



# ADMIRAL

PREMIUM END MILLS

**SOLID CARBIDE  
END MILLS**

2019 / 2020



# ABOUT ADMIRAL END MILLS

Carbide End Mills engineered to the highest quality with the best raw material & coatings for demanding applications. High tech geometries manufactured on the most state of the art 5 Axis CNC Grinders in the world. Extremely rigid quality control to assure the tightest tolerances & consistency.

## GOOD

- General Purpose
- 30 deg Helix Carbide
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"

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

● GOOD ⊖ OK ○ NOT OPTIMAL



## BETTER

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"

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

● BETTER ⊖ OK ○ NOT OPTIMAL

## BEST

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Extra Fine Sub-Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0015"

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

● BEST ⊖ OK ○ NOT OPTIMAL

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

● BEST












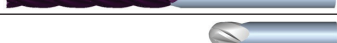






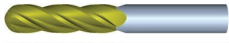
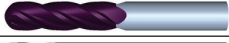














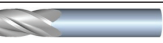
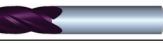








## COATINGS:

- **TiN** (Titanium Nitride) - Gold Color; Provides added abrasion resistance & reduced friction for chips
- **TiAlN** (Titanium Aluminum Nitride) - Blue-Grey Color; Provides the benefits of TiN plus higher heat resistance to improve tool life
- **ZrN** (Zirconium Nitride) - Pale Gold Color; Provides high lubricity for machining aluminum & non-ferrous materials
- **DLC** (Diamond Like Carbon) - Black Color; Extremely hard with very high wear resistance for machining aluminum & non-ferrous materials





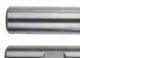
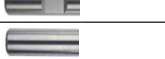



















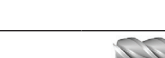














Series	Description	Flutes		Pages
001	Standard Carbide, <b>Stub Length</b> , Square, Single End Uncoated	2,3,4		1
002	Standard Carbide, <b>Stub Length</b> , Square, Single End, TiN coated	2,3,4		1
003	Standard Carbide, <b>Stub Length</b> , Square, Single End, TiALN coated	2,3,4		1
004	Standard Carbide, <b>Regular Length</b> , Square, Single End Uncoated	2,3,4		1,2
005	Standard Carbide, <b>Regular Length</b> , Square, Single End, TiN coated	2,3,4		1,2
006	Standard Carbide, <b>Regular Length</b> , Square, Single End, TiALN coated	2,3,4		1,2
007	Standard Carbide, <b>Long Length</b> , Square, Single End Uncoated	2,4		3
008	Standard Carbide, <b>Long Length</b> , Square, Single End, TiN coated	2,4		3
009	Standard Carbide, <b>Long Length</b> , Square, Single End, TiALN coated	2,4		3
010	Standard Carbide, <b>Extra Long Length</b> , Square, Single End Uncoated	2,4		3
011	Standard Carbide, <b>Extra Long Length</b> , Square, Single End, TiN coated	2,4		3
012	Standard Carbide, <b>Extra Long Length</b> , Square, Single End, TiALN coated	2,4		3
013	Standard Carbide, <b>Stub Length</b> , Ball Nose, Single End Uncoated	2,3,4		5
014	Standard Carbide, <b>Stub Length</b> , Ball Nose, Single End, TiN coated	2,3,4		5
015	Standard Carbide, <b>Stub Length</b> , Ball Nose, Single End, TiALN coated	2,3,4		5
016	Standard Carbide, <b>Regular Length</b> , Ball Nose, Single End Uncoated	2,3,4		5,6
017	Standard Carbide, <b>Regular Length</b> , Ball Nose, Single End, TiN coated	2,3,4		5,6
018	Standard Carbide, <b>Regular Length</b> , Ball Nose, Single End, TiALN coated	2,3,4		5,6
019	Standard Carbide, <b>Long Length</b> , Ball Nose, Single End Uncoated	2,4		7
020	Standard Carbide, <b>Long Length</b> , Ball Nose, Single End, TiN coated	2,4		7
021	Standard Carbide, <b>Long Length</b> , Ball Nose, Single End, TiALN coated	2,4		7
022	Standard Carbide, <b>Extra Long Length</b> , Ball Nose, Single End Uncoated	2,4		7
023	Standard Carbide, <b>Extra Long Length</b> , Ball Nose, Single End, TiN coated	2,4		7
024	Standard Carbide, <b>Extra Long Length</b> , Ball Nose, Single End, TiALN coated	2,4		7
025	Standard Carbide, <b>Stub Length</b> , Square, Double End Uncoated	2,4		8
026	Standard Carbide, <b>Stub Length</b> , Square, Double End, TiN coated	2,4		8
027	Standard Carbide, <b>Stub Length</b> , Square, Double End, TiALN coated	2,4		8
028	Standard Carbide, <b>Stub Length</b> , Ball Nose, Double End Uncoated	2,4		9
029	Standard Carbide, <b>Stub Length</b> , Ball Nose, Double End, TiN coated	2,4		9
030	Standard Carbide, <b>Stub Length</b> , Ball Nose, Double End, TiALN coated	2,4		9
031	Standard Carbide, <b>Regular Length</b> , Square, Double End Uncoated	2,4		8
032	Standard Carbide, <b>Regular Length</b> , Square, Double End, TiALN coated	2,4		8
033	Standard Carbide, <b>Regular Length</b> , Ball Nose, Double End Uncoated	2,4		9
034	Standard Carbide, <b>Regular Length</b> , Ball Nose, Double End, TiALN coated	2,4		9
041	<b>METRIC</b> - Standard Carbide, <b>Regular Length</b> , Square, Single End Uncoated	2,3,4		4
042	<b>METRIC</b> - Standard Carbide, <b>Regular Length</b> , Square, Single End, TiALN coated	2,3,4		4
045	<b>METRIC</b> - Standard Carbide, <b>Long Length</b> , Square, Single End Uncoated	2,4		4
046	<b>METRIC</b> - Standard Carbide, <b>Long Length</b> , Square, Single End, TiALN coated	2,4		4
047	<b>METRIC</b> - Standard Carbide, <b>Extra Long Length</b> , Square, Single End Uncoated	2,4		4
048	<b>METRIC</b> - Standard Carbide, <b>Extra Long Length</b> , Square, Single End, TiALN coated	2,4		4
043	<b>METRIC</b> - Standard Carbide, <b>Regular Length</b> , Ball Nose, Single End Uncoated	2,3,4		7
044	<b>METRIC</b> - Standard Carbide, <b>Regular Length</b> , Ball Nose, Single End, TiALN coated	2,3,4		7
104	Drill/Mill 90 Degree - Standard Carbide Uncoated	2,4		3
106	Drill/Mill 90 Degree - Standard Carbide TiALN coated	2,4		3

**GOOD**

**NEW**



Series	Description	Flutes		Pages
190	High Performance Variable Pitch, <b>Stub Length</b> , Round Shk- TiALN	4		10
191	High Performance Variable Pitch, <b>Stub Length</b> , Weldon Shk- TiALN	4		10
090	High Performance Variable Pitch, <b>Regular Length</b> , Round Shk- TiALN	4		10
091	High Performance Variable Pitch, <b>Regular Length</b> , Weldon Shk- TiALN	4		10
092	High Performance Variable Pitch, <b>Long Length</b> , Round Shk- TiALN	4		11
093	High Performance Variable Pitch, <b>Long Length</b> , Weldon Shk- TiALN	4		11
098	High Performance Variable Pitch, <b>Extra Long Length</b> , Round Shk- TiALN	4		11
094	High Performance Variable Pitch, <b>Regular Length</b> , Ball Nose, Round Shk- TiALN	4		12
095	High Performance Variable Pitch, <b>Regular Length</b> , Ball Nose, Weldon Shk- TiALN	4		12
096	High Performance Variable Pitch, <b>Long Length</b> , Ball Nose, Round Shk- TiALN	4		12
097	High Performance Variable Pitch, <b>Long Length</b> , Ball Nose, Weldon Shk- TiALN	4		12
099	High Performance Variable Pitch, <b>Extra Long Length</b> , Ball Nose, Round Shk- TiALN	4		12
290	High Performance Variable Pitch, <b>Long Reach Neck Relief</b> , Round Shk- TiALN	4		13
294	High Performance Variable Pitch, <b>Long Reach Neck Relief</b> , Ball Nose, Round Shk- TiALN	4		13
180	ULTRA High Performance Variable Pitch, <b>Stub Length</b> , Round Shk- TiALN	4		14
181	ULTRA High Performance Variable Pitch, <b>Stub Length</b> , Weldon Shk- TiALN	4		14
080	ULTRA High Performance Variable Pitch, <b>Regular Length</b> , Round Shk- TiALN	4,5		14
081	ULTRA High Performance Variable Pitch, <b>Regular Length</b> , Weldon Shk- TiALN	4		14
082	ULTRA High Performance Variable Pitch, <b>Long Length</b> , Round Shk- TiALN	4		15
083	ULTRA High Performance Variable Pitch, <b>Long Length</b> , Weldon Shk- TiALN	4		15
088	ULTRA High Performance Variable Pitch, <b>Extra Long Length</b> , Round Shk- TiALN	4		15
084	ULTRA High Performance Variable Pitch, <b>Regular Length</b> , Ball Nose, Round Shk- TiALN	4		16
085	ULTRA High Performance Variable Pitch, <b>Regular Length</b> , Ball Nose, Weldon Shk- TiALN	4		16
086	ULTRA High Performance Variable Pitch, <b>Long Length</b> , Ball Nose, Round Shk- TiALN	4		16
087	ULTRA High Performance Variable Pitch, <b>Long Length</b> , Ball Nose, Weldon Shk- TiALN	4		16
089	ULTRA High Performance Variable Pitch, <b>Extra Long Length</b> , Ball Nose, Round Shk- TiALN	4		16
380	ULTRA High Performance Variable Pitch, <b>Regular Length Finishers</b> , Round Shk- TiALN	6,7		17
480	ULTRA High Performance Variable Pitch, <b>Long Reach Finishers</b> , - TiALN (Neck Relieving Available)	6		17
170	ULTRA High Performance Var. Pitch & Helix, <b>Regular Length</b> , Uncoated - ALUMINUM	2,3		19
070	ULTRA High Performance Var. Pitch & Helix, <b>Regular Length</b> , ZrN Coated - ALUMINUM	2,3		19
270	ULTRA High Performance Var. Pitch & Helix, <b>Regular Length</b> , DLC Coated - ALUMINUM	2,3		19
172	ULTRA High Performance Var. Pitch & Helix, <b>Long Length</b> , Uncoated - ALUMINUM	2,3		19
072	ULTRA High Performance Var. Pitch & Helix, <b>Long Length</b> , ZrN Coated - ALUMINUM	2,3		19
272	ULTRA High Performance Var. Pitch & Helix, <b>Long Length</b> , DLC Coated - ALUMINUM	2,3		19
178	ULTRA High Performance Var. Pitch & Helix, <b>Extra Long Length</b> , Uncoated - ALUMINUM	2,3		19
078	ULTRA High Performance Var. Pitch & Helix, <b>Extra Long Length</b> , ZrN Coated - ALUMINUM	2,3		19
278	ULTRA High Performance Var. Pitch & Helix, <b>Extra Long Length</b> , DLC Coated - ALUMINUM	2,3		19
174	ULTRA High Performance Var. Pitch & Helix, <b>Regular Length</b> , Ball Nose Uncoated - ALUMINUM	2,3		20
074	ULTRA High Performance Var. Pitch & Helix, <b>Regular Length</b> , Ball Nose ZrN Coated - ALUMINUM	2,3		20
274	ULTRA High Performance Var. Pitch & Helix, <b>Regular Length</b> , Ball Nose DLC Coated - ALUMINUM	2,3		20
176	ULTRA High Performance Var. Pitch & Helix, <b>Long Length</b> , Ball Nose Uncoated - ALUMINUM	2,3		20
076	ULTRA High Performance Var. Pitch & Helix, <b>Long Length</b> , Ball Nose ZrN Coated - ALUMINUM	2,3		20
276	ULTRA High Performance Var. Pitch & Helix, <b>Long Length</b> , Ball Nose DLC Coated - ALUMINUM	2,3		20
179	ULTRA High Performance Var. Pitch & Helix, <b>Extra Long Length</b> , Ball Nose Uncoated - ALUMINUM	2,3		20
079	ULTRA High Performance Var. Pitch & Helix, <b>Extra Long Length</b> , Ball Nose ZrN Coated - ALUMINUM	2,3		20
279	ULTRA High Performance Var. Pitch & Helix, <b>Extra Long Length</b> , Ball Nose DLC Coated - ALUMINUM	2,3		20

BETTER

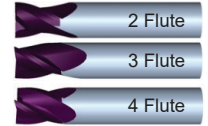
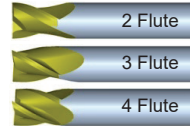
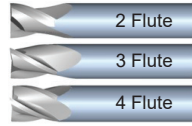
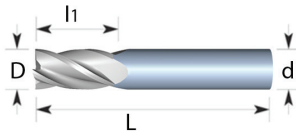
BEST

BEST

P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
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		● GOOD ○ OK ○ NOT OPTIMAL

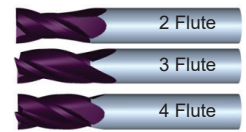
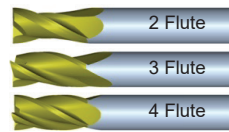
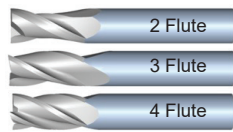
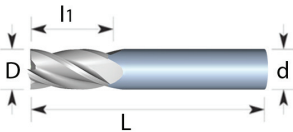
## STANDARD PERFORMANCE

- General Purpose
- 30 deg Helix Carbide
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



### Square End, Standard Carbide, Stub Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated			TiN Coated				TiAlN Coated				
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8	1/16	1-1/2	001-031-2	001-031-3	001-031-4	\$7.53	002-031-2	002-031-3	002-031-4	\$9.25	003-031-2	003-031-3	003-031-4	\$9.78
3/64	1/8	3/32	1-1/2	001-046-2	001-046-3	001-046-4	\$7.53	002-046-2	002-046-3	002-046-4	\$9.25	003-046-2	003-046-3	003-046-4	\$9.78
1/16	1/8	1/8	1-1/2	001-062-2	001-062-3	001-062-4	\$6.02	002-062-2	002-062-3	002-062-4	\$8.27	003-062-2	003-062-3	003-062-4	\$8.27
3/32	1/8	3/16	1-1/2	001-093-2	001-093-3	001-093-4	\$5.28	002-093-2	002-093-3	002-093-4	\$7.27	003-093-2	003-093-3	003-093-4	\$7.50
1/8	1/8	1/4	1-1/2	001-125-2	001-125-3	001-125-4	\$5.02	002-125-2	002-125-3	002-125-4	\$7.27	003-125-2	003-125-3	003-125-4	\$7.27
5/32	3/16	5/16	2	001-156-2	001-156-3	001-156-4	\$11.18	002-156-2	002-156-3	002-156-4	\$13.74	003-156-2	003-156-3	003-156-4	\$14.45
3/16	3/16	3/8	2	001-187-2	001-187-3	001-187-4	\$10.81	002-187-2	002-187-3	002-187-4	\$13.48	003-187-2	003-187-3	003-187-4	\$14.06
7/32	1/4	7/16	2	001-218-2	001-218-3	001-218-4	\$13.05	002-218-2	002-218-3	002-218-4	\$17.44	003-218-2	003-218-3	003-218-4	\$18.89
1/4	1/4	1/2	2	001-250-2	001-250-3	001-250-4	\$10.68	002-250-2	002-250-3	002-250-4	\$16.91	003-250-2	003-250-3	003-250-4	\$16.52
5/16	3/8	1/2	2	001-312-2	001-312-3	001-312-4	\$14.43	002-312-2	002-312-3	002-312-4	\$21.14	003-312-2	003-312-3	003-312-4	\$22.67
3/8	3/8	5/8	2	001-375-2	001-375-3	001-375-4	\$18.34	002-375-2	002-375-3	002-375-4	\$23.78	003-375-2	003-375-3	003-375-4	\$26.56
7/16	7/16	5/8	2-1/2	001-437-2	001-437-3	001-437-4	\$25.10	002-437-2	002-437-3	002-437-4	\$32.37	003-437-2	003-437-3	003-437-4	\$36.89
1/2	1/2	5/8	2-1/2	001-500-2	001-500-3	001-500-4	\$31.39	002-500-2	002-500-3	002-500-4	\$38.32	003-500-2	003-500-3	003-500-4	\$43.15
5/8	5/8	3/4	3	001-625-2	001-625-3	001-625-4	\$64.03	002-625-2	002-625-3	002-625-4	\$73.99	003-625-2	003-625-3	003-625-4	\$82.39
3/4	3/4	1	3	001-750-2	001-750-3	001-750-4	\$89.13	002-750-2	002-750-3	002-750-4	\$95.13	003-750-2	003-750-3	003-750-4	\$110.11
1	1	1	3	001-100-2	001-100-3	001-100-4	\$158.02	002-100-2	002-100-3	002-100-4	\$178.36	003-100-2	003-100-3	003-100-4	\$197.39



