
1/4	1/4	3/4	2-1/2	.060	415-1367	415-1463	9.55	415-1415	415-1511	13.99
5/16	5/16	13/16	2-1/2	.015	415-1368	415-1464	14.64	415-1416	415-1512	20.12
5/16	5/16	13/16	2-1/2	.020	415-1369	415-1465	14.64	415-1417	415-1513	20.12
5/16	5/16	13/16	2-1/2	.030	415-1370	415-1466	14.64	415-1418	415-1514	20.12
5/16	5/16	13/16	2-1/2	.045	415-1371	415-1467	14.64	415-1419	415-1515	20.12
5/16	5/16	13/16	2-1/2	.060	415-1372	415-1468	14.64	415-1420	415-1516	20.12
3/8	3/8	1	2-1/2	.015	415-1373	415-1469	19.60	415-1421	415-1517	21.80
3/8	3/8	1	2-1/2	.020	415-1374	415-1470	19.60	415-1422	415-1518	21.80
3/8	3/8	1	2-1/2	.030	415-1375	415-1471	19.60	415-1423	415-1519	21.80
3/8	3/8	1	2-1/2	.045	415-1376	415-1472	19.60	415-1424	415-1520	21.80
3/8	3/8	1	2-1/2	.060	415-1377	415-1473	19.60	415-1425	415-1521	21.80
1/2	1/2	1	3	.015	415-1378	415-1474	33.73	415-1426	415-1522	36.51
1/2	1/2	1	3	.020	415-1379	415-1475	33.73	415-1427	415-1523	36.51



Regular Length Micrograin Solid Carbide End Mills(cont.)



SIZE SHANK FLUTE LENGTH OAL				SQUARE END						BALL END					
				UNCOATED			ALTIM COATED			UNCOATED			ALTIM COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
5/64"	1/8"	1/4"	1-1/2"	415-0971	415-0567	\$5.36	415-1008	415-0606	\$7.24	415-1166	415-0772	\$6.03	415-1203	415-0809	\$8.15
3/32	1/8	3/8	1-1/2	415-0972	415-0568	4.27	415-1009	415-0607	5.96	415-1167	415-0773	6.34	415-1204	415-0810	8.55
7/64	1/8	3/8	1-1/2	415-0973	415-0569	4.91	415-1010	415-0608	6.64	415-1168	415-0774	6.34	415-1205	415-0811	8.55
1/8	1/8	1/2	1-1/2	415-0974	415-0570	4.52	415-1011	415-0609	5.54	415-1169	415-0775	5.81	415-1206	415-0812	7.84
9/64	3/16	9/16	2	415-0975	415-0571	6.62	415-1012	415-0610	8.95	415-1170	415-0776	8.51	415-1207	415-0813	11.49
5/32	3/16	9/16	2	415-0976	415-0572	6.68	415-1013	415-0611	7.74	415-1171	415-0777	8.51	415-1208	415-0814	11.49
11/64	3/16	5/8	2	415-0977	415-0573	6.34	415-1014	415-0612	8.55	415-1172	415-0778	8.51	415-1209	415-0815	11.49
3/16	3/16	5/8	2	415-0978	415-0574	6.17	415-1015	415-0613	7.74	415-1173	415-0779	7.66	415-1210	415-0816	10.33
13/64	1/4	5/8	2-1/2	415-0979	415-0575	9.00	415-1016	415-0614	11.80	415-1174	415-0780	9.93	415-1211	415-0817	14.07
7/32	1/4	5/8	2-1/2	415-0980	415-0576	9.18	415-1017	415-0615	10.68	415-1175	415-0781	9.93	415-1212	415-0818	14.07
15/64	1/4	3/4	2-1/2	415-0981	415-0577	10.39	415-1018	415-0616	13.38	415-1176	415-0782	9.93	415-1213	415-0819	14.07
1/4	1/4	3/4	2-1/2	415-0982	415-0578	7.62	415-1019	415-0617	10.68	415-1177	415-0783	10.40	415-1214	415-0820	13.40
17/64	5/16	3/4	2-1/2	415-0983	415-0579	13.73	415-1020	415-0618	17.65	415-1178	415-0784	14.07	415-1215	415-0821	18.09
9/32	5/16	3/4	2-1/2	415-0984	415-0580	13.73	415-1021	415-0619	17.65	415-1179	415-0785	14.10	415-1216	415-0822	18.12
19/64	5/16	13/16	2-1/2	415-0985	415-0581	13.73	415-1022	415-0620	17.65	415-1180	415-0786	15.32	415-1217	415-0823	20.10
5/16	5/16	13/16	2-1/2	415-0986	415-0582	9.91	415-1023	415-0621	12.78	415-1181	415-0787	12.96	415-1218	415-0824	16.67
21/64	3/8	1	2-1/2	415-0987	415-0583	15.40	415-1024	415-0622	19.80	415-1182	415-0788	17.81	415-1219	415-0825	24.04
11/32	3/8	1	2-1/2	415-0988	415-0584	15.40	415-1025	415-0623	19.80	415-1183	415-0789	18.70	415-1220	415-0826	24.04
23/64	3/8	1	2-1/2	415-0989	415-0585	15.40	415-1026	415-0624	19.80	415-1184	415-0790	17.81	415-1221	415-0827	24.04
3/8	3/8	1	2-1/2	415-0990	415-0586	11.82	415-1027	415-0625	14.62	415-1185	415-0791	13.87	415-1222	415-0828	19.61
25/64	7/16	1	2-3/4	415-0991	415-0587	20.15	415-1028	415-0626	26.01	415-1186	415-0792	24.12	415-1223	415-0829	31.08
13/32	7/16	1	2-3/4	415-0992	415-0588	20.15	415-1029	415-0627	26.01	415-1187	415-0793	24.12	415-1224	415-0830	31.08
27/64	7/16	1	2-3/4	415-0993	415-0589	20.80	415-1030	415-0628	26.87	415-1188	415-0794	24.12	415-1225	415-0831	31.08
7/16	7/16	1	2-3/4	415-0994	415-0590	18.14	415-1031	415-0629	22.34	415-1189	415-0795	20.54	415-1226	415-0832	26.47
29/64	1/2	1	3	415-0995	415-0591	29.96	415-1032	415-0630	38.35	415-1190	415-0796	31.79	415-1227	415-0833	41.01
15/32	1/2	1	3	415-0996	415-0592	29.96	415-1033	415-0631	38.35	415-1191	415-0797	31.79	415-1228	415-0834	41.01
31/64	1/2	1	3	415-0997	415-0593	29.96	415-1034	415-0632	38.35	415-1192	415-0798	31.79	415-1229	415-0835	41.01
1/2	1/2	1	3	415-0998	415-0594	21.78	415-1035	415-0633	27.19	415-1193	415-0799	28.17	415-1230	415-0836	36.29
1/2	1/2	1-1/4	3		415-0595	21.78		415-0634	27.19						
9/16	9/16	1-1/4	3-1/2	415-0999	415-0596	41.17	415-1036	415-0635	54.36	415-1194	415-0800	42.92	415-1231	415-0837	52.82
5/8	5/8	1-1/4	3-1/2	415-1000	415-0597	41.65	415-1037	415-0636	53.09	415-1195	415-0801	45.53	415-1232	415-0838	58.69
3/4	3/4	1-1/2	4	415-1001	415-0598	58.51	415-1038	415-0637	75.35	415-1196	415-0802	67.09	415-1233	415-0839	87.43
7/8	7/8	1-1/2	4	415-1002	415-0599	107.00	415-1039	415-0638	135.42	415-1197	415-0803	129.92	415-1234	415-0840	165.07
1	1	1-1/2	4	415-1003	415-0600	95.70	415-1040	415-0639	122.40	415-1198	415-0804	119.84	415-1235	415-0841	154.42
1-1/4	1-1/4	2	4-1/4		415-0601	336.28		415-0640	382.13						



Long and Extra Long Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30



LONG LENGTH 4 FLUTE-SQUARE END - UNCOATED



LONG LENGTH 4 FLUTE-SQUARE END - ALTIM COATED



EXTRA LONG LENGTH 4 FLUTE-SQUARE END - UNCOATED



EXTRA LONG LENGTH 4 FLUTE-SQUARE END - ALTIM COATED



LONG LENGTH 4 FLUTE-BALL NOSE - UNCOATED



LONG LENGTH 4 FLUTE-BALL NOSE - ALTIM COATED



EXTRA LONG LENGTH 4 FLUTE-BALL NOSE - UNCOATED



EXTRA LONG LENGTH 4 FLUTE-BALL NOSE - ALTIM COATED



LONG LENGTH 2 FLUTE-SQUARE END - UNCOATED



LONG LENGTH 2 FLUTE-SQUARE END - ALTIM COATED



EXTRA LONG LENGTH 2 FLUTE-SQUARE END - UNCOATED



EXTRA LONG LENGTH 2 FLUTE-SQUARE END - ALTIM COATED



LONG LENGTH 2 FLUTE-BALL NOSE - UNCOATED



LONG LENGTH 2 FLUTE-BALL NOSE - ALTIM COATED



EXTRA LONG LENGTH 2 FLUTE-BALL NOSE - UNCOATED



EXTRA LONG LENGTH 2 FLUTE-BALL NOSE - ALTIM COATED

END MILLS • Solid Carbide



Regular Length Double End Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FLUTE - SQUARE
END - 30° - UNCOATED



2 FLUTE - SQUARE
END - 30° - ALTIN COATED



4 FLUTE - SQUARE
END - 30° - UNCOATED



4 FLUTE - SQUARE
END - 30° - ALTIN COATED



2 FLUTE - BALL
NOSE- 30° - UNCOATED



2 FLUTE - BALL
NOSE - 30° - ALTIN COATED



4 FLUTE - BALL
NOSE- 30° - UNCOATED



4 FLUTE - BALL
NOSE - 30° - ALTIN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+ .000, -.002"	-.0001, -.0004"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTIN COATED			UNCOATED			ALTIN COATED		
				2 FL	4 FL	PRICE	2 FL	4 FL	PRICE	2 FL	4 FLUTE	PRICE	2 FL	4 FL	PRICE
1/8"	3/8"	3/8"	3-1/8"	415-1837	415-1881	\$14.93	415-1848	415-1892	\$28.22	415-1859	415-1903	\$24.88	415-1870	415-1914	\$33.57
5/32	3/8	7/16	3-1/4	415-1838	415-1882	14.46	415-1849	415-1893	27.33	415-1860	415-1904	24.88	415-1871	415-1915	33.57
3/16	3/8	1/2	3-1/4	415-1839	415-1883	14.46	415-1850	415-1894	27.33	415-1861	415-1905	24.88	415-1872	415-1916	33.57
7/32	3/8	9/16	3-1/2	415-1840	415-1884	15.28	415-1851	415-1895	28.87	415-1862	415-1906	24.88	415-1873	415-1917	33.57
1/4	3/8	5/8	3-1/2	415-1841	415-1885	14.87	415-1852	415-1896	28.11	415-1863	415-1907	24.88	415-1874	415-1918	33.57
9/32	3/8	11/16	3-1/2	415-1842	415-1886	16.39	415-1853	415-1897	30.98	415-1864	415-1908	28.56	415-1875	415-1919	38.56
5/16	3/8	3/4	3-1/2	415-1843	415-1887	16.39	415-1854	415-1898	30.98	415-1865	415-1909	28.56	415-1876	415-1920	38.56
11/32	3/8	3/4	3-1/2	415-1844	415-1888	16.39	415-1855	415-1899	30.98	415-1866	415-1910	28.56	415-1877	415-1921	38.56
3/8	3/8	3/4	3-1/2	415-1845	415-1889	16.39	415-1856	415-1900	30.98	415-1867	415-1911	28.56	415-1878	415-1922	38.56
7/16	1/2	7/8	4	415-1846	415-1890	24.39	415-1857	415-1901	46.10	415-1868	415-1912	38.86	415-1879	415-1923	52.47
1/2	1/2	1	4	415-1847	415-1891	27.40	415-1858	415-1902	51.79	415-1869	415-1913	42.25	415-1880	415-1924	57.04



Metric Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



METRIC 4 FLUTE SQUARE
END- 30° - UNCOATED



METRIC 4 FLUTE SQUARE
END- 30° - ALTIN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+ .000, -.002"	-.0001, -.0004"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END			
				UNCOATED 4 FL	Price	ALTIN COATED 4 FL	Price
3.5"	4"	12"	50"	415-0531	\$8.58	415-0547	\$10.72
4.0	4	14	50	415-0532	8.58	415-0548	10.72
4.5	6	16	50	415-0533	10.49	415-0549	13.12
5.0	6	16	50	415-0534	10.49	415-0550	13.12
6.0	6	19	50	415-0535	10.96	415-0551	13.71
7.0	8	19	63	415-0536	11.93	415-0552	14.91
8.0	8	20	63	415-0537	12.40	415-0553	15.50
9.0	10	22	75	415-0538	18.12	415-0554	22.65
10.0	10	22	75	415-0539	22.89	415-0555	28.62
11.0	12	25	75	415-0540	25.27	415-0556	31.60
12.0	12	25	75	415-0541	26.24	415-0557	32.79
14.0	14	32	89	415-0542	44.35	415-0558	55.44
16.0	16	32	89	415-0543	50.55	415-0559	63.20
18.0	18	38	100	415-0544	69.15	415-0560	86.44
20.0	20	38	100	415-0545	109.69	415-0561	137.10
25.0	25	38	100	415-0546	143.07	415-0562	178.84



Stub Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FLUTE - SQUARE
END - 30° - UNCOATED



2 FLUTE - SQUARE
END - 30° - ALTIN COATED



4 FLUTE - SQUARE
END - 30° - UNCOATED



4 FLUTE - SQUARE
END - 30° - ALTIN COATED



2 FLUTE - BALL
NOSE - 30° - UNCOATED



2 FLUTE - BALL
NOSE - 30° - ALTIN COATED



4 FLUTE - BALL
NOSE - 30° - UNCOATED



4 FLUTE - BALL
NOSE - 30° - ALTIN COATED

TOLERANCES	DIAMETER	SHANK
1/64"-1/2"	+0.000,-.002"	-.0001,-.0004"
5/8"-3/4"	+0.000,-.003	-.0001,-.0004"

SIZE SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END						
			UNCOATED			ALTIN COATED			UNCOATED			ALTIN COATED			
			2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price	
1/32"	1/8"	1/16"	1-1/2"	415-0396	415-0464	\$4.93	415-0413	415-0481	\$6.40	415-0430	415-0498	\$6.43	415-0447	415-0515	\$8.22
3/64	1/8	3/32	1-1/2"	415-0397	415-0465	4.93	415-0414	415-0482	6.40	415-0431	415-0499	6.43	415-0448	415-0516	8.22
1/16	1/8	1/8	1-1/2"	415-0398	415-0466	3.70	415-0415	415-0483	4.82	415-0432	41 5-0500	4.83	415-0449	415-0517	6.17
5/64	1/8	1/8	1-1/2"	415-0399	415-0467	6.24	415-0416	415-0484	7.81	415-0433	415-0501	7.83	415-0450	415-0518	9.77
3/32	1/8	3/16	1-1/2"	415-0400	415-0468	3.70	415-0417	415-0485	4.82	415-0434	415-0502	4.83	415-0451	415-0519	6.17
1/8	1/8	1/4	1-1/2"	415-0401	415-0469	3.53	415-0418	415-0486	4.61	415-0435	415-0503	4.58	415-0452	415-0520	5.87
5/32	3/16	5/16	2	415-0402	415-0470	5.87	415-0419	415-0487	7.25	415-0436	415-0504	7.63	415-0453	415-0521	9.77
3/16	3/16	3/8	2	415-0403	415-0471	5.52	415-0420	415-0488	6.83	415-0437	415-0505	7.15	415-0454	415-0522	9.16
7/32	1/4	7/16	2	415-0404	415-0472	7.41	415-0421	415-0489	9.20	415-0438	415-0506	9.62	415-0455	415-0523	12.31
1/4	1/4	1/2	2	415-0405	415-0473	6.51	415-0422	415-0490	8.08	415-0439	415-0507	8.43	415-0456	415-0524	10.78
5/16	5/16	1/2	2	415-0406	415-0474	8.79	415-0423	415-0491	11.42	415-0440	415-0508	11.40	415-0457	415-0525	14.59
3/8	3/8	5/8	2	415-0407	415-0475	11.34	415-0424	415-0492	14.04	415-0441	415-0509	14.73	415-0458	415-0526	17.59
7/16	7/16	5/8	2-1/2"	415-0408	415-0476	14.15	415-0425	415-0493	17.56	415-0442	415-0510	18.41	415-0459	415-0527	22.44
1/2	1/2	5/8	2-1/2"	415-0409	415-0477	17.86	415-0426	415-0494	22.18	415-0443	415-0511	23.20	415-0460	415-0528	29.69
5/8	5/8	3/4	3	415-0410	415-0478	37.81	415-0427	415-0495	44.67	415-0444	415-0512	44.30	415-0461	415-0529	54.24
3/4	3/4	1	3	415-0411	415-0479	52.93	415-0428	415-0496	65.49	415-0445	415-0513	67.35	415-0462	415-0530	86.23



Stub Length Double End Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FLUTE - SQUARE
END - 30° - UNCOATED



2 FLUTE - SQUARE
END - 30° - ALTIN COATED



4 FLUTE - SQUARE
END - 30° - UNCOATED



4 FLUTE - SQUARE
END - 30° - ALTIN COATED



2 FLUTE - BALL
NOSE - 30° - UNCOATED



2 FLUTE - BALL
NOSE - 30° - ALTIN COATED



4 FLUTE - BALL
NOSE - 30° - UNCOATED



4 FLUTE - BALL
NOSE - 30° - ALTIN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+0.000,-.002"	-.0001,-.0004"

SIZE SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END						
			UNCOATED			ALTIN COATED			UNCOATED			ALTIN COATED			
			2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price	
1/16"	1/8"	1/8"	1-1/2"	415-1925	415-1969	\$6.85	415-1936	415-1980	\$9.25	415-1947	415-1991	\$11.90	415-1958	415-2002	\$11.56
3/32	1/8	3/16	1-1/2"	415-1926	415-1970	7.06	415-1937	415-1981	9.25	415-1948	415-1992	8.806	415-1959	415-2003	11.90
1/8	1/8	1/4	1-1/2"	415-1927	415-1971	5.68	415-1938	415-1982	7.67	415-1949	415-1993	7.112	415-1960	415-2004	9.60
5/32	3/16	5/16	2	415-1928	415-1972	7.66	415-1939	415-1983	10.33	415-1950	415-1994	9.576	415-1961	415-2005	12.92
3/16	3/16	3/8	2	415-1929	415-1973	7.66	415-1940	415-1984	10.33	415-1951	415-1995	9.576	415-1962	415-2006	12.92
7/32	1/4	1/2	2-1/2"	415-1930	415-1974	10.50	415-1941	415-1985	14.18	415-1952	415-1996	13.132	415-1963	415-2007	17.72
1/4	1/4	1/2	2-1/2"	415-1931	415-1975	10.50	415-1942	415-1986	14.18	415-1953	415-1997	13.132	415-1964	415-2008	17.72
5/16	5/16	1/2	2-1/2"	415-1932	415-1976	14.20	415-1943	415-1987	17.42	415-1954	415-1998	17.738	415-1965	415-2009	21.77
3/8	3/8	9/12	2-1/2"	415-1933	415-1977	15.67	415-1944	415-1988	19.22	415-1955	415-1999	19.586	415-1966	415-2010	24.02
7/16	7/16	9/12	2-3/4"	415-1934	415-1978	22.13	415-1945	415-1989	27.17	415-1956	415-2000	27.664	415-1967	415-2011	33.96
1/2	1/2	5/8	3	415-1935	415-1979	27.09	415-1946	415-1990	36.58	415-1957	415-2001	33.866	415-1968	415-2012	45.72



