



***Solid Carbide***

- End Mills
- Drills
- Reamers
- Burs
- Specials



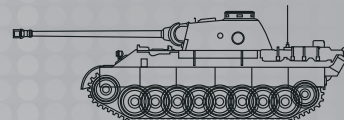
**Aerospace**



**Automotive**



**General Engineering**



**Defense**



**Medical**





Dear Valued Customer,

All of us here at Cobra Carbide are excited to introduce the new North American Version of our 2012 catalog. With much pride and a lot of hard work, we have put together our catalog featuring the latest in carbide cutting technology.

For over two decades, American Quality Tools, d.b.a. Cobra Carbide has been serving 900 of its industrial distributors in 45 countries. We offer an excellent quality product at fair prices to all our distributors.

Cobra Carbide employs a team of experienced design engineers who can design a tool specific to your customers needs. All of our tools are manufactured in our state of the art facilities which are well equipped with a battery of brand new Walters and Rollomatics machines. We are also equipped with a micron filtration system which provides a high gloss finish and offers better life to all of our tools. This combined with the latest measuring and inspection along with our team of experienced tool makers produces a product which is second to none.

We have an ISO 9001 Certification from TUV Nord, Germany. We have the discipline and processes to compete with Carbide Manufacturers anywhere in the world. We manufacture tools per DIN, ISO and ANSI specs. Cobra Carbide will continue to invest in new technology to keep up with the needs of the future in the Carbide Industry.

This new catalog includes all of our High Performance End mills and Drills including the Viper, Krait, Aluma and Black Mamba Series. We are continuing to build our inventory so that we can continually offer same day shipping for most standard products.

Our commitment is to provide superior quality tools at competitive pricing with great customer service. Cobra Carbide Tools are available through a network of Industrial Distributors and Representatives. For a location near you, please call 1-800-872-0841

We thank you for your patronage for the last 20+ years and will continue working hard to earn all your business.

Team Cobra  
Riverside, California  
USA





# C

## Contents

Solid Carbide EndMills.....	E.01 - E.45
Solid Carbide Drills .....	D.01 - D.38
Solid Carbide Reamers.....	D.39 - D.46
Solid Carbide Burrs.....	B.01 - B.17
Solid Carbide Boring Tools .....	B.18

# T

## Terms & Conditions

Net 30 days from date of invoice on approved accounts. Past due invoices are subject to a 2% service charge per month. Returned checks will be assessed fee and account will be put on credit hold.

### Minimum Order:

Minimum order billing required on regular stock items.  
Special orders will also require a minimum billing as per quotation.

### Warranty:

Cobra Carbide products shall not be subject to any claims what so ever arising out of breach of contracts or warranties. Replacement or credit will not be issued if there is a reason to believe the products has been misused, operated improperly or run outside of the normal tool specifications. Cobra Carbide or American Quality Tools assumes no responsibility or any liability for their products. Our liability is limited to replacement of the tools sold by us.

### Note:

Cobra Carbide is registered trademark of AQT.  
Reproduction of this catalog in whole or in parts is forbidden without written permission of AQT.

# Pictorial Index - EndMills

## HIGH PERFORMANCE ENDMILLS



E.01-02

VIPER - Variable Helix EndMills  
- 4 & 5 Flute - 32°- 38° Helix  
- Slotting, Profiling & EndMilling



E.03-04

KRAIT - High Feed EndMills  
- 4 Flute - 40° Helix  
- High Feed Milling



E.05-06

ALUMA ENDMILLS  
- 2 & 3 Flute - Uncoated - 35° & 40° Helix  
- Aluminium Profiling, Slotting & EndMilling



E.07-08

Spherical Ball EndMills  
- 2 & 4 Flute - 220° Arc  
- Cavity Milling & Profiling



E.09

HIGH SHEAR ENDMILLS  
- 3 Flute - 60° Helix  
- Profiling, Slotting & EndMilling



E.10

ENDMILLS FOR HARDENED STEEL  
- 6 Flute - 45° Helix for Tough Material  
- Milling of Hardened Steel



E.11

MULTIFLUTE  
- 45° Helix



E.45

SUPER VIPER - SET  
- 4 Flute - 28°- 39° Helix  
- Slotting, Profiling & EndMilling

## GENERAL ENDMILLS



E.14-19

Square & Ball Nose EndMills - 30° Helix  
- 2 Flute - Stub, Regular & Long Length  
- General Milling



E.20-25

Square & Ball Nose EndMills - 30° Helix  
- 4 Flute - Stub, Regular & Long Length  
- General Milling



E.26

Square EndMills - 30° Helix  
- 3 Flute - Regular Length  
- General Milling



E.27-30

Square & Ball Nose EndMills - 30° Helix  
- 2 & 4 Flute - Double End - Stub Length  
- General Milling



E.31

Square & Ball Nose EndMills - 30° Helix  
- 2 & 4 Flute - Double End with Weldon  
- General Milling



E.32

90° Drill Mill  
- 2 & 4 Flute - Spotting, Chamfering,  
Countersinking, Drilling / Slotting (Soft materials)