### Square End, Standard Carbide, Regular Length, Single End

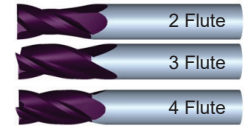
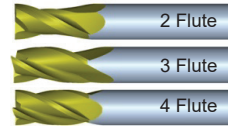
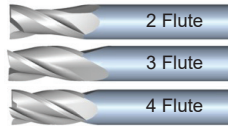
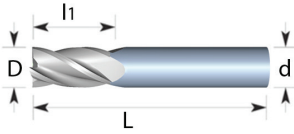
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated			TiN Coated				TiAlN Coated				
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/64	1/8	1/16	1-1/2	004-015-2	004-015-3	004-015-4	\$8.59	005-015-2	005-015-3	005-015-4	\$9.64	006-015-2	006-015-3	006-015-4	\$10.70
1/32	1/8	3/32	1-1/2	004-031-2	004-031-3	004-031-4	\$7.93	005-031-2	005-031-3	005-031-4	\$9.12	006-031-2	006-031-3	006-031-4	\$10.28
3/64	1/8	1/8	1-1/2	004-046-2	004-046-3	004-046-4	\$7.93	005-046-2	005-046-3	005-046-4	\$9.12	006-046-2	006-046-3	006-046-4	\$10.28
1/16	1/8	3/16	1-1/2	004-062-2	004-062-3	004-062-4	\$6.34	005-062-2	005-062-3	005-062-4	\$7.53	006-062-2	006-062-3	006-062-4	\$8.69
5/64	1/8	1/4	1-1/2	004-078-2	004-078-3	004-078-4	\$5.95	005-078-2	005-078-3	005-078-4	\$6.71	006-078-2	006-078-3	006-078-4	\$8.46
3/32	1/8	3/8	1-1/2	004-093-2	004-093-3	004-093-4	\$5.55	005-093-2	005-093-3	005-093-4	\$6.74	006-093-2	006-093-3	006-093-4	\$7.90
7/64	1/8	3/8	1-1/2	004-109-2	004-109-3	004-109-4	\$5.55	005-109-2	005-109-3	005-109-4	\$6.61	006-109-2	006-109-3	006-109-4	\$7.93
1/8	1/8	1/2	1-1/2	004-125-2	004-125-3	004-125-4	\$5.28	005-125-2	005-125-3	005-125-4	\$6.47	006-125-2	006-125-3	006-125-4	\$7.64
9/64	3/16	9/16	2	004-140-2	004-140-3	004-140-4	\$12.29	005-140-2	005-140-3	005-140-4	\$13.66	006-140-2	006-140-3	006-140-4	\$16.36
5/32	3/16	9/16	2	004-156-2	004-156-3	004-156-4	\$11.76	005-156-2	005-156-3	005-156-4	\$13.48	006-156-2	006-156-3	006-156-4	\$15.19
11/64	3/16	9/16	2	004-171-2	004-171-3	004-171-4	\$12.29	005-171-2	005-171-3	005-171-4	\$13.50	006-171-2	006-171-3	006-171-4	\$15.80
3/16	3/16	5/8	2	004-187-2	004-187-3	004-187-4	\$11.36	005-187-2	005-187-3	005-187-4	\$13.08	006-187-2	006-187-3	006-187-4	\$14.80
13/64	1/4	5/8	2-1/2	004-203-2	004-203-3	004-203-4	\$15.56	005-203-2	005-203-3	005-203-4	\$18.05	006-203-2	006-203-3	006-203-4	\$21.85
7/32	1/4	5/8	2-1/2	004-218-2	004-218-3	004-218-4	\$13.74	005-218-2	005-218-3	005-218-4	\$16.78	006-218-2	006-218-3	006-218-4	\$19.90
15/64	1/4	3/4	2-1/2	004-234-2	004-234-3	004-234-4	\$15.56	005-234-2	005-234-3	005-234-4	\$17.84	006-234-2	006-234-3	006-234-4	\$21.56
1/4	1/4	3/4	2-1/2	004-250-2	004-250-3	004-250-4	\$11.23	005-250-2	005-250-3	005-250-4	\$16.52	006-250-2	006-250-3	006-250-4	\$17.39

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

● GOOD ○ OK ○ NOT OPTIMAL

## STANDARD PERFORMANCE

- General Purpose
- 30 deg Helix Carbide
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



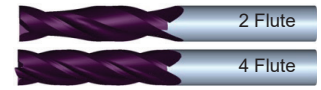
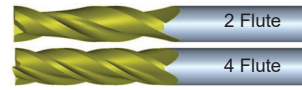
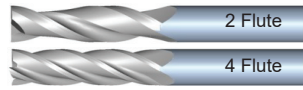
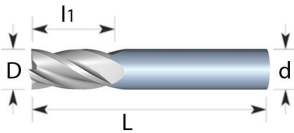
### Square End, Standard Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
17/64	5/16	7/8	2-1/2	004-265-2	004-265-3	004-265-4	\$18.63	005-265-2	005-265-3	005-265-4	\$21.03	006-265-2	006-265-3	006-265-4	\$26.34
9/32	5/16	7/8	2-1/2	004-281-2	004-281-3	004-281-4	\$17.04	005-281-2	005-281-3	005-281-4	\$20.48	006-281-2	006-281-3	006-281-4	\$24.52
19/64	5/16	7/8	2-1/2	004-296-2	004-296-3	004-296-4	\$18.63	005-296-2	005-296-3	005-296-4	\$20.72	006-296-2	006-296-3	006-296-4	\$25.47
5/16	5/16	7/8	2-1/2	004-312-2	004-312-3	004-312-4	\$15.19	005-312-2	005-312-3	005-312-4	\$20.08	006-312-2	006-312-3	006-312-4	\$23.86
21/64	3/8	7/8	2-1/2	004-328-2	004-328-3	004-328-4	\$21.54	005-328-2	005-328-3	005-328-4	\$24.47	006-328-2	006-328-3	006-328-4	\$31.50
11/32	3/8	7/8	2-1/2	004-343-2	004-343-3	004-343-4	\$19.82	005-343-2	005-343-3	005-343-4	\$23.78	006-343-2	006-343-3	006-343-4	\$28.49
23/64	3/8	7/8	2-1/2	004-359-2	004-359-3	004-359-4	\$21.54	005-359-2	005-359-3	005-359-4	\$23.60	006-359-2	006-359-3	006-359-4	\$28.72
3/8	3/8	1	2-1/2	004-375-2	004-375-3	004-375-4	\$19.29	005-375-2	005-375-3	005-375-4	\$23.12	006-375-2	006-375-3	006-375-4	\$27.96
25/64	7/16	1	2-1/2	004-390-2	004-390-3	004-390-4	\$33.69	005-390-2	005-390-3	005-390-4	\$41.62	006-390-2	006-390-3	006-390-4	\$42.28
13/32	7/16	1	2-1/2	004-406-2	004-406-3	004-406-4	\$33.03	005-406-2	005-406-3	005-406-4	\$40.96	006-406-2	006-406-3	006-406-4	\$41.62
27/64	7/16	1	2-1/2	004-421-2	004-421-3	004-421-4	\$31.71	005-421-2	005-421-3	005-421-4	\$39.64	006-421-2	006-421-3	006-421-4	\$39.90
7/16	7/16	1	2-1/2	004-437-2	004-437-3	004-437-4	\$27.75	005-437-2	005-437-3	005-437-4	\$39.64	006-437-2	006-437-3	006-437-4	\$40.14
29/64	1/2	1	3	004-453-2	004-453-3	004-453-4	\$37.26	005-453-2	005-453-3	005-453-4	\$44.87	006-453-2	006-453-3	006-453-4	\$50.07
15/32	1/2	1	3	004-468-2	004-468-3	004-468-4	\$36.33	005-468-2	005-468-3	005-468-4	\$44.76	006-468-2	006-468-3	006-468-4	\$49.55
31/64	1/2	1	3	004-484-2	004-484-3	004-484-4	\$35.01	005-484-2	005-484-3	005-484-4	\$43.68	006-484-2	006-484-3	006-484-4	\$48.88
1/2	1/2	1	3	004-500-2	004-500-3	004-500-4	\$33.03	005-500-2	005-500-3	005-500-4	\$39.90	006-500-2	006-500-3	006-500-4	\$45.42
33/64	9/16	1-1/4	3-1/2	004-515-2	004-515-3	004-515-4	\$74.38	005-515-2	005-515-3	005-515-4	\$98.35	006-515-2	006-515-3	006-515-4	\$107.47
17/32	9/16	1-1/4	3-1/2	004-531-2	004-531-3	004-531-4	\$73.86	005-531-2	005-531-3	005-531-4	\$96.10	006-531-2	006-531-3	006-531-4	\$105.17
35/64	9/16	1-1/4	3-1/2	004-546-2	004-546-3	004-546-4	\$70.02	005-546-2	005-546-3	005-546-4	\$110.40	006-546-2	006-546-3	006-546-4	\$99.30
9/16	9/16	1-1/4	3-1/2	004-562-2	004-562-3	004-562-4	\$64.74	005-562-2	005-562-3	005-562-4	\$77.03	006-562-2	006-562-3	006-562-4	\$84.08
37/64	5/8	1-1/4	3-1/2	004-578-2	004-578-3	004-578-4	\$76.89	005-578-2	005-578-3	005-578-4	\$95.13	006-578-2	006-578-3	006-578-4	\$101.10
19/32	5/8	1-1/4	3-1/2	004-593-2	004-593-3	004-593-4	\$73.99	005-593-2	005-593-3	005-593-4	\$92.96	006-593-2	006-593-3	006-593-4	\$99.30
39/64	5/8	1-1/4	3-1/2	004-609-2	004-609-3	004-609-4	\$71.35	005-609-2	005-609-3	005-609-4	\$90.27	006-609-2	006-609-3	006-609-4	\$97.43
5/8	5/8	1-1/4	3-1/2	004-625-2	004-625-3	004-625-4	\$67.38	005-625-2	005-625-3	005-625-4	\$76.10	006-625-2	006-625-3	006-625-4	\$86.72
41/64	3/4	1-1/2	4	004-640-2	004-640-3	004-640-4	\$113.25	005-640-2	005-640-3	005-640-4	\$135.16	006-640-2	006-640-3	006-640-4	\$133.50
21/32	3/4	1-1/2	4	004-656-2	004-656-3	004-656-4	\$112.30	005-656-2	005-656-3	005-656-4	\$133.31	006-656-2	006-656-3	006-656-4	\$131.33
43/64	3/4	1-1/2	4	004-671-2	004-671-3	004-671-4	\$110.98	005-671-2	005-671-3	005-671-4	\$131.25	006-671-2	006-671-3	006-671-4	\$131.06
11/16	3/4	1-1/2	4	004-687-2	004-687-3	004-687-4	\$97.77	005-687-2	005-687-3	005-687-4	\$126.44	006-687-2	006-687-3	006-687-4	\$127.89
45/64	3/4	1-1/2	4	004-703-2	004-703-3	004-703-4	\$104.38	005-703-2	005-703-3	005-703-4	\$124.35	006-703-2	006-703-3	006-703-4	\$129.61
23/32	3/4	1-1/2	4	004-718-2	004-718-3	004-718-4	\$104.38	005-718-2	005-718-3	005-718-4	\$123.11	006-718-2	006-718-3	006-718-4	\$128.69
47/64	3/4	1-1/2	4	004-734-2	004-734-3	004-734-4	\$104.38	005-734-2	005-734-3	005-734-4	\$122.08	006-734-2	006-734-3	006-734-4	\$128.34
3/4	3/4	1-1/2	4	004-750-2	004-750-3	004-750-4	\$93.81	005-750-2	005-750-3	005-750-4	\$109.40	006-750-2	006-750-3	006-750-4	\$115.90
49/64	7/8	1-1/2	4	004-765-2	004-765-3	004-765-4	\$188.93	005-765-2	005-765-3	005-765-4	\$210.15	006-765-2	006-765-3	006-765-4	\$238.35
25/32	7/8	1-1/2	4	004-781-2	004-781-3	004-781-4	\$188.93	005-781-2	005-781-3	005-781-4	\$208.99	006-781-2	006-781-3	006-781-4	\$237.34
51/64	7/8	1-1/2	4	004-796-2	004-796-3	004-796-4	\$188.93	005-796-2	005-796-3	005-796-4	\$207.83	006-796-2	006-796-3	006-796-4	\$236.31
13/16	7/8	1-1/2	4	004-812-2	004-812-3	004-812-4	\$188.93	005-812-2	005-812-3	005-812-4	\$206.37	006-812-2	006-812-3	006-812-4	\$232.53
53/64	7/8	1-1/2	4	004-828-2	004-828-3	004-828-4	\$183.12	005-828-2	005-828-3	005-828-4	\$207.40	006-828-2	006-828-3	006-828-4	\$233.99
27/32	7/8	1-1/2	4	004-843-2	004-843-3	004-843-4	\$183.12	005-843-2	005-843-3	005-843-4	\$207.01	006-843-2	006-843-3	006-843-4	\$233.27
55/64	7/8	1-1/2	4	004-859-2	004-859-3	004-859-4	\$183.12	005-859-2	005-859-3	005-859-4	\$206.37	006-859-2	006-859-3	006-859-4	\$232.53
7/8	7/8	1-1/2	4	004-875-2	004-875-3	004-875-4	\$166.47	005-875-2	005-875-3	005-875-4	\$185.76	006-875-2	006-875-3	006-875-4	\$205.13
57/64	1	1-1/2	4	004-890-2	004-890-3	004-890-4	\$194.48	005-890-2	005-890-3	005-890-4	\$220.72	006-890-2	006-890-3	006-890-4	\$240.41
29/32	1	1-1/2	4	004-906-2	004-906-3	004-906-4	\$194.48	005-906-2	005-906-3	005-906-4	\$216.55	006-906-2	006-906-3	006-906-4	\$239.01
59/64	1	1-1/2	4	004-921-2	004-921-3	004-921-4	\$194.48	005-921-2	005-921-3	005-921-4	\$213.64	006-921-2	006-921-3	006-921-4	\$237.63
15/16	1	1-1/2	4	004-937-2	004-937-3	004-937-4	\$186.03	005-937-2	005-937-3	005-937-4	\$209.28	006-937-2	006-937-3	006-937-4	\$232.53
61/64	1	1-1/2	4	004-953-2	004-953-3	004-953-4	\$186.03	005-953-2	005-953-3	005-953-4	\$212.13	006-953-2	006-953-3	006-953-4	\$231.08
31/32	1	1-1/2	4	004-968-2	004-968-3	004-968-4	\$186.03	005-968-2	005-968-3	005-968-4	\$210.81	006-968-2	006-968-3	006-968-4	\$229.60
63/64	1	1-1/2	4	004-984-2	004-984-3	004-984-4	\$186.03	005-984-2	005-984-3	005-984-4	\$210.81	006-984-2	006-984-3	006-984-4	\$229.59
1	1	1-1/2	4	004-100-2	004-100-3	004-100-4	\$169.11	005-100-2	005-100-3	005-100-4	\$188.40	006-100-2	006-100-3	006-100-4	\$207.77

P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	○	Hardened Steel
●	GOOD	○ OK ○ NOT OPTIMAL

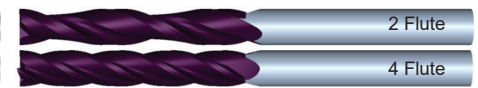
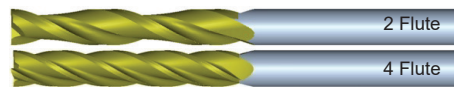
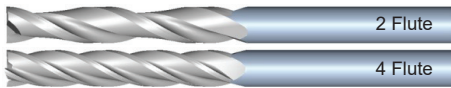
## STANDARD PERFORMANCE

- General Purpose
- 30 deg Helix Carbide
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



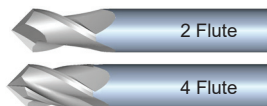
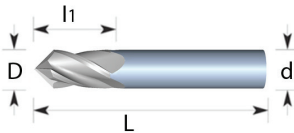
### Square End, Standard Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	3/4	2-1/2	007-125-2	--	007-125-4	\$10.97	008-125-2	--	008-125-4	\$12.56	009-125-2	--	009-125-4	\$14.16
3/16	3/16	3/4	2-1/2	007-187-2	--	007-187-4	\$16.01	008-187-2	--	008-187-4	\$18.13	009-187-2	--	009-187-4	\$20.24
1/4	1/4	1-1/8	3	007-250-2	--	007-250-4	\$19.16	008-250-2	--	008-250-4	\$22.24	009-250-2	--	009-250-4	\$25.31
5/16	5/16	1-1/8	3	007-312-2	--	007-312-4	\$23.78	008-312-2	--	008-312-4	\$28.05	009-312-2	--	009-312-4	\$32.32
3/8	3/8	1-1/8	3	007-375-2	--	007-375-4	\$33.03	008-375-2	--	008-375-4	\$37.36	009-375-2	--	009-375-4	\$41.70
7/16	7/16	2	4	007-437-2	--	007-437-4	\$52.37	008-437-2	--	008-437-4	\$58.71	009-437-2	--	009-437-4	\$65.06
1/2	1/2	2	4	007-500-2	--	007-500-4	\$56.60	008-500-2	--	008-500-4	\$64.34	009-500-2	--	009-500-4	\$72.09
5/8	5/8	2-1/4	5	007-625-2	--	007-625-4	\$103.05	008-625-2	--	008-625-4	\$114.68	009-625-2	--	009-625-4	\$126.31
3/4	3/4	2-1/4	5	007-750-2	--	007-750-4	\$145.33	008-750-2	--	008-750-4	\$158.57	009-750-2	--	009-750-4	\$171.81
1	1	2-1/4	5	007-100-2	--	007-100-4	\$224.61	008-100-2	--	008-100-4	\$247.81	009-100-2	--	009-100-4	\$271.01

