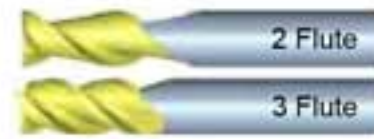
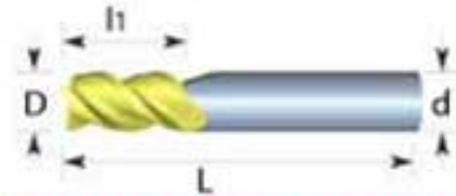


P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel

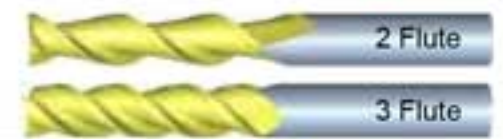
ULTRA HIGH PERFORMANCE - Aluminum

- Special 45 Degree Helix Design with Cylindrical Margin
- Ultra High Performance Micro Grain Carbide with extremely high Transverse Rupture strength
- Variable Pitch & Special Core Design with Chipbreaker Flute
- Diameter Tolerances: +0.0000"/-0.0004"



ULTRA HIGH PERFORMANCE Medium/Finishing, Regular Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut Li	O.A.L. L	Corner Radius	Uncoated			ZrN Coated			DLC Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
1/8	1/8	1/2	1-1/2	SQ	170-125-2	170-125-3	\$11.27	--	--	--	--	--	--
3/16	3/16	5/8	2	SQ	170-188-2	170-188-3	\$14.97	070-188-2	070-188-3	\$17.44	270-188-2	270-188-3	\$29.65
1/4	1/4	3/4	2-1/2	SQ	170-250-2	170-250-3	\$16.32	070-250-2	070-250-3	\$21.60	270-250-2	270-250-3	\$36.72
1/4	1/4	3/4	2-1/2	.020CR	170-250-2-020R	170-250-3-020R	\$16.32	070-250-2-020R	070-250-3-020R	\$21.60	270-250-2-020R	270-250-3-020R	\$36.72
5/16	5/16	13/16	2-1/2	SQ	170-312-2	170-312-3	\$21.60	070-312-2	070-312-3	\$29.84	270-312-2	270-312-3	\$50.73
5/16	5/16	13/16	2-1/2	.020CR	170-312-2-020R	170-312-3-020R	\$21.60	070-312-2-020R	070-312-3-020R	\$29.84	270-312-2-020R	270-312-3-020R	\$50.73
3/8	3/8	1	2-1/2	SQ	170-375-2	170-375-3	\$28.48	070-375-2	070-375-3	\$36.48	270-375-2	270-375-3	\$62.02
3/8	3/8	1	2-1/2	.020CR	170-375-2-020R	170-375-3-020R	\$28.48	070-375-2-020R	070-375-3-020R	\$36.48	270-375-2-020R	270-375-3-020R	\$62.02
1/2	1/2	1-1/4	3	SQ	170-500-2	170-500-3	\$47.04	070-500-2	070-500-3	\$60.80	270-500-2	270-500-3	\$103.36
1/2	1/2	1-1/4	3	.030CR	170-500-2-030R	170-500-3-030R	\$47.04	070-500-2-030R	070-500-3-030R	\$60.80	270-500-2-030R	270-500-3-030R	\$103.36
5/8	5/8	1-1/4	3-1/2	SQ	170-625-2	170-625-3	\$93.44	070-625-2	070-625-3	\$104.00	270-625-2	270-625-3	\$176.79
5/8	5/8	1-1/4	3-1/2	.030CR	170-625-2-030R	170-625-3-030R	\$93.44	070-625-2-030R	070-625-3-030R	\$104.00	270-625-2-030R	270-625-3-030R	\$176.79
3/4	3/4	1-1/2	4	SQ	170-750-2	170-750-3	\$129.59	070-750-2	070-750-3	\$151.99	270-750-2	270-750-3	\$258.39
3/4	3/4	1-1/2	4	.030CR	170-750-2-030R	170-750-3-030R	\$129.59	070-750-2-030R	070-750-3-030R	\$151.99	270-750-2-030R	270-750-3-030R	\$258.39
1	1	1-1/2	4	SQ	170-100-2	170-100-3	\$223.07	070-100-2	070-100-3	\$247.99	270-100-2	270-100-3	\$421.58
1	1	1-1/2	4	.030CR	170-100-2-030R	170-100-3-030R	\$223.07	070-100-2-030R	070-100-3-030R	\$247.99	270-100-2-030R	270-100-3-030R	\$421.58