E.33-34

Decimal EndMills - Square & Ball Nose  
- 2 & 4 Flute  
- PCB Applications



E.35-42

Square & Ball Nose EndMills - 30° Helix  
- 2 & 4 Flute - Regular & Long Length  
- General Milling - Metric



E.43-44

Corner Radius EndMills  
- 2 & 4 Flute - Regular & Long Length - 30° Helix  
- Profiling



E.12-13

Roughers  
- Fine & Coarse Pitch  
- Heavy Material Removal



E.45

Roughers Set  
- Fine Pitch  
- Heavy Material Removal



# Aerospace

I N D U S T R Y

## VIPER - Variable Helix EndMills

*4 & 5 Flute - Regular Length.....E.01-02*

## KRAIT - High Feed EndMills

*4 Flute HP EndMills.....E.03-04*

## Aluma EndMills

*2 & 3 Flute.....E.05-06*

## High Shear EndMills

*3 Flute 60°.....E.09*

## EndMills for Hardened Steel

*6 Flute 45° for Tough Material.....E.10*

## MultiFlute

*6 & 8 Flute 45° Helix.....E.11*

## 2, 3 & 4 Flute Square & Ball Nose

*Stub, Regular & Long Length.....E.14-31*

## 90° Drill Point EndMills

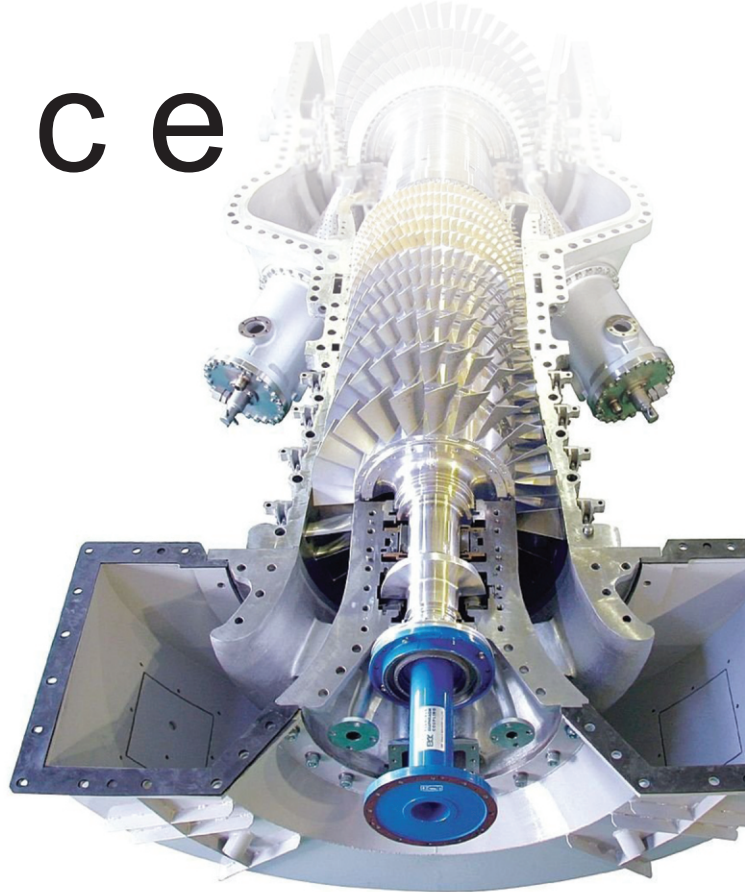
*2 & 4 Flute.....E.32*

## Corner Radius EndMills

*2 & 4 Flute.....E.35-44*

## Roughers

*Fine & Coarsh Pitch.....E.12-13*





# Automotive

I N D U S T R Y

## VIPER - Variable Helix EndMills

*4 & 5 Flute - Regular Length*.....E.01-02

## KRAIT - High Feed EndMills

*4 Flute HP EndMills*.....E.03-04

## Aluma EndMills

*2 & 3 Flute*.....E.05-06

## High Shear EndMills

*3 Flute 60°*.....E.09

## EndMills for Hardened Steel

*6 Flute 45° for Tough Material*.....E.10

## MultiFlute

*6 & 8 Flute 45° Helix*.....E.11

## 2, 3 & 4 Flute Square & Ball Nose

*Stub, Regular & Long Length*.....E.14-31

## 90° Drill Point EndMills

*2 & 4 Flute*.....E.32

## Corner Radius EndMills

*2 & 4 Flute*.....E.35-44

## Roughers

*Fine & Coarsh Pitch*.....E.12-13





# Die & Mould

I N D U S T R Y

## Spherical Ball EndMills

*2 & 4 Flute.....*E.07-08

## EndMills for Hardened Steel

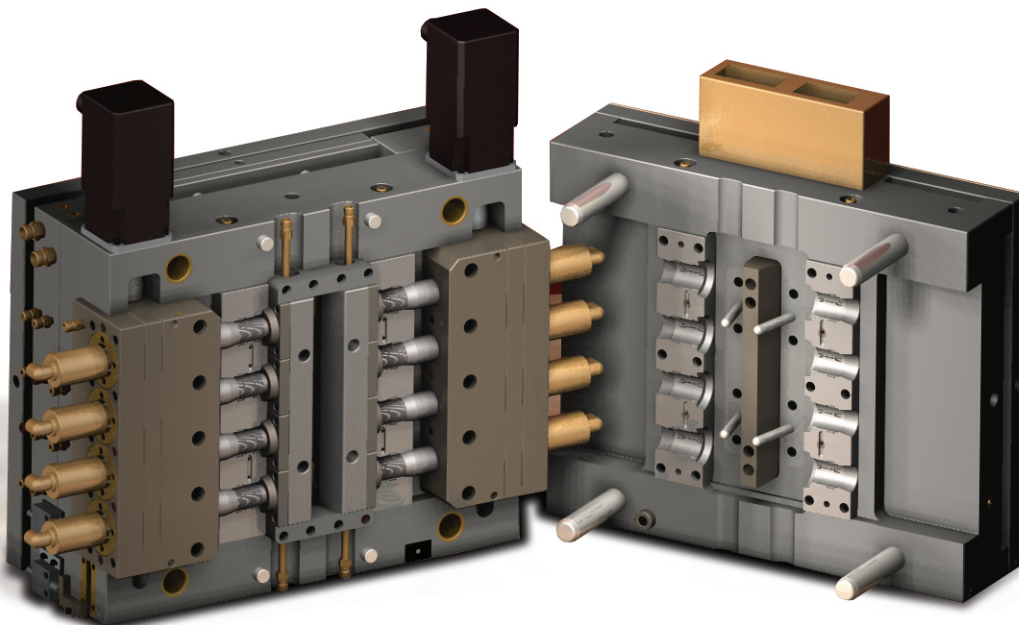
*6 Flute 45° for Tough Material.....*E.10

