

GR Series: UnCoated fractional end mills

Thick core, high strength, high hardness solid carbide end mills with increased helix and extended cutting lengths.



- Designed for milling of hardened steels, non-metals & non-ferrous alloys
- Proprietary cemented carbide grade offers extremely high hardness and density
- Features heavy core construction for maximum rigidity
- Tight tolerance with SmoothGrind polish-ground surfaces
- Regular, Long (L), and Extra-Long (XL) lengths

Diam	LOC	OAL	Shank	2 flute Square UnCoated		2 flute Ball UnCoated		4 flute Square UnCoated		4 flute Ball UnCoated	
				EDP#	Price	EDP#	Price	EDP#	Price	EDP#	Price
1/64	5/64	1-1/2	1/8	00837	\$20.10	00854	\$22.30	00871	\$20.10	00888	\$22.30
1/32	5/32	1-1/2	1/8	00838	\$19.10	00855	\$21.20	00872	\$19.10	00889	\$21.20
1/32L	1/16	2"	1/8	00839	\$22.30	00708	\$24.40	11156	\$22.30	11175	\$24.40
1/32XL	1/4	2"	1/8	00840	\$26.50	00007	\$28.60	11157	\$26.50	11176	\$28.60
3/64	15/64	1-1/2	1/8	23106	\$18.00	23108	\$20.10	23100	\$18.00	23103	\$20.10
1/16	5/16	1-1/2	1/8	10054	\$18.00	10118	\$20.10	10167	\$18.00	10216	\$20.10
1/16L	1/4	2"	1/8	11099	\$21.20	11169	\$23.30	11158	\$21.20	11177	\$23.30
1/16XL	1/2	2"	1/8	11020	\$26.50	11032	\$28.60	11026	\$26.50	11038	\$28.60
5/64	25/64	1-1/2	1/8	10055	\$17.00	10119	\$19.10	10168	\$17.00	10217	\$19.10
3/32	15/32	1-1/2	1/8	10056	\$17.00	10120	\$19.10	10169	\$17.00	10218	\$19.10
7/64	35/64	1-1/2	1/8	10057	\$17.00	10121	\$19.10	10170	\$17.00	10219	\$19.10
1/8	5/8	1-1/2	1/8	10058	\$15.90	10122	\$18.00	10171	\$15.90	10220	\$18.00
1/8L	1/2	3"	1/8	11100	\$22.30	11170	\$24.40	11159	\$22.30	11178	\$24.40
1/8XL	1"	4"	1/8	11021	\$31.80	11033	\$33.90	11027	\$31.80	11039	\$33.90
9/64	45/64	2"	3/16	10059	\$22.30	10123	\$24.40	10172	\$22.30	10221	\$24.40
5/32	3/4	2"	3/16	10060	\$22.30	10124	\$24.40	10173	\$22.30	10222	\$24.40
11/64	3/4	2"	3/16	10061	\$22.30	10125	\$24.40	10174	\$22.30	10223	\$24.40
3/16	3/4	2"	3/16	10062	\$22.30	10126	\$24.40	10175	\$22.30	10224	\$24.40
3/16L	3/4	3"	3/16	11101	\$28.60	11171	\$30.70	11160	\$28.60	11179	\$30.70
3/16XL	1-3/8	4"	3/16	11022	\$40.30	11034	\$42.40	11028	\$40.30	11040	\$42.40
7/32	1"	2-1/2	1/4	10063	\$27.60	10127	\$30.70	10176	\$27.60	10225	\$30.70
1/4	1"	2-1/2	1/4	10064	\$27.60	10128	\$30.70	10177	\$27.60	10226	\$30.70
1/4L	1"	4"	1/4	11023	\$37.10	11035	\$40.30	11029	\$37.10	11041	\$40.30
1/4XL	1-1/2	6"	1/4	11102	\$55.10	11172	\$58.30	11161	\$55.10	11180	\$58.30
5/16	1"	2-1/2	5/16	10713	\$33.90	10716	\$38.20	10719	\$33.90	10722	\$38.20
3/8	1"	2-1/2	3/8	10714	\$42.40	10717	\$47.70	10720	\$42.40	10723	\$47.70
3/8L	1-3/8	4"	3/8	11024	\$61.50	11036	\$66.80	11030	\$61.50	11042	\$66.80
3/8XL	2"	6"	3/8	11103	\$86.90	11173	\$92.20	11167	\$86.90	11181	\$92.20
7/16	1"	3"	7/16	10997	\$63.60	10998	\$72.10	11001	\$63.60	11002	\$72.10
1/2	1-1/4	3"	1/2	10715	\$65.70	10718	\$74.20	10721	\$65.70	10724	\$74.20
1/2L	1-3/8	4"	1/2	11155	\$80.60	11174	\$89.00	11168	\$80.60	11182	\$89.00
1/2XL	2"	6"	1/2	11025	\$106.00	11037	\$114.50	11031	\$106.00	11043	\$114.50
5/8	1-3/8	3-1/2	5/8	00851	\$116.60	00861	\$127.20	00868	\$116.60	00874	\$127.20
3/4	1-3/8	4"	3/4	00852	\$148.40	00863	\$161.10	00869	\$148.40	00876	\$161.10
1"	1-3/8	4"	1"	00859	\$243.80	00866	\$259.70	00873	\$243.80	00878	\$259.70