2 FLUTE - BALL NOSE - UNCOATED



2 FLUTE - BALL NOSE - ALTiN COATED

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTiN COATED			UNCOATED			ALTiN COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
0.009"	0.125"	0.027"	1-1/2"	415-2017		\$17.25	415-2071		\$20.69	415-2125		\$21.56	415-2179		\$25.87
0.010	0.125	0.030	1-1/2	415-2018	415-2445	17.25	415-2072	415-2494	20.69	415-2126	415-2543	21.56	415-2180	415-2592	25.87
0.011	0.125	0.033	1-1/2	415-2019	415-2446	15.43	415-2073	415-2495	18.52	415-2127	415-2544	19.31	415-2181	415-2593	23.17
0.012	0.125	0.036	1-1/2	415-2020	415-2447	15.43	415-2074	415-2496	18.52	415-2128	415-2545	19.31	415-2182	415-2594	23.17
0.013	0.125	0.039	1-1/2	415-2021	415-2448	12.77	415-2075	415-2497	15.33	415-2129	415-2546	15.99	415-2183	415-2595	19.18
0.014	0.125	0.042	1-1/2	415-2022	415-2449	12.77	415-2076	415-2498	15.33	415-2130	415-2547	15.99	415-2184	415-2596	19.18
0.015	0.125	0.045	1-1/2	415-2023	415-2450	10.79	415-2077	415-2499	12.95	415-2131	415-2548	13.50	415-2185	415-2597	16.18
0.016	0.125	0.048	1-1/2	415-2024	415-2451	10.79	415-2078	415-2500	12.95	415-2132	415-2549	13.50	415-2186	415-2598	16.18
0.017	0.125	0.051	1-1/2	415-2025	415-2452	10.79	415-2079	415-2501	12.95	415-2133	415-2550	13.50	415-2187	415-2599	16.18
0.018	0.125	0.054	1-1/2	415-2026	415-2453	10.79	415-2080	415-2502	12.95	415-2134	415-2551	13.50	415-2188	415-2600	16.18
0.019	0.125	0.057	1-1/2	415-2027	415-2454	10.79	415-2081	415-2503	12.95	415-2135	415-2552	13.50	415-2189	415-2601	16.18
0.020	0.125	0.060	1-1/2	415-2028	415-2455	9.81	415-2082	415-2504	11.77	415-2136	415-2553	12.26	415-2190	415-2602	14.71
0.021	0.125	0.063	1-1/2	415-2029	415-2456	9.81	415-2083	415-2505	11.77	415-2137	415-2554	12.26	415-2191	415-2603	14.71
0.022	0.125	0.066	1-1/2	415-2030	415-2457	9.81	415-2084	415-2506	11.77	415-2138	415-2555	12.26	415-2192	415-2604	14.71
0.023	0.125	0.069	1-1/2	415-2031	415-2458	9.81	415-2085	415-2507	11.77	415-2139	415-2556	12.26	415-2193	415-2605	14.71
0.024	0.125	0.072	1-1/2	415-2032	415-2459	9.81	415-2086	415-2508	11.77	415-2140	415-2557	12.26	415-2194	415-2606	14.71
0.025	0.125	0.075	1-1/2	415-2033	415-2460	9.81	415-2087	415-2509	11.77	415-2141	415-2558	12.26	415-2195	415-2607	14.71
0.026	0.125	0.078	1-1/2	415-2034	415-2461	9.21	415-2088	415-2510	11.05	415-2142	415-2559	11.51	415-2196	415-2608	13.80
0.027	0.125	0.081	1-1/2	415-2035	415-2462	9.21	415-2089	415-2511	11.05	415-2143	415-2560	11.51	415-2197	415-2609	13.80
0.028	0.125	0.084	1-1/2	415-2036	415-2463	9.21	415-2090	415-2512	11.05	415-2144	415-2561	11.51	415-2198	415-2610	13.80
0.029	0.125	0.087	1-1/2	415-2037	415-2464	9.21	415-2091	415-2513	11.05	415-2145	415-2562	11.51	415-2199	415-2611	13.80
0.030	0.125	0.090	1-1/2	415-2038	415-2465	9.21	415-2092	415-2514	11.05	415-2146	415-2563	11.51	415-2200	415-2612	13.80
0.031	0.125	0.093	1-1/2	415-2039	415-2466	8.62	415-2093	415-2515	10.35	415-2147	415-2564	10.79	415-2201	415-2613	12.95
0.032	0.125	0.096	1-1/2	415-2040	415-2467	8.62	415-2094	415-2516	10.35	415-2148	415-2565	10.79	415-2202	415-2614	12.95
0.033	0.125	0.099	1-1/2	415-2041	415-2468	8.62	415-2095	415-2517	10.35	415-2149	415-2566	10.79	415-2203	415-2615	12.95
0.034	0.125	0.102	1-1/2	415-2042	415-2469	8.62	415-2096	415-2518	10.35	415-2150	415-2567	10.79	415-2204	415-2616	12.95
0.035	0.125	0.105	1-1/2	415-2043	415-2470	8.62	415-2097	415-2519	10.35	415-2151	415-2568	10.79	415-2205	415-2617	12.95
0.036	0.125	0.108	1-1/2	415-2044	415-2471	8.62	415-2098	415-2520	10.35	415-2152	415-2569	10.79	415-2206	415-2618	12.95
0.037	0.125	0.111	1-1/2	415-2045	415-2472	8.62	415-2099	415-2521	10.35	415-2153	415-2570	10.79	415-2207	415-2619	12.95
0.038	0.125	0.114	1-1/2	415-2046	415-2473	8.62	415-2100	415-2522	10.35	415-2154	415-2571	10.79	415-2208	415-2620	12.95
0.039	0.125	0.117	1-1/2	415-2047	415-2474	8.62	415-2101	415-2523	10.35	415-2155	415-2572	10.79	415-2209	415-2621	12.95
0.040	0.125	0.120	1-1/2	415-2048	415-2475	8.62	415-2102	415-2524	10.35	415-2156	415-2573	10.79	415-2210	415-2622	12.95
0.041	0.125	0.123	1-1/2	415-2049	415-2476	8.62	415-2103	415-2525	10.35	415-2157	415-2574	10.79	415-2211	415-2623	12.95
0.042	0.125	0.126	1-1/2	415-2050	415-2477	8.62	415-2104	415-2526	10.35	415-2158	415-2575	10.79	415-2212	415-2624	12.95
0.043	0.125	0.129	1-1/2	415-2051	415-2478	8.62	415-2105	415-2527	10.35	415-2159	415-2576	10.79	415-2213	415-2625	12.95
0.044	0.125	0.132	1-1/2	415-2052	415-2479	8.41	415-2106	415-2528	10.11	415-2160	415-2577	10.53	415-2214	415-2626	12.64
0.045	0.125	0.135	1-1/2	415-2053	415-2480	8.41	415-2107	415-2529	10.11	415-2161	415-2578	10.53	415-2215	415-2627	12.64
0.046	0.125	0.138	1-1/2	415-2054	415-2481	8.41	415-2108	415-2530	10.11	415-2162	415-2579	10.53	415-2216	415-2628	12.64
0.047	0.125	0.141	1-1/2	415-2055	415-2482	8.41	415-2109	415-2531	10.11	415-2163	415-2580	10.53	415-2217	415-2629	12.64
0.048	0.125	0.144	1-1/2	415-2056	415-2483	8.41	415-2110	415-2532	10.11	415-2164	415-2581	10.53	415-2218	415-2630	12.64
0.049	0.125	0.147	1-1/2	415-2057	415-2484	8.41	415-2111	415-2533	10.11	415-2165	415-2582	10.53	415-2219	415-2631	12.64
0.050	0.125	0.150	1-1/2	415-2058	415-2485	8.41	415-2112	415-2534	10.11	415-2166	415-2583	10.53	415-2220	415-2632	12.64
0.051	0.125	0.153	1-1/2	415-2059	415-2486	8.41	415-2113	415-2535	10.11	415-2167	415-2584	10.53	415-2221	415-2633	12.64
0.052	0.125	0.156	1-1/2	415-2060	415-2487	8.41	415-2114	415-2536	10.11	415-2168	415-2585	10.53	415-2222	415-2634	12.64
0.053	0.125	0.159	1-1/2	415-2061	415-2488	8.41	415-2115	415-2537	10.11	415-2169	415-2586	10.53	415-2223	415-2635	12.64
0.054	0.125	0.162	1-1/2	415-2062	415-2489	8.41	415-2116	415-2538	10.11	415-2170	415-2587	10.53	415-2224	415-2636	12.64
0.055	0.125	0.165	1-1/2	415-2063	415-2490	8.41	415-2117	415-2539	10.11	415-2171	415-2588	10.53	415-2225	415-2637	12.64
0.056	0.125	0.168	1-1/2	415-2064	415-2491	8.41	415-2118	415-2540	10.11	415-2172	415-2589	10.53	415-2226	415-2638	12.64
0.057	0.125	0.171	1-1/2	415-2065	415-2492	8.41	415-2119	415-2541	10.11	415-2173	415-2590	10.53	415-2227	415-2639	12.64
0.058	0.125	0.174	1-1/2	415-2066	415-2493	8.41	415-2120	415-2542	10.11	415-2174	415-2591	10.53	415-2228	415-2640	12.64
0.059	0.125	0.177	1-1/2	415-2229	415-2641	8.41	415-2283	415-2695	10.11	415-2337	415-2749	10.53	415-2391	415-2803	12.64

SHARS Solid Carbide Ball Nose End Mills



Import

- Double end
- Center cutting

Dia	Shank	Flute Length	OAL	2 Flute	4 Flute	Price(D)
1/16"	1/8"	3/16"	1-1/2"	404-5618	404-5608	\$7.15
3/32	1/8	3/8	1-1/2	404-5621	404-5622	8.30
1/8	1/8	1/2	1-1/2	404-5619	404-5609	6.75
5/32	3/16	1/2	2	404-5620	404-5610	9.25
3/16	3/16	1/2	2	404-5601	404-5611	9.25
7/32	1/4	1/2	2-1/2	404-5602	404-5612	12.75
1/4	1/4	5/8	2-1/2	404-5603	404-5613	12.95
5/16	5/16	5/8	2-1/2	404-5604	404-5614	17.50
3/8	3/8	3/4	2-1/2	404-5605	404-5615	19.50
7/16	7/16	3/4	3	404-5606	404-5616	28.75
1/2	1/2	3/4	3	404-5607	404-5617	28.75

SHARS Solid Carbide Ball Nose End Mills



Import

- Single end
- Center cutting

Dia	Shank	Flute Length	OAL	2 Flute	4 Flute	Price(B)
1/16"	1/8"	3/16"	1-1/2"	404-5748	404-5734	\$5.10
3/32	1/8	3/16	1-1/2	404-5755	404-5754	5.10
1/8	1/8	1/2	1-1/2	404-5749	404-5736	4.30
5/32	3/16	9/16	2	404-5750	404-5737	6.10
3/16	3/16	5/8	2	404-5751	404-5738	7.30
1/4	1/4	3/4	2-1/2	404-5753	404-5740	7.95
5/16	5/16	3/4	2-1/2	404-5724	404-5741	11.25
3/8	3/8	7/8	2-1/2	404-5725	404-5742	13.75
7/16	7/16	1	3	404-5726	404-5743	20.85
1/2	1/2	1	3	404-5727	404-5744	22.90
5/8	5/8	1-1/4	3-1/2	404-5728	404-5745	43.60
3/4	3/4	1-1/2	4	404-5729	404-5746	65.50
1	1	1-1/2	4	404-5730	404-5747	109.95

SHARS HSS T-Slot Cutters



Bolt Size	Cutter Dia.	Cutter Thick	Shank Dia.	OAL	Order No.	Price(D)
1/4"	9/16"	15/64"	1/2"	2-19/32"	404-1700	\$11.60
5/16	21/32	17/64	1/2	2-11/16	404-1701	13.20
3/8	25/32	21/64	3/4	3-1/4	404-1702	17.40
1/2	31/32	25/64	3/4	3-7/16	404-1703	21.95
5/8	1-1/4	31/64	1	3-15/16	404-1704	28.00
3/4	1-15/32	5/8	1	4-7/16	404-1705	31.00
1	1-27/32	53/64	1-1/4	4-13/16	404-1706	79.95
1-1/4	2-7/32	1-3/32	1-1/4	5-3/8	404-1707	117.95
1-1/2	2-21/32	1-11/32	1-1/4	5-29/32	404-1708	119.95

SHARS Carbide Serrated Edge End Mills



- Must run at a high speed with a high rate of feed.
- Removes metal with the speed of a hog mill and with the strength of carbide
- Weldon shank

Dia.	Shank	Flute Length	OAL	Flutes	Order No.	Price(B)
3/4"	3/4"	1-5/8"	4-1/8"	3	404-5760	\$33.50
3/4	3/4	1-5/8	5-1/8	3	404-5761	35.50
1	3/4	2	4-1/2	4	404-5762	42.75
1	3/4	2	6-1/2	4	404-5763	45.05
1	1	2	6-1/2	4	404-5764	46.35
1-1/4	1-1/4	2	4-3/4	4	404-5765	52.85
1-1/4	1-1/4	4	6-1/2	4	404-5766	79.00
1-3/4	1-1/4	2	4-3/4	4	404-5767	89.00
2	1-1/4	2	4-3/4	6	404-5768	90.00
2	2	2	6-3/4	6	404-5769	96.00
2	2	4	8/3/4	6	404-5770	115.95

SHARS 3xD Miniature Micrograin Solid Carbide End Mills

3 x Diameter • 2&4 Flute • Square & Ball End • Uncoated & ALTiN Coated

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FLUTE - SQUARE END - UNCOATED



2 FLUTE - BALL NOSE - UNCOATED



2 FLUTE - SQUARE END - ALTiN COATED



2 FLUTE - BALL NOSE - ALTiN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+.0005,-.0005"	-.0001,-.0003"

SIZE SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END						
			UNCOATED			ALTiN COATED			UNCOATED			ALTiN COATED			
			2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price	
0.005"	0.125"	0.015"	1-1/2"	415-2013		\$19.24	415-2067		\$23.09	415-2121		\$24.05	415-2175		\$28.87
0.006	0.125	0.018	1-1/2	415-2014		19.24	415-2068		23.09	415-2122		24.05	415-2176		28.87
0.007	0.125	0.021	1-1/2	415-2015		19.24	415-2069		23.09	415-2123		24.05	415-2177		28.87
0.008	0.125	0.024	1-1/2	415-2016		19.24	415-2070		23.09	415-2124		24.05	415-2178		28.87

END MILLS • Solid Carbide

SHARS 2 & 4 Flute 90° Point Solid Carbide & M42 Drill Mills

- Drill/Mill can be used for drilling, slotting, chamfering, and profile milling
- Made from premium submicron grain carbide
- Made in USA



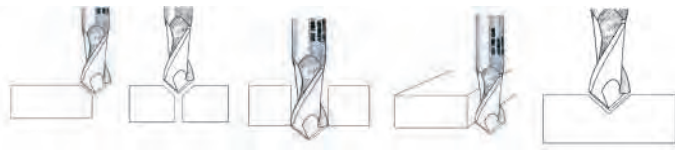
Solid Carbide

Dia	Shank	LOC	OAL	2 Flute	4 Flute	Price(B)
1/16	1/8	3/16	1-1/2	414-2558	414-2588	\$7.37
3/32	1/8	3/8	1-1/2	414-2559	414-2589	7.37
1/8	1/8	1/2	1-1/2	414-2560	414-2590	6.86
3/16	3/16	5/8	2	414-2561	414-2591	9.85
1/4	1/4	3/4	2-1/2	414-2562	414-2592	12.62
5/16	5/16	13/16	2-1/2	414-2563	414-2593	15.97
3/8	3/8	1	2-1/2	414-2564	414-2594	19.88
7/16	7/16	1	2-3/4	414-2565	414-2595	27.12
1/2	1/2	1	3	414-2566	414-2596	32.95
5/8	5/8	1-1/4	3-1/2	414-2567	414-2597	63.51
3/4	3/4	1-1/2	4	414-2568	414-2598	93.76

Carbide Cutting Diameter Tolerance +.000"/-.002"
Cobalt Cutting Diameter Tolerance +.0015"/-.0000"

M42 8% Cobalt

Dia	Shank	LOC	OAL	2 Flute	Price(B)
1/8	3/8	3/8	2-5/16	414-3749	\$14.98
1/4	3/8	5/8	2-7/16	414-3750	12.82
5/16	3/8	23/32	2-15/32	414-3751	12.82
3/8	3/8	3/4	2-1/2	414-3752	12.82
7/16	3/8	1-1/32	2-23/32	414-3753	19.44
1/2	1/2	1-1/4	3-1/4	414-3754	18.28
9/16	1/2	1-13/32	3-13/32	414-3755	24.53
5/8	5/8	1-5/8	3-3/4	414-3756	26.80
11/16	5/8	1-21/32	3-25/32	414-3757	31.11
3/4	3/4	1-11/16	3-15/16	414-3758	30.80
13/16	3/4	1-29/32	4-5/32	414-3759	40.35
7/8	3/4	1-15/16	4-3/16	414-3760	41.34
1	3/4	2	4-1/4	414-3761	46.06



Chamfer Countersink Drilling Sidemilling Spotting

- AlTiN coated drill mills also available
- Also available in 60, 82, 90, 100 and 120 degree points

SHARS 45° & 60° HSS Dovetail Cutters



- For cutting dovetails and angles in materials
- Designed to take the place of arbor & threaded hole type cutters
- Can be used in manual and CNC machinery

Cutter Dia.	Shank Dia.	OAL	Cutter	45° Model	60° Model	Price(D)
3/8"	3/8"	2-1/8"	3/16"	404-1611	404-1621	\$11.49
1/2	3/8	2-1/8	1/4	404-1612	404-1622	8.99
3/4	3/8	2-1/8	5/16	404-1613	404-1623	12.69
1-3/8	5/8	2-7/8	9/16	404-1614	404-1624	29.95
1-7/8	7/8	3-1/4	13/16	404-1615	404-1625	41.19
2-1/4	1	3-3/4	1-1/16	404-1616	404-1626	51.95
4pc.set 3/8,1/2,3/4,1-3/8"				404-1610	404-1620	63.95

SHARS 2 & 4 Flute Micrograin Solid Carbide End Mills

Center cutting • Square Nose • Single or Double End • Uncoated or TiAlN



Single End

Mill	Shank	Flute Length	OAL	Uncoated 2 Flutes	Uncoated 4 Flutes	Price(B)
1/16"	1/8"	3/16"	1-1/2"	404-5685	404-5701	\$3.50
3/32	1/8	5/16	1-1/2	404-5732	404-5733	3.10
1/8	1/8	1/2	1-1/2	404-5686	404-5702	2.95
5/32	3/16	9/16	2	404-5687	404-5703	6.10
3/16	3/16	5/8	2	404-5688	404-5704	5.50
7/32	1/4	5/8	2-1/2	404-5689	404-5705	7.45
1/4	1/4	3/4	2-1/2	404-5690	404-5706	6.50
5/16	5/16	13/16	2-1/2	404-5691	404-5707	8.30
3/8	3/8	7/8	2-1/2	404-5692	404-5708	11.50
7/16	7/16	7/8	2-1/2	404-5693	404-5709	14.35
1/2	1/2	1	3	404-5694	404-5710	17.90
5/8	5/8	1-1/4	3-1/2	404-5695	404-5711	36.50
3/4	3/4	1-1/2	4	404-5696	404-5712	55.95
1	1	1-1/2	4	404-5697	404-5713	79.95



Import

TiAlN coated, 4FL.