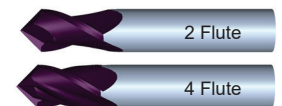


### Square End, Standard Carbide, Extra Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	1	3	010-125-2	--	010-125-4	\$16.41	011-125-2	--	011-125-4	\$18.01	012-125-2	--	012-125-4	\$19.61
3/16	3/16	1-1/8	3	010-187-2	--	010-187-4	\$17.18	011-187-2	--	011-187-4	\$19.29	012-187-2	--	012-187-4	\$21.40
1/4	1/4	1-1/2	4	010-250-2	--	010-250-4	\$22.46	011-250-2	--	011-250-4	\$26.32	012-250-2	--	012-250-4	\$30.18
5/16	5/16	1-5/8	4	010-312-2	--	010-312-4	\$27.75	011-312-2	--	011-312-4	\$32.57	012-312-2	--	012-312-4	\$37.39
3/8	3/8	1-3/4	4	010-375-2	--	010-375-4	\$36.33	011-375-2	--	011-375-4	\$41.62	012-375-2	--	012-375-4	\$45.98
1/2	1/2	3	6	010-500-2	--	010-500-4	\$88.52	011-500-2	--	011-500-4	\$99.33	012-500-2	--	012-500-4	\$110.14
5/8	5/8	3	6	010-625-2	--	010-625-4	\$116.27	011-625-2	--	011-625-4	\$129.81	012-625-2	--	012-625-4	\$143.35
3/4	3/4	3	6	010-750-2	--	010-750-4	\$161.19	011-750-2	--	011-750-4	\$177.25	012-750-2	--	012-750-4	\$193.32
1	1	3	6	010-100-2	--	010-100-4	\$303.88	011-100-2	--	011-100-4	\$330.92	012-100-2	--	012-100-4	\$357.97



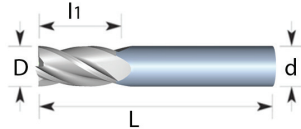
**NEW**



### Drill/Mill 90 Degree, Standard Carbide, Regular Length

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	1/2	1-1/2	104-125-2	--	104-125-4	\$13.91	--	--	--	--	106-125-2	--	106-125-4	\$16.82
3/16	3/16	5/8	2	104-187-2	--	104-187-4	\$15.78	--	--	--	--	106-187-2	--	106-187-4	\$21.05
1/4	1/4	3/4	2-1/2	104-250-2	--	104-250-4	\$19.09	--	--	--	--	106-250-2	--	106-250-4	\$26.59
5/16	5/16	7/8	2-1/2	104-312-2	--	104-312-4	\$24.72	--	--	--	--	106-312-2	--	106-312-4	\$33.92
3/8	3/8	1	2-1/2	104-375-2	--	104-375-4	\$28.94	--	--	--	--	106-375-2	--	106-375-4	\$40.00
7/16	7/16	1	2-3/4	104-437-2	--	104-437-4	\$47.68	--	--	--	--	106-437-2	--	106-437-4	\$63.07
1/2	1/2	1	3	104-500-2	--	104-500-4	\$51.52	--	--	--	--	106-500-2	--	106-500-4	\$67.01
5/8	5/8	1-1/4	3-1/2	104-625-2	--	104-625-4	\$89.50	--	--	--	--	106-625-2	--	106-625-4	\$108.78
3/4	3/4	1-1/2	4	104-750-2	--	104-750-4	\$140.72	--	--	--	--	106-750-2	--	106-750-4	\$164.31





P	Steel	
M	Stainless Steel	
K	Cast Iron	
N	Non-Ferrous	
S	High Temp. Alloys	
H	Hardened Steel	
● GOOD	○ OK	○ NOT OPTIMAL

### STANDARD PERFORMANCE

- General Purpose
- 10% Micro Grain Carbide
- 30 deg Helix Carbide
- Diameter Tolerances: +0.0000"/-0.0020"

#### METRIC - Square End, Standard Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1	1	3	38	041-010-2	041-010-3	041-010-4	\$10.94	--	--	--	--	042-010-2	042-010-3	042-010-4	\$13.46
1.5	2	5	38	041-015-2	041-015-3	041-015-4	\$10.83	--	--	--	--	042-015-2	042-015-3	042-015-4	\$13.46
2	2	6	38	041-020-2	041-020-3	041-020-4	\$8.72	--	--	--	--	042-020-2	042-020-3	042-020-4	\$10.95
3	3	12	38	041-030-2	041-030-3	041-030-4	\$6.74	--	--	--	--	042-030-2	042-030-3	042-030-4	\$8.92
3.5	4	12	50	041-035-2	041-035-3	041-035-4	\$11.86	--	--	--	--	042-035-2	042-035-3	042-035-4	\$14.20
4	4	14	50	041-040-2	041-040-3	041-040-4	\$11.39	--	--	--	--	042-040-2	042-040-3	042-040-4	\$13.94
4.5	5	14	50	041-045-2	041-045-3	041-045-4	\$11.86	--	--	--	--	042-045-2	042-045-3	042-045-4	\$14.59
5	5	16	50	041-050-2	041-050-3	041-050-4	\$12.79	--	--	--	--	042-050-2	042-050-3	042-050-4	\$15.38
6	6	19	63	041-060-2	041-060-3	041-060-4	\$12.55	--	--	--	--	042-060-2	042-060-3	042-060-4	\$15.47
7	7	19	63	041-070-2	041-070-3	041-070-4	\$17.84	--	--	--	--	042-070-2	042-070-3	042-070-4	\$20.74
8	8	19	63	041-080-2	041-080-3	041-080-4	\$16.52	--	--	--	--	042-080-2	042-080-3	042-080-4	\$20.19
9	9	22	70	041-090-2	041-090-3	041-090-4	\$29.65	--	--	--	--	042-090-2	042-090-3	042-090-4	\$34.80
10	10	22	70	041-100-2	041-100-3	041-100-4	\$26.16	--	--	--	--	042-100-2	042-100-3	042-100-4	\$31.59
11	11	25	70	041-110-2	041-110-3	041-110-4	\$39.53	--	--	--	--	042-110-2	042-110-3	042-110-4	\$46.47
12	12	25	75	041-120-2	041-120-3	041-120-4	\$37.21	--	--	--	--	042-120-2	042-120-3	042-120-4	\$40.42
14	14	30	88	041-140-2	041-140-3	041-140-4	\$61.04	--	--	--	--	042-140-2	042-140-3	042-140-4	\$69.98
16	16	32	88	041-160-2	041-160-3	041-160-4	\$81.39	--	--	--	--	042-160-2	042-160-3	042-160-4	\$93.09
18	18	36	100	041-180-2	041-180-3	041-180-4	\$93.01	--	--	--	--	042-180-2	042-180-3	042-180-4	\$107.68
20	20	38	100	041-200-2	041-200-3	041-200-4	\$111.62	--	--	--	--	042-200-2	042-200-3	042-200-4	\$128.14
22	22	38	100	041-220-2	041-220-3	041-220-4	\$137.19	--	--	--	--	042-220-2	042-220-3	042-220-4	\$156.95
25	25	38	100	041-250-2	041-250-3	041-250-4	\$161.19	--	--	--	--	042-250-2	042-250-3	042-250-4	\$183.66

#### METRIC - Square End, Standard Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
3	3	25	75	045-030-2	--	045-030-4	\$11.77	--	--	--	--	046-030-2	--	046-030-4	\$14.41
4	4	25	75	045-040-2	--	045-040-4	\$16.36	--	--	--	--	046-040-2	--	046-040-4	\$18.59
5	5	25	75	045-050-2	--	045-050-4	\$16.52	--	--	--	--	046-050-2	--	046-050-4	\$19.25
6	6	25	75	045-060-2	--	045-060-4	\$20.03	--	--	--	--	046-060-2	--	046-060-4	\$22.66
8	8	30	100	045-080-2	--	045-080-4	\$24.27	--	--	--	--	046-080-2	--	046-080-4	\$26.61
10	10	38	100	045-100-2	--	045-100-4	\$41.71	--	--	--	--	046-100-2	--	046-100-4	\$46.24
12	12	50	100	045-120-2	--	045-120-4	\$58.97	--	--	--	--	046-120-2	--	046-120-4	\$63.43
14	14	50	125	045-140-2	--	045-140-4	\$93.85	--	--	--	--	046-140-2	--	046-140-4	\$100.41
16	16	75	150	045-160-2	--	045-160-4	\$122.52	--	--	--	--	046-160-2	--	046-160-4	\$129.62
18	18	75	150	045-180-2	--	045-180-4	\$157.22	--	--	--	--	046-180-2	--	046-180-4	\$166.47
20	20	75	150	045-200-2	--	045-200-4	\$215.36	--	--	--	--	046-200-2	--	046-200-4	\$251.06
25	25	75	150	045-250-2	--	045-250-4	\$305.20	--	--	--	--	046-250-2	--	046-250-4	\$315.77

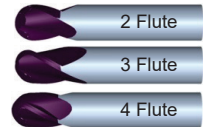
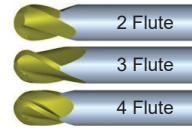
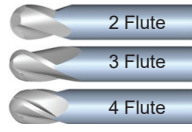
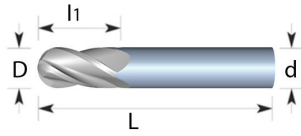
#### METRIC - Square End, Standard Carbide, Extra-Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
3	3	25	100	047-030-2	--	047-030-4	\$17.08	--	--	--	--	048-030-2	--	048-030-4	\$19.78
4	4	50	100	047-040-2	--	047-040-4	\$21.18	--	--	--	--	048-040-2	--	048-040-4	\$24.53
5	5	30	100	047-050-2	--	047-050-4	\$18.62	--	--	--	--	048-050-2	--	048-050-4	\$21.27
6	6	50	100	047-060-2	--	047-060-4	\$25.17	--	--	--	--	048-060-2	--	048-060-4	\$27.84
8	8	50	150	047-080-2	--	047-080-4	\$30.27	--	--	--	--	048-080-2	--	048-080-4	\$34.43
10	10	75	150	047-100-2	--	047-100-4	\$60.78	--	--	--	--	048-100-2	--	048-100-4	\$65.90
12	12	75	150	047-120-2	--	047-120-4	\$84.48	--	--	--	--	048-120-2	--	048-120-4	\$89.84
14	14	75	150	047-140-2	--	047-140-4	\$104.92	--	--	--	--	048-140-2	--	048-140-4	\$111.66

P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	○	Hardened Steel
●	GOOD	○ OK ○ NOT OPTIMAL

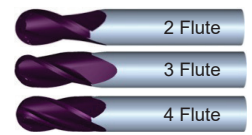
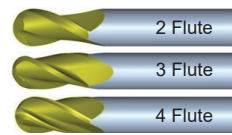
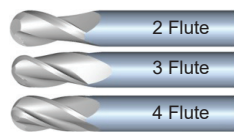
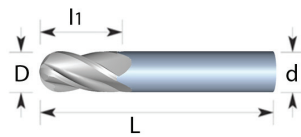
## STANDARD PERFORMANCE

- General Purpose
- 30 deg Helix Carbide
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



### Ball Nose, Standard Carbide, Stub Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8	1/16	1-1/2	013-031-2	013-031-3	013-031-4	\$11.31	014-031-2	014-031-3	014-031-4	\$12.82	015-031-2	015-031-3	015-031-4	\$13.53
3/64	1/8	3/32	1-1/2	013-046-2	013-046-3	013-046-4	\$11.31	014-046-2	014-046-3	014-046-4	\$12.68	015-046-2	015-046-3	015-046-4	\$13.53
1/16	1/8	1/8	1-1/2	013-062-2	013-062-3	013-062-4	\$10.04	014-062-2	014-062-3	014-062-4	\$11.63	015-062-2	015-062-3	015-062-4	\$12.29
3/32	1/8	3/16	1-1/2	013-093-2	013-093-3	013-093-4	\$10.04	014-093-2	014-093-3	014-093-4	\$11.23	015-093-2	015-093-3	015-093-4	\$12.29
1/8	1/8	1/4	1-1/2	013-125-2	013-125-3	013-125-4	\$8.03	014-125-2	014-125-3	014-125-4	\$9.51	015-125-2	015-125-3	015-125-4	\$10.28
5/32	3/16	5/16	2	013-156-2	013-156-3	013-156-4	\$13.32	014-156-2	014-156-3	014-156-4	\$15.85	015-156-2	015-156-3	015-156-4	\$16.57
3/16	3/16	3/8	2	013-187-2	013-187-3	013-187-4	\$13.32	014-187-2	014-187-3	014-187-4	\$15.59	015-187-2	015-187-3	015-187-4	\$16.57
7/32	1/4	7/16	2	013-218-2	013-218-3	013-218-4	\$16.33	014-218-2	014-218-3	014-218-4	\$21.14	015-218-2	015-218-3	015-218-4	\$22.17
1/4	1/4	1/2	2	013-250-2	013-250-3	013-250-4	\$15.33	014-250-2	014-250-3	014-250-4	\$20.61	015-250-2	015-250-3	015-250-4	\$21.17
5/16	3/8	1/2	2	013-312-2	013-312-3	013-312-4	\$19.58	014-312-2	014-312-3	014-312-4	\$25.10	015-312-2	015-312-3	015-312-4	\$27.82
3/8	3/8	5/8	2	013-375-2	013-375-3	013-375-4	\$23.86	014-375-2	014-375-3	014-375-4	\$27.75	015-375-2	015-375-3	015-375-4	\$32.08
7/16	7/16	5/8	2-1/2	013-437-2	013-437-3	013-437-4	\$36.41	014-437-2	014-437-3	014-437-4	\$31.71	015-437-2	015-437-3	015-437-4	\$48.17
1/2	1/2	5/8	2-1/2	013-500-2	013-500-3	013-500-4	\$40.16	014-500-2	014-500-3	014-500-4	\$43.60	015-500-2	015-500-3	015-500-4	\$52.08
5/8	5/8	3/4	3	013-625-2	013-625-3	013-625-4	\$76.58	014-625-2	014-625-3	014-625-4	\$84.56	015-625-2	015-625-3	015-625-4	\$94.94
3/4	3/4	1	3	013-750-2	013-750-3	013-750-4	\$105.43	014-750-2	014-750-3	014-750-4	\$116.27	015-750-2	015-750-3	015-750-4	\$126.41
1	1	1	3	013-100-2	013-100-3	013-100-4	\$203.07	014-100-2	014-100-3	014-100-4	\$232.53	015-100-2	015-100-3	015-100-4	\$245.08



### Ball Nose, Standard Carbide, Regular Length, Single End

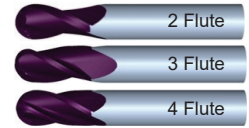
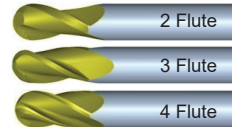
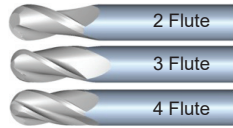
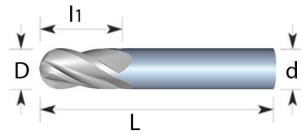
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/64	1/8	1/16	1-1/2	016-015-2	016-015-3	016-015-4	\$16.13	017-015-2	017-015-3	017-015-4	\$17.32	018-015-2	018-015-3	018-015-4	\$15.72
1/32	1/8	3/32	1-1/2	016-031-2	016-031-3	016-031-4	\$11.89	017-031-2	017-031-3	017-031-4	\$13.08	018-031-2	018-031-3	018-031-4	\$14.24
3/64	1/8	1/8	1-1/2	016-046-2	016-046-3	016-046-4	\$11.89	017-046-2	017-046-3	017-046-4	\$13.08	018-046-2	018-046-3	018-046-4	\$14.24
1/16	1/8	3/16	1-1/2	016-062-2	016-062-3	016-062-4	\$10.57	017-062-2	017-062-3	017-062-4	\$12.29	018-062-2	018-062-3	018-062-4	\$12.92
5/64	1/8	1/4	1-1/2	016-078-2	016-078-3	016-078-4	\$10.57	017-078-2	017-078-3	017-078-4	\$12.02	018-078-2	018-078-3	018-078-4	\$12.05
3/32	1/8	3/8	1-1/2	016-093-2	016-093-3	016-093-4	\$10.57	017-093-2	017-093-3	017-093-4	\$12.29	018-093-2	018-093-3	018-093-4	\$12.92
7/64	1/8	3/8	1-1/2	016-109-2	016-109-3	016-109-4	\$10.57	017-109-2	017-109-3	017-109-4	\$11.63	018-109-2	018-109-3	018-109-4	\$11.10
1/8	1/8	1/2	1-1/2	016-125-2	016-125-3	016-125-4	\$8.46	017-125-2	017-125-3	017-125-4	\$11.49	018-125-2	018-125-3	018-125-4	\$10.81
9/64	3/16	9/16	2	016-140-2	016-140-3	016-140-4	\$14.53	017-140-2	017-140-3	017-140-4	\$18.07	018-140-2	018-140-3	018-140-4	\$19.13
5/32	3/16	9/16	2	016-156-2	016-156-3	016-156-4	\$14.00	017-156-2	017-156-3	017-156-4	\$16.12	018-156-2	018-156-3	018-156-4	\$17.44
11/64	3/16	9/16	2	016-171-2	016-171-3	016-171-4	\$14.53	017-171-2	017-171-3	017-171-4	\$17.23	018-171-2	018-171-3	018-171-4	\$18.73
3/16	3/16	5/8	2	016-187-2	016-187-3	016-187-4	\$14.00	017-187-2	017-187-3	017-187-4	\$15.85	018-187-2	018-187-3	018-187-4	\$17.44
13/64	1/4	5/8	2-1/2	016-203-2	016-203-3	016-203-4	\$18.36	017-203-2	017-203-3	017-203-4	\$21.69	018-203-2	018-203-3	018-203-4	\$25.00
7/32	1/4	5/8	2-1/2	016-218-2	016-218-3	016-218-4	\$17.18	017-218-2	017-218-3	017-218-4	\$20.48	018-218-2	018-218-3	018-218-4	\$23.33
15/64	1/4	3/4	2-1/2	016-234-2	016-234-3	016-234-4	\$18.36	017-234-2	017-234-3	017-234-4	\$21.54	018-234-2	018-234-3	018-234-4	\$24.26
1/4	1/4	3/4	2-1/2	016-250-2	016-250-3	016-250-4	\$16.12	017-250-2	017-250-3	017-250-4	\$19.16	018-250-2	018-250-3	018-250-4	\$22.28