Sharpness & Lubricity
 Sharpness & Lubricity

SmoothGrind[®]
 Micro-Polished Surface Finishes Exclusively by Tool Alliance[®]



Specs (micro end mills cutting diameter < 1/8"):
 Cutting Diam +.0003 / -.0003
 Shank Diam +.0000 / -.0002
 Radius ± .00015
 SFR = Shrink Fit Ready



Specs (fractional end mills cut diameter ≥ 1/8"):
 Cutting Diam +.0000 / -.0015
 Shank Diam +.0000 / -.00025
 Radius ± .00075
 SFR = Shrink Fit Ready

new! Technical Data: MP, GR, GRD, SS, NF & LRX Series

Speeds and Feeds for a variety of materials.

35% tighter shank tolerance than h6!
Shrink-Fit Ready!



- Data is for UnCoated (UC) condition of tool
- For coated tools, increase SFM by at least 25%
- For D1 and D2 coatings please refer to their separate Data sheet on page #37
- If recommended speed is higher than machine tool's capacity, run at maximum RPM and reduce feed rate accordingly



Peripheral Milling: Full length of cut possible if radial depth ≤ 10% of tool diameter.



Slot Milling: Based on axial depth < 20% of tool diameter.

Fractional Data

	Peripheral Milling SFPM	Slotting SFPM	Feed Per Tooth based on End Mill Diameter								
			< .010	1/64"	1/32"	1/16"	1/8"	3/16"	1/4"	3/8"	1/2"
Non-Ferrous											
6061 T6 Aluminum	up to 2000	up to 1500	.0001	.00015	.0002	.0004	.0008	.0012	.0015	.002	.003
Copper, Brass, Bronze	up to 1200	up to 1000	.0001	.00015	.0002	.0004	.0008	.0012	.0015	.002	.003
Plastics	up to 2000	up to 1500	.00015	.0002	.0003	.0006	.001	.002	.003	.004	.005
Steels											
1018, 1020	150 to 300	125 to 250	.0001	.00015	.0002	.00025	.0005	.001	.0015	.002	.0025
4140, 4340, P20	125 to 250	125 to 225	.00007	.0001	.00015	.00025	.0005	.0007	.001	.0015	.002
A2, D2, H13 ≤ 32HRC	125 to 225	100 to 150	.00007	.0001	.00015	.00025	.0005	.0007	.001	.0015	.002
A2, D2, H13 ≥ 32HRC	100 to 125	100 to 125	.0001	.00015	.0001	.00015	.0003	.0005	.0008	.0010	.0015
Stainless Steels											
15-5, 17-4 ≤ 32HRC	150 to 350	100 to 225	.00007	.0001	.00015	.00025	.0005	.0007	.001	.0015	.002
15-5, 17-4 ≥ 32HRC	100 to 125	100 to 150	.00005	.00008	.0001	.00015	.0003	.0005	.0008	.0010	.0015
303, 304, 316	150 to 300	125 to 225	.00007	.0001	.00015	.00025	.0005	.0007	.001	.0012	.0015
420, 440C	150 to 250	125 to 225	.00007	.0001	.00015	.00025	.0005	.0007	.001	.0015	.0015
High Temp Alloys											
Inconel 625	75 to 150	75 to 125	.00005	.00008	.0001	.00015	.0005	.0007	.001	.0015	.002
Inconel 718	50 to 120	50 to 110	.00005	.00008	.0001	.00013	.0003	.0005	.001	.0015	.0015
6Al-4V Titanium	100 to 150	75 to 125	.00005	.00008	.0001	.00015	.0005	.0007	.001	.001	.0015
Cast Iron											
Gray Iron ≤ 32HRC	150 to 300	125 to 250	.0001	.00015	.0002	.00025	.0005	.0007	.001	.0015	.002
Ductile Iron	150 to 250	125 to 250	.0001	.00015	.0002	.00025	.0005	.0007	.001	.0015	.002