Single End



Dia.	Shank	LOC	OAL	TiAlN	Price(E)
1/8"	1/8"	1/2"	1-1/2"	404-9420	\$4.50
3/16	3/16	5/8	2	404-9421	6.30
1/4	1/4	3/4	2-1/2	404-9422	9.50
5/16	5/16	13/16	2-1/2	404-9423	13.10
3/8	3/8	7/8	2-1/2	404-9424	19.40
1/2	1/2	1	3	404-9425	23.95

Double End

Mill	Shank	Flute	OAL	2 Flutes	4 Flutes	Price(B)
1/16"	1/8"	1/8"	1-1/2"	404-5788	404-5714	\$5.75
1/8	1/8	1/4	1-1/2	404-5789	404-5715	5.50
5/32	3/16	5/16	2	404-5790	404-5716	7.90
3/16	3/16	3/8	2	404-5791	404-5717	7.90
7/32	1/4	1/2	2-1/2	404-5792	404-5718	9.00
1/4	1/4	1/2	2-1/2	404-5793	404-5719	9.00
5/16	5/16	1/2	2-1/2	404-5794	404-5720	13.50
3/8	3/8	1/2	2-1/2	404-5795	404-5721	14.95
7/16	1/2	5/8	3	404-5796	404-5722	23.80
1/2	1/2	5/8	3	404-5797	404-5723	27.95

SHARS Rougher Finisher High Performance Micrograin Solid Carbide End Mills

-Corner radius allows for higher feed rate
For detail speed and feed rate chart see www.shars.com

Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK	RADIUS
ALL SIZES	+ .000, - .002"	- .0001, - .0004"	+ .002, - .002"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END				
				UNCOATED		RADIUS	ALTIM COATED	
				4 FL	Price		4 FL	Price
1/4"	1/4"	3/4"	2-1/2"	415-0326	\$29.95	.020"	415-0333	\$37.44
5/16	5/16	13/16	2-1/2"	415-0327	32.42	.020	415-0334	40.53
3/8	3/8	7/8	2-1/2"	415-0328	35.24	.020	415-0335	44.04
1/2	1/2	1-1/4	3	415-0329	40.73	.040	415-0336	50.92
5/8	5/8	1-5/8	3-1/2"	415-0330	81.10	.040	415-0337	101.37
3/4	3/4	1-5/8	4	415-0331	108.36	.040	415-0338	135.45
1	1	2	4	415-0332	176.83	.040	415-0339	221.05



SHARS Thread Mill High Performance Micrograin Solid Carbide End Mills

UN, NPT PIPE, NPTF PIPE, Metric Thread-Internal/External
For detail speed and feed rate chart see www.shars.com
For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



THERADMILL CUTTING DIAMETER TOLERANCE	+ .002, - .002"
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UN THREADS - ALTIM COATED

SIZE	SHANK DIA	CUTTING DIA.	THREAD LENGTH	OVERALL LENGTH	NO. OF FLUTES	INTERNAL UN	Price
6-32"	1/8"	0.115"	0.218"	2"	3	415-0340	\$56.51
8-32	1/8	0.115	0.250	2	3	415-0341	56.51
8-36	1/8	0.115	0.250	2	3	415-0342	56.51
10-24	3/16	0.120	0.312	2	3	415-0343	56.51
10-32	3/16	0.120	0.312	2	3	415-0344	56.51
1/4-20	3/16	0.180	0.500	2-1/2	3	415-0345	63.91
1/4-28	3/16	0.180	0.500	2-1/2	3	415-0346	63.91
5/16-18	1/4	0.240	0.625	2-1/2	3	415-0347	75.21
5/16-24	1/4	0.240	0.625	2-1/2	3	415-0348	75.21
3/8-16	5/16	0.290	0.750	3	4	415-0349	89.64
3/8-24	5/16	0.290	0.750	3	4	415-0350	89.64
7/16-14	3/8	0.340	0.875	3	4	415-0351	96.64
7/16-20	3/8	0.340	0.875	3	4	415-0352	96.64
1/2-13	3/8	0.350	0.875	3-1/2	4	415-0353	96.64
1/2-20	3/8	0.350	0.875	3-1/2	4	415-0354	96.64
9/16-12	1/2	0.370	0.875	3-1/2	4	415-0355	96.64
9/16-18	1/2	0.370	0.875	3-1/2	4	415-0356	96.64
5/8-11	1/2	0.470	1.250	3-1/2	5	415-0357	120.81
5/8-18	1/2	0.470	1.250	3-1/2	5	415-0358	120.81
3/4-10	1/2	0.495	1.250	3-1/2	5	415-0359	120.81
3/4-16	1/2	0.495	1.250	3-1/2	5	415-0360	120.81
7/8-9	5/8	0.620	1.250	3-1/2	5	415-0361	151.20
7/8-14	5/8	0.620	1.250	3-1/2	5	415-0362	151.20
1-8	3/4	0.620	1.375	4	5	415-0363	151.20
1-12	3/4	0.620	1.375	4	5	415-0364	151.20



NPT PIPE THERAD - ALTIM COATED

SIZE	SHANK DIA	CUTTING DIA.	THREAD LENGTH	OVERALL LENGTH	NO. OF FLUTES	INTERNAL UN	Price
1/16-27"	1/4"	0.245"	0.437"	2-1/2"	3	415-0365	\$75.21
1/8-27	5/16	0.31	0.437	2-1/2	4	415-0366	75.21
1/4-18	3/8	0.37	0.625	3	4	415-0367	85.74
3/8-18	3/8	0.37	0.625	3	4	415-0368	85.74
1/2-14	1/2	0.495	0.875	3-1/2	4	415-0369	120.81
3/4-14	1/2	0.495	0.875	3-1/2	4	415-0370	120.81
1-11-1/2	3/4	0.62	1.125	4	5	415-0371	151.20

NPTF PIPE THERAD - ALTIM COATED

SIZE	SHANK DIA	CUTTING DIA.	THREAD LENGTH	OVERALL LENGTH	NO. OF FLUTES	INTERNAL UN	Price
1/16-27"	1/4"	0.245"	0.437"	2-1/2"	3	415-0372	\$75.21
1/8-27	5/16	0.31	0.437	2-1/2	4	415-0373	75.21
1/4-18	3/8	0.37	0.625	3	4	415-0374	85.74
3/8-18	3/8	0.37	0.625	3	4	415-0375	85.74
1/2-14	1/2	0.495	0.875	3-1/2	4	415-0376	120.81
3/4-14	1/2	0.495	0.875	3-1/2	4	415-0377	120.81
1-11-1/2	3/4	0.62	1.125	4	5	415-0378	151.20

METRIC THREADS - ALTIM COATED

SIZE	SHANK DIA	CUTTING DIA.	THREAD LENGTH	OVERALL LENGTH	NO. OF FLUTES	INTERNAL UN	Price
M4-0.70"	1/8"	0.115"	0.250"	2"	3	415-0379	\$57.68
M4.5-0.75	1/8	0.12	0.250	2	3	415-0380	57.68
M5-0.80	3/16	0.12	0.312	2	3	415-0381	57.68
M6-1.00	3/16	0.17	0.500	2-1/2	3	415-0382	63.52
M8-0.75	1/4	0.235	0.625	2-1/2	3	415-0383	75.21
M8-1.00	1/4	0.235	0.625	2-1/2	3	415-0384	75.21
M8-1.25	1/4	0.235	0.625	2-1/2	3	415-0385	75.21
M10-1.25	5/16	0.3	0.750	3	4	415-0386	89.64
M10-1.50	5/16"	0.3"	0.750"	3"	4	415-0387	\$89.64
M12-1.00	3/8	0.36	0.875	3-1/2	4	415-0388	97.03
M12-1.25	3/8	0.36	0.875	3-1/2	4	415-0389	97.03
M12-1.75	3/8	0.36	0.875	3-1/2	4	415-0390	97.03
M14-1.50	3/8	0.36	0.875	3-1/2	4	415-0391	97.03
M16-2.00	1/2	0.47	1.250	3-1/2	5	415-0392	120.81
M18-2.50	1/2	0.47	1.250	3-1/2	5	415-0393	120.81
M20-3.00	5/8	0.47	1.250	3-1/2	5	415-0394	120.81

END MILLS • Solid Carbide




2 & 3 Flute 45° Helix High Performance Micrograin Solid Carbide

End Mills For Aluminum









Square End • Corner Radius • Uncoated • ZRN (Zirconium Nitride) Coated
Great for plunge, slot and profile

**USA
Made**











Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.

	REGULAR LENGTH - 2 FLUTE - SQUARE END - 45° UNCOATED		REGULAR LENGTH - 2 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	REGULAR LENGTH - 2 FLUTE - SQUARE END - 45° UNCOATED		REGULAR LENGTH - 2 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	LONG LENGTH - 2 FLUTE - SQUARE END - 45° UNCOATED		LONG LENGTH - 2 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	LONG LENGTH - 2 FLUTE - SQUARE END - 45° UNCOATED		LONG LENGTH - 2 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED

TOLERANCES	DIAMETER	SHANK	RADIUS
1/4-1/2"	+0.00,-.002"	-.0001,-.0004"	+.002,-.002"
5/8"-1"	+0.00,-.003	-.0001,-.0004	+.002,-.002

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END				CORNER RADIUS				
				UNCOATED	Price	ZRN COATED	Price	RADIUS	UNCOATED	Price	ZRN COATED	Price
1/4"	1/4"	3/4"	2-1/2"	415-0186	\$14.92	415-0193	\$18.05	.020"	415-0200	\$16.67	415-0207	\$20.15
1/4"	1/4"	1-1/4"	3"	415-0214	20.48	415-0221	24.77	.020	415-0228	22.88	415-0235	27.65
5/16"	5/16"	13/16"	2-1/2"	415-0187	17.63	415-0194	21.32	.020	415-0201	19.68	415-0208	23.80
5/16"	5/16"	1-3/8"	3"	415-0215	26.53	415-0222	33.68	.020	415-0229	29.61	415-0236	37.60
3/8"	3/8"	1"	2-1/2"	415-0188	18.66	415-0195	22.55	.020	415-0202	20.83	415-0209	25.19
3/8"	3/8"	1-1/2"	4"	415-0216	33.22	415-0223	40.18	.020	415-0230	37.10	415-0237	44.87
1/2"	1/2"	1-1/4"	3"	415-0189	30.88	415-0196	35.83	.040	415-0203	34.48	415-0210	40.00
1/2"	1/2"	2"	4"	415-0217	46.55	415-0224	56.45	.040	415-0231	51.97	415-0238	63.03
5/8"	5/8"	1-5/8"	3-1/2"	415-0190	59.09	415-0197	71.61	.040	415-0204	63.10	415-0211	76.47
5/8"	5/8"	2-3/8"	5"	415-0218	96.53	415-0225	122.85	.040	415-0232	103.08	415-0239	131.19
3/4"	3/4"	1-3/4"	4"	415-0191	84.70	415-0198	102.86	.040	415-0205	90.45	415-0212	109.84
3/4"	3/4"	2-1/2"	5"	415-0219	106.06	415-0226	132.76	.040	415-0233	113.27	415-0240	141.79
1"	1"	1-3/4"	4"	415-0192	139.64	415-0199	169.30	.040	415-0206	149.13	415-0213	180.81
1"	1"	2-1/4"	5"	415-0220	174.36	415-0227	209.08	.040	415-0234	186.20	415-0241	223.29

	REGULAR LENGTH - 3 FLUTE - SQUARE END - 45° UNCOATED		REGULAR LENGTH - 3 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	REGULAR LENGTH - 3 FLUTE - 45° UNCOATED		REGULAR LENGTH - 3 FLUTE - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	LONG LENGTH - 3 FLUTE - SQUARE END - 45° UNCOATED		LONG LENGTH - 3 FLUTE - SQUARE END - 45° ZRN (ZIRCONIUM NITRIDE) COATED
	CORNER RADIUS		CORNER RADIUS
	LONG LENGTH - 3 FLUTE - 45° UNCOATED		LONG LENGTH - 3 FLUTE - 45° ZRN (ZIRCONIUM NITRIDE) COATED

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END				CORNER RADIUS				
				UNCOATED	Price	ZRN COATED	Price	RADIUS	UNCOATED	Price	ZRN COATED	Price
1/4"	1/4"	3/4"	2-1/2"	415-0242	\$14.92	415-0249	\$18.05	.020"	415-0256	\$16.67	415-0263	\$20.15
1/4"	1/4"	1-1/4"	3"	415-0270	20.48	415-0277	24.77	.020	415-0284	22.88	415-0291	27.65
5/16"	5/16"	13/16"	2-1/2"	415-0243	17.63	415-0250	21.32	.020	415-0257	19.68	415-0264	23.80
5/16"	5/16"	1-3/8"	3"	415-0271	26.53	415-0278	33.68	.020	415-0285	29.61	415-0292	37.60
3/8"	3/8"	1"	2-1/2"	415-0244	18.66	415-0251	22.55	.020	415-0258	20.83	415-0265	25.19
3/8"	3/8"	1-1/2"	4"	415-0272	33.22	415-0279	40.18	.020	415-0286	37.10	415-0293	44.87
1/2"	1/2"	1-1/4"	3"	415-0245	30.88	415-0252	35.83	.040	415-0259	34.48	415-0266	40.00
1/2"	1/2"	2"	4"	415-0273	46.55	415-0280	56.45	.040	415-0287	51.97	415-0294	63.03
5/8"	5/8"	1-5/8"	3-1/2"	415-0246	59.09	415-0253	71.61	.040	415-0260	63.10	415-0267	76.47
5/8"	5/8"	2-3/8"	5"	415-0274	96.53	415-0281	122.85	.040	415-0288	103.08	415-0295	131.19
3/4"	3/4"	1-3/4"	4"	415-0247	84.70	415-0254	102.86	.040	415-0261	90.45	415-0268	109.84
3/4"	3/4"	2-1/2"	5"	415-0275	106.06	415-0282	132.76	.040	415-0289	113.27	415-0296	141.79
1"	1"	1-3/4"	4"	415-0248	139.64	415-0255	169.30	.040	415-0262	149.13	415-0269	180.81
1"	1"	2-1/4"	5"	415-0276	174.36	415-0283	209.08	.040	415-0290	186.20	415-0297	223.29



Variable Helix High Performance Micrograin Solid Carbide End Mills

Chatter Free • Harmonic Shift • Exceptional Finish • Corner Radius • ALTIN Coating
 Great for slotting, roughing, ramping and finishing;
 For detail speed and feed rate chart see www.shars.com



Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	ALTIN COATED	
					4 FL	Price
1/4"	1/4"	3/8"	2"	.015-.020	415-0001	\$16.53
1/4"	1/4"	3/4"	2-1/2"	.015-.020	415-0008	18.80
1/4"	1/4"	1-1/8"	3"	.015-.020	415-0015	20.23
5/16"	5/16"	1/16"	2"	.015-.020	415-0002	19.43
5/16"	5/16"	13/16"	2-1/2"	.015-.020	415-0009	21.08
5/16"	5/16"	1-1/8"	3"	.015-.020	415-0016	24.35
3/8"	3/8"	1/2"	2"	.015-.020	415-0003	24.79
3/8"	3/8"	1"	2-1/2"	.015-.020	415-0010	27.17
3/8"	3/8"	1-1/4"	3"	.015-.020	415-0017	27.52
1/2"	1/2"	5/8"	2-1/2"	.030-.035	415-0004	37.62
1/2"	1/2"	1-1/4"	3"	.030-.035	415-0011	41.97
1/2"	1/2"	2"	4"	.030-.035	415-0018	51.06
5/8*	5/8"	3/4"	3"	.030-.035	415-0005	65.31
5/8*	5/8"	1-5/8"	3-1/2"	.030-.035	415-0012	66.85
5/8*	5/8"	2-1/4"	5"	.030-.035	415-0019	86.03
3/4*	3/4"	1"	3"	.030-.035	415-0006	93.83
3/4*	3/4"	1-5/8"	4"	.030-.035	415-0013	95.83
3/4*	3/4"	2-1/4"	5"	.030-.035	415-0020	109.05
1*	1"	1-1/4"	3"	.030-.035	415-0007	154.99
1*	1"	2"	4"	.030-.035	415-0014	163.63
1*	1"	3"	6"	.030-.035	415-0021	207.98

*WITH WELDON FLATS

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+0.000,-.002	-.0001,-.0004



CORNER RADIUS
 STUB LENGTH - 4 FLUTE - VARIABLE HELIX
 ALTIN COATED



CORNER RADIUS
 REGULAR LENGTH - 4 FLUTE - VARIABLE HELIX
 ALTIN COATED



CORNER RADIUS
 LONG LENGTH - 4 FLUTE - VARIABLE HELIX
 ALTIN COATED



6 Flute 40° Helix High Performance Micrograin Solid Carbide End Mills

Radial Relief For Strength · Stronger Core · ALTIN Coating · Square End · Corner Radius
 Great for profiling



Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.

TOLERANCES	DIAMETER	SHANK	RADIUS
ALL SIZES	+0.000,-.002"	-.0001,-.0004"	+0.002,-.002"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END		ALTIN COATED		
				6FL	Price	6FL	RADIUS	Price
1/4"	1/4"	3/4"	2-1/2"	415-0022	\$31.57	415-0038	.020	\$35.24
1/4"	1/4"	1-1/8"	3"	415-0030	34.80	415-0046	.020	38.86
5/16"	5/16"	13/16"	2-1/2"	415-0023	37.49	415-0039	.020	41.86
5/16"	5/16"	1-1/8"	3"	415-0031	40.60	415-0047	.020	45.33
3/8"	3/8"	1"	2-1/2"	415-0024	40.40	415-0040	.040	45.12
3/8"	3/8"	1-1/4"	3"	415-0032	46.16	415-0048	.040	51.53
7/16"	7/16"	1"	2-3/4"	415-0025	49.41	415-0041	.040	55.17
7/16"	7/16"	2"	4"	415-0033	68.84	415-0049	.040	76.85
1/2"	1/2"	1-1/4"	3"	415-0026	54.03	415-0042	.040	60.31
1/2"	1/2"	2"	4"	415-0034	71.78	415-0050	.040	80.14
5/8"	5/8"	1-5/8"	3-1/2"	415-0027	90.02	415-0043	.040	96.14
5/8"	5/8"	2-1/4"	5"	415-0035	111.51	415-0051	.040	119.08
3/4"	3/4"	1-5/8"	4"	415-0028	113.01	415-0044	.040	120.68
3/4"	3/4"	2-1/4"	5"	415-0036	139.26	415-0052	.040	148.72
1"	1"	2"	4"	415-0029	173.08	415-0045	.040	184.84
1"	1"	3"	6"	415-0037	282.24	415-0053	.040	301.42



REGULAR LENGTH - 6 FLUTE - SQUARE END - 40°
 HELIX ALTIN COATED



LONG LENGTH - 6 FLUTE - SQUARE END - 40°
 HELIX ALTIN COATED



CORNER RADIUS
 REGULAR LENGTH - 6 FLUTE - 40°
 HELIX ALTIN COATED



CORNER RADIUS
 LONG LENGTH - 6 FLUTE - 40°
 HELIX ALTIN COATED

END MILLS • Solid Carbide



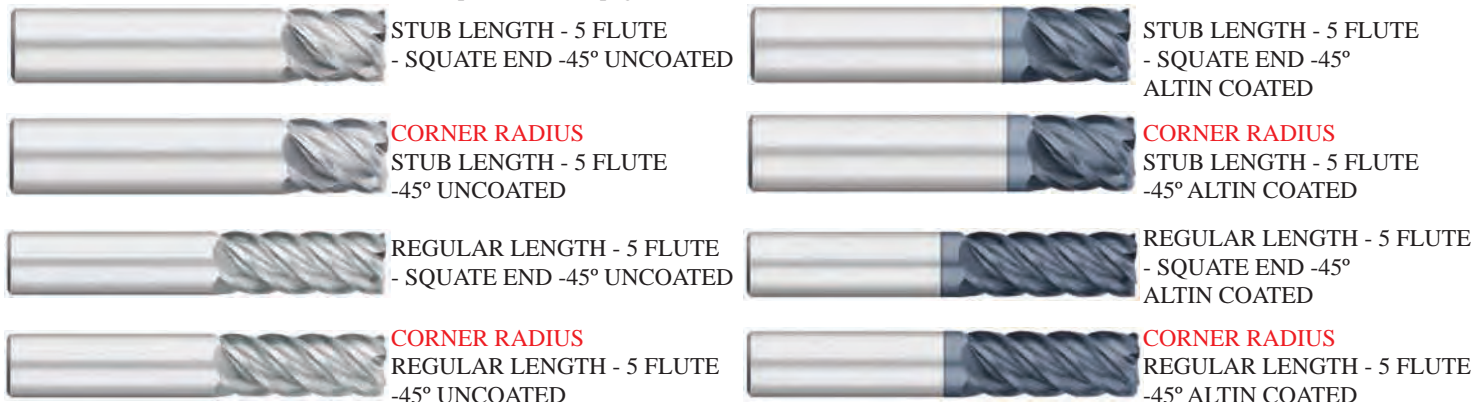
5 Flute 45° Helix High Performance Micrograin Solid Carbide End Mills

Corner Radius - Square End
Great for profiling and finishing



Material	Alloy Steel	Stainless Steel	Cast Iron	Aluminum Alloy	High Temperature Alloy
Application					

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK	RADIUS
1/4-1/2"	+0.000,-0.002"	-0.0001,-0.0004"	+0.002,-0.002"
5/8"-1"	+0.000,-0.003	-0.0001,-0.0004	+0.002,-0.002