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

● GOOD    ○ OK    ○ NOT OPTIMAL

## STANDARD PERFORMANCE

- General Purpose
- 30 deg Helix Carbide
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



### Ball Nose, Standard Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
17/64	5/16	7/8	2-1/2	016-265-2	016-265-3	016-265-4	\$24.05	017-265-2	017-265-3	017-265-4	\$26.03	018-265-2	018-265-3	018-265-4	\$31.52
9/32	5/16	7/8	2-1/2	016-281-2	016-281-3	016-281-4	\$22.46	017-281-2	017-281-3	017-281-4	\$24.44	018-281-2	018-281-3	018-281-4	\$29.81
19/64	5/16	7/8	2-1/2	016-296-2	016-296-3	016-296-4	\$24.05	017-296-2	017-296-3	017-296-4	\$24.39	018-296-2	018-296-3	018-296-4	\$30.41
5/16	5/16	7/8	2-1/2	016-312-2	016-312-3	016-312-4	\$20.61	017-312-2	017-312-3	017-312-4	\$23.78	018-312-2	018-312-3	018-312-4	\$29.28
21/64	3/8	7/8	2-1/2	016-328-2	016-328-3	016-328-4	\$27.08	017-328-2	017-328-3	017-328-4	\$29.78	018-328-2	018-328-3	018-328-4	\$36.94
11/32	3/8	7/8	2-1/2	016-343-2	016-343-3	016-343-4	\$25.10	017-343-2	017-343-3	017-343-4	\$29.07	018-343-2	018-343-3	018-343-4	\$33.77
23/64	3/8	7/8	2-1/2	016-359-2	016-359-3	016-359-4	\$27.08	017-359-2	017-359-3	017-359-4	\$29.70	018-359-2	018-359-3	018-359-4	\$34.59
3/8	3/8	1	2-1/2	016-375-2	016-375-3	016-375-4	\$25.10	017-375-2	017-375-3	017-375-4	\$29.07	018-375-2	018-375-3	018-375-4	\$33.77
25/64	7/16	1	2-1/2	016-390-2	016-390-3	016-390-4	\$41.75	017-390-2	017-390-3	017-390-4	\$49.55	018-390-2	018-390-3	018-390-4	\$54.78
13/32	7/16	1	2-1/2	016-406-2	016-406-3	016-406-4	\$40.96	017-406-2	017-406-3	017-406-4	\$48.88	018-406-2	018-406-3	018-406-4	\$52.43
27/64	7/16	1	2-1/2	016-421-2	016-421-3	016-421-4	\$40.69	017-421-2	017-421-3	017-421-4	\$48.22	018-421-2	018-421-3	018-421-4	\$51.21
7/16	7/16	1	2-1/2	016-437-2	016-437-3	016-437-4	\$39.64	017-437-2	017-437-3	017-437-4	\$49.02	018-437-2	018-437-3	018-437-4	\$52.03
29/64	1/2	1	3	016-453-2	016-453-3	016-453-4	\$45.19	017-453-2	017-453-3	017-453-4	\$53.75	018-453-2	018-453-3	018-453-4	\$60.78
15/32	1/2	1	3	016-468-2	016-468-3	016-468-4	\$44.79	017-468-2	017-468-3	017-468-4	\$53.61	018-468-2	018-468-3	018-468-4	\$58.13
31/64	1/2	1	3	016-484-2	016-484-3	016-484-4	\$44.39	017-484-2	017-484-3	017-484-4	\$52.80	018-484-2	018-484-3	018-484-4	\$56.81
1/2	1/2	1	3	016-500-2	016-500-3	016-500-4	\$42.28	017-500-2	017-500-3	017-500-4	\$50.21	018-500-2	018-500-3	018-500-4	\$54.67
33/64	9/16	1-1/4	3-1/2	016-515-2	016-515-3	016-515-4	\$97.77	017-515-2	017-515-3	017-515-4	\$108.29	018-515-2	018-515-3	018-515-4	\$122.11
17/32	9/16	1-1/4	3-1/2	016-531-2	016-531-3	016-531-4	\$92.48	017-531-2	017-531-3	017-531-4	\$107.55	018-531-2	018-531-3	018-531-4	\$120.42
35/64	9/16	1-1/4	3-1/2	016-546-2	016-546-3	016-546-4	\$89.84	017-546-2	017-546-3	017-546-4	\$105.09	018-546-2	018-546-3	018-546-4	\$115.76
9/16	9/16	1-1/4	3-1/2	016-562-2	016-562-3	016-562-4	\$80.59	017-562-2	017-562-3	017-562-4	\$90.37	018-562-2	018-562-3	018-562-4	\$99.94
37/64	5/8	1-1/4	3-1/2	016-578-2	016-578-3	016-578-4	\$99.09	017-578-2	017-578-3	017-578-4	\$108.15	018-578-2	018-578-3	018-578-4	\$114.76
19/32	5/8	1-1/4	3-1/2	016-593-2	016-593-3	016-593-4	\$93.81	017-593-2	017-593-3	017-593-4	\$107.73	018-593-2	018-593-3	018-593-4	\$113.86
39/64	5/8	1-1/4	3-1/2	016-609-2	016-609-3	016-609-4	\$91.16	017-609-2	017-609-3	017-609-4	\$105.12	018-609-2	018-609-3	018-609-4	\$113.17
5/8	5/8	1-1/4	3-1/2	016-625-2	016-625-3	016-625-4	\$80.59	017-625-2	017-625-3	017-625-4	\$90.24	018-625-2	018-625-3	018-625-4	\$99.94
41/64	3/4	1-1/2	4	016-640-2	016-640-3	016-640-4	\$136.08	017-640-2	017-640-3	017-640-4	\$157.22	018-640-2	018-640-3	018-640-4	\$152.28
21/32	3/4	1-1/2	4	016-656-2	016-656-3	016-656-4	\$136.08	017-656-2	017-656-3	017-656-4	\$156.25	018-656-2	018-656-3	018-656-4	\$150.27
43/64	3/4	1-1/2	4	016-671-2	016-671-3	016-671-4	\$134.76	017-671-2	017-671-3	017-671-4	\$154.63	018-671-2	018-671-3	018-671-4	\$148.24
11/16	3/4	1-1/2	4	016-687-2	016-687-3	016-687-4	\$126.84	017-687-2	017-687-3	017-687-4	\$150.43	018-687-2	018-687-3	018-687-4	\$146.79
45/64	3/4	1-1/2	4	016-703-2	016-703-3	016-703-4	\$124.19	017-703-2	017-703-3	017-703-4	\$150.96	018-703-2	018-703-3	018-703-4	\$148.87
23/32	3/4	1-1/2	4	016-718-2	016-718-3	016-718-4	\$124.19	017-718-2	017-718-3	017-718-4	\$149.77	018-718-2	018-718-3	018-718-4	\$148.32
47/64	3/4	1-1/2	4	016-734-2	016-734-3	016-734-4	\$124.19	017-734-2	017-734-3	017-734-4	\$148.35	018-734-2	018-734-3	018-734-4	\$147.61
3/4	3/4	1-1/2	4	016-750-2	016-750-3	016-750-4	\$110.98	017-750-2	017-750-3	017-750-4	\$130.01	018-750-2	018-750-3	018-750-4	\$133.07
49/64	7/8	1-1/2	4	016-765-2	016-765-3	016-765-4	\$245.61	017-765-2	017-765-3	017-765-4	\$259.75	018-765-2	018-765-3	018-765-4	\$286.04
25/32	7/8	1-1/2	4	016-781-2	016-781-3	016-781-4	\$245.61	017-781-2	017-781-3	017-781-4	\$259.43	018-781-2	018-781-3	018-781-4	\$285.43
51/64	7/8	1-1/2	4	016-796-2	016-796-3	016-796-4	\$245.61	017-796-2	017-796-3	017-796-4	\$258.69	018-796-2	018-796-3	018-796-4	\$284.85
13/16	7/8	1-1/2	4	016-812-2	016-812-3	016-812-4	\$245.61	017-812-2	017-812-3	017-812-4	\$256.66	018-812-2	018-812-3	018-812-4	\$281.95
53/64	7/8	1-1/2	4	016-828-2	016-828-3	016-828-4	\$238.61	017-828-2	017-828-3	017-828-4	\$257.64	018-828-2	018-828-3	018-828-4	\$283.27
27/32	7/8	1-1/2	4	016-843-2	016-843-3	016-843-4	\$238.61	017-843-2	017-843-3	017-843-4	\$257.32	018-843-2	018-843-3	018-843-4	\$282.69
55/64	7/8	1-1/2	4	016-859-2	016-859-3	016-859-4	\$238.61	017-859-2	017-859-3	017-859-4	\$256.98	018-859-2	018-859-3	018-859-4	\$281.95
7/8	7/8	1-1/2	4	016-875-2	016-875-3	016-875-4	\$216.68	017-875-2	017-875-3	017-875-4	\$233.33	018-875-2	018-875-3	018-875-4	\$255.34
57/64	1	1-1/2	4	016-890-2	016-890-3	016-890-4	\$250.63	017-890-2	017-890-3	017-890-4	\$273.23	018-890-2	018-890-3	018-890-4	\$299.39
29/32	1	1-1/2	4	016-906-2	016-906-3	016-906-4	\$250.63	017-906-2	017-906-3	017-906-4	\$270.32	018-906-2	018-906-3	018-906-4	\$295.82
59/64	1	1-1/2	4	016-921-2	016-921-3	016-921-4	\$250.63	017-921-2	017-921-3	017-921-4	\$267.41	018-921-2	018-921-3	018-921-4	\$290.67
15/16	1	1-1/2	4	016-937-2	016-937-3	016-937-4	\$241.12	017-937-2	017-937-3	017-937-4	\$261.60	018-937-2	018-937-3	018-937-4	\$284.85
61/64	1	1-1/2	4	016-953-2	016-953-3	016-953-4	\$241.12	017-953-2	017-953-3	017-953-4	\$265.96	018-953-2	018-953-3	018-953-4	\$286.33
31/32	1	1-1/2	4	016-968-2	016-968-3	016-968-4	\$241.12	017-968-2	017-968-3	017-968-4	\$262.87	018-968-2	018-968-3	018-968-4	\$285.51
63/64	1	1-1/2	4	016-984-2	016-984-3	016-984-4	\$241.12	017-984-2	017-984-3	017-984-4	\$261.89	018-984-2	018-984-3	018-984-4	\$284.85
1	1	1-1/2	4	016-100-2	016-100-3	016-100-4	\$219.32	017-100-2	017-100-3	017-100-4	\$237.03	018-100-2	018-100-3	018-100-4	\$257.98

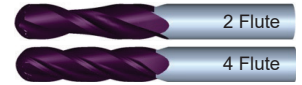
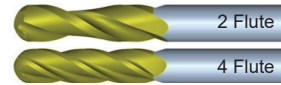
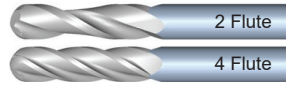
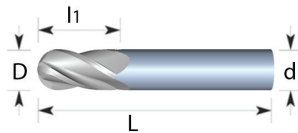




P	Steel	
M	Stainless Steel	
K	Cast Iron	
N	Non-Ferrous	
S	High Temp. Alloys	
H	Hardened Steel	
● GOOD	● OK	○ NOT OPTIMAL

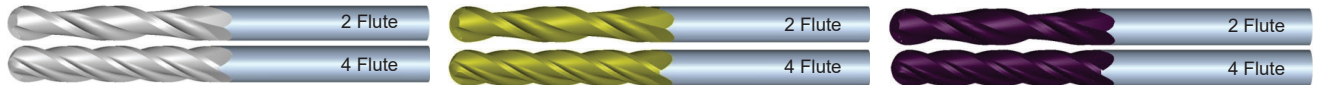
## STANDARD PERFORMANCE

- General Purpose
- 10% Micro Grain Carbide
- 30 deg Helix Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



### Ball Nose, Standard Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	3/4	2-1/2	019-125-2	--	019-125-4	\$17.97	020-125-2	--	020-125-4	\$19.57	021-125-2	--	021-125-4	\$21.17
3/16	3/16	3/4	2-1/2	019-187-2	--	019-187-4	\$21.46	020-187-2	--	020-187-4	\$23.57	021-187-2	--	021-187-4	\$25.68
1/4	1/4	1-1/8	3	019-250-2	--	019-250-4	\$27.82	020-250-2	--	020-250-4	\$30.67	021-250-2	--	021-250-4	\$33.51
5/16	5/16	1-1/8	3	019-312-2	--	019-312-4	\$33.69	020-312-2	--	020-312-4	\$37.96	021-312-2	--	021-312-4	\$42.23
3/8	3/8	1-1/8	3	019-375-2	--	019-375-4	\$43.60	020-375-2	--	020-375-4	\$47.93	021-375-2	--	021-375-4	\$52.27
7/16	7/16	2	4	019-437-2	--	019-437-4	\$63.64	020-437-2	--	020-437-4	\$69.05	021-437-2	--	021-437-4	\$74.44
1/2	1/2	2	4	019-500-2	--	019-500-4	\$69.68	020-500-2	--	020-500-4	\$77.42	021-500-2	--	021-500-4	\$85.17
5/8	5/8	2-1/4	5	019-625-2	--	019-625-4	\$130.61	020-625-2	--	020-625-4	\$142.24	021-625-2	--	021-625-4	\$153.87
3/4	3/4	2-1/4	5	019-750-2	--	019-750-4	\$183.65	020-750-2	--	020-750-4	\$196.89	021-750-2	--	021-750-4	\$210.13
1	1	2-1/4	5	019-100-2	--	019-100-4	\$285.38	020-100-2	--	020-100-4	\$308.58	021-100-2	--	021-100-4	\$331.78



### Ball Nose, Standard Carbide, Extra Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	1	3	022-125-2	--	022-125-4	\$21.30	023-125-2	--	023-125-4	\$22.90	024-125-2	--	024-125-4	\$24.50
3/16	3/16	1-1/8	3	022-187-2	--	022-187-4	\$23.62	023-187-2	--	023-187-4	\$25.74	024-187-2	--	024-187-4	\$27.85
1/4	1/4	1-1/2	4	022-250-2	--	022-250-4	\$31.05	023-250-2	--	023-250-4	\$34.91	024-250-2	--	024-250-4	\$38.76
5/16	5/16	1-5/8	4	022-312-2	--	022-312-4	\$37.92	023-312-2	--	023-312-4	\$42.94	024-312-2	--	024-312-4	\$47.96
3/8	3/8	1-3/4	4	022-375-2	--	022-375-4	\$50.21	023-375-2	--	023-375-4	\$67.58	024-375-2	--	024-375-4	\$73.06
1/2	1/2	3	6	022-500-2	--	022-500-4	\$109.66	023-500-2	--	023-500-4	\$111.88	024-500-2	--	024-500-4	\$125.99
5/8	5/8	3	6	022-625-2	--	022-625-4	\$153.26	023-625-2	--	023-625-4	\$166.80	024-625-2	--	024-625-4	\$179.02
3/4	3/4	3	6	022-750-2	--	022-750-4	\$206.11	023-750-2	--	023-750-4	\$221.58	024-750-2	--	024-750-4	\$237.05
1	1	3	6	022-100-2	--	022-100-4	\$356.73	023-100-2	--	023-100-4	\$383.77	024-100-2	--	024-100-4	\$410.82

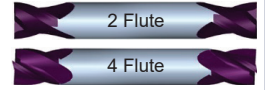
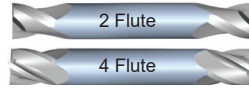
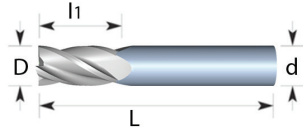
### METRIC - Ball End, Standard Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1	1	3	38	043-010-2	043-010-3	043-010-4	\$12.68	--	--	--	--	044-010-2	044-010-3	044-010-4	\$13.95
1.5	2	5	38	043-015-2	043-015-3	043-015-4	\$12.68	--	--	--	--	044-015-2	044-015-3	044-015-4	\$13.95
2	2	6	38	043-020-2	043-020-3	043-020-4	\$10.46	--	--	--	--	044-020-2	044-020-3	044-020-4	\$11.52
3	3	12	38	043-030-2	043-030-3	043-030-4	\$10.46	--	--	--	--	044-030-2	044-030-3	044-030-4	\$11.52
3.5	4	12	50	043-035-2	043-035-3	043-035-4	\$14.43	--	--	--	--	044-035-2	044-035-3	044-035-4	\$15.89
4	4	14	50	043-040-2	043-040-3	043-040-4	\$13.95	--	--	--	--	044-040-2	044-040-3	044-040-4	\$15.38
4.5	5	14	50	043-045-2	043-045-3	043-045-4	\$14.43	--	--	--	--	044-045-2	044-045-3	044-045-4	\$15.91
5	5	16	50	043-050-2	043-050-3	043-050-4	\$15.35	--	--	--	--	044-050-2	044-050-3	044-050-4	\$16.90
6	6	19	63	043-060-2	043-060-3	043-060-4	\$17.92	--	--	--	--	044-060-2	044-060-3	044-060-4	\$19.77
7	7	19	63	043-070-2	043-070-3	043-070-4	\$28.01	--	--	--	--	044-070-2	044-070-3	044-070-4	\$30.81
8	8	19	63	043-080-2	043-080-3	043-080-4	\$22.02	--	--	--	--	044-080-2	044-080-3	044-080-4	\$24.40
9	9	22	70	043-090-2	043-090-3	043-090-4	\$36.39	--	--	--	--	044-090-2	044-090-3	044-090-4	\$40.02
10	10	22	70	043-100-2	043-100-3	043-100-4	\$32.90	--	--	--	--	044-100-2	044-100-3	044-100-4	\$36.17
11	11	25	70	043-110-2	043-110-3	043-110-4	\$43.60	--	--	--	--	044-110-2	044-110-3	044-110-4	\$47.96
12	12	25	75	043-120-2	043-120-3	043-120-4	\$42.28	--	--	--	--	044-120-2	044-120-3	044-120-4	\$46.51
14	14	30	88	043-140-2	043-140-3	043-140-4	\$62.10	--	--	--	--	044-140-2	044-140-3	044-140-4	\$68.31
16	16	32	88	043-160-2	043-160-3	043-160-4	\$83.05	--	--	--	--	044-160-2	044-160-3	044-160-4	\$90.03
18	18	36	100	043-180-2	043-180-3	043-180-4	\$110.35	--	--	--	--	044-180-2	044-180-3	044-180-4	\$118.74
20	20	38	100	043-200-2	043-300-3	043-400-4	\$137.19	--	--	--	--	044-200-2	044-300-3	044-400-4	\$144.30
22	22	38	100	043-220-2	043-320-3	043-420-4	\$162.77	--	--	--	--	044-220-2	044-320-3	044-420-4	\$173.77
25	25	38	100	043-250-2	043-350-3	043-450-4	\$199.98	--	--	--	--	044-250-2	044-350-3	044-450-4	\$212.04