## MultiFlute

*6 & 8 Flute 45° Helix.....*E.11

## Corner Radius EndMills

*2 & 4 Flute.....*E.35-44



## Variable Helix EndMills



Tolerance - Shank Dia: h6 & Cut Dia: h10

### Features

- Helix angle varies along flutes. - Substantial increases in metal removal rates.
- Increased stability during cutting action.
- Unequal flutes help in reducing chatter
- Can be used as a Rougher or finisher
- Effective for both slotting and profiling operations

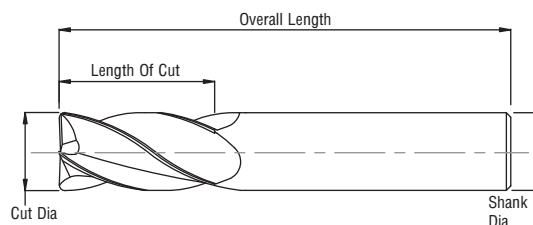


### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
	●	●	●	●	●	●	

● Excellent

● Good



## 4 Flute - Stub Length

Cut Dia	Shank Dia	Description			AlTiN Coated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/4"	1/4"	1/2"	2"	.015-.020	19804	\$ 35.90
5/16"	5/16"	1/2"	2"	.015-.020	19810	54.90
3/8"	3/8"	5/8"	2"	.015-.020	19816	59.50
7/16"	7/16"	1"	2-3/4"	.015-.020	19822	91.00
1/2"	1/2"	5/8"	2-1/2"	.025-.030	19824	86.00
5/8"	5/8"	3/4"	3"	.030-.035	19830	149.50
3/4"	3/4"	1"	3"	.030-.035	19836	211.00

## 4 Flute - Long Length

Cut Dia	Shank Dia	Description			AlTiN Coated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/4"	1/4"	1-1/8"	3"	.015-.020	19808	\$ 57.50
5/16"	5/16"	1-1/8"	3"	.015-.020	19814	64.50
3/8"	3/8"	1-1/8"	3"	.015-.020	19820	81.70
1/2"	1/2"	2"	4"	.025-.030	19828	123.40
5/8"	5/8"	2-1/4"	5"	.030-.035	19834	225.20
3/4"	3/4"	2-1/4"	5"	.030-.035	19840	351.70



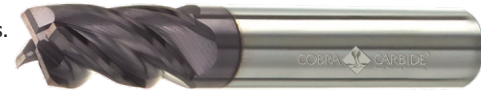
### Variable Helix EndMills



Tolerance - Shank Dia: h6 & Cut Dia: h10

#### Features

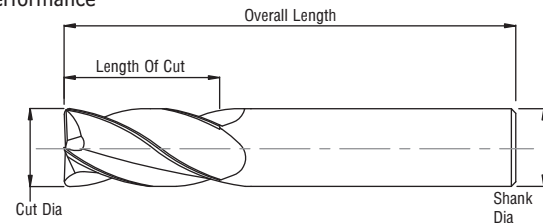
- Helix angle changes along flutes. - Substantial increases in metal removal rates.
- Increased stability during cutting action.
- Unequal Flutes help in reducing chatter
- Can be used as a Rougher or finisher
- Effective for both slotting and profiling operations
- 5 Flute design allows for Faster Feed Rates while providing improved cutting performance



#### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
	●	●	●	●	●	●	

● Excellent ● Good



### 4 Flute - Regular Length

Cut Dia	Shank Dia	Description			AlTiN Coated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/8"	1/8"	1/2"	1-1/2"	.010-.015	19800	\$ 22.20
3/16"	3/16"	5/8"	2"	.015-.020	19802	30.50
1/4"	1/4"	3/4"	2-1/2"	.015-.020	19806	40.90
5/16"	5/16"	13/16"	2-1/2"	.015-.020	19812	59.90
3/8"	3/8"	1"	2-1/2"	.015-.020	19818	67.20
1/2"	1/2"	1"	3"	.025-.030	19826	89.90
5/8"	5/8"	1-1/4"	3-1/2"	.030-.035	19832	160.20
3/4"	3/4"	1-1/2"	4"	.030-.035	19838	212.50
1"	1"	1-1/2"	4"	.030-.035	19842	405.00

### 5 Flute - Regular Length

Cut Dia	Shank Dia	Description			AlTiN Coated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/4"	1/4"	3/4"	2-1/2"	.015-.020	19844	\$ 46.50
3/8"	3/8"	1"	2-1/2"	.015-.020	19846	70.85
1/2"	1/2"	1"	3"	.025-.030	19848	99.85
5/8"	5/8"	1-1/4"	3-1/2"	.030-.035	19850	185.00
3/4"	3/4"	1-1/2"	4"	.030-.035	19852	233.00
1"	1"	1-1/2"	4"	.030-.035	19854	433.00

## High Feed EndMills



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

- Designed for slotting, roughing & finishing of alloy steel, stainless steel & high temp alloys at higher feed rates.
- Large Web thickness & Spherical Flute geometry.
- Special flute geometry allows exception chip evacuation and tool rigidity.
- 4 Flute center cutting mill utilizes the optimal helix angle, more web thickness
- AlTiN coated for improved tool life and increased production out put
- Provides a superior finish.

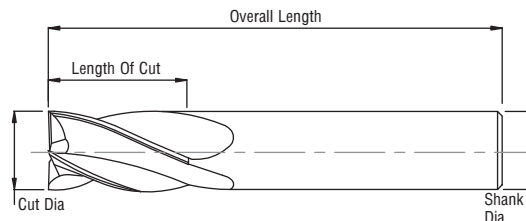


### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
	●	●		●	●	●	

● Excellent

● Good



## 4 Flute - Stub Length AlTiN Coated

Description				Square End		Radius End		
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	Corner Radius	EDP #	List Price
1/4"	1/4"	3/8"	2"	29800	\$ 36.65	.015-.020	29802	\$ 40.65
5/16"	5/16"	7/16"	2"	29804	41.65	.015-.020	29806	47.00
3/8"	3/8"	1/2"	2"	29808	51.65	.015-.020	29810	60.00
1/2"	1/2"	5/8"	2-1/2"	29812	80.10	.030-.035	29814	96.00
5/8"	5/8"	1"	3"	29816	166.65	.030-.035	29818	188.35
3/4"	3/4"	1"	3"	29820	216.65	.030-.035	29822	243.35

## 4 Flute - Regular Length AlTiN Coated

Description				Square End		Radius End		
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	Corner Radius	EDP #	List Price
1/4"	1/4"	3/4"	2-1/2"	29824	\$ 38.35	.015-.020	29826	\$ 42.35
5/16"	5/16"	13/16"	2-1/2"	29828	46.65	.015-.020	29830	51.85
3/8"	3/8"	7/8"	2-1/2"	29832	56.70	.015-.020	29834	65.00
7/16"	7/16"	1"	2-3/4"	29836	71.65	.015-.020	29838	81.65
1/2"	1/2"	1"	3"	29840	88.50	.030-.035	29842	103.65
9/16"	9/16"	1-1/4"	3-1/2"	29844	141.65	.030-.035	29846	158.35
5/8"	5/8"	1-1/4"	3-1/2"	29848	185.00	.030-.035	29850	207.00
3/4"	3/4"	1-1/2"	4"	29852	240.00	.030-.035	29854	267.00
1"	1"	1-1/2"	4"	29856	383.35	.030-.035	29858	430.00



## High Feed EndMills



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

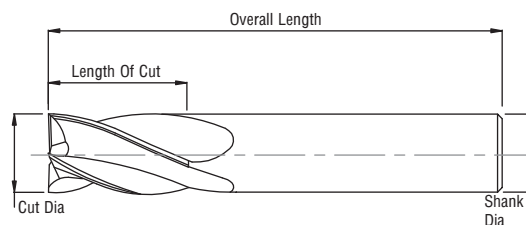
- Designed for slotting, roughing & finishing of alloy steel, stainless steel & high temp alloys at higher feed rates.
- Large Web thickness & Spherical Flute geometry.
- Special flute geometry allows exceptional chip evacuation and tool rigidity.
- 4 Flute center cutting mill utilizes the optimal helix angle, more web thickness
- AlTiN coated for improved tool life and increased production out put
- Provides a superior finish.