				SQUARE END				CORNER RADIUS				
SIZE	SHANK	FLUTE LENGTH	OAL	UNCOATED	Price	ALTIN COATED	Price	RADIUS	UNCOATED	Price	ALTIN COATED	Price
1/8"	1/8"	1/4"	1-1/2"	415-0118	\$4.00	415-0127	\$5.05	.010	415-0136	\$4.48	415-0145	\$5.64
1/8"	1/8"	1/2	1-1/2	415-0154	8.55	415-0162	10.68	.010	415-0170	9.55	415-0178	11.93
3/16	3/16	3/8	2	415-0119	7.03	415-0128	8.41	.010	415-0137	7.84	415-0146	9.39
3/16	3/16	3/4	2	415-0155	10.75	415-0163	12.80	.010	415-0171	12.00	415-0179	14.29
1/4	1/4	1/2	2	415-0120	8.47	415-0129	10.07	.020	415-0138	9.46	415-0147	11.24
1/4	1/4	3/4	2-1/2	415-0156	11.58	415-0164	13.78	.020	415-0172	12.92	415-0180	15.39
5/16	5/16	1/2	2	415-0121	10.18	415-0130	12.71	.020	415-0139	11.37	415-0148	14.20
5/16	5/16	7/8	2-1/2	415-0157	13.96	415-0165	16.59	.020	415-0173	15.58	415-0181	18.52
3/8	3/8	5/8	2	415-0122	16.74	415-0131	19.94	.020	415-0140	18.68	415-0149	22.25
3/8	3/8	7/8	2-1/2	415-0158	18.68	415-0166	22.26	.020	415-0174	20.86	415-0182	24.85
7/16	7/16	5/8	2-1/2	415-0123	19.14	415-0132	22.79	.020	415-0141	21.38	415-0150	25.45
1/2	1/2	5/8	2-1/2	415-0124	22.11	415-0133	26.33	.040	415-0142	24.70	415-0151	29.40
1/2	1/2	1	3	415-0159	34.89	415-0167	43.40	.040	415-0175	38.95	415-0183	48.45
5/8	5/8	3/4	3	415-0125	39.27	415-0134	47.53	.040	415-0143	41.93	415-0152	50.76
5/8	5/8	1-1/4	3-1/2	415-0160	66.14	415-0168	83.90	.040	415-0176	70.63	415-0184	89.60
3/4	3/4	1	3	415-0126	52.91	415-0135	65.31	.040	415-0144	56.50	415-0153	69.73
3/4	3/4	1-1/2	4	415-0161	93.00	415-0169	114.07	.040	415-0177	99.32	415-0185	121.83



Fine Pitch High Performance Micrograin Solid Carbide End Mills

- Minimum chatter and vibration while removing maximum material
- Great for hardened steels, titanium, inconel and other space age materials

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK
1/4"-1/2"	+0.000,-0.002"	-0.0001,-0.0004"
5/8"-1"	+0.000,-0.003	-0.0001,-0.0004

				SQUARE END			
SIZE	SHANK	FLUTE LENGTH	OAL	UNCOATED		ALTIN COATED	
				4 FL	Price	4 FL	Price
1/4"	1/4"	3/4"	2-1/2"	415-0298	\$17.12	415-0305	\$21.41
5/16	5/16	13/16	2-1/2	415-0299	24.04	415-0306	30.06
3/8	3/8	7/8	2-1/2	415-0300	28.04	415-0307	35.06
1/2	1/2	1-1/4	3	415-0301	35.06	415-0308	43.82
5/8	5/8	1-5/8	3-1/2	415-0302	75.73	415-0309	94.65
3/4	3/4	1-5/8	4	415-0303	90.87	415-0310	113.60
1	1	2	4	415-0304	168.77	415-0311	210.95





Corner Radius Extra Long Length Micrograin Solid Carbide End Mills(cont.)

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED		ALTiN COATED	
					4FL	Price	4 FL	Price
1/4"	1/4"	1-1/2"	4"	.060"	415-1689	\$19.04	415-1768	\$23.80
1/4	1/4	1-1/2	6	.015	415-1690	25.76	415-1769	32.20
1/4	1/4	1-1/2	6	.020	415-1691	25.76	415-1770	32.20
1/4	1/4	1-1/2	6	.030	415-1692	25.76	415-1771	32.20
1/4	1/4	1-1/2	6	.045	415-1693	25.76	415-1772	32.20
1/4	1/4	1-1/2	6	.060	415-1694	25.76	415-1773	32.20
5/16	5/16	1-5/8	4	.015	415-1695	26.00	415-1774	32.49
5/16	5/16	1-5/8	4	.020	415-1696	26.00	415-1775	32.49
5/16	5/16	1-5/8	4	.030	415-1697	26.00	415-1776	32.49
5/16	5/16	1-5/8	4	.045	415-1698	26.00	415-1777	32.49
5/16	5/16	1-5/8	4	.060	415-1699	26.00	415-1778	32.49
3/8	3/8	1-3/4	4	.015	415-1700	29.51	415-1779	36.89
3/8	3/8	1-3/4	4	.020	415-1701	29.51	415-1780	36.89
3/8	3/8	1-3/4	4	.030	415-1702	29.51	415-1781	36.89
3/8	3/8	1-3/4	4	.045	415-1703	29.51	415-1782	36.89
3/8	3/8	1-3/4	4	.060	415-1704	29.51	415-1783	36.89
3/8	3/8	1-1/2	6	.015	415-1705	44.69	415-1784	55.86
3/8	3/8	1-1/2	6	.020	415-1706	44.69	415-1785	55.86
3/8	3/8	1-1/2	6	.030	415-1707	44.69	415-1786	55.86
3/8	3/8	1-1/2	6	.045	415-1708	44.69	415-1787	55.86
3/8	3/8	1-1/2	6	.060	415-1709	44.69	415-1788	55.86
1/2	1/2	1-1/2	6	.015	415-1710	68.00	415-1789	85.01
1/2	1/2	1-1/2	6	.020	415-1711	68.00	415-1790	85.01
1/2	1/2	1-1/2	6	.030	415-1712	68.00	415-1791	85.01
1/2	1/2	1-1/2	6	.045	415-1713	68.00	415-1792	85.01
1/2	1/2	1-1/2	6	.060	415-1714	68.00	415-1793	85.01
1/2	1/2	1-1/2	6	.090	415-1715	68.00	415-1794	85.01
1/2	1/2	1-1/2	6	.125	415-1716	68.00	415-1795	85.01
1/2	1/2	3	6	.015	415-1717	71.39	415-1796	89.22
1/2	1/2	3	6	.020	415-1718	71.39	415-1797	89.22
1/2	1/2	3	6	.030	415-1719	71.39	415-1798	89.22
1/2	1/2	3	6	.045	415-1720	71.39	415-1799	89.22
1/2	1/2	3	6	.060	415-1721	71.39	415-1800	89.22
1/2	1/2	3	6	.090	415-1722	71.39	415-1801	89.22
1/2	1/2	3	6	.125	415-1723	71.39	415-1802	89.22
5/8	5/8	3	6	.015	415-1724	96.73	415-1803	120.92
5/8	5/8	3	6	.020	415-1725	96.73	415-1804	120.92
5/8	5/8	3	6	.030	415-1726	96.73	415-1805	120.92
5/8	5/8	3	6	.045	415-1727	96.73	415-1806	120.92
5/8	5/8	3	6	.060	415-1728	96.73	415-1807	120.92
5/8	5/8	3	6	.090	415-1729	96.73	415-1808	120.92
3/4	3/4	3	6	.015	415-1730	143.77	415-1809	179.70
3/4	3/4	3	6	.020	415-1731	143.77	415-1810	179.70
3/4	3/4	3	6	.030	415-1732	143.77	415-1811	179.70
3/4	3/4	3	6	.045	415-1733	143.77	415-1812	179.70
3/4	3/4	3	6	.060	415-1734	143.77	415-1813	179.70
3/4	3/4	3	6	.090	415-1735	143.77	415-1814	179.70
3/4	3/4	3	6	.125	415-1736	143.77	415-1815	179.70
3/4	3/4	3	6	.125	415-1736	143.77	415-1815	179.70
3/4	3/4	4	7	.015	415-1737	246.71	415-1816	308.38
3/4	3/4	4	7	.020	415-1738	246.71	415-1817	308.38
3/4	3/4	4	7	.030	415-1739	246.71	415-1818	308.38
3/4	3/4	4	7	.045	415-1740	246.71	415-1819	308.38
3/4	3/4	4	7	.060	415-1741	246.71	415-1820	308.38
3/4	3/4	4	7	.090	415-1742	246.71	415-1821	308.38
3/4	3/4	4	7	.125	415-1743	246.71	415-1822	308.38
1	1	3	6	.015	415-1744	244.05	415-1823	305.06
1	1	3	6	.020	415-1745	244.05	415-1824	305.06
1	1	3	6	.030	415-1746	244.05	415-1825	305.06
1	1	3	6	.045	415-1747	244.05	415-1826	305.06
1	1	3	6	.060	415-1748	244.05	415-1827	305.06
1	1	3	6	.090	415-1749	244.05	415-1828	305.06
1	1	3	6	.090	415-1749	244.05	415-1828	305.06
1	1	3	6	.125	415-1750	244.05	415-1829	305.06
1	1	4	7	.015	415-1751	319.91	415-1830	399.90
1	1	4	7	.020	415-1752	319.91	415-1831	399.90
1	1	4	7	.030	415-1753	319.91	415-1832	399.90
1	1	4	7	.045	415-1754	319.91	415-1833	399.90
1	1	4	7	.060	415-1755	319.91	415-1834	399.90
1	1	4	7	.090	415-1756	319.91	415-1835	399.90
1	1	4	7	.125	415-1757	319.91	415-1836	399.90
1	1	4	7	.125	415-1757	319.91	415-1836	399.90

END MILLS • Solid Carbide



Corner Radius Long Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



CORNER RADIUS

LONG LENGTH 4 FLUTE - 30°- UNCOATED

TOLERANCES	DIAMETER	SHANK	RADIUS
1/8"-1/2"	+0.00,-.002"	-.0001,-.0004"	+0.002,-.002"
5/8"-1"	+0.00,-.003	-.0001,-.0004	+0.002,-.002



CORNER RADIUS

LONG LENGTH 4 FLUTE - 30°- ALTiN COATED



SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED		ALTiN COATED	
					4FL	Price	4 FL	Price
1/8"	1/8"	3/4"	2-1/4"	.015"	415-1549	\$11.09	415-1614	\$13.86
1/8"	1/8"	3/4"	2-1/4"	.020	415-1550	11.09	415-1615	13.86
1/8"	1/8"	3/4"	2-1/4"	.030	415-1551	11.09	415-1616	13.86
3/16	3/16	3/4"	2-1/2"	.015	415-1552	13.02	415-1617	16.27
3/16	3/16	3/4"	2-1/2"	.020	415-1553	13.02	415-1618	16.27
3/16	3/16	3/4"	2-1/2"	.030	415-1554	13.02	415-1619	16.27
1/4"	1/4"	1-1/8"	3	.015	415-1555	18.63	415-1620	23.30
1/4"	1/4"	1-1/8"	3	.020	415-1556	18.63	415-1621	23.30
1/4"	1/4"	1-1/8"	3	.030	415-1557	18.63	415-1622	23.30
1/4"	1/4"	1-1/8"	3	.045	415-1558	18.63	415-1623	23.30
1/4"	1/4"	1-1/8"	3	.060	415-1559	18.63	415-1624	23.30
1/4"	1/4"	1	4	.015	415-1560	19.63	415-1625	24.54
1/4"	1/4"	1	4	.020	415-1561	19.63	415-1626	24.54
1/4"	1/4"	1	4	.030	415-1562	19.63	415-1627	24.54
1/4"	1/4"	1	4	.045	415-1563	19.63	415-1628	24.54
1/4"	1/4"	1	4	.060	415-1564	19.63	415-1629	24.54
5/16	5/16	1-1/8"	3	.015	415-1565	21.03	415-1630	26.28
5/16	5/16	1-1/8"	3	.020	415-1566	21.03	415-1631	26.28
5/16	5/16	1-1/8"	3	.030	415-1567	21.03	415-1632	26.28
5/16	5/16	1-1/8"	3	.045	415-1568	21.03	415-1633	26.28
5/16	5/16	1-1/8"	3	.060	415-1569	21.03	415-1634	26.28
3/8	3/8	1-1/8"	3	.015	415-1570	24.12	415-1635	30.16
3/8	3/8	1-1/8"	3	.020	415-1571	24.12	415-1636	30.16
3/8	3/8	1-1/8"	3	.030	415-1572	24.12	415-1637	30.16
3/8	3/8	1-1/8"	3	.045	415-1573	24.12	415-1638	30.16
3/8	3/8	1-1/8"	3	.060	415-1574	24.12	415-1639	30.16
3/8	3/8	1	4	.015	415-1575	28.17	415-1640	35.21
3/8	3/8	1	4	.020	415-1576	28.17	415-1641	35.21
3/8	3/8	1	4	.030	415-1577	28.17	415-1642	35.21
3/8	3/8	1	4	.045	415-1578	28.17	415-1643	35.21
3/8	3/8	1	4	.060	415-1579	28.17	415-1644	35.21
1/2	1/2	1	4	.015	415-1580	41.15	415-1645	51.44
1/2	1/2	1	4	.020	415-1581	41.15	415-1646	51.44

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED		ALTiN COATED	
					4FL	Price	4 FL	Price
1/2"	1/2"	1"	4"	.030"	415-1582	\$41.15	415-1647	\$51.44
1/2"	1/2"	1	4	.045	415-1583	41.15	415-1648	51.44
1/2"	1/2"	1	4	.060	415-1584	41.15	415-1649	51.44
1/2"	1/2"	1	4	.090	415-1585	41.15	415-1650	51.44
1/2"	1/2"	1	4	.125	415-1586	41.15	415-1651	51.44
1/2"	1/2"	2	4	.015	415-1587	43.61	415-1652	54.50
1/2"	1/2"	2	4	.020	415-1588	43.61	415-1653	54.50
1/2"	1/2"	2	4	.030	415-1589	43.61	415-1654	54.50
1/2"	1/2"	2	4	.045	415-1590	43.61	415-1655	54.50
1/2"	1/2"	2	4	.060	415-1591	43.61	415-1656	54.50
1/2"	1/2"	2	4	.090	415-1592	43.61	415-1657	54.50
1/2"	1/2"	2	4	.125	415-1593	43.61	415-1658	54.50
5/8	5/8	2-1/4"	5	.015	415-1594	89.63	415-1659	112.04
5/8	5/8	2-1/4"	5	.020	415-1595	89.63	415-1660	112.04
5/8	5/8	2-1/4"	5	.030	415-1596	89.63	415-1661	112.04
5/8	5/8	2-1/4"	5	.045	415-1597	89.63	415-1662	112.04
5/8	5/8	2-1/4"	5	.060	415-1598	89.63	415-1663	112.04
5/8	5/8	2-1/4"	5	.090	415-1599	89.63	415-1664	112.04
3/4	3/4	2-1/4"	5	.015	415-1600	123.80	415-1665	154.74
3/4	3/4	2-1/4"	5	.020	415-1601	123.80	415-1666	154.74
3/4	3/4	2-1/4"	5	.030	415-1602	123.80	415-1667	154.74
3/4	3/4	2-1/4"	5	.045	415-1603	123.80	415-1668	154.74
3/4	3/4	2-1/4"	5	.060	415-1604	123.80	415-1669	154.74
3/4	3/4	2-1/4"	5	.090	415-1605	123.80	415-1670	154.74
3/4	3/4	2-1/4"	5	.125	415-1606	123.80	415-1671	154.74
1	1	2-1/4"	5	.015	415-1607	169.50	415-1672	211.88
1	1	2-1/4"	5	.020	415-1608	169.50	415-1673	211.88
1	1	2-1/4"	5	.030	415-1609	169.50	415-1674	211.88
1	1	2-1/4"	5	.045	415-1610	169.50	415-1675	211.88
1	1	2-1/4"	5	.060	415-1611	169.50	415-1676	211.88
1	1	2-1/4"	5	.090	415-1612	169.50	415-1677	211.88
1	1	2-1/4"	5	.125	415-1613	169.50	415-1678	211.88



Corner Radius Extra Long Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



CORNER RADIUS

EXTRA LONG LENGTH 4 FLUTE - 30°- UNCOATED

TOLERANCES	DIAMETER	SHANK	RADIUS
1/8"-1/2"	+0.00,-.002"	-.0001,-.0004"	+0.002,-.002"
5/8"-1"	+0.00,-.003	-.0001,-.0004	+0.002,-.002



CORNER RADIUS

EXTRA LONG LENGTH 4 FLUTE - 30°- ALTiN COATED



SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED		ALTiN COATED	
					4FL	Price	4 FL	Price
1/8"	1/8"	1"	3"	.015"	415-1679	\$12.39	415-1758	\$15.48
1/8"	1/8"	1	3	.020	415-1680	12.39	415-1759	15.48
1/8"	1/8"	1	3	.030	415-1681	12.39	415-1760	15.48
3/16	3/16	1-1/8"	3	.015	415-1682	13.48	415-1761	16.86
3/16	3/16	1-1/8"	3	.020	415-1683	13.48	415-1762	16.86
3/16	3/16	1-1/8"	3	.030	415-1684	13.48	415-1763	16.86
1/4"	1/4"	1-1/2"	4	.015	415-1685	19.04	415-1764	23.80
1/4"	1/4"	1-1/2"	4	.020	415-1686	19.04	415-1765	23.80
1/4"	1/4"	1-1/2"	4	.030	415-1687	19.04	415-1766	23.80
1/4"	1/4"	1-1/2"	4	.045	415-1688	19.04	415-1767	23.80



Corner Radius Regular Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



CORNER RADIUS
2 FLUTE - 30° - UNCOATED



CORNER RADIUS
4 FLUTE - 30° - UNCOATED



CORNER RADIUS
2 FLUTE - 30° - ALTIN COATED



CORNER RADIUS
4 FLUTE - 30° - ALTIN COATED

TOLERANCES	DIAMETER	SHANK	RADIUS
1/8"-1/2"	+0.00,-.002"	-.0001,-.0004"	+0.002,-.002"
5/8"-1"	+0.00,-.003	-.0001,-.0004	+0.002,-.002