P	Steel	
M	Stainless Steel	
K	Cast Iron	
N	Non-Ferrous	
S	High Temp. Alloys	
H	Hardened Steel	
● GOOD	○ OK	○ NOT OPTIMAL

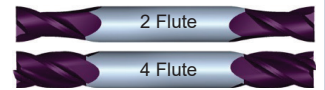
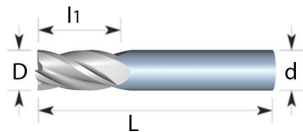
## STANDARD PERFORMANCE

- General Purpose
- 30 deg Helix Carbide
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



### Square End, Standard Carbide, Stub Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated			Price	TiN Coated			Price	TiAlN Coated			Price
				2 Flute Part#	3 Flute Part#	4 Flute Part#		2 Flute Part#	3 Flute Part#	4 Flute Part#		2 Flute Part#	3 Flute Part#	4 Flute Part#	
1/32	1/8	1/16	1-1/2	025-031-2	--	025-031-4	\$11.89	026-031-2	--	026-031-4	\$13.48	027-031-2	--	027-031-4	\$13.21
3/64	1/8	3/32	1-1/2	025-046-2	--	025-046-4	\$11.89	026-046-2	--	026-046-4	\$13.34	027-046-2	--	027-046-4	\$13.21
1/16	1/8	1/8	1-1/2	025-062-2	--	025-062-4	\$10.57	026-062-2	--	026-062-4	\$11.73	027-062-2	--	027-062-4	\$11.89
3/32	1/8	3/16	1-1/2	025-093-2	--	025-093-4	\$10.04	026-093-2	--	026-093-4	\$11.63	027-093-2	--	027-093-4	\$11.36
7/64	1/8	7/32	1-1/2	025-109-2	--	025-109-4	\$9.78	026-109-2	--	026-109-4	\$11.63	027-109-2	--	027-109-4	\$11.10
1/8	1/8	1/4	1-1/2	025-125-2	--	025-125-4	\$9.51	026-125-2	--	026-125-4	\$11.49	027-125-2	--	027-125-4	\$10.83
5/32	3/16	5/16	2	025-156-2	--	025-156-4	\$14.53	026-156-2	--	026-156-4	\$16.25	027-156-2	--	027-156-4	\$17.97
3/16	3/8	5/16	2	025-187-2	--	025-187-4	\$13.87	026-187-2	--	026-187-4	\$16.12	027-187-2	--	027-187-4	\$17.18
7/32	1/4	3/8	2-1/2	025-218-2	--	025-218-4	\$16.38	026-218-2	--	026-218-4	\$19.45	027-218-2	--	027-218-4	\$22.46
1/4	1/4	1/2	2-1/2	025-250-2	--	025-250-4	\$16.12	026-250-2	--	026-250-4	\$19.16	027-250-2	--	027-250-4	\$21.67
9/32	5/16	1/2	2-1/2	025-281-2	--	025-281-4	\$19.82	026-281-2	--	026-281-4	\$23.65	027-281-2	--	027-281-4	\$27.75
5/16	5/16	1/2	2-1/2	025-312-2	--	025-312-4	\$19.29	026-312-2	--	026-312-4	\$23.12	027-312-2	--	027-312-4	\$26.95
3/8	3/8	9/16	2-1/2	025-375-2	--	025-375-4	\$25.10	026-375-2	--	026-375-4	\$28.93	027-375-2	--	027-375-4	\$33.03
7/16	1/2	9/16	2-3/4	025-437-2	--	025-437-4	\$38.32	026-437-2	--	026-437-4	\$44.50	027-437-2	--	027-437-4	\$48.88
1/2	1/2	5/8	3	025-500-2	--	025-500-4	\$42.28	026-500-2	--	026-500-4	\$48.36	027-500-2	--	027-500-4	\$50.21
9/16	5/8	11/16	3-1/2	025-562-2	--	025-562-4	\$92.48	026-562-2	--	026-562-4	\$87.33	027-562-2	--	027-562-4	\$105.70
5/8	5/8	11/16	3-1/2	025-625-2	--	025-625-4	\$89.84	026-625-2	--	026-625-4	\$102.16	027-625-2	--	027-625-4	\$100.41
3/4	3/4	7/8	4	025-750-2	--	025-750-4	\$113.62	026-750-2	--	026-750-4	\$129.95	027-750-2	--	027-750-4	\$134.76



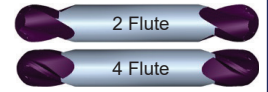
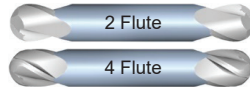
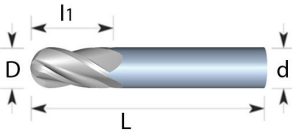
### Square End, Standard Carbide, Regular Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated			Price	TiN Coated			Price	TiAlN Coated			Price
				2 Flute Part#	3 Flute Part#	4 Flute Part#		2 Flute Part#	3 Flute Part#	4 Flute Part#		2 Flute Part#	3 Flute Part#	4 Flute Part#	
3/32	3/8	5/16	3	031-093-2	--	031-093-4	\$37.52	--	--	--	--	032-093-2	--	032-093-4	\$42.81
1/8	3/8	3/8	3-1/16	031-125-2	--	031-125-4	\$36.99	--	--	--	--	032-125-2	--	032-125-4	\$42.28
5/32	3/8	7/16	3-1/8	031-156-2	--	031-156-4	\$36.47	--	--	--	--	032-156-2	--	032-156-4	\$42.41
3/16	3/8	1/2	3-1/4	031-187-2	--	031-187-4	\$35.67	--	--	--	--	032-187-2	--	032-187-4	\$41.62
7/32	3/8	9/16	3-1/2	031-218-2	--	031-218-4	\$35.67	--	--	--	--	032-218-2	--	032-218-4	\$41.62
1/4	3/8	5/8	3-1/2	031-250-2	--	031-250-4	\$35.67	--	--	--	--	032-250-2	--	032-250-4	\$41.62
5/16	3/8	3/4	3-1/2	031-312-2	--	031-312-4	\$37.52	--	--	--	--	032-312-2	--	032-312-4	\$43.73
3/8	3/8	3/4	3-1/2	031-375-2	--	031-375-4	\$39.64	--	--	--	--	032-375-2	--	032-375-4	\$45.85
7/16	1/2	7/8	4	031-437-2	--	031-437-4	\$60.78	--	--	--	--	032-437-2	--	032-437-4	\$67.65
1/2	1/2	1	4	031-500-2	--	031-500-4	\$55.49	--	--	--	--	032-500-2	--	032-500-4	\$64.74
5/8	5/8	1-1/2	6	031-625-2	--	031-625-4	\$110.98	--	--	--	--	032-625-2	--	032-625-4	\$122.87
3/4	3/4	1-1/2	6	031-750-2	--	031-750-4	\$161.19	--	--	--	--	032-750-2	--	032-750-4	\$174.40

P	●	Steel
M	◐	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	○	Hardened Steel
●	GOOD	◐ OK ○ NOT OPTIMAL

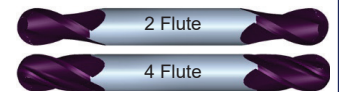
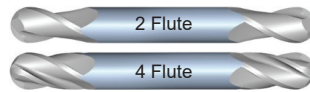
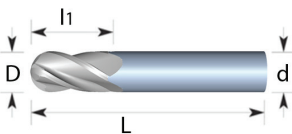
## STANDARD PERFORMANCE

- General Purpose
- 30 deg Helix Carbide
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



### Ball Nose, Standard Carbide, Stub Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8	1/16	1-1/2	028-031-2	--	028-031-4	\$21.14	029-031-2	--	029-031-4	\$22.46	030-031-2	--	030-031-4	\$22.46
3/64	1/8	3/32	1-1/2	028-046-2	--	028-046-4	\$21.14	029-046-2	--	029-046-4	\$22.46	030-046-2	--	030-046-4	\$22.46
1/16	1/8	1/8	1-1/2	028-062-2	--	028-062-4	\$19.03	029-062-2	--	029-062-4	\$20.88	030-062-2	--	030-062-4	\$21.14
3/32	1/8	3/16	1-1/2	028-093-2	--	028-093-4	\$18.50	029-093-2	--	029-093-4	\$20.08	030-093-2	--	030-093-4	\$21.14
7/64	1/8	7/32	1-1/2	028-109-2	--	028-109-4	\$18.50	029-109-2	--	029-109-4	\$20.08	030-109-2	--	030-109-4	\$20.61
1/8	1/8	1/4	1-1/2	028-125-2	--	028-125-4	\$17.97	029-125-2	--	029-125-4	\$19.69	030-125-2	--	030-125-4	\$20.61
5/32	3/16	5/16	2	028-156-2	--	028-156-4	\$21.14	029-156-2	--	029-156-4	\$22.59	030-156-2	--	030-156-4	\$24.57
3/16	3/8	5/16	2	028-187-2	--	028-187-4	\$20.61	029-187-2	--	029-187-4	\$22.20	030-187-2	--	030-187-4	\$23.78
7/32	1/4	3/8	2-1/2	028-218-2	--	028-218-4	\$21.93	029-218-2	--	029-218-4	\$23.91	030-218-2	--	030-218-4	\$27.75
1/4	1/4	1/2	2-1/2	028-250-2	--	028-250-4	\$21.40	029-250-2	--	029-250-4	\$23.78	030-250-2	--	030-250-4	\$26.42
9/32	5/16	1/2	2-1/2	028-281-2	--	028-281-4	\$25.10	029-281-2	--	029-281-4	\$27.75	030-281-2	--	030-281-4	\$33.03
5/16	5/16	1/2	2-1/2	028-312-2	--	028-312-4	\$23.78	029-312-2	--	029-312-4	\$27.08	030-312-2	--	030-312-4	\$31.71
3/8	3/8	9/16	2-1/2	028-375-2	--	028-375-4	\$36.99	029-375-2	--	029-375-4	\$40.96	030-375-2	--	030-375-4	\$44.92
7/16	1/2	9/16	2-3/4	028-437-2	--	028-437-4	\$47.56	029-437-2	--	029-437-4	\$55.49	030-437-2	--	030-437-4	\$58.13
1/2	1/2	5/8	3	028-500-2	--	028-500-4	\$55.49	029-500-2	--	029-500-4	\$63.42	030-500-2	--	030-500-4	\$66.06
9/16	5/8	11/16	3-1/2	028-562-2	--	028-562-4	\$124.19	029-562-2	--	029-562-4	\$134.76	030-562-2	--	030-562-4	\$142.69
5/8	5/8	11/16	3-1/2	028-625-2	--	028-625-4	\$116.27	029-625-2	--	029-625-4	\$126.84	030-625-2	--	030-625-4	\$136.08
3/4	3/4	7/8	4	028-750-2	--	028-750-4	\$147.98	029-750-2	--	029-750-4	\$161.19	030-750-2	--	030-750-4	\$174.40



### Ball Nose, Standard Carbide, Regular Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiN Coated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
3/32	3/8	5/16	3	033-093-2	--	033-093-4	\$47.56	--	--	--	--	034-093-2	--	034-093-4	\$52.85
1/8	3/8	3/8	3-1/16	033-125-2	--	033-125-4	\$44.92	--	--	--	--	034-125-2	--	034-125-4	\$50.21
5/32	3/8	7/16	3-1/8	033-156-2	--	033-156-4	\$44.92	--	--	--	--	034-156-2	--	034-156-4	\$50.87
3/16	3/8	1/2	3-1/4	033-187-2	--	033-187-4	\$43.60	--	--	--	--	034-187-2	--	034-187-4	\$49.55
7/32	3/8	9/16	3-1/2	033-218-2	--	033-218-4	\$43.60	--	--	--	--	034-218-2	--	034-218-4	\$49.55
1/4	3/8	5/8	3-1/2	033-250-2	--	033-250-4	\$43.60	--	--	--	--	034-250-2	--	034-250-4	\$49.55
5/16	3/8	3/4	3-1/2	033-312-2	--	033-312-4	\$50.21	--	--	--	--	034-312-2	--	034-312-4	\$56.42
3/8	3/8	3/4	3-1/2	033-375-2	--	033-375-4	\$50.21	--	--	--	--	034-375-2	--	034-375-4	\$56.42
7/16	1/2	7/8	4	033-437-2	--	033-437-4	\$73.99	--	--	--	--	034-437-2	--	034-437-4	\$80.86
1/2	1/2	1	4	033-500-2	--	033-500-4	\$71.35	--	--	--	--	034-500-2	--	034-500-4	\$80.59
5/8	5/8	1-1/2	6	033-625-2	--	033-625-4	\$153.26	--	--	--	--	034-625-2	--	034-625-4	\$165.15
3/4	3/4	1-1/2	6	033-750-2	--	033-750-4	\$206.11	--	--	--	--	034-750-2	--	034-750-4	\$219.32

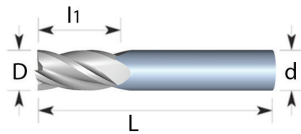


P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	○	Hardened Steel

● BETTER ○ OK ○ NOT OPTIMAL

## HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



**NEW**



HIGH PERFORMANCE Variable Pitch Carbide, Stub Length, Single End								
Cutter Diam. D	Shank Diam. d	Length Of Cut l <sub>1</sub>	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated	
					4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/8	2	SQ	190-188-4	\$15.70	--	
3/16	3/16	3/8	2	.015CR	190-188-4-015R	\$15.70	--	
1/4	1/4	3/8	2	SQ	190-250-4	\$19.87	--	
1/4	1/4	3/8	2	.015CR	190-250-4-015R	\$19.87	--	
5/16	5/16	3/8	2	SQ	190-312-4	\$27.44	--	
5/16	5/16	3/8	2	.020CR	190-312-4-020R	\$27.44	--	
3/8	3/8	1/2	2	SQ	190-375-4	\$32.78	--	
3/8	3/8	1/2	2	.020CR	190-375-4-020R	\$32.78	--	
1/2	1/2	5/8	2-1/2	SQ	190-500-4	\$48.23	191-500-4	\$48.23
1/2	1/2	5/8	2-1/2	.030CR	190-500-4-030R	\$48.23	191-500-4-030R	\$48.23
5/8	5/8	3/4	3	SQ	190-625-4	\$85.62	191-625-4	\$85.62
5/8	5/8	3/4	3	.030CR	190-625-4-030R	\$85.62	191-625-4-030R	\$85.62
3/4	3/4	1	3	SQ	190-750-4	\$120.98	191-750-4	\$120.98
3/4	3/4	1	3	.030CR	190-750-4-030R	\$120.98	191-750-4-030R	\$120.98



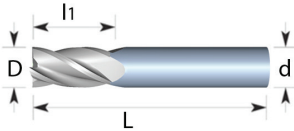
HIGH PERFORMANCE Variable Pitch Carbide, Regular Length, Single End								
Cutter Diam. D	Shank Diam. d	Length Of Cut l <sub>1</sub>	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated	
					4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price
3/16	3/16	5/8	2	SQ	090-188-4	\$20.97	--	
3/16	3/16	5/8	2	.015CR	090-188-4-015R	\$20.97	--	
1/4	1/4	3/4	2-1/2	SQ	090-250-4	\$22.08	091-250-4	\$22.08
1/4	1/4	3/4	2-1/2	.020CR	090-250-4-020R	\$22.08	091-250-4-020R	\$22.08
5/16	5/16	13/16	2-1/2	SQ	090-312-4	\$30.47	091-312-4	\$30.47
5/16	5/16	13/16	2-1/2	.020CR	090-312-4-020R	\$30.47	091-312-4-020R	\$30.47
3/8	3/8	7/8	2-1/2	SQ	090-375-4	\$35.64	091-375-4	\$35.64
3/8	3/8	7/8	2-1/2	.020CR	090-375-4-020R	\$35.64	091-375-4-020R	\$35.64
7/16	7/16	1	2-3/4	SQ	090-437-4	\$46.83	091-437-4	\$46.83
1/2	1/2	1-1/4	3	SQ	090-500-4	\$53.60	091-500-4	\$53.60
1/2	1/2	1-1/4	3	.015CR	090-500-4-015R	\$53.60	091-500-4-015R	\$53.60
1/2	1/2	1-1/4	3	.030CR	090-500-4-030R	\$53.60	091-500-4-030R	\$53.60
1/2	1/2	1-1/4	3	.060CR	090-500-4-060R	\$53.60	091-500-4-060R	\$53.60
5/8	5/8	1-1/4	3-1/2	SQ	090-625-4	\$88.26	091-625-4	\$88.26
5/8	5/8	1-1/4	3-1/2	.030CR	090-625-4-030R	\$88.26	091-625-4-030R	\$88.26
5/8	5/8	1-1/4	3-1/2	.060CR	090-625-4-060R	\$88.26	091-625-4-060R	\$88.26
5/8	5/8	1-1/4	3-1/2	.125CR	090-625-4-125R	\$88.26	091-625-4-125R	\$88.26
3/4	3/4	1-1/2	4	SQ	090-750-4	\$128.39	091-750-4	\$128.39
3/4	3/4	1-1/2	4	.030CR	090-750-4-030R	\$128.39	091-750-4-030R	\$128.39
3/4	3/4	1-1/2	4	.060CR	090-750-4-060R	\$128.39	091-750-4-060R	\$128.39
3/4	3/4	1-1/2	4	.125CR	090-750-4-125R	\$128.39	091-750-4-125R	\$128.39
1	1	1-1/2	4	SQ	090-100-4	\$209.04	091-100-4	\$209.04
1	1	1-1/2	4	.030CR	090-100-4-030R	\$209.04	091-100-4-030R	\$209.04
1	1	1-1/2	4	.060CR	090-100-4-060R	\$209.04	091-100-4-060R	\$209.04
1	1	1-1/2	4	.125CR	090-100-4-125R	\$209.04	091-100-4-125R	\$209.04