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
	●	●		●	●	●	

● Excellent    ● Good



## 4 Flute - Long Length AlTiN Coated

Description				Square End	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price
1/4"	1/4"	1-1/8"	3"	29860	\$ 46.70
3/8"	3/8"	1-1/8"	3"	29864	88.40
1/2"	1/2"	2"	4"	29868	113.35
5/8"	5/8"	2-1/4"	5"	29872	213.45
3/4"	3/4"	2-1/4"	5"	29876	367.00

## 2 Flute Square Aluma



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

- High feed roughing with excellent chip evacuation.
- Special ultra fine grade for machining Aluminum
- Advance Flute geometry results in maximum metal removal and better chip evacuation
- Excellent for slotting and profiling at high speeds

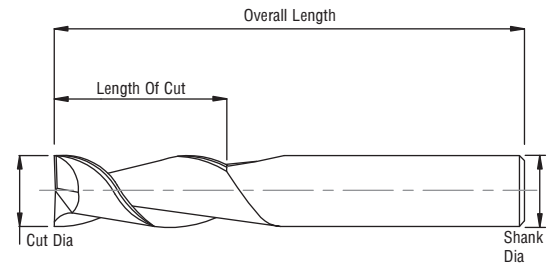


### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●						◐	

● Excellent

◐ Good



## Regular Length

Cut Dia	Shank Dia	Description			Uncoated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/4"	1/4"	3/4"	2-1/2"	.010	27900	\$ 28.15
5/16"	5/16"	13/16"	2-1/2"	.010	27902	36.65
3/8"	3/8"	1"	2-1/2"	.015	27904	42.15
1/2"	1/2"	1"	3"	.020	27906	70.75
5/8"	5/8"	1-1/4"	3-1/2"	.020	27908	135.00
3/4"	3/4"	1-1/2"	4"	.030	27910	202.00

## Long Length

Cut Dia	Shank Dia	Description			Uncoated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/4"	1/4"	1-1/8"	3"	.010	27912	\$ 36.00
5/16"	5/16"	1-1/8"	3"	.010	27914	41.00
3/8"	3/8"	1-1/8"	3"	.015	27916	58.50
1/2"	1/2"	2"	4"	.020	27918	88.00
5/8"	5/8"	2-1/4"	5"	.020	27920	175.00
3/4"	3/4"	2-1/4"	5"	.030	27922	260.00



## 3 Flute Square Aluma



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

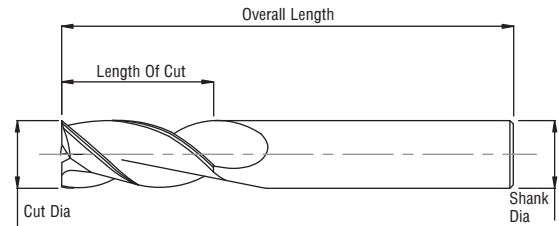
- Excellent finish with high speeds. - Special ultra fine grade for machining Aluminum.
- Advance Flute geometry results in maximum metal removal and better chip evacuation
- Excellent for slotting and profiling at high speeds
- Great choice for finishing and light Roughing Applications
- 3 Flute comes with a small Radius (.125) for added Strength

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●						●	

● Excellent

● Good



## Regular Length

Cut Dia	Shank Dia	Description			Uncoated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/4"	1/4"	3/4"	2-1/2"	.005	27864	\$ 28.00
5/16"	5/16"	13/16"	2-1/2"	.005	27866	36.50
3/8"	3/8"	1"	2-1/2"	.005	27868	42.15
7/16"	7/16"	1"	2-3/4"	.005	27870	60.00
1/2"	1/2"	1-1/4"	3"	.005	27872	70.00
5/8"	5/8"	1-5/8"	3-1/2"	.005	27874	134.00
3/4"	3/4"	1-5/8"	4"	.005	27876	201.00
1"	1"	1-1/2"	4"	.005	27878	309.00

## Long Length

Cut Dia	Shank Dia	Description			Uncoated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/4"	1/4"	1-1/8"	3"	.005	27880	\$ 36.50
5/16"	5/16"	1-1/8"	3"	.005	27882	41.00
3/8"	3/8"	1-1/8"	3"	.005	27884	59.00
1/2"	1/2"	1-1/2"	4"	.005	27886	87.00
1/2"	1/2"	2"	4"	.005	27888	87.00
5/8"	5/8"	2-1/4"	5"	.005	27890	175.00
3/4"	3/4"	2-1/4"	5"	.005	27892	257.00
1"	1"	2-1/4"	5"	.005	27894	380.00

## 2 Flute Spherical Ball EndMills



Tolerance: Shank Dia: h6 & Cut Dia: h8

### Features

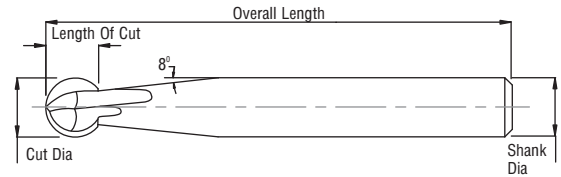
- High performance ball nose endmills are used in mold industries & have a full 220 ° arc cutting capability
- Tools are stocked with a coating to optimize cutting performance
- AlTiN Coated for increased tool life.
- Specially made for Mold Industry