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED			ALTIN COATED		
					2 FL	4 FL	Price	2 FL	4 FL	Price
1/8"	1/8"	1/2"	2-1/2"	.015"	415-1357	415-1453	\$6.55	415-1405	415-1501	\$10.19
1/8"	1/8"	1/2"	2-1/2"	.020	415-1358	415-1454	6.55	415-1406	415-1502	10.19
1/8"	1/8"	1/2"	2-1/2"	.030	415-1359	415-1455	6.55	415-1407	415-1503	10.18
3/16	3/16	5/8"	2	.015	415-1360	415-1456	6.55	415-1408	415-1504	10.19
3/16	3/16	5/8"	2	.020	415-1361	415-1457	6.55	415-1409	415-1505	10.19
3/16	3/16	5/8"	2	.030	415-1362	415-1458	6.55	415-1410	415-1506	10.19
1/4	1/4	3/4	2-1/2"	.015	415-1363	415-1459	9.55	415-1411	415-1507	13.99
1/4	1/4	3/4	2-1/2"	.020	415-1364	415-1460	9.55	415-1412	415-1508	13.99
1/4	1/4	3/4	2-1/2"	.030	415-1365	415-1461	9.55	415-1413	415-1509	13.99
1/4	1/4	3/4	2-1/2"	.045	415-1366	415-1462	9.55	415-1414	415-1510	13.99
1/4	1/4	3/4	2-1/2"	.060	415-1367	415-1463	9.55	415-1415	415-1511	13.99
5/16	5/16	13/16	2-1/2"	.015	415-1368	415-1464	14.64	415-1416	415-1512	20.12
5/16	5/16	13/16	2-1/2"	.020	415-1369	415-1465	14.64	415-1417	415-1513	20.12
5/16	5/16	13/16	2-1/2"	.030	415-1370	415-1466	14.64	415-1418	415-1514	20.12
5/16	5/16	13/16	2-1/2"	.045	415-1371	415-1467	14.64	415-1419	415-1515	20.12
5/16	5/16	13/16	2-1/2"	.060	415-1372	415-1468	14.64	415-1420	415-1516	20.12
3/8	3/8	1	2-1/2"	.015	415-1373	415-1469	19.60	415-1421	415-1517	21.80
3/8	3/8	1	2-1/2"	.020	415-1374	415-1470	19.60	415-1422	415-1518	21.80
3/8	3/8	1	2-1/2"	.030	415-1375	415-1471	19.60	415-1423	415-1519	21.80
3/8	3/8	1	2-1/2"	.045	415-1376	415-1472	19.60	415-1424	415-1520	21.80
3/8	3/8	1	2-1/2"	.060	415-1377	415-1473	19.60	415-1425	415-1521	21.80
1/2	1/2	1	3	.015	415-1378	415-1474	33.73	415-1426	415-1522	36.51
1/2	1/2	1	3	.020	415-1379	415-1475	33.73	415-1427	415-1523	36.51
1/2	1/2	1	3	.030	415-1380	415-1476	33.73	415-1428	415-1524	36.51
1/2	1/2	1	3	.045	415-1381	415-1477	33.73	415-1429	415-1525	36.51
1/2	1/2	1	3	.060	415-1382	415-1478	33.73	415-1430	415-1526	36.51
1/2	1/2	1	3	.090	415-1383	415-1479	33.73	415-1431	415-1527	36.51
1/2	1/2	1	3	.125	415-1384	415-1480	33.73	415-1432	415-1528	36.51
5/8	5/8	1-1/4	3-1/2"	.015	415-1385	415-1481	47.71	415-1433	415-1529	52.54
5/8	5/8	1-1/4	3-1/2"	.020	415-1386	415-1482	47.71	415-1434	415-1530	52.54
5/8	5/8	1-1/4	3-1/2"	.030	415-1387	415-1483	47.71	415-1435	415-1531	52.54
5/8	5/8	1-1/4	3-1/2"	.045	415-1388	415-1484	47.71	415-1436	415-1532	52.54
5/8	5/8	1-1/4	3-1/2"	.060	415-1389	415-1485	47.71	415-1437	415-1533	52.54
5/8	5/8	1-1/4	3-1/2"	.090	415-1390	415-1486	47.71	415-1438	415-1534	52.54
3/4	3/4	1-1/2	4	.015	415-1391	415-1487	70.59	415-1439	415-1535	73.77
3/4	3/4	1-1/2	4	.020	415-1392	415-1488	70.59	415-1440	415-1536	73.77
3/4	3/4	1-1/2	4	.030	415-1393	415-1489	70.59	415-1441	415-1537	73.77
3/4	3/4	1-1/2	4	.045	415-1394	415-1490	70.59	415-1442	415-1538	73.77
3/4	3/4	1-1/2	4	.060	415-1395	415-1491	70.59	415-1443	415-1539	73.77
3/4	3/4	1-1/2	4	.090	415-1396	415-1492	70.59	415-1444	415-1540	73.77
3/4	3/4	1-1/2	4	.125	415-1397	415-1493	70.59	415-1445	415-1541	73.77
1	1	1-1/2	4	.015	415-1398	415-1494	133.56	415-1446	415-1542	153.97
1	1	1-1/2	4	.020	415-1399	415-1495	133.56	415-1447	415-1543	153.97
1	1	1-1/2	4	.030	415-1400	415-1496	133.56	415-1448	415-1544	153.97
1	1	1-1/2	4	.045	415-1401	415-1497	133.56	415-1449	415-1545	153.97
1	1	1-1/2	4	.060	415-1402	415-1498	133.56	415-1450	415-1546	153.97
1	1	1-1/2	4	.090	415-1403	415-1499	133.56	415-1451	415-1547	153.97
1	1	1-1/2	4	.125	415-1404	415-1500	133.56	415-1452	415-1548	153.97

END MILLS • Solid Carbide



Long and Extra Long Micrograin Solid Carbide End Mills



TOLERANCES	DIAMETER	SHANK
1/8"-1/2"	+0.000,-.002"	-.0001,-.0004"
5/8"-1"	+0.000,-.003	-.0001,-.0004

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTIM COATED			UNCOATED			ALTIM COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
1/8"	1/8"	3/4"	2-1/4"	415-1078	415-0680	\$7.31	415-1092	415-0694	\$11.032	415-1273	415-0879	\$8.69	415-1287	415-0893	\$11.17
1/8"	1/8"	1	3	415-1120	415-0722	8.16	415-1134	415-0738	11.242	415-1315	415-0921	9.73	415-1329	415-0937	13.13
3/16	3/16	3/4	2-1/2	415-1079	415-0681	8.58	415-1093	415-0695	15.834	415-1274	415-0880	10.00	415-1288	415-0994	12.85
3/16	3/16	1-1/8	3	415-1121	415-0723	8.89	415-1135	415-0739	16.17	415-1316	415-0922	10.65	415-1330	415-0938	13.71
1/4	1/4	1-1/8	3	415-1080	415-0682	12.28	415-1094	415-0696	16.688	415-1275	415-0881	14.07	415-1289	415-0895	18.10
1/4	1/4	1-1/2	4	415-1122	415-0724	12.54	415-1136	415-0740	21.826	415-1317	415-0923	14.38	415-1331	415-0939	18.49
1/4	1/4	1	4	415-1081	415-0683	12.94	415-1095	415-0697	18.718	415-1276	415-0882	15.53	415-1290	415-0896	20.01
1/4	1/4	1-1/2	6	415-1123	415-0725	16.98	415-1137	415-0741	22.106	415-1318	415-0924	17.37	415-1332	415-0940	22.34
5/16	5/16	1-1/8	3	415-1082	415-0684	13.86	415-1096	415-0698	21.462	415-1277	415-0883	16.53	415-1291	415-0897	22.33
5/16	5/16	1-1/8	4	415-1124	415-0726	17.14	415-1138	415-0742	24.92	415-1319	415-0925	20.66	415-1333	415-0941	26.68
3/8	3/8	1-1/8	3	415-1083	415-0685	15.90	415-1097	415-0699	23.898	415-1278	415-0884	19.10	415-1292	415-0898	25.79
3/8	3/8	1	4	415-1084	415-0686	18.56	415-1098	415-0700	32.578	415-1279	415-0885	23.38	415-1293	415-0899	30.39
3/8	3/8	1-1/2	6	415-1126	415-0728	29.46	415-1140	415-0744	50.876	415-1321	415-0927	31.35	415-1335	415-0943	39.10
3/8	3/8	1-3/4	4	415-1125	415-0727	19.46	415-1139	415-0743	37.968	415-1320	415-0926	22.26	415-1334	415-0942	28.43
7/16	7/16	2	4	415-1085	415-0687	25.06	415-1099	415-0701	34.944	415-1280	415-0886	31.99	415-1294	415-0900	41.58
7/16	7/16	3	6	415-1127	415-0729	39.66	415-1141	415-0745	55.636	415-1322	415-0928	47.05	415-1336	415-0944	60.41
1/2	1/2	1	4	415-1086	415-0688	27.13	415-1100	415-0702	36.876	415-1281	415-0887	32.75	415-1295	415-0901	41.65
1/2	1/2	2	4	415-1087	415-0689	28.74	415-1101	415-0703	79.478	415-1282	415-0888	33.07	415-1296	415-0902	41.97
1/2	1/2	1-1/2	6	415-1128	415-0730	44.83	415-1142	415-0746	57.862	415-1323	415-0929	49.91	415-1337	415-0945	63.91
1/2	1/2	3	6	415-1129	415-0731	47.05	415-1143	415-0747	85.204	415-1324	415-0930	50.23	415-1338	415-0946	64.86
5/8	5/8	2-1/4	5	415-1088	415-0690	64.22	415-1102	415-0704	114.45	415-1283	415-0889	75.35	415-1297	415-0903	95.70
5/8	5/8	3	6	415-1130	415-0732	69.31	415-1144	415-0748	126.532	415-1325	415-0931	79.17	415-1339	415-0947	97.29
3/4	3/4	2-1/4	5	415-1089	415-0691	88.70	415-1103	415-0705	198.702	415-1284	415-0890	104.92	415-1298	415-0904	132.90
3/4	3/4	3	6	415-1131	415-0733	103.01	415-1145	415-0749	143.66	415-1326	415-0932	112.27	415-1340	415-0948	151.56
3/4	3/4	4	7		415-0734	176.76		415-0750	212.058		415-0933	167.87		415-0949	209.83
7/8	7/8	2-1/4	5	415-1090	415-0692	168.14	415-1104	415-0706	156.744	415-1285	415-0891	180.36	415-1299	415-0905	221.63
7/8	7/8	3	6	415-1132	415-0735	183.43	415-1146	415-0751	229.278	415-1327	415-0934	198.70	415-1341	415-0950	247.62
1	1	2-1/4	5	415-1091	415-0693	121.45	415-1105	415-0707	11.032	415-1286	415-0892	207.61	415-1300	415-0906	255.30
1	1	3	6	415-1133	415-0736	174.86	415-1147	415-0752	214.886	415-1328	415-0935	200.30	415-1342	415-0951	257.87
1	1	4	7		415-0737	229.24		415-0753	281.372		415-0936	242.27		415-0952	288.53



Corner Radius Regular Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium

USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK	RADIUS
1/8"-1/2"	+0.000,-.002"	-.0001,-.0004"	+0.002,-.002"
5/8"-1"	+0.000,-.003	-.0001,-.0004	+0.002,-.002



CORNER RADIUS
2 FLUTE - 30° - UNCOATED



CORNER RADIUS
4 FLUTE - 30° - UNCOATED



CORNER RADIUS
2 FLUTE - 30° - ALTIM COATED



CORNER RADIUS
4 FLUTE - 30° - ALTIM COATED

SIZE	SHANK	FLUTE LENGTH	OAL	RADIUS	UNCOATED			ALTIM COATED		
					2 FL	4 FL	Price	2 FL	4 FL	Price
1/8"	1/8"	1/2"	2-1/2"	.015"	415-1357	415-1453	\$6.55	415-1405	415-1501	\$10.19
1/8"	1/8"	1/2	2-1/2	.020	415-1358	415-1454	6.55	415-1406	415-1502	10.19
1/8"	1/8"	1/2	2-1/2	.030	415-1359	415-1455	6.55	415-1407	415-1503	10.18
3/16	3/16	5/8	2	.015	415-1360	415-1456	6.55	415-1408	415-1504	10.19
3/16	3/16	5/8	2	.020	415-1361	415-1457	6.55	415-1409	415-1505	10.19
3/16	3/16	5/8	2	.030	415-1362	415-1458	6.55	415-1410	415-1506	10.19
1/4	1/4	3/4	2-1/2	.015	415-1363	415-1459	9.55	415-1411	415-1507	13.99
1/4	1/4	3/4	2-1/2	.020	415-1364	415-1460	9.55	415-1412	415-1508	13.99
1/4	1/4	3/4	2-1/2	.030	415-1365	415-1461	9.55	415-1413	415-1509	13.99
1/4	1/4	3/4	2-1/2	.045	415-1366	415-1462	9.55	415-1414	415-1510	13.99
1/4	1/4	3/4	2-1/2	.060	415-1367	415-1463	9.55	415-1415	415-1511	13.99
5/16	5/16	13/16	2-1/2	.015	415-1368	415-1464	14.64	415-1416	415-1512	20.12
5/16	5/16	13/16	2-1/2	.020	415-1369	415-1465	14.64	415-1417	415-1513	20.12
5/16	5/16	13/16	2-1/2	.030	415-1370	415-1466	14.64	415-1418	415-1514	20.12
5/16	5/16	13/16	2-1/2	.045	415-1371	415-1467	14.64	415-1419	415-1515	20.12
5/16	5/16	13/16	2-1/2	.060	415-1372	415-1468	14.64	415-1420	415-1516	20.12
3/8	3/8	1	2-1/2	.015	415-1373	415-1469	19.60	415-1421	415-1517	21.80
3/8	3/8	1	2-1/2	.020	415-1374	415-1470	19.60	415-1422	415-1518	21.80
3/8	3/8	1	2-1/2	.030	415-1375	415-1471	19.60	415-1423	415-1519	21.80
3/8	3/8	1	2-1/2	.045	415-1376	415-1472	19.60	415-1424	415-1520	21.80
3/8	3/8	1	2-1/2	.060	415-1377	415-1473	19.60	415-1425	415-1521	21.80
1/2	1/2	1	3	.015	415-1378	415-1474	33.73	415-1426	415-1522	36.51
1/2	1/2	1	3	.020	415-1379	415-1475	33.73	415-1427	415-1523	36.51



Regular Length Micrograin Solid Carbide End Mills(cont.)



SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTIM COATED			UNCOATED			ALTIM COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
5/64"	1/8"	1/4"	1-1/2"	415-0971	415-0567	\$5.36	415-1008	415-0606	\$7.24	415-1166	415-0772	\$6.03	415-1203	415-0809	\$8.15
3/32	1/8	3/8	1-1/2	415-0972	415-0568	4.27	415-1009	415-0607	5.96	415-1167	415-0773	6.34	415-1204	415-0810	8.55
7/64	1/8	3/8	1-1/2	415-0973	415-0569	4.91	415-1010	415-0608	6.64	415-1168	415-0774	6.34	415-1205	415-0811	8.55
1/8	1/8	1/2	1-1/2	415-0974	415-0570	4.52	415-1011	415-0609	5.54	415-1169	415-0775	5.81	415-1206	415-0812	7.84
9/64	3/16	9/16	2	415-0975	415-0571	6.62	415-1012	415-0610	8.95	415-1170	415-0776	8.51	415-1207	415-0813	11.49
5/32	3/16	9/16	2	415-0976	415-0572	6.68	415-1013	415-0611	7.74	415-1171	415-0777	8.51	415-1208	415-0814	11.49
11/64	3/16	5/8	2	415-0977	415-0573	6.34	415-1014	415-0612	8.55	415-1172	415-0778	8.51	415-1209	415-0815	11.49
3/16	3/16	5/8	2	415-0978	415-0574	6.17	415-1015	415-0613	7.74	415-1173	415-0779	7.66	415-1210	415-0816	10.33
13/64	1/4	5/8	2-1/2	415-0979	415-0575	9.00	415-1016	415-0614	11.80	415-1174	415-0780	9.93	415-1211	415-0817	14.07
7/32	1/4	5/8	2-1/2	415-0980	415-0576	9.18	415-1017	415-0615	10.68	415-1175	415-0781	9.93	415-1212	415-0818	14.07
15/64	1/4	3/4	2-1/2	415-0981	415-0577	10.39	415-1018	415-0616	13.38	415-1176	415-0782	9.93	415-1213	415-0819	14.07
1/4	1/4	3/4	2-1/2	415-0982	415-0578	7.62	415-1019	415-0617	10.68	415-1177	415-0783	10.40	415-1214	415-0820	13.40
17/64	5/16	3/4	2-1/2	415-0983	415-0579	13.73	415-1020	415-0618	17.65	415-1178	415-0784	14.07	415-1215	415-0821	18.09
9/32	5/16	3/4	2-1/2	415-0984	415-0580	13.73	415-1021	415-0619	17.65	415-1179	415-0785	14.10	415-1216	415-0822	18.12
19/64	5/16	13/16	2-1/2	415-0985	415-0581	13.73	415-1022	415-0620	17.65	415-1180	415-0786	15.32	415-1217	415-0823	20.10
5/16	5/16	13/16	2-1/2	415-0986	415-0582	9.91	415-1023	415-0621	12.78	415-1181	415-0787	12.96	415-1218	415-0824	16.67
21/64	3/8	1	2-1/2	415-0987	415-0583	15.40	415-1024	415-0622	19.80	415-1182	415-0788	17.81	415-1219	415-0825	24.04
11/32	3/8	1	2-1/2	415-0988	415-0584	15.40	415-1025	415-0623	19.80	415-1183	415-0789	18.70	415-1220	415-0826	24.04
23/64	3/8	1	2-1/2	415-0989	415-0585	15.40	415-1026	415-0624	19.80	415-1184	415-0790	17.81	415-1221	415-0827	24.04
3/8	3/8	1	2-1/2	415-0990	415-0586	11.82	415-1027	415-0625	14.62	415-1185	415-0791	13.87	415-1222	415-0828	19.61
25/64	7/16	1	2-3/4	415-0991	415-0587	20.15	415-1028	415-0626	26.01	415-1186	415-0792	24.12	415-1223	415-0829	31.08
13/32	7/16	1	2-3/4	415-0992	415-0588	20.15	415-1029	415-0627	26.01	415-1187	415-0793	24.12	415-1224	415-0830	31.08
27/64	7/16	1	2-3/4	415-0993	415-0589	20.80	415-1030	415-0628	26.87	415-1188	415-0794	24.12	415-1225	415-0831	31.08
7/16	7/16	1	2-3/4	415-0994	415-0590	18.14	415-1031	415-0629	22.34	415-1189	415-0795	20.54	415-1226	415-0832	26.47
29/64	1/2	1	3	415-0995	415-0591	29.96	415-1032	415-0630	38.35	415-1190	415-0796	31.79	415-1227	415-0833	41.01
15/32	1/2	1	3	415-0996	415-0592	29.96	415-1033	415-0631	38.35	415-1191	415-0797	31.79	415-1228	415-0834	41.01
31/64	1/2	1	3	415-0997	415-0593	29.96	415-1034	415-0632	38.35	415-1192	415-0798	31.79	415-1229	415-0835	41.01
1/2	1/2	1	3	415-0998	415-0594	21.78	415-1035	415-0633	27.19	415-1193	415-0799	28.17	415-1230	415-0836	36.29
1/2	1/2	1-1/4	3		415-0595	21.78		415-0634	27.19						
9/16	9/16	1-1/4	3-1/2	415-0999	415-0596	41.17	415-1036	415-0635	54.36	415-1194	415-0800	42.92	415-1231	415-0837	52.82
5/8	5/8	1-1/4	3-1/2	415-1000	415-0597	41.65	415-1037	415-0636	53.09	415-1195	415-0801	45.53	415-1232	415-0838	58.69
3/4	3/4	1-1/2	4	415-1001	415-0598	58.51	415-1038	415-0637	75.35	415-1196	415-0802	67.09	415-1233	415-0839	87.43
7/8	7/8	1-1/2	4	415-1002	415-0599	107.00	415-1039	415-0638	135.42	415-1197	415-0803	129.92	415-1234	415-0840	165.07
1	1	1-1/2	4	415-1003	415-0600	95.70	415-1040	415-0639	122.40	415-1198	415-0804	119.84	415-1235	415-0841	154.42
1-1/4	1-1/4	2	4-1/4		415-0601	336.28		415-0640	382.13						



Long and Extra Long Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30



LONG LENGTH 4 FLUTE-SQUARE END - UNCOATED



LONG LENGTH 4 FLUTE-SQUARE END - ALTIM COATED



EXTRA LONG LENGTH 4 FLUTE-SQUARE END - UNCOATED



EXTRA LONG LENGTH 4 FLUTE-SQUARE END - ALTIM COATED



LONG LENGTH 4 FLUTE-BALL NOSE - UNCOATED



LONG LENGTH 4 FLUTE-BALL NOSE - ALTIM COATED



EXTRA LONG LENGTH 4 FLUTE-BALL NOSE - UNCOATED



EXTRA LONG LENGTH 4 FLUTE-BALL NOSE - ALTIM COATED



LONG LENGTH 2 FLUTE-SQUARE END - UNCOATED



LONG LENGTH 2 FLUTE-SQUARE END - ALTIM COATED



EXTRA LONG LENGTH 2 FLUTE-SQUARE END - UNCOATED



EXTRA LONG LENGTH 2 FLUTE-SQUARE END - ALTIM COATED



LONG LENGTH 2 FLUTE-BALL NOSE - UNCOATED



LONG LENGTH 2 FLUTE-BALL NOSE - ALTIM COATED



EXTRA LONG LENGTH 2 FLUTE-BALL NOSE - UNCOATED



EXTRA LONG LENGTH 2 FLUTE-BALL NOSE - ALTIM COATED

END MILLS • Solid Carbide



Regular Length Double End Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FLUTE - SQUARE
END - 30° - UNCOATED