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

● BETTER ◐ OK ○ NOT OPTIMAL

## HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



### HIGH PERFORMANCE Variable Pitch Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated	
					4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/4	2-1/2	SQ	092-188-4	\$35.64	--	
3/16	3/16	3/4	2-1/2	.015CR	092-188-4-015R	\$35.64	--	
1/4	1/4	1-1/8	3	SQ	092-250-4	\$37.56	093-250-4	\$37.56
1/4	1/4	1-1/8	3	.020CR	092-250-4-020R	\$37.56	093-250-4-020R	\$37.56
5/16	5/16	1-1/8	3	SQ	092-312-4	\$51.81	093-312-4	\$51.81
5/16	5/16	1-1/8	3	.020CR	092-312-4-020R	\$51.81	093-312-4-020R	\$51.81
3/8	3/8	1-1/8	3	SQ	092-375-4	\$60.56	093-375-4	\$60.56
3/8	3/8	1-1/8	3	.020CR	092-375-4-020R	\$60.56	093-375-4-020R	\$60.56
7/16	7/16	2	4	SQ	092-437-4	\$79.59	093-437-4	\$79.59
1/2	1/2	2	4	SQ	092-500-4	\$91.13	093-500-4	\$91.13
1/2	1/2	2	4	.015CR	092-500-4-015R	\$91.13	093-500-4-015R	\$91.13
1/2	1/2	2	4	.030CR	092-500-4-030R	\$91.13	093-500-4-030R	\$91.13
1/2	1/2	2	4	.060CR	092-500-4-060R	\$91.13	093-500-4-060R	\$91.13
5/8	5/8	2-1/4	5	SQ	092-625-4	\$132.41	093-625-4	\$132.41
5/8	5/8	2-1/4	5	.030CR	092-625-4-030R	\$132.41	093-625-4-030R	\$132.41
5/8	5/8	2-1/4	5	.060CR	092-625-4-060R	\$132.41	093-625-4-060R	\$132.41
5/8	5/8	2-1/4	5	.125CR	092-625-4-125R	\$132.41	093-625-4-125R	\$132.41
3/4	3/4	2-1/4	5	SQ	092-750-4	\$187.11	093-750-4	\$187.11
3/4	3/4	2-1/4	5	.030CR	092-750-4-030R	\$187.11	093-750-4-030R	\$187.11
3/4	3/4	2-1/4	5	.060CR	092-750-4-060R	\$187.11	093-750-4-060R	\$187.11
3/4	3/4	2-1/4	5	.125CR	092-750-4-125R	\$187.11	093-750-4-125R	\$187.11
1	1	2-1/4	5	SQ	092-100-4	\$271.73	093-100-4	\$271.73
1	1	2-1/4	5	.030CR	092-100-4-030R	\$271.73	093-100-4-030R	\$271.73
1	1	2-1/4	5	.060CR	092-100-4-060R	\$271.73	093-100-4-060R	\$271.73
1	1	2-1/4	5	.125CR	092-100-4-125R	\$271.73	093-100-4-125R	\$271.73



**NEW**

### HIGH PERFORMANCE Variable Pitch Carbide, Extra Long Length, Single End

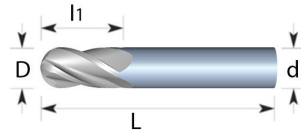
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated	
					4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price
3/16	3/16	1-1/8	3	SQ	098-188-4	\$39.19	--	
1/4	1/4	1-1/2	4	SQ	098-250-4	\$44.68	--	
5/16	5/16	1-5/8	4	SQ	098-312-4	\$59.59	--	
3/8	3/8	1-3/4	4	SQ	098-375-4	\$66.63	--	
1/2	1/2	3	6	SQ	098-500-4	\$138.53	--	
5/8	5/8	3	6	SQ	098-625-4	\$153.59	--	
3/4	3/4	3	6	SQ	098-750-4	\$213.31	--	
1	1	3	6	SQ	098-100-4	\$363.29	--	

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

● BETTER ○ OK ○ NOT OPTIMAL

## HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



HIGH PERFORMANCE Variable Pitch Carbide, Ball Regular Length, Single End							
Cutter Diam. D	Shank Diam. d	Length Of Cut l <sub>1</sub>	O.A.L. L	TiALN Coated		TiALN Coated	
				4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price
3/16	3/16	5/8	2	094-188-4	\$25.16	--	
1/4	1/4	3/4	2-1/2	094-250-4	\$26.51	095-250-4	\$26.51
5/16	5/16	13/16	2-1/2	094-312-4	\$36.57	095-312-4	\$36.57
3/8	3/8	7/8	2-1/2	094-375-4	\$42.76	095-375-4	\$42.76
7/16	7/16	1	2-3/4	094-437-4	\$56.18	095-437-4	\$56.18
1/2	1/2	1	3	094-500-4	\$64.33	095-500-4	\$64.33
5/8	5/8	1-1/4	3-1/2	094-625-4	\$105.93	095-625-4	\$105.93
3/4	3/4	1-1/2	4	094-750-4	\$149.68	095-750-4	\$149.68
1	1	1-1/2	4	094-100-4	\$250.84	095-100-4	\$250.84



HIGH PERFORMANCE Variable Pitch Carbide, Ball Long Length, Single End							
Cutter Diam. D	Shank Diam. d	Length Of Cut l <sub>1</sub>	O.A.L. L	TiALN Coated		TiALN Coated	
				4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/4	2-1/2	096-188-4	\$42.76	--	
1/4	1/4	1-1/8	3	096-250-4	\$45.06	097-250-4	\$45.06
5/16	5/16	1-1/8	3	096-312-4	\$62.16	097-312-4	\$62.16
3/8	3/8	1-1/8	3	096-375-4	\$72.68	097-375-4	\$72.68
7/16	7/16	2	4	096-437-4	\$95.50	097-437-4	\$95.50
1/2	1/2	2	4	096-500-4	\$109.38	097-500-4	\$109.38
5/8	5/8	2-1/4	5	096-625-4	\$158.87	097-625-4	\$158.87
3/4	3/4	2-1/4	5	096-750-4	\$224.52	097-750-4	\$224.52
1	1	2-1/4	5	096-100-4	\$326.09	097-100-4	\$326.09



**NEW**

HIGH PERFORMANCE Variable Pitch Carbide, Ball Extra Long Length, Single End							
Cutter Diam. D	Shank Diam. d	Length Of Cut l <sub>1</sub>	O.A.L. L	TiALN Coated		TiALN Coated	
				4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price
3/16	3/16	1-1/8	3	099-188-4	\$49.16	--	
1/4	1/4	1-1/2	4	099-250-4	\$51.81	--	
5/16	5/16	1-5/8	4	099-312-4	\$70.86	--	
3/8	3/8	1-3/4	4	099-375-4	\$101.76	--	
1/2	1/2	3	6	099-500-4	\$166.25	--	
5/8	5/8	3	6	099-625-4	\$177.91	--	
3/4	3/4	3	6	099-750-4	\$255.97	--	
1	1	3	6	099-100-4	\$433.69	--	

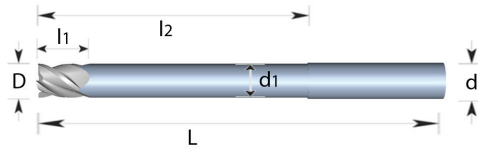


P	●	Steel
M	◻	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	◻	Hardened Steel

● BETTER ◻ OK ○ NOT OPTIMAL

## HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0020"



**NEW**



HIGH PERFORMANCE Variable Pitch Carbide, Long Reach Neck Relief, Single End										
Cutter Diam. D	Shank Diam. d	Necked Diam. d <sub>1</sub>	Length Of Cut l <sub>1</sub>	Length Below Shk. l <sub>2</sub>	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated	
							4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price
3/16	3/16	.1775	3/8	2-1/2	4	SQ	290-188-4	\$64.94	--	--
3/16	3/16	.1775	3/8	2-1/2	4	.015CR	290-188-4-015R	\$64.94	--	--
1/4	1/4	.2400	3/8	2-1/2	4	SQ	290-250-4	\$71.61	--	--
1/4	1/4	.2400	3/8	2-1/2	4	.015CR	290-250-4-015R	\$71.61	--	--
5/16	5/16	.3025	7/16	2-1/2	4	SQ	290-312-4	\$84.60	--	--
5/16	5/16	.3025	7/16	2-1/2	4	.015CR	290-312-4-015R	\$84.60	--	--
3/8	3/8	.3650	1/2	2-1/2	4	SQ	290-375-4	\$89.72	--	--
3/8	3/8	.3650	1/2	2-1/2	4	.015CR	290-375-4-015R	\$89.72	--	--
1/2	1/2	.4800	5/8	3	5	SQ	290-500-4	\$132.76	--	--
1/2	1/2	.4800	5/8	3	5	.020CR	290-500-4-020R	\$132.76	--	--
1/2	1/2	.4800	5/8	4	6	SQ	290-500-4-L	\$143.92	--	--
1/2	1/2	.4800	5/8	4	6	.020CR	290-500-4-020R-L	\$143.92	--	--
5/8	5/8	.6050	3/4	3	5	SQ	290-625-4	\$164.31	--	--
5/8	5/8	.6050	3/4	3	5	.020CR	290-625-4-020R	\$164.31	--	--
5/8	5/8	.6050	3/4	4	6	SQ	290-625-4-L	\$172.01	--	--
5/8	5/8	.6050	3/4	4	6	.020CR	290-625-4-020R-L	\$172.01	--	--
3/4	3/4	.7300	1	3	5	SQ	290-750-4	\$221.01	--	--
3/4	3/4	.7300	1	3	5	.020CR	290-750-4-020R	\$221.01	--	--
3/4	3/4	.7300	1	4	6	SQ	290-750-4-L	\$232.55	--	--
3/4	3/4	.7300	1	4	6	.020CR	290-750-4-020R-L	\$232.55	--	--
3/4	3/4	.7300	1	5	7	SQ	290-750-4-LL	\$265.26	--	--
3/4	3/4	.7300	1	5	7	.020CR	290-750-4-020R-LL	\$265.26	--	--
1	1	.9800	1-1/4	3	5	SQ	290-100-4	\$357.52	--	--
1	1	.9800	1-1/4	3	5	.020CR	290-100-4-020R	\$357.52	--	--
1	1	.9800	1-1/4	4	6	SQ	290-100-4-L	\$382.53	--	--
1	1	.9800	1-1/4	4	6	.020CR	290-100-4-020R-L	\$382.53	--	--
1	1	.9800	1-1/4	5	7	SQ	290-100-4-LL	\$442.17	--	--
1	1	.9800	1-1/4	5	7	.020CR	290-100-4-020R-LL	\$442.17	--	--



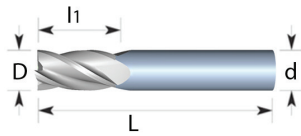
**NEW**

HIGH PERFORMANCE Variable Pitch Carbide, Ball Long Reach Neck Relief, Single End										
Cutter Diam. D	Shank Diam. d	Necked Diam. d <sub>1</sub>	Length Of Cut l <sub>1</sub>	Length Below Shk. l <sub>2</sub>	O.A.L. L	TiAlN Coated		TiAlN Coated		
						4 Flute - ROUND Shank Part#	Price	4 Flute - WELDON Shank Part#	Price	
3/16	3/16	.1775	3/8	2-1/2	4	294-188-4	\$73.94	--	--	
1/4	1/4	.2400	3/8	2-1/2	4	294-250-4	\$83.56	--	--	
5/16	5/16	.3025	7/16	2-1/2	4	294-312-4	\$93.95	--	--	
3/8	3/8	.3650	1/2	2-1/2	4	294-375-4	\$101.64	--	--	
1/2	1/2	.4800	5/8	3	5	294-500-4	\$145.84	--	--	
1/2	1/2	.4800	5/8	4	6	294-500-4-L	\$153.54	--	--	
5/8	5/8	.6050	3/4	3	5	294-625-4	\$194.27	--	--	
5/8	5/8	.6050	3/4	4	6	294-625-4-L	\$201.00	--	--	
3/4	3/4	.7300	1	3	5	294-750-4	\$267.51	--	--	
3/4	3/4	.7300	1	4	6	294-750-4-L	\$279.06	--	--	
3/4	3/4	.7300	1	5	7	294-750-4-LL	\$307.92	--	--	
1	1	.9800	1-1/4	3	5	294-100-4	\$431.76	--	--	
1	1	.9800	1-1/4	4	6	294-100-4-L	\$456.78	--	--	
1	1	.9800	1-1/4	5	7	294-100-4-LL	\$508.72	--	--	

P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	○	Hardened Steel
●	BEST	○ OK ○ NOT OPTIMAL

## ULTRA HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Extra Fine Sub-Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0015"



**NEW**



Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated	
					4 Flute - ROUND Shank		4 Flute - WELDON Shank	
					Part#	Price	Part#	Price
3/16	3/16	3/8	2	SQ	180-188-4	\$18.87	--	--
3/16	3/16	3/8	2	.015CR	180-188-4-015R	\$18.87	--	--
1/4	1/4	3/8	2	SQ	180-250-4	\$23.38	--	--
1/4	1/4	3/8	2	.015CR	180-250-4-015R	\$23.38	--	--
5/16	5/16	3/8	2	SQ	180-312-4	\$32.30	--	--
5/16	5/16	3/8	2	.020CR	180-312-4-020R	\$32.30	--	--
3/8	3/8	1/2	2	SQ	180-375-4	\$40.37	--	--
3/8	3/8	1/2	2	.020CR	180-375-4-020R	\$40.37	--	--
1/2	1/2	5/8	2-1/2	SQ	180-500-4	\$65.80	181-500-4	\$65.80
1/2	1/2	5/8	2-1/2	.030CR	180-500-4-030R	\$65.80	181-500-4-030R	\$65.80
5/8	5/8	3/4	3	SQ	180-625-4	\$121.31	181-625-4	\$121.31
5/8	5/8	3/4	3	.030CR	180-625-4-030R	\$121.31	181-625-4-030R	\$121.31
3/4	3/4	1	3	SQ	180-750-4	\$177.30	181-750-4	\$177.30
3/4	3/4	1	3	.030CR	180-750-4-030R	\$177.30	181-750-4-030R	\$177.30



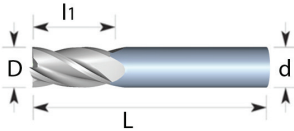
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated		TiAlN Coated	
					4 Flute - ROUND Shank		4 Flute - WELDON Shank		5 Flute - ROUND Shank	
					Part#	Price	Part#	Price	Part#	Price
1/8	1/8	1/2	1-1/2	.010CR	080-125-4-010R	\$17.89	--	--	--	--
3/16	3/16	5/8	2	SQ	080-188-4	\$20.97	--	--	--	--
3/16	3/16	5/8	2	.015CR	080-188-4-015R	\$20.97	--	--	--	--
1/4	1/4	3/4	2-1/2	SQ	080-250-4	\$25.97	081-250-4	\$25.97	080-250-5	\$25.97
1/4	1/4	3/4	2-1/2	.020CR	080-250-4-020R	\$25.97	081-250-4-020R	\$25.97	080-250-5-020R	\$25.97
5/16	5/16	13/16	2-1/2	SQ	080-312-4	\$35.89	081-312-4	\$35.89	080-312-5	\$35.89
5/16	5/16	13/16	2-1/2	.020CR	080-312-4-020R	\$35.89	081-312-4-020R	\$35.89	080-312-5-020R	\$35.89
3/8	3/8	7/8	2-1/2	SQ	080-375-4	\$43.87	081-375-4	\$43.87	080-375-5	\$43.87
3/8	3/8	7/8	2-1/2	.020CR	080-375-4-020R	\$43.87	081-375-4-020R	\$43.87	080-375-5-020R	\$43.87
3/8	3/8	7/8	2-1/2	.030CR	080-375-4-030R	\$43.87	081-375-4-030R	\$43.87	080-375-5-030R	\$43.87
7/16	7/16	1	2-3/4	SQ	080-437-4	\$63.49	081-437-4	\$63.49	--	--
1/2	1/2	1-1/4	3	SQ	080-500-4	\$73.11	081-500-4	\$73.11	080-500-5	\$73.11
1/2	1/2	1-1/4	3	.015CR	080-500-4-015R	\$73.11	081-500-4-015R	\$73.11	--	--
1/2	1/2	1-1/4	3	.030CR	080-500-4-030R	\$73.11	081-500-4-030R	\$73.11	080-500-5-030R	\$73.11
1/2	1/2	1-1/4	3	.060CR	080-500-4-060R	\$73.11	081-500-4-060R	\$73.11	--	--
5/8	5/8	1-1/4	3-1/2	SQ	080-625-4	\$125.05	081-625-4	\$125.05	080-625-5	\$125.05
5/8	5/8	1-1/4	3-1/2	.030CR	080-625-4-030R	\$125.05	081-625-4-030R	\$125.05	080-625-5-030R	\$125.05
5/8	5/8	1-1/4	3-1/2	.060CR	080-625-4-060R	\$125.05	081-625-4-060R	\$125.05	--	--
5/8	5/8	1-1/4	3-1/2	.125CR	080-625-4-125R	\$125.05	081-625-4-125R	\$125.05	--	--
3/4	3/4	1-1/2	4	SQ	080-750-4	\$182.77	081-750-4	\$182.77	080-750-5	\$182.77
3/4	3/4	1-1/2	4	.030CR	080-750-4-030R	\$182.77	081-750-4-030R	\$182.77	080-750-5-030R	\$182.77
3/4	3/4	1-1/2	4	.060CR	080-750-4-060R	\$182.77	081-750-4-060R	\$182.77	--	--
3/4	3/4	1-1/2	4	.125CR	080-750-4-125R	\$182.77	081-750-4-125R	\$182.77	--	--
1	1	1-1/2	4	SQ	080-100-4	\$313.02	081-100-4	\$313.02	080-100-5	\$313.02
1	1	1-1/2	4	.030CR	080-100-4-030R	\$313.02	081-100-4-030R	\$313.02	080-100-5-030R	\$313.02
1	1	1-1/2	4	.060CR	080-100-4-060R	\$313.02	081-100-4-060R	\$313.02	--	--
1	1	1-1/2	4	.125CR	080-100-4-125R	\$313.02	081-100-4-125R	\$313.02	--	--