ULTRA HIGH PERFORMANCE Medium/Finishing, Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut Li	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	3/4	2-1/2	SQ	172-188-2	172-188-3	\$24.64	072-188-2	072-188-3	\$34.67
1/4	1/4	1-1/8	3	SQ	172-250-2	172-250-3	\$30.80	072-250-2	072-250-3	\$36.54
5/16	5/16	1-1/8	3	SQ	172-312-2	172-312-3	\$45.92	072-312-2	072-312-3	\$50.84
3/8	3/8	1-1/8	3	SQ	172-375-2	172-375-3	\$51.84	072-375-2	072-375-3	\$61.45
1/2	1/2	2	4	SQ	172-500-2	172-500-3	\$80.80	072-500-2	072-500-3	\$92.80
5/8	5/8	2-1/4	5	SQ	172-625-2	172-625-3	\$129.59	072-625-2	072-625-3	\$142.39
3/4	3/4	2-1/4	5	SQ	172-750-2	172-750-3	\$180.47	072-750-2	072-750-3	\$193.59
1	1	2-1/4	5	SQ	172-100-2	172-100-3	\$280.97	072-100-2	072-100-3	\$311.99



ULTRA HIGH PERFORMANCE Medium/Finishing, Extra Long Length, Single End - ALUMINUM

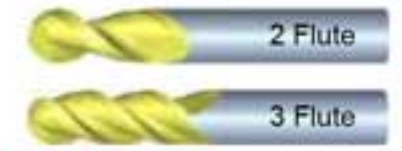
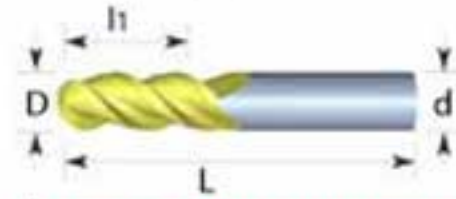
Cutter Diam. D	Shank Diam. d	Length Of Cut Li	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	1-1/8	3	SQ	178-188-2	178-188-3	\$29.70	078-188-2	078-188-3	\$38.14
1/4	1/4	1-1/2	4	SQ	178-250-2	178-250-3	\$40.32	078-250-2	078-250-3	\$43.48
5/16	5/16	1-5/8	4	SQ	178-312-2	178-312-3	\$53.27	078-312-2	078-312-3	\$58.47
3/8	3/8	1-3/4	4	SQ	178-375-2	178-375-3	\$57.02	078-375-2	078-375-3	\$67.59
1/2	1/2	3	6	SQ	178-500-2	178-500-3	\$120.64	078-500-2	078-500-3	\$141.05
5/8	5/8	3	6	SQ	178-625-2	178-625-3	\$160.31	078-625-2	078-625-3	\$165.53
3/4	3/4	3	6	SQ	178-750-2	178-750-3	\$197.51	078-750-2	078-750-3	\$220.30
1	1	3	6	SQ	178-100-2	178-100-3	\$384.60	078-100-2	078-100-3	\$417.21

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel

ULTRA HIGH PERFORMANCE - Aluminum

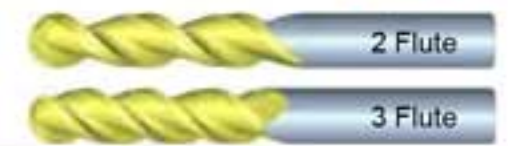
- Special 45 Degree Helix Design with Cylindrical Margin
- Variable Pitch & Special Core Design with Chipbreaker Flute Geometries

- Ultra High Performance Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0004"