2 FLUTE - SQUARE
END - 30° - ALTIN COATED



4 FLUTE - SQUARE
END - 30° - UNCOATED



4 FLUTE - SQUARE
END - 30° - ALTIN COATED



2 FLUTE - BALL
NOSE- 30° - UNCOATED



2 FLUTE - BALL
NOSE - 30° - ALTIN COATED



4 FLUTE - BALL
NOSE- 30° - UNCOATED



4 FLUTE - BALL
NOSE - 30° - ALTIN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+ .000, -.002"	-.0001, -.0004"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTIN COATED			UNCOATED			ALTIN COATED		
				2 FL	4 FL	PRICE	2 FL	4 FL	PRICE	2 FL	4 FLUTE	PRICE	2 FL	4 FL	PRICE
1/8"	3/8"	3/8"	3-1/8"	415-1837	415-1881	\$14.93	415-1848	415-1892	\$28.22	415-1859	415-1903	\$24.88	415-1870	415-1914	\$33.57
5/32	3/8	7/16	3-1/4	415-1838	415-1882	14.46	415-1849	415-1893	27.33	415-1860	415-1904	24.88	415-1871	415-1915	33.57
3/16	3/8	1/2	3-1/4	415-1839	415-1883	14.46	415-1850	415-1894	27.33	415-1861	415-1905	24.88	415-1872	415-1916	33.57
7/32	3/8	9/16	3-1/2	415-1840	415-1884	15.28	415-1851	415-1895	28.87	415-1862	415-1906	24.88	415-1873	415-1917	33.57
1/4	3/8	5/8	3-1/2	415-1841	415-1885	14.87	415-1852	415-1896	28.11	415-1863	415-1907	24.88	415-1874	415-1918	33.57
9/32	3/8	11/16	3-1/2	415-1842	415-1886	16.39	415-1853	415-1897	30.98	415-1864	415-1908	28.56	415-1875	415-1919	38.56
5/16	3/8	3/4	3-1/2	415-1843	415-1887	16.39	415-1854	415-1898	30.98	415-1865	415-1909	28.56	415-1876	415-1920	38.56
11/32	3/8	3/4	3-1/2	415-1844	415-1888	16.39	415-1855	415-1899	30.98	415-1866	415-1910	28.56	415-1877	415-1921	38.56
3/8	3/8	3/4	3-1/2	415-1845	415-1889	16.39	415-1856	415-1900	30.98	415-1867	415-1911	28.56	415-1878	415-1922	38.56
7/16	1/2	7/8	4	415-1846	415-1890	24.39	415-1857	415-1901	46.10	415-1868	415-1912	38.86	415-1879	415-1923	52.47
1/2	1/2	1	4	415-1847	415-1891	27.40	415-1858	415-1902	51.79	415-1869	415-1913	42.25	415-1880	415-1924	57.04



Metric Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



METRIC 4 FLUTE SQUARE
END- 30° - UNCOATED



METRIC 4 FLUTE SQUARE
END- 30° - ALTIN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+ .000, -.002"	-.0001, -.0004"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END			
				UNCOATED 4 FL	Price	ALTIN COATED 4 FL	Price
3.5"	4"	12"	50"	415-0531	\$8.58	415-0547	\$10.72
4.0	4	14	50	415-0532	8.58	415-0548	10.72
4.5	6	16	50	415-0533	10.49	415-0549	13.12
5.0	6	16	50	415-0534	10.49	415-0550	13.12
6.0	6	19	50	415-0535	10.96	415-0551	13.71
7.0	8	19	63	415-0536	11.93	415-0552	14.91
8.0	8	20	63	415-0537	12.40	415-0553	15.50
9.0	10	22	75	415-0538	18.12	415-0554	22.65
10.0	10	22	75	415-0539	22.89	415-0555	28.62
11.0	12	25	75	415-0540	25.27	415-0556	31.60
12.0	12	25	75	415-0541	26.24	415-0557	32.79
14.0	14	32	89	415-0542	44.35	415-0558	55.44
16.0	16	32	89	415-0543	50.55	415-0559	63.20
18.0	18	38	100	415-0544	69.15	415-0560	86.44
20.0	20	38	100	415-0545	109.69	415-0561	137.10
25.0	25	38	100	415-0546	143.07	415-0562	178.84



3xD Miniature Micrograin Solid Carbide End Mills(cont.)



3 x Diameter-2&4 Flute-Square & Ball End-Uncoated & ALTiN Coated

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



4 FLUTE - SQUARE END - UNCOATED



4 FLUTE - SQUARE END - ALTiN COATED



4 FLUTE - BALL NOSE - UNCOATED



4 FLUTE - BALL NOSE - ALTiN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+0.0005,-.0005"	-.0001,-.0003"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTiN COATED			UNCOATED			ALTiN COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
0.060"	0.125"	0.180"	1-1/2"	415-2230	415-2642	\$8.41	415-2284	415-2696	\$10.11	415-2338	415-2750	\$10.53	415-2392	415-2804	\$12.64
0.061	0.125	0.183	1-1/2	415-2231	415-2643	8.41	415-2285	415-2697	10.11	415-2339	415-2751	10.53	415-2393	415-2805	12.64
0.062	0.125	0.186	1-1/2	415-2232	415-2644	8.41	415-2286	415-2698	10.11	415-2340	415-2752	10.53	415-2394	415-2806	12.64
0.063	0.125	0.189	1-1/2	415-2233	415-2645	8.41	415-2287	415-2699	10.11	415-2341	415-2753	10.53	415-2395	415-2807	12.64
0.064	0.125	0.192	1-1/2	415-2234	415-2646	8.41	415-2288	415-2700	10.11	415-2342	415-2754	10.53	415-2396	415-2808	12.64
0.065	0.125	0.195	1-1/2	415-2235	415-2647	8.41	415-2289	415-2701	10.11	415-2343	415-2755	10.53	415-2397	415-2809	12.64
0.066	0.125	0.198	1-1/2	415-2236	415-2648	8.41	415-2290	415-2702	10.11	415-2344	415-2756	10.53	415-2398	415-2810	12.64
0.067	0.125	0.201	1-1/2	415-2237	415-2649	8.41	415-2291	415-2703	10.11	415-2345	415-2757	10.53	415-2399	415-2811	12.64
0.068	0.125	0.204	1-1/2	415-2238	415-2650	8.41	415-2292	415-2704	10.11	415-2346	415-2758	10.53	415-2400	415-2812	12.64
0.069	0.125	0.207	1-1/2	415-2239	415-2651	8.41	415-2293	415-2705	10.11	415-2347	415-2759	10.53	415-2401	415-2813	12.64
0.070	0.125	0.210	1-1/2	415-2240	415-2652	8.41	415-2294	415-2706	10.11	415-2348	415-2760	10.53	415-2402	415-2814	12.64
0.071	0.125	0.213	1-1/2	415-2241	415-2653	8.41	415-2295	415-2707	10.11	415-2349	415-2761	10.53	415-2403	415-2815	12.64
0.072	0.125	0.216	1-1/2	415-2242	415-2654	8.41	415-2296	415-2708	10.11	415-2350	415-2762	10.53	415-2404	415-2816	12.64
0.073	0.125	0.219	1-1/2	415-2243	415-2655	8.41	415-2297	415-2709	10.11	415-2351	415-2763	10.53	415-2405	415-2817	12.64
0.074	0.125	0.222	1-1/2	415-2244	415-2656	8.41	415-2298	415-2710	10.11	415-2352	415-2764	10.53	415-2406	415-2818	12.64
0.075	0.125	0.225	1-1/2	415-2245	415-2657	8.41	415-2299	415-2711	10.11	415-2353	415-2765	10.53	415-2407	415-2819	12.64
0.076	0.125	0.228	1-1/2	415-2246	415-2658	8.41	415-2300	415-2712	10.11	415-2354	415-2766	10.53	415-2408	415-2820	12.64
0.077	0.125	0.231	1-1/2	415-2247	415-2659	8.41	415-2301	415-2713	10.11	415-2355	415-2767	10.53	415-2409	415-2821	12.64
0.078	0.125	0.234	1-1/2	415-2248	415-2660	8.41	415-2302	415-2714	10.11	415-2356	415-2768	10.53	415-2410	415-2822	12.64
0.079	0.125	0.237	1-1/2	415-2249	415-2661	8.41	415-2303	415-2715	10.11	415-2357	415-2769	10.53	415-2411	415-2823	12.64
0.080	0.125	0.240	1-1/2	415-2250	415-2662	8.41	415-2304	415-2716	10.11	415-2358	415-2770	10.53	415-2412	415-2824	12.64
0.081	0.125	0.243	1-1/2	415-2251	415-2663	8.41	415-2305	415-2717	10.11	415-2359	415-2771	10.53	415-2413	415-2825	12.64
0.082	0.125	0.246	1-1/2	415-2252	415-2664	8.41	415-2306	415-2718	10.11	415-2360	415-2772	10.53	415-2414	415-2826	12.64
0.083	0.125	0.249	1-1/2	415-2253	415-2665	8.41	415-2307	415-2719	10.11	415-2361	415-2773	10.53	415-2415	415-2827	12.64
0.084	0.125	0.252	1-1/2	415-2254	415-2666	8.41	415-2308	415-2720	10.11	415-2362	415-2774	10.53	415-2416	415-2828	12.64
0.085	0.125	0.255	1-1/2	415-2255	415-2667	8.41	415-2309	415-2721	10.11	415-2363	415-2775	10.53	415-2417	415-2829	12.64
0.086	0.125	0.258	1-1/2	415-2256	415-2668	8.41	415-2310	415-2722	10.11	415-2364	415-2776	10.53	415-2418	415-2830	12.64
0.087	0.125	0.261	1-1/2	415-2257	415-2669	8.41	415-2311	415-2723	10.11	415-2365	415-2777	10.53	415-2419	415-2831	12.64
0.088	0.125	0.263	1-1/2	415-2258	415-2670	8.41	415-2312	415-2724	10.11	415-2366	415-2778	10.53	415-2420	415-2832	12.64
0.089	0.125	0.267	1-1/2	415-2259	415-2671	8.41	415-2313	415-2725	10.11	415-2367	415-2779	10.53	415-2421	415-2833	12.64
0.090	0.125	0.270	1-1/2	415-2260	415-2672	8.41	415-2314	415-2726	10.11	415-2368	415-2780	10.53	415-2422	415-2834	12.64
0.091	0.125	0.273	1-1/2	415-2261	415-2673	8.41	415-2315	415-2727	10.11	415-2369	415-2781	10.53	415-2423	415-2835	12.64
0.092	0.125	0.276	1-1/2	415-2262	415-2674	8.41	415-2316	415-2728	10.11	415-2370	415-2782	10.53	415-2424	415-2836	12.64
0.093	0.125	0.279	1-1/2	415-2263	415-2675	8.41	415-2317	415-2729	10.11	415-2371	415-2783	10.53	415-2425	415-2837	12.64
0.094	0.125	0.282	1-1/2	415-2264	415-2676	8.41	415-2318	415-2730	10.11	415-2372	415-2784	10.53	415-2426	415-2838	12.64
0.095	0.125	0.285	1-1/2	415-2265	415-2677	8.41	415-2319	415-2731	10.11	415-2373	415-2785	10.53	415-2427	415-2839	12.64
0.096	0.125	0.288	1-1/2	415-2266	415-2678	8.41	415-2320	415-2732	10.11	415-2374	415-2786	10.53	415-2428	415-2840	12.64
0.097	0.125	0.291	1-1/2	415-2267	415-2679	8.41	415-2321	415-2733	10.11	415-2375	415-2787	10.53	415-2429	415-2841	12.64
0.098	0.125	0.294	1-1/2	415-2268	415-2680	8.41	415-2322	415-2734	10.11	415-2376	415-2788	10.53	415-2430	415-2842	12.64
0.099	0.125	0.297	1-1/2	415-2269	415-2681	8.41	415-2323	415-2735	10.11	415-2377	415-2789	10.53	415-2431	415-2843	12.64
0.100	0.125	0.300	1-1/2	415-2270	415-2682	8.41	415-2324	415-2736	10.11	415-2378	415-2790	10.53	415-2432	415-2844	12.64
0.101	0.125	0.303	1-1/2	415-2271	415-2683	8.41	415-2325	415-2737	10.11	415-2379	415-2791	10.53	415-2433	415-2845	12.64
0.102	0.125	0.306	1-1/2	415-2272	415-2684	8.41	415-2326	415-2738	10.11	415-2380	415-2792	10.53	415-2434	415-2846	12.64
0.103	0.125	0.309	1-1/2	415-2273	415-2685	8.41	415-2327	415-2739	10.11	415-2381	415-2793	10.53	415-2435	415-2847	12.64
0.104	0.125	0.312	1-1/2	415-2274	415-2686	8.41	415-2328	415-2740	10.11	415-2382	415-2794	10.53	415-2436	415-2848	12.64
0.105	0.125	0.315	1-1/2	415-2275	415-2687	8.41	415-2329	415-2741	10.11	415-2383	415-2795	10.53	415-2437	415-2849	12.64
0.106	0.125	0.318	1-1/2	415-2276	415-2688	8.41	415-2330	415-2742	10.11	415-2384	415-2796	10.53	415-2438	415-2850	12.64
0.107	0.125	0.321	1-1/2	415-2277	415-2689	8.41	415-2331	415-2743	10.11	415-2385	415-2797	10.53	415-2439	415-2851	12.64
0.108	0.125	0.324	1-1/2	415-2278	415-2690	8.41	415-2332	415-2744	10.11	415-2386	415-2798	10.53	415-2440	415-2852	12.64
0.109	0.125	0.327	1-1/2	415-2279	415-2691	8.41	415-2333	415-2745	10.11	415-2387	415-2799	10.53	415-2441	415-2853	12.64
0.110	0.125	0.330	1-1/2	415-2280	415-2692	8.41	415-2334	415-2746	10.11	415-2388	415-2800	10.53	415-2442	415-2854	12.64
0.115	0.125	0.345	1-1/2	415-2281	415-2693	8.41	415-2335	415-2747	10.11	415-2389	415-2801	10.53	415-2443	415-2855	12.64
0.120	0.125	0.360	1-1/2	415-2282	415-2694	8.41	415-2336	415-2748	10.11	415-2390	415-2802	10.53	415-2444	415-2856	12.64



Stub Length Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FLUTE - SQUARE
END - 30° - UNCOATED



2 FLUTE - SQUARE
END - 30° - ALTIM COATED



4 FLUTE - SQUARE
END - 30° - UNCOATED



4 FLUTE - SQUARE
END - 30° - ALTIM COATED



2 FLUTE - BALL
NOSE - 30° - UNCOATED



2 FLUTE - BALL
NOSE - 30° - ALTIM COATED



4 FLUTE - BALL
NOSE - 30° - UNCOATED



4 FLUTE - BALL
NOSE - 30° - ALTIM COATED

TOLERANCES	DIAMETER	SHANK
1/64"-1/2"	+0.000,-.002"	-.0001,-.0004"
5/8"-3/4"	+0.000,-.003	-.0001,-.0004"

SIZE SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END						
			UNCOATED			ALTIM COATED			UNCOATED			ALTIM COATED			
			2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price	
1/32"	1/8"	1/16"	1-1/2"	415-0396	415-0464	\$4.93	415-0413	415-0481	\$6.40	415-0430	415-0498	\$6.43	415-0447	415-0515	\$8.22
3/64	1/8	3/32	1-1/2"	415-0397	415-0465	4.93	415-0414	415-0482	6.40	415-0431	415-0499	6.43	415-0448	415-0516	8.22
1/16	1/8	1/8	1-1/2"	415-0398	415-0466	3.70	415-0415	415-0483	4.82	415-0432	41 5-0500	4.83	415-0449	415-0517	6.17
5/64	1/8	1/8	1-1/2"	415-0399	415-0467	6.24	415-0416	415-0484	7.81	415-0433	415-0501	7.83	415-0450	415-0518	9.77
3/32	1/8	3/16	1-1/2"	415-0400	415-0468	3.70	415-0417	415-0485	4.82	415-0434	415-0502	4.83	415-0451	415-0519	6.17
1/8	1/8	1/4	1-1/2"	415-0401	415-0469	3.53	415-0418	415-0486	4.61	415-0435	415-0503	4.58	415-0452	415-0520	5.87
5/32	3/16	5/16	2	415-0402	415-0470	5.87	415-0419	415-0487	7.25	415-0436	415-0504	7.63	415-0453	415-0521	9.77
3/16	3/16	3/8	2	415-0403	415-0471	5.52	415-0420	415-0488	6.83	415-0437	415-0505	7.15	415-0454	415-0522	9.16
7/32	1/4	7/16	2	415-0404	415-0472	7.41	415-0421	415-0489	9.20	415-0438	415-0506	9.62	415-0455	415-0523	12.31
1/4	1/4	1/2	2	415-0405	415-0473	6.51	415-0422	415-0490	8.08	415-0439	415-0507	8.43	415-0456	415-0524	10.78
5/16	5/16	1/2	2	415-0406	415-0474	8.79	415-0423	415-0491	11.42	415-0440	415-0508	11.40	415-0457	415-0525	14.59
3/8	3/8	5/8	2	415-0407	415-0475	11.34	415-0424	415-0492	14.04	415-0441	415-0509	14.73	415-0458	415-0526	17.59
7/16	7/16	5/8	2-1/2"	415-0408	415-0476	14.15	415-0425	415-0493	17.56	415-0442	415-0510	18.41	415-0459	415-0527	22.44
1/2	1/2	5/8	2-1/2"	415-0409	415-0477	17.86	415-0426	415-0494	22.18	415-0443	415-0511	23.20	415-0460	415-0528	29.69
5/8	5/8	3/4	3	415-0410	415-0478	37.81	415-0427	415-0495	44.67	415-0444	415-0512	44.30	415-0461	415-0529	54.24
3/4	3/4	1	3	415-0411	415-0479	52.93	415-0428	415-0496	65.49	415-0445	415-0513	67.35	415-0462	415-0530	86.23



Stub Length Double End Micrograin Solid Carbide End Mills

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FLUTE - SQUARE
END - 30° - UNCOATED



2 FLUTE - SQUARE
END - 30° - ALTIM COATED



4 FLUTE - SQUARE
END - 30° - UNCOATED



4 FLUTE - SQUARE
END - 30° - ALTIM COATED



2 FLUTE - BALL
NOSE - 30° - UNCOATED



2 FLUTE - BALL
NOSE - 30° - ALTIM COATED



4 FLUTE - BALL
NOSE - 30° - UNCOATED



4 FLUTE - BALL
NOSE - 30° - ALTIM COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+0.000,-.002"	-.0001,-.0004"

SIZE SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END						
			UNCOATED			ALTIM COATED			UNCOATED			ALTIM COATED			
			2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price	
1/16"	1/8"	1/8"	1-1/2"	415-1925	415-1969	\$6.85	415-1936	415-1980	\$9.25	415-1947	415-1991	\$11.90	415-1958	415-2002	\$11.56
3/32	1/8	3/16	1-1/2"	415-1926	415-1970	7.06	415-1937	415-1981	9.25	415-1948	415-1992	8.806	415-1959	415-2003	11.90
1/8	1/8	1/4	1-1/2"	415-1927	415-1971	5.68	415-1938	415-1982	7.67	415-1949	415-1993	7.112	415-1960	415-2004	9.60
5/32	3/16	5/16	2	415-1928	415-1972	7.66	415-1939	415-1983	10.33	415-1950	415-1994	9.576	415-1961	415-2005	12.92
3/16	3/16	3/8	2	415-1929	415-1973	7.66	415-1940	415-1984	10.33	415-1951	415-1995	9.576	415-1962	415-2006	12.92
7/32	1/4	1/2	2-1/2"	415-1930	415-1974	10.50	415-1941	415-1985	14.18	415-1952	415-1996	13.132	415-1963	415-2007	17.72
1/4	1/4	1/2	2-1/2"	415-1931	415-1975	10.50	415-1942	415-1986	14.18	415-1953	415-1997	13.132	415-1964	415-2008	17.72
5/16	5/16	1/2	2-1/2"	415-1932	415-1976	14.20	415-1943	415-1987	17.42	415-1954	415-1998	17.738	415-1965	415-2009	21.77
3/8	3/8	9/12	2-1/2"	415-1933	415-1977	15.67	415-1944	415-1988	19.22	415-1955	415-1999	19.586	415-1966	415-2010	24.02
7/16	7/16	9/12	2-3/4"	415-1934	415-1978	22.13	415-1945	415-1989	27.17	415-1956	415-2000	27.664	415-1967	415-2011	33.96
1/2	1/2	5/8	3	415-1935	415-1979	27.09	415-1946	415-1990	36.58	415-1957	415-2001	33.866	415-1968	415-2012	45.72

END MILLS • Corner Rounding & Ball

SHARS HSS & Cobalt Corner Rounding End Mill Set



- Right hand cut, Weldon shank
- Use to mill rounded corners
- Form relieved for longer tool life
- May be resharpened repeatedly without changing form
- Suitable for ferrous and non-ferrous materials
- Add "C" after order # for cobalt