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

● BEST   ● OK   ○ NOT OPTIMAL

## ULTRA HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Extra Fine Sub-Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0015"



### ULTRA HIGH PERFORMANCE Variable Pitch Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated	
					4 Flute - ROUND Shank		4 Flute - WELDON Shank	
					Part#	Price	Part#	Price
3/16	3/16	3/4	2-1/2	SQ	082-188-4	\$41.69	--	
3/16	3/16	3/4	2-1/2	.015CR	082-188-4-015R	\$41.69	--	
1/4	1/4	1-1/8	3	SQ	082-250-4	\$43.94	083-250-4	\$43.94
1/4	1/4	1-1/8	3	.020CR	082-250-4-020R	\$43.94	083-250-4-020R	\$43.94
5/16	5/16	1-1/8	3	SQ	082-312-4	\$61.14	083-312-4	\$61.14
5/16	5/16	1-1/8	3	.020CR	082-312-4-020R	\$61.14	083-312-4-020R	\$61.14
3/8	3/8	1-1/8	3	SQ	082-375-4	\$73.89	083-375-4	\$73.89
3/8	3/8	1-1/8	3	.020CR	082-375-4-020R	\$73.89	083-375-4-020R	\$73.89
7/16	7/16	2	4	SQ	082-437-4	\$95.78	083-437-4	\$95.78
1/2	1/2	2	4	SQ	082-500-4	\$111.59	083-500-4	\$111.59
1/2	1/2	2	4	.015CR	082-500-4-015R	\$111.59	083-500-4-015R	\$111.59
1/2	1/2	2	4	.030CR	082-500-4-030R	\$111.59	083-500-4-030R	\$111.59
1/2	1/2	2	4	.060CR	082-500-4-060R	\$111.59	083-500-4-060R	\$111.59
5/8	5/8	2-1/4	5	SQ	082-625-4	\$171.23	083-625-4	\$171.23
5/8	5/8	2-1/4	5	.030CR	082-625-4-030R	\$171.23	083-625-4-030R	\$171.23
5/8	5/8	2-1/4	5	.060CR	082-625-4-060R	\$171.23	083-625-4-060R	\$171.23
5/8	5/8	2-1/4	5	.125CR	082-625-4-125R	\$171.23	083-625-4-125R	\$171.23
3/4	3/4	2-1/4	5	SQ	082-750-4	\$232.79	083-750-4	\$232.79
3/4	3/4	2-1/4	5	.030CR	082-750-4-030R	\$232.79	083-750-4-030R	\$232.79
3/4	3/4	2-1/4	5	.060CR	082-750-4-060R	\$232.79	083-750-4-060R	\$232.79
3/4	3/4	2-1/4	5	.125CR	082-750-4-125R	\$232.79	083-750-4-125R	\$232.79
1	1	2-1/4	5	SQ	082-100-4	\$375.16	083-100-4	\$375.16
1	1	2-1/4	5	.030CR	082-100-4-030R	\$375.16	083-100-4-030R	\$375.16
1	1	2-1/4	5	.060CR	082-100-4-060R	\$375.16	083-100-4-060R	\$375.16
1	1	2-1/4	5	.125CR	082-100-4-125R	\$375.16	083-100-4-125R	\$375.16



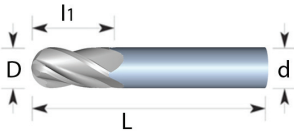
### ULTRA HIGH PERFORMANCE Variable Pitch Carbide, Extra Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		TiAlN Coated	
					4 Flute - ROUND Shank		4 Flute - WELDON Shank	
					Part#	Price	Part#	Price
3/16	3/16	1-1/8	3	SQ	088-188-4	\$45.86	--	
1/4	1/4	1-1/2	4	SQ	088-250-4	\$52.29	--	
5/16	5/16	1-5/8	4	SQ	088-312-4	\$70.31	--	
3/8	3/8	1-3/4	4	SQ	088-375-4	\$81.28	--	
1/2	1/2	3	6	SQ	088-500-4	\$169.62	--	
5/8	5/8	3	6	SQ	088-625-4	\$199.05	--	
3/4	3/4	3	6	SQ	088-750-4	\$264.91	--	
1	1	3	6	SQ	088-100-4	\$501.70	--	

P	Steel	
M	Stainless Steel	
K	Cast Iron	
N	Non-Ferrous	
S	High Temp. Alloys	
H	Hardened Steel	
● BEST	● OK	○ NOT OPTIMAL

## ULTRA HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Extra Fine Sub-Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0015"



Cutter Diam. D	Shank Diam. d	Length Of Cut l <sub>1</sub>	O.A.L. L	TiALN Coated		TiALN Coated	
				4 Flute - ROUND Shank		4 Flute - WELDON Shank	
				Part#	Price	Part#	Price
3/16	3/16	5/8	2	084-188-4	\$25.16	--	
1/4	1/4	3/4	2-1/2	084-250-4	\$31.17	085-250-4	\$31.17
5/16	5/16	13/16	2-1/2	084-312-4	\$43.05	085-312-4	\$43.05
3/8	3/8	7/8	2-1/2	084-375-4	\$52.64	085-375-4	\$52.64
7/16	7/16	1	2-3/4	084-437-4	\$76.19	085-437-4	\$76.19
1/2	1/2	1	3	084-500-4	\$87.73	085-500-4	\$87.73
5/8	5/8	1-1/4	3-1/2	084-625-4	\$150.07	085-625-4	\$150.07
3/4	3/4	1-1/2	4	084-750-4	\$219.33	085-750-4	\$219.33
1	1	1-1/2	4	084-100-4	\$357.85	085-100-4	\$357.85



Cutter Diam. D	Shank Diam. d	Length Of Cut l <sub>1</sub>	O.A.L. L	TiALN Coated		TiALN Coated	
				4 Flute - ROUND Shank		4 Flute - WELDON Shank	
				Part#	Price	Part#	Price
3/16	3/16	3/4	2-1/2	086-188-4	\$50.04	--	
1/4	1/4	1-1/8	3	086-250-4	\$52.73	087-250-4	\$52.73
5/16	5/16	1-1/8	3	086-312-4	\$73.36	087-312-4	\$73.36
3/8	3/8	1-1/8	3	086-375-4	\$88.66	087-375-4	\$88.66
7/16	7/16	2	4	086-437-4	\$114.93	087-437-4	\$114.93
1/2	1/2	2	4	086-500-4	\$133.91	087-500-4	\$135.38
5/8	5/8	2-1/4	5	086-625-4	\$205.47	087-625-4	\$205.47
3/4	3/4	2-1/4	5	086-750-4	\$279.35	087-750-4	\$279.35
1	1	2-1/4	5	086-100-4	\$450.20	087-100-4	\$450.20



Cutter Diam. D	Shank Diam. d	Length Of Cut l <sub>1</sub>	O.A.L. L	TiALN Coated		TiALN Coated	
				4 Flute - ROUND Shank		4 Flute - WELDON Shank	
				Part#	Price	Part#	Price
3/16	3/16	1-1/8	3	089-188-4	\$57.42	--	
1/4	1/4	1-1/2	4	089-250-4	\$61.17	--	
5/16	5/16	1-5/8	4	089-312-4	\$83.63	--	
3/8	3/8	1-3/4	4	089-375-4	\$123.97	--	
1/2	1/2	3	6	089-500-4	\$203.54	--	
5/8	5/8	3	6	089-625-4	\$228.92	--	
3/4	3/4	3	6	089-750-4	\$317.89	--	
1	1	3	6	089-100-4	\$602.04	--	

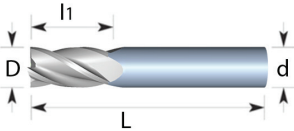


P	●	Steel
M	●	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	●	High Temp. Alloys
H	●	Hardened Steel

● BEST   ● OK   ○ NOT OPTIMAL

## ULTRA HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch to reduce chatter
- 10% Extra Fine Sub-Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0015"



**NEW**



### ULTRA HIGH PERFORMANCE Variable Pitch Carbide, Finishers, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiALN Coated		TiALN Coated	
					6 Flute - ROUND Shank Part#	Price	7 Flute - ROUND Shank Part#	Price
1/4	1/4	3/4	2-1/2	SQ	380-250-6	\$25.97	--	
1/4	1/4	3/4	2-1/2	.030CR	380-250-6-030R	\$25.97	--	
3/8	3/8	7/8	2-1/2	SQ	380-375-6	\$43.87	--	
3/8	3/8	7/8	2-1/2	.030CR	380-375-6-030R	\$43.87	--	
1/2	1/2	1	3	SQ	380-500-6	\$73.11	--	
1/2	1/2	1	3	.030CR	380-500-6-030R	\$73.11	380-500-7-030R	\$80.42
5/8	5/8	1-1/4	3-1/2	SQ	380-625-6	\$125.06	--	
5/8	5/8	1-1/4	3-1/2	.030CR	380-625-6-030R	\$125.06	380-625-7-030R	\$137.57
3/4	3/4	1-1/2	4	SQ	380-750-6	\$182.78	--	
3/4	3/4	1-1/2	4	.030CR	380-750-6-030R	\$182.78	380-750-7-030R	\$201.06
1	1	1-1/2	4	SQ	380-100-6	\$298.22	--	
1	1	1-1/2	4	.030CR	380-100-6-030R	\$298.22	380-100-7-030R	\$328.04



### 6 & 7 Flute High Performance End Mills

- Full edge finishing with low radial engagement at high speeds & feeds
- Excellent for Trochoidal Milling
- Take advantage of Radial Chip Thinning Factor compensation (RCTF), to move at high velocities

**NEW**

\*\*\* Neck Relief ground on any of these tools to your size

\*\*\* In just 2-3 Business Days, for only \$25.00 Extra!



### ULTRA HIGH PERFORMANCE Variable Pitch Carbide, Long Reach Finishers, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiALN Coated		TiALN Coated	
					6 Flute - ROUND Shank Part#	Price	6 Flute - WELDON Shank Part#	Price
1/4	1/4	3/8	3	.030CR	480-250-6-030R	\$49.06	--	
3/8	3/8	1/2	3	.030CR	480-375-6-030R	\$75.81	--	
3/8	3/8	1/2	6	.030CR	480-375-6-030R-LL	\$85.43	--	
1/2	1/2	5/8	4	.030CR	480-500-6-030R	\$121.98	--	
1/2	1/2	5/8	6	.030CR	480-500-6-030R-LL	\$152.48	--	
5/8	5/8	3/4	4	.030CR	480-625-6-030R	\$137.62	--	
5/8	5/8	3/4	6	.030CR	480-625-6-030R-LL	\$183.36	--	

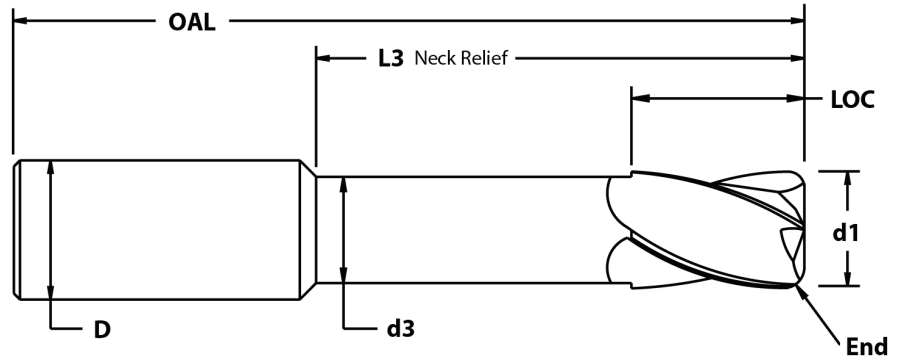


**End:**

- Square
- Ball Nose
- Corner Radius (Size: \_\_\_\_\_)
- Chamfer (Size: \_\_\_\_\_)

**Dimensions:**

- OAL (Overall Length): \_\_\_\_\_
- D (Shank Diameter): \_\_\_\_\_
- LOC (Length of Cut): \_\_\_\_\_
- d1 (Tool Diameter): \_\_\_\_\_
- Number of Flutes: \_\_\_\_\_

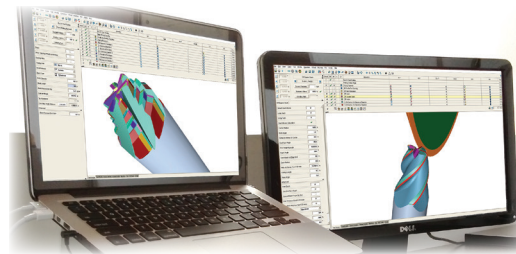


Quantities To Quote On: \_\_\_\_\_

**OPTIONAL:**

**Neck Relief:**

- No
- Yes
  - d3 (Neck Relief Diameter): \_\_\_\_\_
  - L3 (Length from Tip): \_\_\_\_\_



**Shank Type:**

- Cylindrical
- Weldon Flat
- Whistle Notch

**Tapered:**

- No
- Yes
  - Taper Angle (Indicate if angle is per side or included): \_\_\_\_\_
  - d1 (Tip Diameter): \_\_\_\_\_

**Coating:**

- Uncoated
- TiALN (Titanium Aluminum Nitride)
- ALCrN (Aluminum Chromium Nitride)
- ZrN (Zirconium Nitride)
- DLC (Diamond Like Carbon)

**OTHER INFORMATION:**

Material(s) being machined: \_\_\_\_\_

End User Company Name: \_\_\_\_\_

End User Contact: \_\_\_\_\_

Sales Representative: \_\_\_\_\_

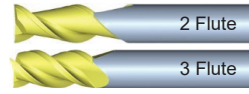
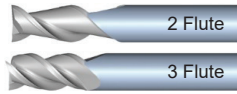
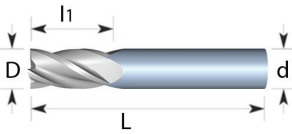
Other Information: \_\_\_\_\_



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

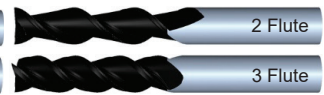
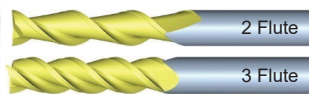
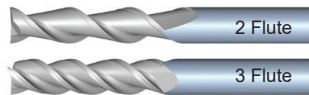
## ULTRA HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch & Cylindrical Margin to reduce chatter
- 10% Extra Fine Sub-Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0004"