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
	●	●	●	●	●		●

● Excellent

● Good



## Regular Length

Description				AlTiN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price
1/8"	1/8"	3/32"	1-1/2"	16300	\$ 34.33
3/16"	3/16"	9/64"	2"	16304	42.83
1/4"	1/4"	3/16"	2-1/2"	16308	62.33
3/8"	3/8"	9/32"	2-1/2"	16312	87.67
1/2"	1/2"	3/8"	3"	16316	130.00

## Long Length

Description				AlTiN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price
1/8"	1/8"	3/32"	3"	16302	\$ 39.00
3/16"	3/16"	9/64"	3"	16306	48.67
1/4"	1/4"	3/16"	4"	16310	68.83
3/8"	3/8"	9/32"	4"	16314	99.00
1/2"	1/2"	3/8"	6"	16318	185.00

## 4 Flute Spherical Ball EndMills



Tolerance: Shank Dia: h6 & Cut Dia: h8

### Features

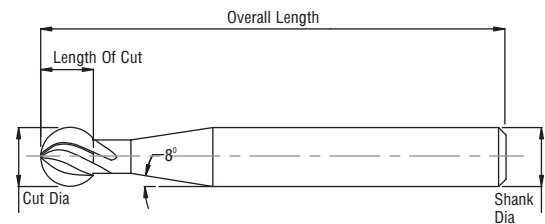
- High performance ball nose endmills are used in mold industries & have a full 220 ° arc cutting capability
- Tools are stocked with a coating to optimize cutting performance
- AlTiN Coated for increased tool life.
- Specially made for Mold Industry

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
	●	●	●	●	●		●

● Excellent

● Good



## Regular Length

Description				AlTiN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price
1/8"	1/8"	3/32"	1-1/2"	16320	\$ 34.33
3/16"	3/16"	9/64"	2"	16324	42.83
1/4"	1/4"	3/16"	2-1/2"	16328	62.33
3/8"	3/8"	9/32"	2-1/2"	16332	87.67
1/2"	1/2"	3/8"	3"	16336	130.00

## Long Length

Description				AlTiN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price
1/8"	1/8"	3/32"	3"	16322	\$ 39.00
3/16"	3/16"	9/64"	3"	16326	48.67
1/4"	1/4"	3/16"	4"	16330	68.83
3/8"	3/8"	9/32"	4"	16334	99.00
1/2"	1/2"	3/8"	6"	16338	185.00



## 3 Flute 60° Helix



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

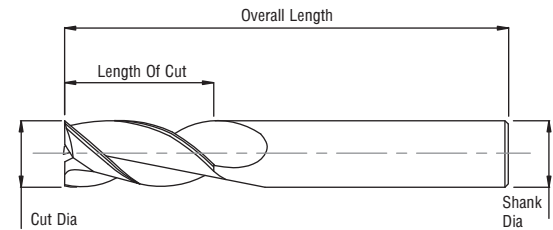
- Suitable for profiling operation
- High shear geometry with edge strength
- Increased cutting edge engagement
- Increased tool life



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium

Excellent Good



## Regular Length

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/8"	1/8"	1/2"	1-1/2"	27300	\$ 13.30	27304	\$ 16.30
3/16"	3/16"	5/8"	2"	27308	16.70	27312	20.50
1/4"	1/4"	3/4"	2-1/2"	27316	20.00	27320	26.30
5/16"	5/16"	13/16"	2-1/2"	27324	28.30	27328	40.00
3/8"	3/8"	1"	2-1/2"	27332	35.00	27336	47.50
7/16"	7/16"	1"	2-3/4"	27340	43.30	27344	57.20
1/2"	1/2"	1"	3"	27348	56.70	27352	70.00
5/8"	5/8"	1-1/4"	3-1/2"	27356	100.00	27360	121.70
3/4"	3/4"	1-1/2"	4"	27364	150.00	27368	178.30
1"	1"	1-1/2"	4"	27372	241.70	27376	278.30

## 6 Flute 45° For Tough Material



Tolerance: Shank Dia: h6 & Cut Dia: h10

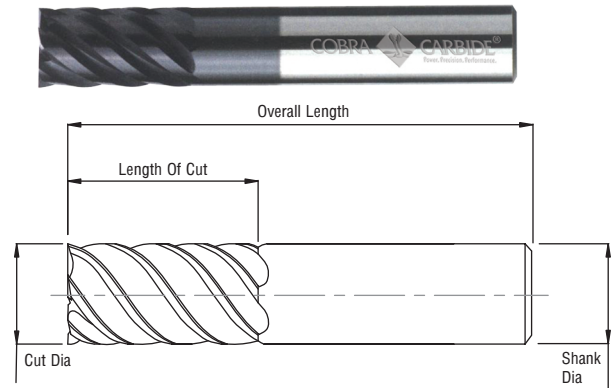
### Features

- Made from premium submicron grain carbide.
- Increased core diameter for added strength.
- Use for light finishing cuts
- AlTiN coated for increased tool life.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
	●	●	●	◐	●	◐	◐