Radius	Shank	Head	Order No.	Cobalt(B)	HSS(C)
1/16"	3/8"	7/16"	404-5801*	\$9.90	\$4.50
3/32	3/8	1/2	404-5802*	10.80	4.50
1/8	1/2	5/8	404-5803*	11.20	5.85
5/32	1/2	3/4	404-5804*	12.10	6.60
3/16	1/2	7/8	404-5805*	14.50	9.95
3/16	3/4	7/8	404-5806	14.60	9.95
7/32	1/2	7/8	404-5807	—	9.50
1/4	1/2	1	404-5808*	19.10	10.40
1/4	3/4	1	404-5809	19.50	10.40
9/32	5/8	1	404-5810	—	12.50
5/16	1/2	1-1/8	404-5811*	25.10	12.50
5/16	3/4	1-1/8	404-5812	—	12.50
3/8	1/2	1-1/4	404-5813	32.00	19.55
3/8	7/8	1-1/4	404-5814	32.00	19.55
3/8	3/4	1-1/4	404-5815	32.00	19.55
7/16	1	1-3/8	404-5816	37.60	19.95
7/16	3/4	1-3/8	404-5817	—	19.95
1/2	3/4	1-1/2	404-5818	45.10	29.00
1/2	1	1-1/2	404-5819	—	29.95
5/8	3/4	1-3/4	404-5820	81.10	35.95
5/8	1	1-5/8	404-5821	81.50	28.00
3/4	3/4	2-1/4	404-5822	92.60	36.95
3/4	1	2-1/4	404-5823	92.60	30.00
7/8	3/4	2-1/2	404-5824	—	26.50
1	3/4	2-5/8	404-5825	—	59.95

Set Includes	Order No.	Cobalt(B)	HSS(B)
8 Pieces: 1/16, 3/32, 1/8, 5/32, 3/16, 1/4, 5/16, 3/8"	404-5826*	\$110.90	\$79.00
Ideal for your Bridgeport-type machines. 3/4 shank	404-5827	229.95	161.95
8 Pieces: 3/16, 1/4, 5/16, 3/8, 7/16, 1/2, 5/8, 3/4"			

SHARS 2 Flute Corner Rounding Carbide Double End Mills



Radius	Minor Dia	Shank	OAL	Uncoated Price(B)
0.010"	0.105"	1/8"	1-1/2"	414-1409 \$16.81
0.015	0.095	1/8	1-1/2	414-1410 16.81
0.020	0.085	1/8	1-1/2	414-1411 16.81
0.025	0.075	1/8	1-1/2	414-1412 16.81
0.031	0.063	1/8	1-1/2	414-1413 16.81
0.039	0.047	1/8	1-1/2	414-1414 16.81
0.047	0.094	3/16	2	414-1415 21.54
0.050	0.088	3/16	2	414-1416 21.54
0.062	0.064	3/16	2	414-1417 21.54
0.072	0.106	1/4	2-1/2	414-1418 21.54
0.078	0.094	1/4	2-1/2	414-1419 25.53
0.093	0.064	1/4	2-1/2	414-1420 25.53
0.100	0.050	1/4	2-1/2	414-1421 25.53
0.118	0.077	5/16	2-1/2	414-1422 27.62
0.125	0.063	5/16	2-1/2	414-1423 27.62
0.156	0.063	3/8	2-1/2	414-1424 35.46



- Double end
- Can provide uniform or finished corners
- Radius is form relieved
- Made from premium submicron grain carbide
- Made in USA

SHARS USA Carbide End Mill Advantage:



SANDVIK H10F Carbide Blank
on size 1/4" and smaller carbide end mill
Extra-fine Submicron grain Cemented Carbide Grade for Rotary Tools

Tungsten Carbide	Cobalt	Hardness (HRA)	Transverse Rupture Strength (PSI)	Density (g/cm3)	Grain Size (µm)
90%	10%	92.1	623000	14.45	0.8

H10F grade offers an excellent combination of strength and toughness. In addition, a special additive maximize corrosion resistance without loss of toughness. Grades with binder content in the range of 10 wt % and grain size below 1µm have the highest hardness and compressive strengths, combined with exceptionally high wear resistance and high reliability against breakage.



Kennametal TCM 2210 Carbide Blank
on size larger than 1/4" carbide end mill

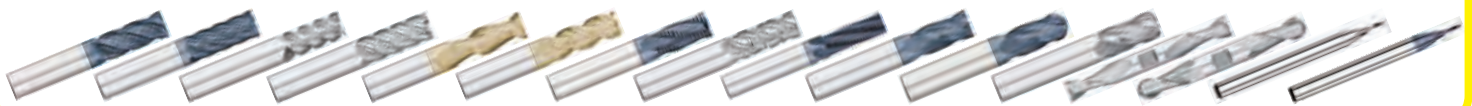
Tooling from TCM is engineered to perform beyond common expectations. We manufacture from high-grade raw materials and blend our unique powder formulations to meet the most demanding requirements of the rotary tool industry.



Our end mill are made using the world renowned Rollomatic CNC grinding machine. 30 sets of ROLLOMATIC CNC grinding machine from Switzerland, for manufacturing carbide end mill from 0.1mm (0.004") to 16mm (5/8"), capable of maintaining an industrial leading tolerance of +/- .0002".



Swiss made PLATIT unit is the 'state-of-the-art' equipment in the coating industry. With in-house Platit PL1001 Compact coating center to minimize production lead time and lowering cost, capable of applying Tin, TiCN, AlTiN, ZRN coating.



SHARS M2AL Roughing End Mills



Coarse Pitch
Center Cutting

Dia	Shank	LOC	OAL	Flutes	Order No.	Price(C)
1/4"	3/8"	5/8"	2-7/16"	4	404-9001*	\$3.50
1/4	3/8	1-1/4	3-1/16	4	404-9002	5.50
5/16	3/8	3/4	2-1/2	4	404-9003*	3.50
5/16	3/8	1-3/8	3-1/8	4	404-9004	6.00
3/8	3/8	3/4	2-5/8	4	404-9005*	4.50
3/8	3/8	1-1/2	3-1/4	4	404-9006	6.00
1/2	1/2	1-1/4	3-1/4	4	404-9007*	5.50
1/2	1/2	2	4	4	404-9008	7.20
5/8	5/8	1-5/8	3-3/4	4	404-9009*	7.00
5/8	5/8	2-1/2	4-5/8	4	404-9010	8.70
3/4	5/8	1-5/8	3-7/8	4	404-9011	13.00
3/4	3/4	1-5/8	3-3/4	4	404-9012*	8.65
3/4	3/4	3	5-1/4	4	404-9013	14.30
7/8	3/4	1-7/8	4-1/8	4	404-9014	12.95
7/8	7/8	1-7/8	4-1/8	4	404-9016	12.00
7/8	7/8	3-1/2	5-3/4	4	404-9017	17.50
1	3/4	2	4-1/2	6	404-9018*	18.00
1	3/4	4	6-1/2	6	404-9019	23.00
1	1	2	4-1/2	6	404-9020	17.00
1	1	3	5-1/2	6	404-9021	22.00
1	1	4	6-1/2	6	404-9022	23.10
1-1/8	1	2	4-1/2	6	404-9023	25.00
1-1/4	3/4	2	4-1/2	6	404-9045	34.95
1-1/4	3/4	4	6-1/2	6	404-9024	30.95
1-1/4	1-1/4	2	4-1/2	6	404-9025	25.95
1-1/4	1-1/4	3	5-1/2	6	404-9026	37.95
1-1/4	1-1/4	4	6-1/2	6	404-9027	37.95
1-1/4	1-1/4	6	8-1/2	6	404-9046	49.95
1-1/2	3/4	4	6-1/4	6	404-9028	38.95
1-1/2	1-1/4	2	4-1/2	6	404-9029	33.95
1-1/2	1-1/4	4	6-1/2	6	404-9030	49.95
1-3/4	1-1/4	2	4-1/2	6	404-9031	39.00
1-3/4	1-1/4	4	6-1/2	6	404-9032	51.95
2	1-1/4	2	4-1/2	8	404-9033	51.95
2	1-1/4	4	6-1/2	8	404-9034	70.00
2	2	3	6-3/4	8	404-9047	76.95
2	2	4	7-3/4	8	404-9035	89.00
2	2	5	8-3/4	8	404-9048	99.00
2	2	6	9-3/4	8	404-9036	148.00
2	2	8	11-3/4	8	404-9037	148.00
2	2	10	13-3/4	8	404-9038	189.95

SHARS M42 Cobalt Roughing End Mills

Coarse Pitch • Center Cutting • Weldon Shank



USA Made
ISO 9001 certified

- Due to the sinusoidal form on cutting edge, small chips are produced which allow faster feed rates than conventional end mills
- Used for difficult and abrasive materials and tough alloys such as: stainless steel, nickel base alloys, brass, iron, etc.



USA Made

Dia	Shank	LOC	OAL	Flutes	Order No.	Price(C)	Order No.	Price(B)
1/4"	3/8"	3/4"	2-1/2"	4	404-9051	\$6.95		
5/16	3/8	3/4	2-1/2	4	404-9052	6.95		
3/8	3/8	3/4	2-1/2	4	404-9053	6.95		
7/16	3/8	1	2-3/4	4	404-9054	9.00		
1/2	1/2	1-1/4	3-1/4	4	404-9055	9.00	414-3606	\$26.67
1/2	1/2	2	4	4	404-9056	11.70	414-3609	37.16
5/8	5/8	1-5/8	3-3/4	4	404-9057	12.00	414-3607	33.01
5/8	5/8	2-1/2	4-5/8	4	404-9058	14.40	414-3610	44.15
3/4	3/4	1-5/8	3-3/4	4	404-9059	17.00	414-3608	40.24
3/4	3/4	3	5-1/4	4	404-9060	19.95	414-3611	51.14
1	3/4	2	4-1/4	4	404-9061	25.00	* 5 Flute	
1	1	2	4-1/2	4	404-9062	26.50	414-3632*	57.48
1	1	3	5-1/2	4	404-9063	32.00	414-3633*	64.72
1	1	4	6-1/2	4	404-9064	37.00	414-3634*	71.91
1	1	6	8-1/2	4	404-9065	56.50		
1-1/4	1-1/4	2	4-1/2	6			414-3654	75.14
1-1/4	1-1/4	4	6-1/2	6			414-3656	104.83
1-1/2	1-1/4	2	4-1/2	6			414-3655	102.28
1-1/2	1-1/4	4	6-1/2	6			414-3657	141.83

SHARS M2AL Roughing End Mill Sets

- Cobalt 5% performance at HSS price
- Specially formulated M2 Steel with aluminum alloy prolongs tool life
- Mill dia tolerance ± .010"

- With wooden stand
- 3/4 Shank stub length
- 5 Pieces
- 1-1/8 Flute length, 3-5/8 Overall length, 6FL
- Set includes 1 each: 1", 1-1/8", 1-1/4", 1-3/8", 1-1/2"

Order No	Price(C)
404-9039	\$129.95

- Regular Length
- 4 Pieces *
- 404-9040 Set includes 1 each: 1/4", 5/16", 3/8", 1/2"
- 404-9041 Set includes 1 each: 1/2", 5/8", 3/4"×3/4", 1"×3/4"

Order No	Price(C)
404-9040	\$17.25
404-9041	39.95

SHARS 4pc. Coarse Tooth M-42 Cobalt Roughing End Mill Sets

- Coarse tooth roughing end mills for heavy cuts, deep slotting, and pocketing.
- 4 Flute, Center Cutting
- Regular Length, 8% Cobalt



Set Contents Includes / each	Order No.	SHARS(C)	USA Made
1/4"×3/8", 5/16×3/8, 3/8×3/8, 1/2×1/2"	404-9042	\$29.50	\$45.50
1/2×1/2, 5/8×5/8, 3/4×3/4, 1×3/4"	404-9043	65.50	68.50

SHARS M42 8% Cobalt TiAlN Coated Fine Pitch Roughing Single End Mills

Cutting Diameter Tolerance+.003"/-.000"



- For profiling, shallow slots
- Fine tooth style for harder metals (Stainless, Inconel, Mold Steels)
- Center Cutting
- TiAlN coated for increased product life



USA Made

Dia	Shank	LOC	OAL	Flutes	Uncoated Price(B)	TiAlN Price(C)	Uncoated Price(B)	
1/4"	3/8"	3/4"	2-1/2"	4"	404-9076	\$8.45	404-9086	\$9.50
5/16	3/8	3/4	2-1/2	4	404-9077	9.45	404-9087	9.95
3/8	3/8	3/4	2-1/4	4	404-9078	10.10	404-9088	10.50
1/2	1/2	1-1/4	3-1/4	4	404-9079	12.65	404-9089	13.20
1/2	1/2	2	4	4	404-9080	15.00	404-9090	15.70
1/2	1/2	3	5	4	404-9081	18.70	404-9091	19.60
5/8	5/8	1-5/8	3-3/4	4	404-9082	19.20	404-9092	20.15
3/4	3/4	1-5/8	3-3/4	4	404-9083	23.95	404-9093	26.30
3/4	3/4	3	5-1/4	4	404-9084	32.95	404-9094	39.60
1	1	2	4-1/2	5	404-9085	35.95	404-9095	42.70
							414-3677	\$26.67
							414-3730	37.16
							414-3679	33.01
							414-3680	40.24
							414-3682	51.14
							414-3703	58.86

END MILLS • BALL

SHARS HSS 4 Flute Ball Nose End Mills



- Single end
- Regular length

Dia	Shank	Flute Length	OAL	Order No.	Price(D)
3/16"	3/8"	1/2"	2-3/8"	404-5970	\$3.75
1/4	3/8	5/8	2-7/16	404-5971	4.75
3/8	3/8	3/4	2-1/2	404-5972	5.25
1/2	1/2	1-1/4	3-1/4	404-5973	4.50
5/8	5/8	1-5/8	3-3/4	404-5974	7.30
3/4	3/4	1-5/8	3-7/8	404-5975	9.70
1	1	2	4-1/2	404-5976	16.20

SHARS 9 Piece 2 Flute HSS Ball Single End Mill Set



INCLUDES:

- 3/8"shank: 1/8", 3/16", 1/4", 5/16", 3/8"
- 1/2"shank: 7/16", 1/2", 5/8"
- 3/4"shank: 3/4"
- Supplied with wooden case

Order No.	USA Brand	SHARS (D)
404-5964	\$102.00	\$42.00

SHARS M2AL 2 Flute Single End Mills



Center cutting • Regular length

M2-AL has the same cutting performance of 5% cobalt at a HSS price.

Size	Shank	LOC	OAL	Order No.	Price(D)
1/8"	3/8"	3/8"	2-5/16"	404-9180	\$2.45
3/16	3/8	7/16	2-5/16	404-9181	2.45
1/4	3/8	1/2	2-5/16	404-9182	2.45
5/16	3/8	9/16	2-5/16	404-9183	2.45
3/8	3/8	9/16	2-5/16	404-9184	2.45
7/16	3/8	13/16	2-1/2	404-9185	2.95
1/2	1/2	1	3	404-9186	3.95
5/8	1/2	1-1/8	3-1/8	404-9187	4.95
5/8	5/8	1-5/16	3-7/16	404-9188	5.10
3/4	5/8	1-5/16	3-7/16	404-9189	6.45
3/4	3/4	1-5/16	3-9/16	404-9190	6.50
7/8	7/8	1-1/2	3-3/4	404-9191	8.35
1	3/4	1-1/2	3-3/4	404-9192	10.90
1	1	1-5/8	4-1/8	404-9193	11.00
1-1/4	1-1/4	1-5/8	4-1/8	404-9194	17.95

SHARS M2AL Hogging Shell Mills



- Heavy duty premium, super-tough
- Key slot drive
- M2-AL has the same cutting performance of 5% cobalt at a HSS price.

Dia.	Cutter	Arbor	Flutes	Order No.	Price(F)
2-1/4"	2"	1"	10	404-9102	\$49.95
2-1/2	1-5/8	1	10	404-9103	74.95
3	1-3/4	1-1/4	12	404-9104	78.15
3-1/2	2	1-1/4	12	404-9105	124.95
4	2-1/4	1-1/2	14	404-9106	172.00

SHARS M2AL 4 Flute Single End Mills



M2-AL has the same cutting performance of 5% cobalt at a HSS price.

Size	Shank	Flute	OAL	Order No.	Price(D)
1/8"	3/8"	3/8"	2-5/16"	404-9111	\$2.95
3/16	3/8	1/2	2-3/8	404-9112	2.95
1/4	3/8	5/8	2-7/16	404-9113	2.95
5/16	3/8	3/4	2-1/2	404-9114	2.95
3/8	3/8	3/4	2-1/2	404-9115	2.95
1/2	1/2	1-1/4	3-1/4	404-9116	4.50
9/16	1/2	1-3/8	3-3/4	404-9117	5.70
5/8	1/2	1-3/8	3-3/8	404-9118	5.80
5/8	5/8	1-5/8	3-3/4	404-9119	6.00
3/4	1/2	1-5/8	3-3/8	404-9120	6.55
3/4	3/4	1-5/8	3-7/8	404-9121	6.60
7/8	7/8	1-7/8	4-1/8	404-9122	11.30
1	3/4	1-7/8	4-1/8	404-9124	12.95
1	1	2	4-1/2	404-9125	13.40
1-1/4	1-1/4	2	4-1/2	404-9126	24.40
1-1/2	1-1/4	2	4-1/2	404-9127	26.70

SHARS HSS Multi Flute Single End Mills



- Long flute length

Cut	Shank	Loc	OAL	Flute No	Order No.	Price(D)
1/4"	3/8"	1-1/4"	3-1/8"	4	404-9520	\$2.95
5/16	3/8	1-3/8	3-1/8	4	404-9521	2.95
3/8	3/8	1-1/2	3-1/4	4	404-9522	4.25
1/2	1/2	2	4	4	404-9524	4.65
5/8	5/8	2-1/2	4-5/8	4	404-9525	8.95
3/4	3/4	3	5-1/4	4	404-9527	11.95
1	1	4	6-1/2	4	404-9531	12.95
1	1	6	8-1/2	4	404-9546	18.10
1-1/4	1-1/4	4	6-1/2	6	404-9537	23.55

SHARS M2AL 4 Flute Single End Mills



M2AL has the same cutting performance of 5% cobalt at a HSS price.