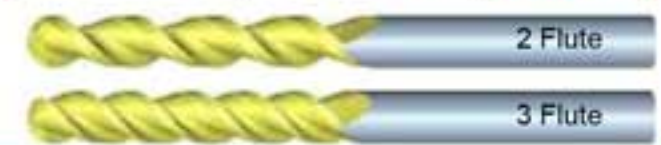
ULTRA HIGH PERFORMANCE Medium/Finishing, Ball Regular Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	5/8	2	BN	174-188-2	174-188-3	\$17.96	074-188-2	074-188-3	\$20.92
1/4	1/4	3/4	2-1/2	BN	174-250-2	174-250-3	\$19.58	074-250-2	074-250-3	\$25.92
5/16	5/16	13/16	2-1/2	BN	174-312-2	174-312-3	\$25.92	074-312-2	074-312-3	\$35.80
3/8	3/8	1	2-1/2	BN	174-375-2	174-375-3	\$34.18	074-375-2	074-375-3	\$43.78
1/2	1/2	1-1/4	3	BN	174-500-2	174-500-3	\$56.44	074-500-2	074-500-3	\$72.96
5/8	5/8	1-1/4	3-1/2	BN	174-625-2	174-625-3	\$112.12	074-625-2	074-625-3	\$124.80
3/4	3/4	1-1/2	4	BN	174-750-2	174-750-3	\$155.51	074-750-2	074-750-3	\$182.39
1	1	1-1/2	4	BN	174-100-2	174-100-3	\$267.68	074-100-2	074-100-3	\$297.59



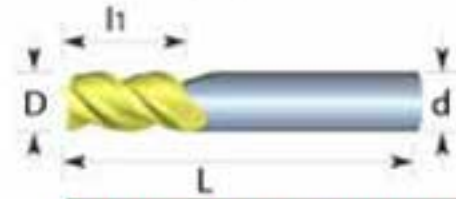
ULTRA HIGH PERFORMANCE Medium/Finishing, Ball Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	3/4	2-1/2	BN	176-188-2	176-188-3	\$29.56	076-188-2	076-188-3	\$41.61
1/4	1/4	1-1/8	3	BN	176-250-2	176-250-3	\$36.96	076-250-2	076-250-3	\$43.85
5/16	5/16	1-1/8	3	BN	176-312-2	176-312-3	\$55.10	076-312-2	076-312-3	\$61.01
3/8	3/8	1-1/8	3	BN	176-375-2	176-375-3	\$62.20	076-375-2	076-375-3	\$73.73
1/2	1/2	2	4	BN	176-500-2	176-500-3	\$96.96	076-500-2	076-500-3	\$111.36
5/8	5/8	2-1/4	5	BN	176-625-2	176-625-3	\$155.51	076-625-2	076-625-3	\$170.87
3/4	3/4	2-1/4	5	BN	176-750-2	176-750-3	\$216.57	076-750-2	076-750-3	\$232.31
1	1	2-1/4	5	BN	176-100-2	176-100-3	\$337.17	076-100-2	076-100-3	\$374.39



ULTRA HIGH PERFORMANCE Medium/Finishing, Ball Extra Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	1-1/8	3	BN	179-188-2	179-188-3	\$35.63	079-188-2	079-188-3	\$45.77
1/4	1/4	1-1/2	4	BN	179-250-2	179-250-3	\$48.38	079-250-2	079-250-3	\$52.18
5/16	5/16	1-5/8	4	BN	179-312-2	179-312-3	\$63.92	079-312-2	079-312-3	\$70.16
3/8	3/8	1-3/4	4	BN	179-375-2	179-375-3	\$68.43	079-375-2	079-375-3	\$81.10
1/2	1/2	3	6	BN	179-500-2	179-500-3	\$144.76	079-500-2	079-500-3	\$169.26
5/8	5/8	3	6	BN	179-625-2	179-625-3	\$192.37	079-625-2	079-625-3	\$198.64
3/4	3/4	3	6	BN	179-750-2	179-750-3	\$237.01	079-750-2	079-750-3	\$264.36
1	1	3	6	BN	179-100-2	179-100-3	\$461.52	079-100-2	079-100-3	\$500.66



P	Steel
M	Stainless Steel
K	Cast Iron
N	• Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
•	BEST