Metric Data

	Peripheral Milling M/Min	Slotting M/Min	Feed Per Tooth based on End Mill Diameter								
			< 1.0mm	2.0 mm	3.0 mm	4.0 mm	5.0 mm	6.0 mm	8.0 mm	10 mm	12 mm
Non-Ferrous											
6061 T6 Aluminum	up to 600	up to 450	0.005	0.007	0.025	0.025	0.030	0.038	0.050	0.050	0.076
Copper, Brass, Bronze	up to 365	up to 300	0.005	0.007	0.025	0.025	0.030	0.038	0.050	0.050	0.076
Plastics	up to 600	up to 450	0.0075	0.009	0.025	0.025	0.050	0.076	0.100	0.100	0.130
Steels											
1018, 1020	45 to 90	38 to 76	0.005	0.005	0.015	0.018	0.025	0.038	0.050	0.050	0.065
4140, 4340, P20	38 to 76	38 to 68	0.004	0.005	0.012	0.014	0.018	0.025	0.038	0.038	0.050
A2, D2, H13 ≤ 32HRC	38 to 68	30 to 45	0.004	0.005	0.012	0.014	0.018	0.025	0.038	0.038	0.050
A2, D2, H13 ≥ 32HRC	30 to 38	30 to 38	0.005	0.005	0.010	0.010	0.012	0.020	0.025	0.025	0.038
Stainless Steels											
15-5, 17-4 ≤ 32HRC	45 to 110	30 to 68	0.004	0.005	0.012	0.014	0.018	0.025	0.038	0.038	0.050
15-5, 17-4 ≥ 32HRC	30 to 38	30 to 45	0.0025	0.005	0.010	0.010	0.012	0.020	0.025	0.025	0.038
303, 304, 316	45 to 90	38 to 68	0.004	0.005	0.012	0.014	0.018	0.025	0.030	0.030	0.038
420, 440C	45 to 76	38 to 68	0.004	0.005	0.012	0.014	0.018	0.025	0.038	0.038	0.038
High Temp Alloys											
Inconel 625	22 to 45	22 to 38	0.0025	0.005	0.012	0.012	0.018	0.025	0.038	0.038	0.050
Inconel 718	15 to 36	15 to 34	0.0025	0.005	0.010	0.010	0.012	0.025	0.038	0.038	0.038
6Al-4V Titanium	30 to 45	22 to 38	0.0025	0.005	0.012	0.012	0.018	0.025	0.025	0.025	0.038
Cast Iron											
Gray Iron ≤ 32HRC	45 to 90	38 to 76	0.005	0.007	0.012	0.014	0.018	0.025	0.038	0.038	0.050
Ductile Iron	45 to 76	38 to 76	0.005	0.007	0.012	0.014	0.018	0.025	0.038	0.038	0.050

1 **ULTRA-Grain®**

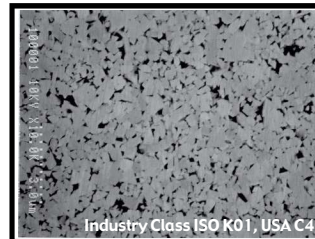
Components of Guaranteed Quality

COMPONENT #1: Carbide Substrate From being the first Company to introduce MicroGrain carbide to the mass-market round tool industry through the present day, Tool Alliance® has consistently innovated new powder and grade combinations for demanding applications. We recognize that our material is the very first Significant Characteristic. By creating partnerships with a limited number of tungsten powder and cemented-carbide material suppliers, we are able to guarantee that our customers receive precision-tolerance tools ground from only the purest, finest grades available worldwide. The following photographs of Ultra-Carb® 1 and Ultra-Grain® 2 respectively demonstrate the complexity of the compound we commonly refer to as Cemented Carbide. Taken at magnification of 10,000 X through an SEM (Scanning Electron Microscope), the visible grains are tungsten while the cobalt binder appears as dark shadows. The largest tungsten grains appearing in the Ultra-Carb photo are less than one micron in size. Note that these grades are two samples representing more than a dozen different substrates we use throughout our product lines, each having a particular application niche. Compared to other industry participants, you will find that Tool Alliance offers the best month-to-month and year-to-year consistency in carbide grain structure.