● Excellent ◐ Good



Hi-Performance EndMills

## Regular Length

Cut Dia	Shank Dia	Description			AlTiN Coated	
		Length Of Cut	Overall Length	Corner Radius	EDP #	List Price
1/4"	1/4"	3/4"	2-1/2"	.015	15604	\$ 41.67
5/16"	5/16"	13/16"	2-1/2"	.020	15606	48.33
3/8"	3/8"	1"	2-1/2"	.020	15608	79.83
1/2"	1/2"	1"	3"	.025	15610	123.17
5/8"	5/8"	1-1/4"	3-1/2"	.030	15612	232.50
3/4"	3/4"	1-1/2"	4"	.035	15614	331.67
1"	1"	1-1/2"	4"	.035	15616	440.83

## Multi Flute 45° Helix



Tolerance: Shank Dia: h6 & Cut Dia: h10

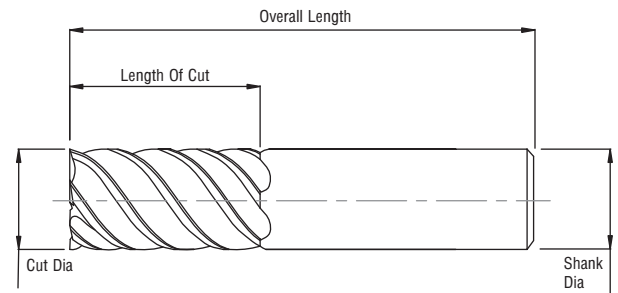
### Features

- Manufactured from premium sub micro grain carbide.
- Multi flute design allows for less chatter & vibration free operations.
- Lighter chip load per tooth increases tool life & providing better finish.
- TiAlN Coated for increased tool life.
- Excellent accuracy.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium

Excellent Good



## Regular Length

Cut Dia	Shank Dia	Description			Uncoated		TiAlN Coated	
		Length Of Cut	Overall Length	No. Of Flutes	EDP #	List Price	EDP #	List Price
3/16"	3/16"	5/8"	2"	6	29400	\$ 20.00	29402	\$ 24.00
1/4"	1/4"	3/4"	2-1/2"	6	29404	25.00	29406	30.00
5/16"	5/16"	13/16"	2-1/2"	6	29408	35.00	29410	45.00
3/8"	3/8"	1"	2-1/2"	6	29412	44.00	29414	55.00
1/2"	1/2"	1"	3"	6	29420	67.00	29418	77.00
5/8"	5/8"	1-1/4"	3-1/2"	8	29424	129.00	29426	146.00
3/4"	3/4"	1-1/2"	4"	6	29428	190.00	29430	215.00
3/4"	3/4"	1-1/2"	4"	8	29432	220.00	29434	254.00



## 4 Flute Fine Pitch Roughing EndMills



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

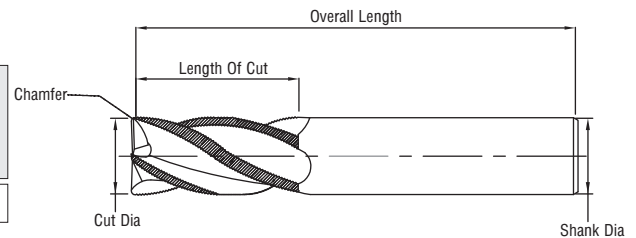
- Excellent roughing with reduced heat in the cut for hard material
- 4 Flute, Right Hand Helix. - Fine Profile
- Small corner Radius / chamfer for Strength
- Form Relieved on high strength carbide for excellent profile milling.
- For Profiling, plunging, and ramping roughing operations in all types of Hard Material



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium

Excellent Good



## Regular Length

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/4"	1/4"	3/4"	2-1/2"	29064	\$ 42.00	29068	\$ 50.00
5/16"	5/16"	11/32"	2-1/2"	29072	50.00	29076	60.00
3/8"	3/8"	7/8"	2-1/2"	29080	59.00	29084	70.00
7/16"	7/16"	1"	2-3/4"	29088	78.00	29092	94.00
1/2"	1/2"	1-1/4"	3"	29096	93.00	29100	106.00
9/16"	9/16"	1-1/4"	3-1/2"	29104	100.00	29108	124.00
5/8"	5/8"	1-1/4"	3-1/2"	29112	155.00	29116	175.00
3/4"	3/4"	1-1/2"	4"	29120	215.00	29124	245.00
1"	1"	1-1/2"	4"	29128	375.00	29132	410.00

## Long Length

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/4"	1/4"	1-1/8"	3"	29136	\$ 60.00	29140	\$ 69.00
3/8"	3/8"	1-1/8"	3"	29152	80.00	29156	94.00
1/2"	1/2"	2"	4"	29160	142.00	29164	160.00
5/8"	5/8"	2-1/4"	5"	29168	200.00	29172	224.00
3/4"	3/4"	2-1/4"	5"	29176	337.00	29180	365.00
1"	1"	2-1/4"	5"	29184	417.00	29188	450.00