ULTRA HIGH PERFORMANCE - Aluminum

- Special 36 Degree Helix Design with Cylindrical Margin
- Variable Pitch & Special Core Design with Chipbreaker Flute Geometries

- Ultra High Performance Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0004"

NEW



ULTRA HIGH PERFORMANCE 3Flute Medium/Roughing - ALUMINUM

Cutter Diam.	Shank Diam.	Length Of Cut	O.A.L.	Corner Radius	Uncoated			ZrN Coated		
					Part#	Chipbreaker Part#	Price	Part#	Chipbreaker Part#	Price
D	d	Li	L							
1/4	1/4	3/4	2-1/2	SQ	370-250-3	--	\$25.11	470-250-3	--	\$21.60
1/4	1/4	3/4	2-1/2	.015CR	370-250-3-015R	--	\$25.11	470-250-3-015R	--	\$21.60
1/4	1/4	3/4	2-1/2	.030CR	370-250-3-030R	--	\$25.11	--	--	
1/4	1/4	3/4	2-1/2	.060CR	370-250-3-060R	--	\$25.11	--	--	
5/16	5/16	13/16	2-1/2	SQ	370-312-3	--	\$33.23	470-312-3	--	\$29.85
5/16	5/16	13/16	2-1/2	.030CR	370-312-3-030R	--	\$33.23	470-312-3-030R	--	\$29.85
5/16	5/16	13/16	2-1/2	.060CR	370-312-3-060R	--	\$33.23	--	--	
3/8	3/8	1	2-1/2	SQ	370-375-3	--	\$43.81	470-375-3	--	\$36.48
3/8	3/8	1	2-1/2	.030CR	370-375-3-030R	570-375-3-030R	\$43.81	470-375-3-030R	670-375-3-030R	\$36.48
3/8	3/8	1	2-1/2	.060CR	370-375-3-060R	--	\$43.81	--	--	
3/8	3/8	1-1/8	3	SQ	372-375-3	--	\$79.74	472-375-3	--	\$61.45
3/8	3/8	1-1/8	3	.030CR	372-375-3-030R	572-375-3-030R	\$79.74	472-375-3-030R	672-375-3-030R	\$61.45
1/2	1/2	1-1/4	3	SQ	370-500-3	--	\$72.36	470-500-3	--	\$60.80
1/2	1/2	1-1/4	3	.030CR	370-500-3-030R	570-500-3-030R	\$72.36	470-500-3-030R	670-500-3-030R	\$60.80
1/2	1/2	1-1/4	3	.060CR	370-500-3-060R	--	\$72.36	--	--	
1/2	1/2	1-1/4	3	.090CR	370-500-3-090R	--	\$72.36	--	--	
1/2	1/2	1-1/4	3	.120CR	370-500-3-120R	--	\$72.36	--	--	
1/2	1/2	2	4	SQ	372-500-3	--	\$124.31	472-500-3	--	\$92.80
1/2	1/2	2	4	.030CR	372-500-3-030R	572-500-3-030R	\$124.31	472-500-3-030R	672-500-3-030R	\$92.80
5/8	5/8	1-1/4	3-1/2	SQ	370-625-3	--	\$143.74	470-625-3	--	\$104.00
5/8	5/8	1-1/4	3-1/2	.030CR	370-625-3-030R	570-625-3-030R	\$143.74	470-625-3-030R	670-625-3-030R	\$104.00
5/8	5/8	1-1/4	3-1/2	.060CR	370-625-3-060R	--	\$143.74	--	--	
5/8	5/8	1-1/4	3-1/2	.090CR	370-625-3-090R	--	\$143.74	--	--	
5/8	5/8	1-1/4	3-1/2	.120CR	370-625-3-120R	--	\$143.74	--	--	
5/8	5/8	2-1/4	5	SQ	372-625-3	--	\$199.38	472-625-3	--	\$142.40
5/8	5/8	2-1/4	5	.030CR	372-625-3-030R	572-625-3-030R	\$199.38	472-625-3-030R	672-625-3-030R	\$142.40
3/4	3/4	1-5/8	4	SQ	370-750-3	--	\$199.38	470-750-3	--	\$152.00
3/4	3/4	1-5/8	4	.030CR	370-750-3-030R	570-750-3-030R	\$199.38	470-750-3-030R	670-750-3-030R	\$152.00
3/4	3/4	1-5/8	4	.060CR	370-750-3-060R	--	\$199.38	--	--	
3/4	3/4	1-5/8	4	.090CR	370-750-3-090R	--	\$199.38	--	--	
3/4	3/4	1-5/8	4	.120CR	370-750-3-120R	--	\$199.38	--	--	
3/4	3/4	2-1/4	5	SQ	372-750-3	--	\$277.66	472-750-3	--	\$193.58
3/4	3/4	2-1/4	5	.030CR	372-750-3-030R	572-750-3-030R	\$277.66	472-750-3-030R	672-750-3-030R	\$193.58
1	1	1-1/2	4	SQ	370-100-3	--	\$343.17	470-100-3	--	\$247.98
1	1	1-1/2	4	.030CR	370-100-3-030R	570-100-3-030R	\$343.17	470-100-3-030R	670-100-3-030R	\$247.98
1	1	1-1/2	4	.060CR	370-100-3-060R	--	\$343.17	--	--	
1	1	1-1/2	4	.120CR	370-100-3-120R	--	\$343.17	--	--	
1	1	2-1/4	5	SQ	372-100-3	--	\$432.26	472-100-3	--	\$311.98
1	1	2-1/4	5	.030CR	372-100-3-030R	572-100-3-030R	\$432.26	472-100-3-030R	672-100-3-030R	\$311.98