Ultra-Carb® 1
Cobalt Percentage: 6%
Grain Size (µm): ≤ 0.8
Hardness: 93.5 HRa
Fracture Toughness (K1c): 6.6
TRS (GPa): 3.8
Density (gm/cc): 14.90

ULTRA-Carb®

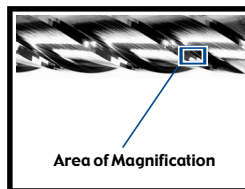


Ultra-Grain® 2
Cobalt Percentage: 8%
Grain Size (µm): ≤ 0.6
Hardness: 93.8 HRa
Fracture Toughness (K1c): 5.8
TRS (GPa): 4.0
Density (gm/cc): 14.6

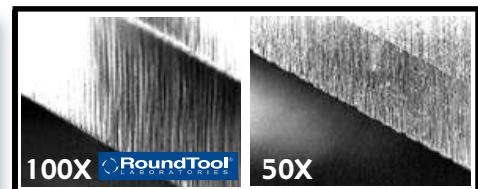
ULTRA-Grain®

2 **SmoothGrind®**

COMPONENT #2: The Grinding Process After selecting the best material available, Tool Alliance has perfected the manufacturing technology to optimize 100% of its physical properties. We call this process SmoothGrind®. Years in development, SmoothGrind is the result of a proprietary combination of material, abrasive, coolant, machine-tool, software, and grinding method technologies that produce cutting tools with superior qualitative characteristics. Sharper and longer lasting cutting edges, enhanced work piece finishes, and improved lubricity are just some of the benefits brought to you by the latest solid carbide rotary tooling advances from Tool Alliance. The following photographs display a RoundTool end mill primary relief featuring SmoothGrind (left) versus a major competitor's product (right). To fully demonstrate the difference, the RoundTool end mill is shown at double the magnification. Note the straight line of our end mill's primary relief in comparison to the jagged edge of the competing product. Keep in mind the competitive end mill is a very good product that has a large following, yet the difference is substantial.



Area of Magnification



SmoothGrind® Competitor's

3 **SmoothContricity®**

35% tighter shank tolerance than h6!



Shrink Fit Ready



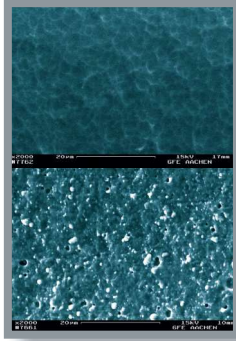
COMPONENT #3: The Tooling Process All the best physical ingredients are wasted unless they are pulled together in a comprehensive system that maximizes their respective attributes. Tool Alliance calls this process SmoothContricity®. Our customer base represents the leading edge of machine tool utilization, and SmoothContricity ensures that optimum results are obtained using qualitative features; minimal run-out (TIR), industry-leading tolerances on diameter & radius, and 100% Shrink Fit Ready (SFR) shanks. Combined, these attributes allow our consumers to reach full machining potential and position the cutting tool as a systematic contributor to process consistency and repeatability.

4 **SmoothEdge®**



COMPONENT #4: The Edge Preparation Process

Our cutting edges are literally too sharp for certain materials. For our carbide inserts and now increasingly for our solid carbide round tools, proper edge preparation can yield huge productivity improvements to "out of the box" tool application. Using a treatment we call SmoothEdge® and performed on machine tools developed in our own R&D lab, we've taken the mystery out of tool "break-in" and provided a consistency that can be counted on time and again. The process ranges from SmoothEdge 1, a micro-blasting treatment using extremely fine aluminum oxide powder (this procedure is standard with any non-micro coated product) to SmoothEdge 5, which adds a double cycle of honing & lubricity treatments. All five will sound and run smooth from the first cut and protect your tooling investment from unnecessary potential for chipping during your initial tooling paths. Big productivity gains can be achieved in certain applications as well due to improved chip formation and evacuation. Learn more about SmoothEdge at toolalliance.com.



Our coating @ 2,000X (top).
Everybody else's (bottom).

SmoothCoat® 5

COMPONENT #5: The Coating Process The challenge of finding a coating method to leverage 100% of the inherent assets of our carbide grade and grinding technologies was difficult. What we finally discovered was such a perfect fit and so logical for our product lines that we invested heavily into the process we now call SmoothCoat®. Much more than simply the standard arc-deposited PVD coating, SmoothCoat involves sputter multi-layering and a multi-step prep & post operation called Micro-Blasting. The advantages of this procedure include relieving of tensile stresses underneath the cutting edge, increased stability of the coating surface, and perhaps most importantly, elevating SmoothGrind even another notch by leveling and activating the cemented carbide substrate. The result is a smooth, shiny, tough, and durable surface that can withstand tomorrow's machining requirements and outlast competitive coatings. Additionally, we've made it a standard feature on thousands of our standard catalog items. Our coating services are performed within our own factories for quality & extremely quick turnaround times.