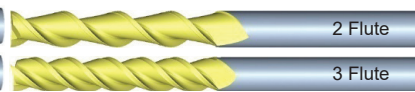
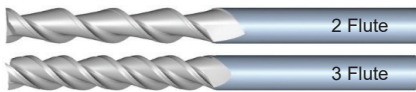
### ULTRA HIGH PERFORMANCE Variable Pitch & Helix Carbide, Regular Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	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	\$13.56	--	--		--	--	
3/16	3/16	5/8	2	SQ	170-188-2	170-188-3	\$18.00	070-188-2	070-188-3	\$20.97	270-188-2	270-188-3	\$35.65
1/4	1/4	3/4	2-1/2	SQ	170-250-2	170-250-3	\$19.62	070-250-2	070-250-3	\$25.97	270-250-2	270-250-3	\$44.16
1/4	1/4	3/4	2-1/2	.020CR	170-250-2-020R	170-250-3-020R	\$19.62	070-250-2-020R	070-250-3-020R	\$25.97	270-250-2-020R	270-250-3-020R	\$44.16
5/16	5/16	13/16	2-1/2	SQ	170-312-2	170-312-3	\$25.97	070-312-2	070-312-3	\$35.89	270-312-2	270-312-3	\$61.00
5/16	5/16	13/16	2-1/2	.020CR	170-312-2-020R	170-312-3-020R	\$25.97	070-312-2-020R	070-312-3-020R	\$35.89	270-312-2-020R	270-312-3-020R	\$61.00
3/8	3/8	1	2-1/2	SQ	170-375-2	170-375-3	\$34.25	070-375-2	070-375-3	\$43.87	270-375-2	270-375-3	\$74.57
3/8	3/8	1	2-1/2	.020CR	170-375-2-020R	170-375-3-020R	\$34.25	070-375-2-020R	070-375-3-020R	\$43.87	270-375-2-020R	270-375-3-020R	\$74.57
1/2	1/2	1-1/4	3	SQ	170-500-2	170-500-3	\$56.56	070-500-2	070-500-3	\$73.11	270-500-2	270-500-3	\$124.29
1/2	1/2	1-1/4	3	.030CR	170-500-2-030R	170-500-3-030R	\$56.56	070-500-2-030R	070-500-3-030R	\$73.11	270-500-2-030R	270-500-3-030R	\$124.29
5/8	5/8	1-1/4	3-1/2	SQ	170-625-2	170-625-3	\$112.36	070-625-2	070-625-3	\$125.05	270-625-2	270-625-3	\$212.59
5/8	5/8	1-1/4	3-1/2	.030CR	170-625-2-030R	170-625-3-030R	\$112.36	070-625-2-030R	070-625-3-030R	\$125.05	270-625-2-030R	270-625-3-030R	\$212.59
3/4	3/4	1-1/2	4	SQ	170-750-2	170-750-3	\$155.84	070-750-2	070-750-3	\$182.77	270-750-2	270-750-3	\$310.71
3/4	3/4	1-1/2	4	.030CR	170-750-2-030R	170-750-3-030R	\$155.84	070-750-2-030R	070-750-3-030R	\$182.77	270-750-2-030R	270-750-3-030R	\$310.71
1	1	1-1/2	4	SQ	170-100-2	170-100-3	\$268.24	070-100-2	070-100-3	\$298.21	270-100-2	270-100-3	\$506.95
1	1	1-1/2	4	.030CR	170-100-2-030R	170-100-3-030R	\$268.24	070-100-2-030R	070-100-3-030R	\$298.21	270-100-2-030R	270-100-3-030R	\$506.95



### ULTRA HIGH PERFORMANCE Variable Pitch & Helix Carbide, Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	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
3/16	3/16	3/4	2-1/2	SQ	172-188-2	172-188-3	\$29.63	072-188-2	072-188-3	\$41.69	272-188-2	272-188-3	\$70.87
1/4	1/4	1-1/8	3	SQ	172-250-2	172-250-3	\$37.04	072-250-2	072-250-3	\$43.94	272-250-2	272-250-3	\$74.71
5/16	5/16	1-1/8	3	SQ	172-312-2	172-312-3	\$55.22	072-312-2	072-312-3	\$61.14	272-312-2	272-312-3	\$103.94
3/8	3/8	1-1/8	3	SQ	172-375-2	172-375-3	\$62.34	072-375-2	072-375-3	\$73.89	272-375-2	272-375-3	\$125.62
1/2	1/2	2	4	SQ	172-500-2	172-500-3	\$97.16	072-500-2	072-500-3	\$111.59	272-500-2	272-500-3	\$189.70
5/8	5/8	2-1/4	5	SQ	172-625-2	172-625-3	\$155.84	072-625-2	072-625-3	\$171.23	272-625-2	272-625-3	\$291.09
3/4	3/4	2-1/4	5	SQ	172-750-2	172-750-3	\$217.02	072-750-2	072-750-3	\$232.79	272-750-2	272-750-3	\$395.75
1	1	2-1/4	5	SQ	172-100-2	172-100-3	\$337.87	072-100-2	072-100-3	\$375.16	272-100-2	272-100-3	\$637.78



### ULTRA HIGH PERFORMANCE Variable Pitch & Helix Carbide, Extra Long Length, Single End - ALUMINUM

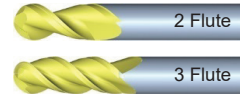
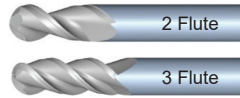
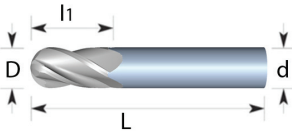
Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated			DLC Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	1-1/8	3	SQ	178-188-2	178-188-3	\$35.71	078-188-2	078-188-3	\$45.86	278-188-2	278-188-3	\$77.96
1/4	1/4	1-1/2	4	SQ	178-250-2	178-250-3	\$48.48	078-250-2	078-250-3	\$52.29	278-250-2	278-250-3	\$88.89
5/16	5/16	1-5/8	4	SQ	178-312-2	178-312-3	\$64.05	078-312-2	078-312-3	\$70.31	278-312-2	278-312-3	\$119.53
3/8	3/8	1-3/4	4	SQ	178-375-2	178-375-3	\$68.57	078-375-2	078-375-3	\$81.28	278-375-2	278-375-3	\$138.17
1/2	1/2	3	6	SQ	178-500-2	178-500-3	\$145.06	078-500-2	078-500-3	\$169.62	278-500-2	278-500-3	\$288.35
5/8	5/8	3	6	SQ	178-625-2	178-625-3	\$192.78	078-625-2	078-625-3	\$199.05	278-625-2	278-625-3	\$338.39
3/4	3/4	3	6	SQ	178-750-2	178-750-3	\$237.50	078-750-2	078-750-3	\$264.91	278-750-2	278-750-3	\$450.35
1	1	3	6	SQ	178-100-2	178-100-3	\$462.48	078-100-2	078-100-3	\$501.70	278-100-2	278-100-3	\$852.89



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

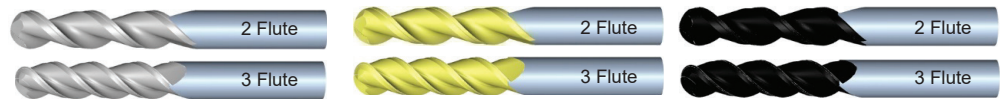
## ULTRA HIGH PERFORMANCE

- Special Helix Design
- Variable Pitch & Cylindrical Margin to reduce chatter
- 10% Extra Fine Sub-Micro Grain Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0004"



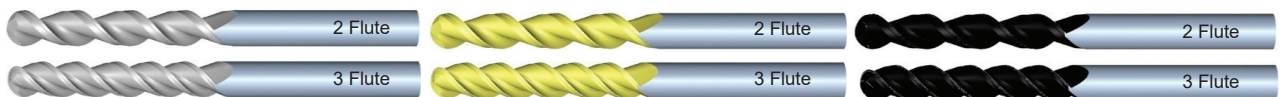
### ULTRA HIGH PERFORMANCE Variable Pitch & Helix Carbide, Ball Regular Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated			DLC Coated		
					2 Flute Part#	3 Flute Part#	Price	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	\$21.59	074-188-2	074-188-3	\$25.16	274-188-2	274-188-3	\$42.79
1/4	1/4	3/4	2-1/2	BN	174-250-2	174-250-3	\$23.55	074-250-2	074-250-3	\$31.17	274-250-2	274-250-3	\$52.98
5/16	5/16	13/16	2-1/2	BN	174-312-2	174-312-3	\$31.17	074-312-2	074-312-3	\$43.05	274-312-2	274-312-3	\$73.20
3/8	3/8	1	2-1/2	BN	174-375-2	174-375-3	\$41.10	074-375-2	074-375-3	\$52.64	274-375-2	274-375-3	\$89.49
1/2	1/2	1-1/4	3	BN	174-500-2	174-500-3	\$67.87	074-500-2	074-500-3	\$87.73	274-500-2	274-500-3	\$149.15
5/8	5/8	1-1/4	3-1/2	BN	174-625-2	174-625-3	\$134.82	074-625-2	074-625-3	\$150.07	274-625-2	274-625-3	\$255.11
3/4	3/4	1-1/2	4	BN	174-750-2	174-750-3	\$187.01	074-750-2	074-750-3	\$219.33	274-750-2	274-750-3	\$372.86
1	1	1-1/2	4	BN	174-100-2	174-100-3	\$321.89	074-100-2	074-100-3	\$357.85	274-100-2	274-100-3	\$608.34



### ULTRA HIGH PERFORMANCE Variable Pitch & Helix Carbide, 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			DLC Coated		
					2 Flute Part#	3 Flute Part#	Price	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	\$35.55	076-188-2	076-188-3	\$50.04	276-188-2	276-188-3	\$85.05
1/4	1/4	1-1/8	3	BN	176-250-2	176-250-3	\$44.44	076-250-2	076-250-3	\$52.73	276-250-2	276-250-3	\$89.64
5/16	5/16	1-1/8	3	BN	176-312-2	176-312-3	\$66.26	076-312-2	076-312-3	\$73.36	276-312-2	276-312-3	\$124.71
3/8	3/8	1-1/8	3	BN	176-375-2	176-375-3	\$74.80	076-375-2	076-375-3	\$88.66	276-375-2	276-375-3	\$150.73
1/2	1/2	2	4	BN	176-500-2	176-500-3	\$116.59	076-500-2	076-500-3	\$133.91	276-500-2	276-500-3	\$227.64
5/8	5/8	2-1/4	5	BN	176-625-2	176-625-3	\$187.01	076-625-2	076-625-3	\$205.47	276-625-2	276-625-3	\$349.31
3/4	3/4	2-1/4	5	BN	176-750-2	176-750-3	\$260.43	076-750-2	076-750-3	\$279.35	276-750-2	276-750-3	\$474.90
1	1	2-1/4	5	BN	176-100-2	176-100-3	\$405.44	076-100-2	076-100-3	\$450.20	276-100-2	276-100-3	\$765.34



### ULTRA HIGH PERFORMANCE Variable Pitch & Helix Carbide, 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			DLC Coated		
					2 Flute Part#	3 Flute Part#	Price	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	\$41.20	079-188-2	079-188-3	\$52.92	279-188-2	279-188-3	\$89.96
1/4	1/4	1-1/2	4	BN	179-250-2	179-250-3	\$55.94	079-250-2	079-250-3	\$60.34	279-250-2	279-250-3	\$102.56
5/16	5/16	1-5/8	4	BN	179-312-2	179-312-3	\$73.91	079-312-2	079-312-3	\$81.13	279-312-2	279-312-3	\$137.92
3/8	3/8	1-3/4	4	BN	179-375-2	179-375-3	\$79.12	079-375-2	079-375-3	\$93.78	279-375-2	279-375-3	\$519.63
1/2	1/2	3	6	BN	179-500-2	179-500-3	\$167.38	079-500-2	079-500-3	\$195.71	279-500-2	279-500-3	\$332.70
5/8	5/8	3	6	BN	179-625-2	179-625-3	\$222.43	079-625-2	079-625-3	\$229.68	279-625-2	279-625-3	\$390.45
3/4	3/4	3	6	BN	179-750-2	179-750-3	\$274.05	079-750-2	079-750-3	\$305.66	279-750-2	279-750-3	\$519.63
1	1	3	6	BN	179-100-2	179-100-3	\$533.63	079-100-2	079-100-3	\$578.88	279-100-2	279-100-3	\$984.10

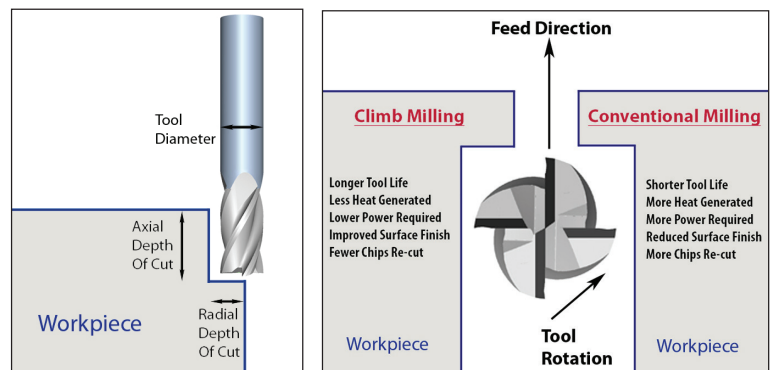


Material	Speed (SFM)		Feed Per Tooth By End Mill Diameter							
	Uncoated	TiAlN Coated	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	600-1200	900-1800	.0020	.0025	.0030	.0035	.0040	.0050	.0060	.0080
Copper & Copper Alloys	350-850	525-1275	.0020	.0025	.0025	.0030	.0030	.0035	.0040	.0060
Brass & Bronze	250-400	375-600	.0020	.0025	.0025	.0030	.0030	.0035	.0040	.0050
Graphite	500-800	500-1200	.0030	.0035	.0025	.0030	.0030	.0040	.0050	.0070
Plastics	600-1100	600-1650	.0030	.0035	.0040	.0050	.0060	.0080	.0100	.0150
Iron, Cast (soft)	250-450	375-650	.0020	.0022	.0025	.0027	.0030	.0045	.0060	.0080
Iron, Cast (hard)	100-250	100-375	.0008	.0010	.0015	.0017	.0020	.0025	.0030	.0040
Iron, Ductile	80-400	100-600	.0010	.0012	.0015	.0017	.0020	.0030	.0040	.0060
Iron, Malleable	150-500	225-650	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0070
Carbon Steels, Low	200-400	300-600	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0070
Carbon Steels, Medium	100-250	150-375	.0015	.0016	.0017	.0018	.0020	.0030	.0040	.0050
Carbon Steels Hardened to 35 Rc	130-230	130-345	.0010	.0011	.0012	.0013	.0015	.0017	.0020	.0030
Carbon Steels Hardened to 50 Rc	70-130	70-160	.0007	.0007	.0008	.0009	.0010	.0015	.0020	.0030
Carbon Steels Hardened to 60 Rc	30-70	30-90	.0005	.0006	.0007	.0009	.0010	.0012	.0015	.0020
Steels, Mold	200-350	300-525	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0040
Steels, Tool	100-250	150-375	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0040
Stainless Steels, Soft	200-350	300-450	.0010	.0012	.0015	.0012	.0020	.0030	.0040	.0060
Stainless Steels, Hard	100-200	150-300	.0005	.0006	.0007	.0008	.0010	.0020	.0030	.0050
Monel & High Nickel Steel	75-175	75-200	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0040
Titanium, Soft	125-300	125-375	.0010	.0012	.0015	.0017	.0020	.0030	.0040	.0060
Titanium, Hard	50-150	50-175	.0005	.0006	.0007	.0008	.0010	.0015	.0020	.0020
Nickel Based High Temp Alloys	50-100	50-125	.0008	.0008	.0009	.0009	.0010	.0012	.0015	.0020

- 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 times the tool diameter for profiling and .5 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

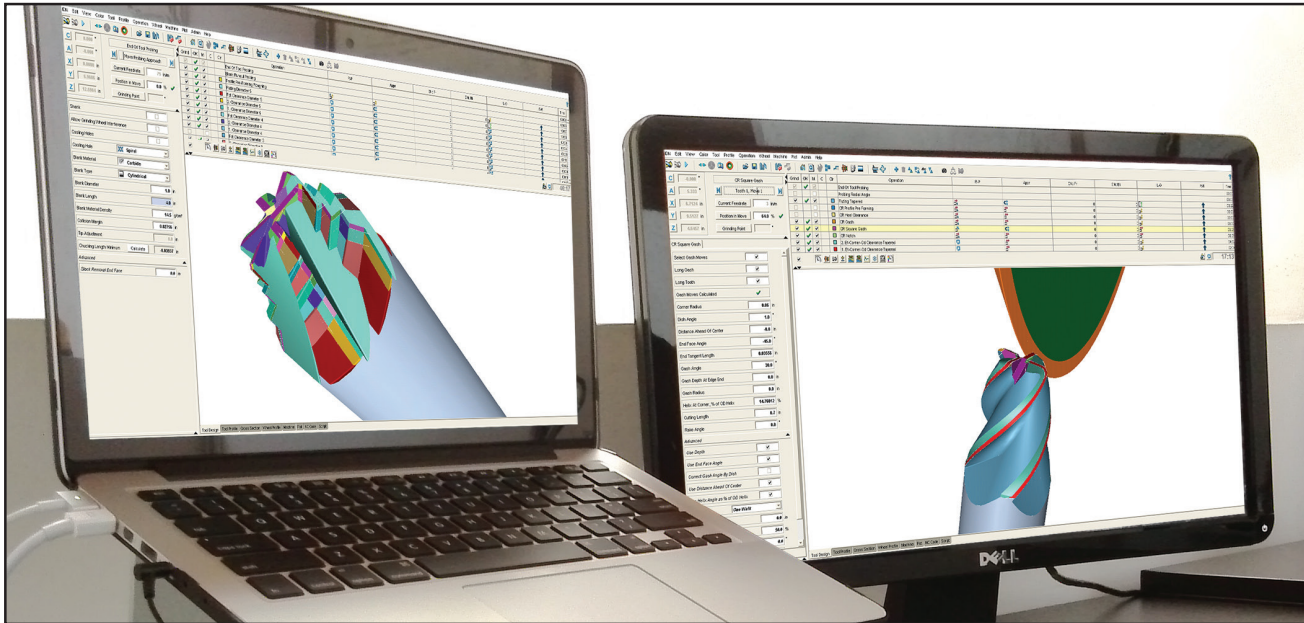
$$RPM = \frac{SFM}{(3.146 * Cutter Diam.) / 12}$$

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



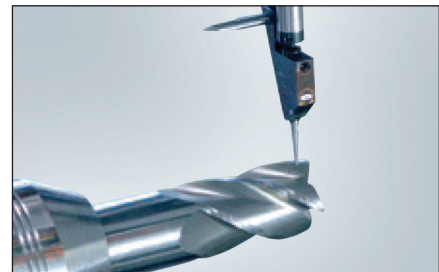
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  - Endmills
  - Drills
  - Reamers
  - Countersinks
  - Counterbores
  - Solid Threadmills
  - Annular Cutters
  - Spot Drills
- Complete re-coating service



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**AFTER**





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