ULTRA HIGH PERFORMANCE - Aluminum

Material	Speed (SFM)	Feed Per Tooth By End Mill Diameter							
		ZrN Coated	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"
Aluminum & Aluminum Alloys	900-1800	.0030	.0035	.0040	.0045	.0050	.0060	.0070	.0090
Copper & Copper Alloys	525-1275	.0030	.0035	.0035	.0040	.0040	.0045	.0050	.0070
Brass & Bronze	375-600	.0030	.0035	.0035	.0040	.0040	.0045	.0050	.0060
Graphite	500-1200	.0040	.0045	.0045	.0045	.0045	.0050	.0060	.0080
Plastics	600-1650	.0040	.0045	.0050	.0060	.0070	.0090	.0110	.0160
Iron, Cast (soft)	--								
Iron, Cast (hard)	--								
Iron, Ductile	--								
Iron, Malleable	--								
Carbon Steels, Low	--								
Carbon Steels, Medium	--								
Carbon Steels Hardened to 35 Rc	--								
Carbon Steels Hardened to 50 Rc	--								
Carbon Steels Hardened to 60 Rc	--								
Steels, Mold	--								
Steels, Tool	--								
Stainless Steels, Soft	--								
Stainless Steels, Hard	--								
Monel & High Nickel Steel	--								
Titanium, Soft	--								
Titanium, Hard	--								
Nickel Based High Temp Alloys	--								



- Higher Feed Per Tooth should be used to start for radial depths of cut less than 25% of the tool diameter. Lower Feed Per Tooth should be used to start for radial depths of cut greater than 25% of the tool diameter.
- The above recommendations are for axial lengths of cut not to exceed 1.5 times the tool diameter for profiling and 1 times the diameter for full slotting.
- The above parameters are recommended starting points only. If the tool is working well, without vibrations or significant noise, increase the SFM and/or Feed Per Tooth in 5-10% increments.
- Optimum speeds & feeds will depend upon material, setup, machine conditions & tool deflection. Higher or lower parameters may be required to achieve optimum machining conditions.
- For Light Radial Depths of cut, make certain to increase the feed rate to compensate for Radial Chip Thinning Factor (RCTF). Consult a formula or app to calculate.
- Climb Milling is preferred to Conventional Milling

$$RPM = \frac{SFM}{(3.146 * \text{Cutter Diam.}) / 12}$$

$$IPM = RPM * \text{Feed Per Tooth} * \# \text{ of Teeth}$$