RoundTool Lab's Standard Coating Availability Coating selection usually included within the EDP but for indicated Series it is added as a suffix to the EDP#.

Other Tool Alliance coatings:



Uncoated



AlTiN HSN²



TiB₂



TiCN

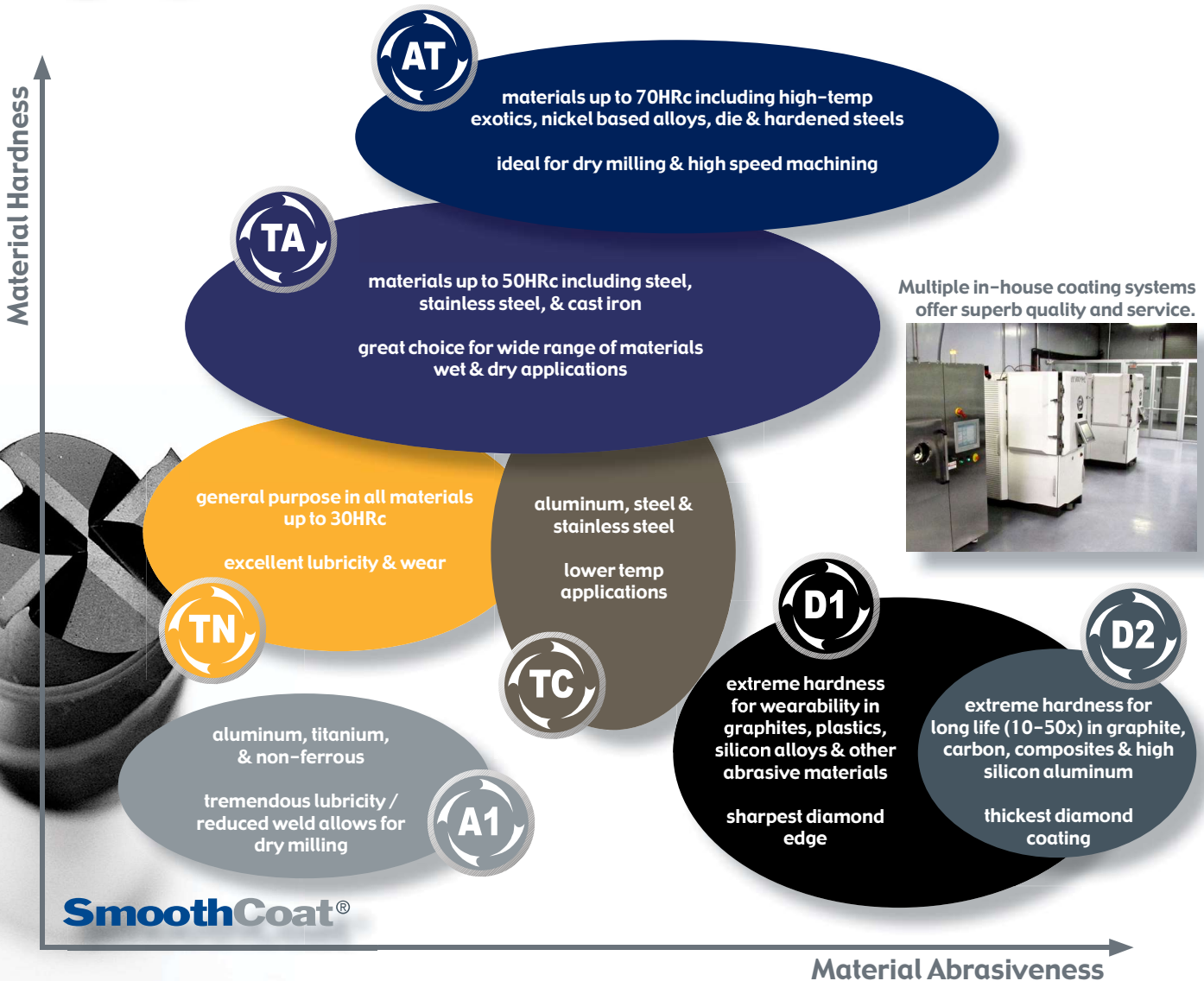


PVD Diamond



CVD Diamond

Standard Coatings available at respective "Coated" List Price



SmoothCoat®

Material Abrasiveness