- Extra long flute length

Cut	Shank	LOC	OAL	Order No.	Price(D)
1/4"	3/8"	1-1/4"	3-1/16"	404-9128	\$2.90
3/8	3/8	1-1/2	3-1/4	404-9129	4.00
5/16	3/8	2	3-3/4	404-9137	8.50
1/2	1/2	2	4	404-9131	5.25
5/8	5/8	2-1/2	4-5/8	404-9132	7.65
3/4	3/4	3	5-1/4	404-9133	10.85
7/8	7/8	3-1/2	5-3/4	404-9134	18.95
1	1	3	5-1/2	404-9123	17.80
1	1	4	6-1/2	404-9135	18.95
1-1/4	1-1/4	4	6-1/2	404-9136	27.50

SHARS HSS 2 Flute Ball Nose End Mills



- Single end
- Regular length

Dia	Shank	Flute Length	OAL	Order No.	Price(D)
1/8"	3/8"	3/8"	2-5/16"	404-5950	\$2.60
3/16	3/8	1/2	2-3/8	404-5951	2.60
1/4	3/8	5/8	2-7/16	404-5952	3.30
5/16	3/8	3/4	2-1/2	404-5953	3.30
3/8	3/8	3/4	2-1/2	404-5954	3.30
7/16	1/2	1	3	404-5955	3.30
1/2	1/2	1	3	404-5956	3.45
9/16	1/2	1	3	404-5957	5.90
5/8	1/2	1-1/8	3-1/8	404-5958	5.90
5/8	5/8	1-3/8	3-1/2	404-5959	6.70
3/4	1/2	1-5/8	3-5/8	404-5960	14.40
3/4	3/4	1-5/8	3-7/8	404-5961	14.50
7/8	7/8	2	4-1/4	404-5962	16.90
1	1	2-1/4	4-3/4	404-5963	17.50

SHARS HSS 2 Flute Ball Nose End Mills



- Double end
- Regular length

Dia	Shank	Flute Length	OAL	Order No.	Price(D)
1/8"	3/8"	3/8"	3-3/16"	404-5980	\$3.70
3/16	3/8	7/16	3-1/8	404-5981	3.70
1/4	3/8	1/2	3-1/8	404-5982	3.70
5/16	3/8	9/16	3-1/8	404-5983	6.30
3/8	3/8	9/16	3-1/8	404-5984	6.30
7/16	1/2	13/16	3-7/8	404-5985	7.75
1/2	1/2	13/16	3-7/8	404-5986	8.60
5/8	5/8	1-1/8	4-9/16	404-5987	10.33
3/4	3/4	1-5/16	5	404-5988	18.75
7/8	7/8	1-9/16	5-1/2	404-5989	21.90
1	1	1-5/8	5-7/8	404-5990	23.95

SHARS M2AL 4 Flute Double End Mills



- Center cutting
- Regular Length

Size	Shank	Flute	OAL	Order No.	Price(D)
3/16"	3/8"	1/2"	3-1/4"	404-9160	\$3.50
1/4	3/8	5/8	3-3/8	404-9161	3.50
5/16	3/8	3/4	3-1/2	404-9162	3.50
3/8	3/8	3/4	3-1/2	404-9163	3.50
1/2	1/2	1	4-5/8	404-9164	5.50
5/8	5/8	1-3/8	5	404-9165	9.10
11/16	3/4	1-5/8	5-5/8	404-9166	10.80
3/4	3/4	1-5/8	5-5/8	404-9167	10.80
1	1	1-7/8	6-3/8	404-9170	16.25

- M2-AL Has same cutting ability as 5% cobalt at HSS price
- Center cutting

SHARS M-42 Cobalt 4 Flute Double End Mills

- 8% Cobalt
- Center cutting
- Regular length



USA Made Cutting Diameter Tolerance +.0000"/-.0015"

Profiling, keyways, plunge



USA Made

Size	Shank	LOC	OAL	Order No.	Price(D)	Order No.	Price(B)
1/8"	3/8"	3/8"	3-1/16"	404-9391	\$6.95	414-3310	\$16.99
3/16	3/8	1/2	3-1/4	404-9393	7.35	414-3312	16.99
1/4	3/8	5/8	3-3/8	404-9395	7.35	414-3314	17.48
5/16	3/8	3/4	3-1/2	404-9397	6.95	414-3316	17.48
3/8	3/8	3/4	3-1/2	404-9399	7.35	414-3318	17.48
7/16	1/2	1	4-1/8	404-9401	9.95	414-3320	27.72
1/2	1/2	1	4-1/8	404-9403	10.50	414-3321	27.66
5/8	5/8	1-3/8	5	404-9405	16.50		
3/4	3/4	1-5/8	5-5/8	404-9407	24.50		
7/8	7/8	1-7/8	6-1/8	404-9409	28.20		
1	1	1-7/8	6-3/8	404-9411	36.90		

SHARS M-42 Cobalt 2 Flute Double End Mills

- 8% Cobalt
- Center cutting
- Regular length



Usage: General purpose milling of most medium and tough alloy materials such as: stainless steel, nickel based alloys, brass, iron, etc. Can be used in profiling, slotting, keyways, and pockets

USA Made Cutting Diameter Tolerance +.0000"/-.0015"



USA Made

Size	Shank	LOC	OAL	Order No.	Price(C)	Order No.	Price(B)
1/8"	3/8"	3/8"	3-1/16"	404-9361	\$6.00	414-3103	\$9.33
3/16	3/8	7/16	3-1/8	404-9363	6.00	414-3105	9.33
1/4	3/8	1/2	3-1/8	404-9365	6.00	414-3107	9.62
5/16	3/8	9/16	3-1/8	404-9367	6.00	414-3109	9.62
3/8	3/8	9/16	3-1/8	404-9369	6.00	414-3111	9.62
7/16	1/2	13/16	3-3/4	404-9371	9.30	414-3113	15.55
1/2	1/2	13/16	3-3/4	404-9373	9.30	414-3114	14.91
5/8	5/8	1-1/8	4-1/2	404-9375	14.90	414-3115	21.94
3/4	3/4	1-5/16	5	404-9377	17.50	414-3116	30.31
7/8	7/8	1-9/16	5-1/2	404-9379	26.80		
1	1	1-5/8	5-7/8	404-9381	31.30		

Single End 2 & 4 Flute • END MILLS

SHARS HSS 4 & 6 Flute Single End Mills



TiN coated to extend tool life by 200-500%. Improved cutting speeds by 25-50% with fewer regrinds.

Center Cutting, Regular Length

Size	Shank	LOC	OAL	Order	Price(C)	TiN	Price(D)
1/8"	3/8"	3/8"	2-5/16"	404-6021	\$2.49	404-6130	\$2.95
3/16	3/8	1/2	2-3/8	404-6022	2.49	404-6131	2.95
1/4	3/8	5/8	2-7/16	404-6023	2.49	404-6132	2.95
5/16	3/8	3/4	2-1/2	404-6024	2.49	404-6133	2.95
3/8	3/8	3/4	2-1/2	404-6025	2.49	404-6134	2.95
7/16	3/8	1	2-11/16	404-6026	3.19	404-6135	3.95
1/2	3/8	1	2-11/16	404-6027	3.19	404-6136	3.95
1/2	1/2	1-1/4	3-1/4	404-6028	3.19	404-6137	4.40
9/16	1/2	1-3/8	3-3/8	404-6029	4.49	404-6138	4.95
5/8	1/2	1-3/8	3-3/8	404-6030	5.40	404-6139	5.30
5/8	5/8	1-5/8	3-3/4	404-6031	5.40	404-6140	6.85
11/16	5/8	1-5/8	3-3/4	404-6232	6.20	404-6263	6.85
3/4	5/8	1-5/8	3-5/8	404-6233	6.80	404-6264	7.50
3/4	1/2	1-5/8	3-5/8	404-6032	6.99	404-6141	7.50
3/4	3/4	1-5/8	3-3/4	404-6033	6.99	404-6142	7.95
13/16	3/4	1-7/8	4-1/8	404-6235	8.60	—	—
7/8	3/4	1-7/8	4-1/8	404-6045	8.80	—	—
7/8	7/8	1-7/8	4-1/8	404-6237	8.80	—	—
1	3/4	1-7/8	4-1/8	404-6253	11.60	404-6143	13.20
1	1	2	4-1/2	404-6254	11.60	404-6144	13.20

SHARS M42 Cobalt 4 Flute Single End Mills

8% Cobalt • Center cutting • Regular length



General purpose milling in most materials of medium and tough alloy materials, such as stainless steel, nickel base alloy, brass, iron etc.

USA Made Cutting Diameter Tolerance +.0015"/-.000"

SHARS USA Made

Size	Shank	LOC	OAL	Order No.	Price(C)	Order No.	Price(B)
1/8"	3/8"	3/8"	2-5/16"	404-9331	\$4.50	414-3209	\$12.63
3/16	3/8	1/2	2-3/8	404-9333	4.50	414-3211	12.63
1/4	3/8	5/8	2-7/16	404-9335	4.50	414-3213	12.63
5/16	3/8	3/4	2-1/2	404-9337	4.50	414-3215	13.19
3/8	3/8	3/4	2-1/2	404-9339	4.50	414-3216	13.19
7/16	3/8	1	2-11/16	404-9341	7.30	414-3218	18.03
1/2	1/2	1-1/4	3-1/4	404-9343	7.50	414-3220	16.81
9/16	1/2	1-3/8	3-3/8	404-9346	9.95	414-3212	23.50
5/8	5/8	1-5/8	3-3/4	404-9348	11.95	414-3214	32.10
11/16	5/8	1-5/8	3-3/4	404-9345	9.80	414-3224	24.91
3/4	3/4	1-5/8	3-7/8	404-9347	12.90	414-3228	32.45
7/8	3/4	1-7/8	4-1/8	404-9349	18.10	414-3230	42.08
1	3/4	1-7/8	4-1/8	404-9351	23.50	414-3231	50.48
1	1	2	4-1/2	404-9353	23.50	414-3233	50.48

SHARS M-42 Cobalt 4 Flute Single End Mills

Long Length 8% Cobalt • Center cutting



Size	Shank	LOC	OAL	Order No.	Price(C)
3/8"	3/8"	1-1/2"	3-1/4"	404-9412	\$5.99
1/4	3/8	1-1/4	3-1/16	404-9413	6.99
1/2	1/2	2	4	404-9414	9.50
5/8	5/8	2-1/2	4-5/8	404-9415	16.80
3/4	3/4	3	5-1/4	404-9416	19.80
1	1	4	6-1/2	404-9417	33.60

SHARS HSS 2 Flute Double End Mills



Center cutting • Regular Length

Dia.	Shank	LOC	OAL	Order No.	Price(D)	TiN	Price(D)
1/8"	3/8"	3/8"	3-1/16"	404-6050	\$2.99	404-6150	\$3.50
5/32	3/8	7/16	3-1/8	404-6051	2.99	404-6151	3.50
3/16	3/8	7/16	3-1/8	404-6052	2.99	404-6152	3.50
7/32	3/8	1/2	3-1/8	404-6053	2.99	404-6153	4.00
1/4	3/8	1/2	3-1/8	404-6054	2.99	404-6154	3.50
9/32	3/8	9/16	3-1/8	404-6055	3.35	404-6155	4.00
5/16	3/8	9/16	3-1/8	404-6056	2.99	404-6156	3.50
11/32	3/8	9/16	3-1/8	404-6057	3.35	404-6157	4.00
3/8	3/8	9/16	3-1/8	404-6058	2.99	404-6158	3.50
13/32	1/2	13/16	3-3/4	404-6059	5.35	404-6159	5.00
7/16	1/2	13/16	3-3/4	404-6060	5.35	—	—
15/32	1/2	13/16	3-3/4	404-6061	5.35	—	—
1/2	1/2	13/16	3-3/4	404-6062	5.35	—	—
9/16	5/8	1-1/8	4-1/2	404-6063	7.20	—	—
5/8	5/8	1-1/8	4-1/2	404-6064	7.20	404-6160	7.95
3/4	3/4	1-5/16	5	404-6065	10.50	404-6161	9.25
7/8	7/8	1-9/16	5-1/2	404-6066	15.00	—	—
1	1	1-5/8	5-7/8	404-6067	20.00	404-6162	14.30

SHARS HSS 4 Flute Double End Mills



Center cutting • Regular Length

Dia.	Shank	LOC	OAL	Order No.	Price(D)	TiN	Price(D)
1/8"	3/8"	3/8"	3-1/8"	404-6068	\$2.99	404-6163	\$3.50
5/32	3/8	7/16	3-1/8	404-6069	2.99	404-6164	3.50
3/16	3/8	1/2	3-1/4	404-6070	2.99	404-6165	3.50
7/32	3/8	9/16	3-1/4	404-6071	2.99	404-6166	4.00
1/4	3/8	5/8	3-3/8	404-6072	2.99	404-6167	3.50
9/32	3/8	11/16	3-3/8	404-6073	3.35	404-6168	4.00
5/16	3/8	3/4	3-1/2	404-6074	3.35	404-6169	3.50
11/32	3/8	3/4	3-3/8	404-6075	3.35	404-6170	4.00
3/8	3/8	3/4	3-1/2	404-6076	2.99	404-6171	3.50
13/32	1/2	1	4-1/8	404-6077	4.90	404-6172	5.00
7/16	1/2	1	4-1/8	404-6078	4.90	—	—
15/32	1/2	1	4-1/8	404-6079	4.90	—	—
1/2	1/2	1	4-1/8	404-6080	4.90	—	—
9/16	5/8	1-3/8	5	404-6081	7.90	—	—
5/8	5/8	1-3/8	5	404-6082	7.90	404-6173	7.95
3/4	3/4	1-5/8	5-3/8	404-6083	7.99	404-6174	11.95
7/8	7/8	1-7/8	6-1/4	404-6084	9.95	—	—
1	1	1-7/8	6-1/2	404-6085	11.95	404-6175	14.30

SHARS M2AL 2 Flute Double End Mills



Size	Shank	Flute	OAL	Order No.	Price(C)
1/8"	3/8"	3/8"	3-1/16"	404-9140	\$3.50
3/16	3/8	7/16	3-1/8	404-9141	3.50
1/4	3/8	1/2	3-1/8	404-9142	3.50
5/16	3/8	9/16	3-1/8	404-9143	3.50
3/8	3/8	9/16	3-1/8	404-9144	3.50
7/16	1/2	13/16	3-3/4	404-9145	5.30
1/2	1/2	13/16	3-3/4	404-9146	5.50
5/8	5/8	1-1/8	4-1/2	404-9147	7.10
11/16	3/4	1-5/16	5	404-9148	10.50
3/4	3/4	1-5/16	5	404-9149	11.95
1	1	1-5/8	5-7/8	404-9151	19.50

M2-AL Has same cutting ability as 5% cobalt at HSS price

Carbide End Mills



1.5xD Miniature Stub Length Micrograin Solid Carbide End Mills

1.5 x Diameter • 2&4 Flute • Square & Ball End • Uncoated & ALTiN Coated

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



2 FL-STUB FLUTE - SQUARE END - UNCOATED



2 FL-STUB FLUTE - BALL NOSE - UNCOATED



4 FL-STUB FLUTE - SQUARE END - UNCOATED



4 FL-STUB FLUTE - BALL NOSE - UNCOATED



2 FL-STUB FLUTE - SQUARE END - ALTiN COATED



2 FL-STUB FLUTE - BALL NOSE - ALTiN COATED



4 FL-STUB FLUTE - SQUARE END - ALTiN COATED



4 FL-STUB FLUTE - BALL NOSE - ALTiN COATED

TOLERANCES	DIAMETER	SHANK
ALL SIZES	+0.0005,-.0005"	-.0001,-.0003"

SIZE	SHANK	FLUTE LENGTH	OAL	SQUARE END						BALL END					
				UNCOATED			ALTiN COATED			UNCOATED			ALTiN COATED		
				2 FL	4 FL	Price	2 FL	4 FL	Price	2 FL	4 FLUTE	Price	2 FL	4 FL	Price
0.005"	0.125"	0.008"	1-1/2"	415-2857		\$22.13	415-2882		\$26.56	415-2907		\$27.66	415-2932		\$23.71
0.010	0.125	0.015	1-1/2"	415-2858	415-2957	19.84	415-2883	415-2981	23.80	415-2908	405-3005	24.79	415-2933	415-3029	21.25
0.015	0.125	0.023	1-1/2"	415-2859	415-2958	12.42	415-2884	415-2982	14.90	415-2909	405-3006	15.51	415-2934	415-3030	13.30
0.020	0.125	0.030	1-1/2"	415-2860	415-2959	11.28	415-2885	415-2983	13.54	415-2910	405-3007	14.11	415-2935	415-3031	12.09
0.025	0.125	0.038	1-1/2"	415-2861	415-2960	11.28	415-2886	415-2984	13.54	415-2911	405-3008	14.11	415-2936	415-3032	12.09
0.030	0.125	0.045	1-1/2"	415-2862	415-2961	10.58	415-2887	415-2985	12.71	415-2912	405-3009	13.23	415-2937	415-3033	11.34
0.031	0.125	0.047	1-1/2"	415-2863	415-2962	9.91	415-2888	415-2986	11.90	415-2913	405-3010	12.42	415-2938	415-3034	10.64
0.035	0.125	0.053	1-1/2"	415-2864	415-2963	9.91	415-2889	415-2987	11.90	415-2914	405-3011	12.42	415-2939	415-3035	10.64
0.040	0.125	0.060	1-1/2"	415-2865	415-2964	9.91	415-2890	415-2988	11.90	415-2915	405-3012	12.42	415-2940	415-3036	10.64
0.045	0.125	0.068	1-1/2"	415-2866	415-2965	9.67	415-2891	415-2989	11.62	415-2916	405-3013	12.11	415-2941	415-3037	10.38
0.047	0.125	0.071	1-1/2"	415-2867	415-2966	9.67	415-2892	415-2990	11.62	415-2917	405-3014	12.11	415-2942	415-3038	10.38
0.050	0.125	0.075	1-1/2"	415-2868	415-2967	9.67	415-2893	415-2991	11.62	415-2918	405-3015	12.11	415-2943	415-3039	10.38
0.055	0.125	0.083	1-1/2"	415-2869	415-2968	9.67	415-2894	415-2992	11.62	415-2919	405-3016	12.11	415-2944	415-3040	10.38
0.060	0.125	0.090	1-1/2"	415-2870	415-2969	9.67	415-2895	415-2993	11.62	415-2920	405-3017	12.11	415-2945	415-3041	10.38
0.062	0.125	0.093	1-1/2"	415-2871	415-2970	9.67	415-2896	415-2994	11.62	415-2921	405-3018	12.11	415-2946	415-3042	10.38
0.065	0.125	0.098	1-1/2"	415-2872	415-2971	9.67	415-2897	415-2995	11.62	415-2922	405-3019	12.11	415-2947	415-3043	10.38
0.070	0.125	0.105	1-1/2"	415-2873	415-2972	9.67	415-2898	415-2996	11.62	415-2923	405-3020	12.11	415-2948	415-3044	10.38
0.075	0.125	0.113	1-1/2"	415-2874	415-2973	9.67	415-2899	415-2997	11.62	415-2924	405-3021	12.11	415-2949	415-3045	10.38
0.078	0.125	0.117	1-1/2"	415-2875	415-2974	9.67	415-2900	415-2998	11.62	415-2925	405-3022	12.11	415-2950	415-3046	10.38
0.080	0.125	0.120	1-1/2"	415-2876	415-2975	9.67	415-2901	415-2999	11.62	415-2926	405-3023	12.11	415-2951	415-3047	10.38
0.085	0.125	0.128	1-1/2"	415-2877	415-2976	9.67	415-2902	415-3000	11.62	415-2927	405-3024	12.11	415-2952	415-3048	10.38
0.090	0.125	0.135	1-1/2"	415-2878	415-2977	9.67	415-2903	415-3001	11.62	415-2928	405-3025	12.11	415-2953	415-3049	10.38
0.093	0.125	0.140	1-1/2"	415-2879	415-2978	9.67	415-2904	415-3002	11.62	415-2929	405-3026	12.11	415-2954	415-3050	10.38
0.095	0.125	0.143	1-1/2"	415-2880	415-2979	9.67	415-2905	415-3003	11.62	415-2930	405-3027	12.11	415-2955	415-3051	10.38
0.100	0.125	0.150	1-1/2"	415-2881	415-2980	9.67	415-2906	415-3004	11.62	415-2931	405-3028	12.11	415-2956	415-3052	10.38



Miniature Corner Radius Micrograin Solid Carbide End Mills

3 x Diameter 1.5 x Diameter • 2&4 Flute • Square & Ball End • Uncoated & ALTiN Coated • Corner Radius

For detail information on carbide blank and manufacturing environment of the following premium USA made solid carbide end mill, please refer to page 30.



TOLERANCES	DIAMETER	SHANK
ALL SIZES	+0.0005,-.0005"	-.0001,-.0003"

Cutting Dia	RADIUS	SHANK	REGULAR FLUTE LENGTH		STUB FLUTE LENGTH		Price	ALTiN COATED		
			4 Flute	4 Flute	4 Flute	4 Flute		REGULAR FLUTE LENGTH	RADIUS	Price
0.015"	0.003"	0.125"	0.045"	415-3135	0.023"	415-3053	\$26.25	415-3176	415-3094	\$32.55
0.020	0.005	0.125	0.060	415-3136	0.030	415-3054	24.50	415-3177	415-3095	30.38
0.025	0.005	0.125	0.075	415-3137	0.038	415-3055	24.50	415-3178	415-3096	30.38
0.030	0.005	0.125	0.090	415-3138	0.045	415-3056	17.50	415-3179	415-3097	21.70
0.030	0.010	0.125	0.090	415-3139	0.045	415-3057	17.50	415-3180	415-3098	21.70
0.031	0.005	0.125	0.093	415-3140	0.047	415-3058	17.50	415-3181	415-3099	21.70
0.031	0.010	0.125	0.093	415-3141	0.047	415-3059	17.50	415-3182	415-3100	21.70
0.035	0.005	0.125	0.105	415-3142	0.053	415-3060	17.50	415-3183	415-3101	21.70
0.035	0.010	0.125	0.105	415-3143	0.053	415-3061	17.50	415-3184	415-3102	21.70
0.040	0.005	0.125	0.120	415-3144	0.060	415-3062	17.50	415-3185	415-3103	21.70
0.040	0.010	0.125	0.120	415-3145	0.060	415-3063	17.50	415-3186	415-3104	21.70
0.045	0.005	0.125	0.135	415-3146	0.068	415-3064	17.50	415-3187	415-3105	21.70