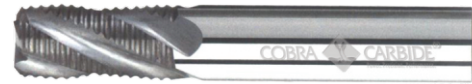
## 4 Flute Coarse Pitch Roughing EndMills



Tolerance: Shank Dia: h6 & Cutting Dia: h10

### Features

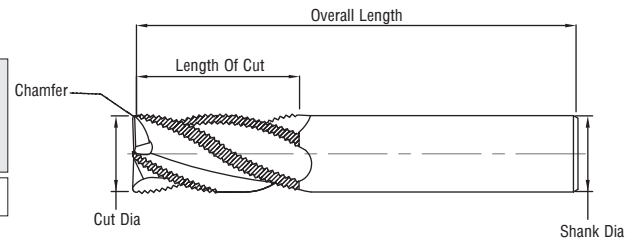
- Excellent roughing with reduced heat in the cut
- 4 Flute, Right Hand Helix. - Coarse Pitch
- Small corner Radius / chamfer for Strength
- Form Relieved on high strength carbide for excellent profile milling.



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●		●		●	

● Excellent ● Good



## Regular Length

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/4"	1/4"	3/4"	2-1/2"	29066	\$ 42.00	29070	\$ 50.00
5/16"	5/16"	11/32"	2-1/2"	29074	50.00	29078	60.00
3/8"	3/8"	7/8"	2-1/2"	29082	59.00	29086	70.00
7/16"	7/16"	1"	2-3/4"	29090	78.00	29094	94.00
1/2"	1/2"	1-1/4"	3"	29098	93.00	29102	106.00
9/16"	9/16"	1-1/4"	3-1/2"	29106	100.00	29110	124.00
5/8"	5/8"	1-1/4"	3-1/2"	29114	155.00	29118	175.00
3/4"	3/4"	1-1/2"	4"	29122	215.00	29126	245.00
1"	1"	1-1/2"	4"	29130	375.00	29134	410.00

## Long Length

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/4"	1/4"	1-1/8"	3"	29138	\$ 60.00	29142	\$ 69.00
3/8"	3/8"	1-1/8"	3"	29154	80.00	29158	94.00
1/2"	1/2"	2"	4"	29162	142.00	29166	160.00
5/8"	5/8"	2-1/4"	5"	29170	200.00	29174	224.00
3/4"	3/4"	2-1/4"	5"	29178	337.00	29182	365.00
1"	1"	2-1/4"	5"	29186	417.00	29190	450.00

## 2 Flute Square Single End



Tolerance: Shank Dia: h6 & Cutting Dia: h10

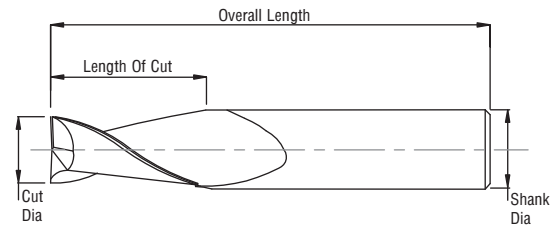
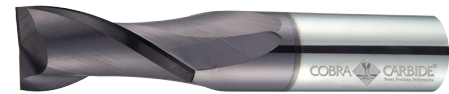
### Features

- Center cutting geometry.
- Design for increased chip removal rate.
- Capable to do slotting, profiling & plunging operations.
- Used for semi-finishing operation.
- Manufactured from premium sub micron grain carbide.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/64"	1/8"	1/32"	1-1/2"	20005	\$ 22.25	20009	\$ 26.75	20013	\$ 27.85
1/32"	1/8"	1/8"	1-1/2"	20029	12.50	20033	15.20	20037	15.90
3/64"	1/8"	1/8"	1-1/2"	20053	12.50	20057	15.20	20061	15.90
1/16"	1/8"	3/16"	1-1/2"	20077	8.95	20081	11.20	20085	11.95
5/64"	1/8"	1/4"	1-1/2"	20089	11.70	20093	14.40	20097	15.00
3/32"	1/8"	3/8"	1-1/2"	20113	8.95	20117	11.20	20121	11.95
7/64"	1/8"	3/8"	1-1/2"	20125	11.70	20129	14.40	20133	15.00
1/8"	1/8"	1/2"	1-1/2"	20149	7.45	20153	9.50	20157	10.40
9/64"	3/16"	9/16"	2"	20209	15.20	20213	18.50	20217	19.70
5/32"	3/16"	9/16"	2"	20233	15.20	20237	18.50	20241	19.70
11/64"	3/16"	5/8"	2"	20245	15.70	20249	19.00	20253	20.20
3/16"	3/16"	5/8"	2"	20269	13.75	20273	17.20	20277	18.10
13/64"	1/4"	5/8"	2 - 1/2"	20329	21.66	20333	28.40	20337	30.40
7/32"	1/4"	5/8"	2 - 1/2"	20353	20.70	20357	26.70	20361	28.40
15/64"	1/4"	3/4"	2 - 1/2"	20365	21.66	20369	28.50	20373	30.90
1/4"	1/4"	3/4"	2 - 1/2"	20389	15.20	20393	19.10	20397	21.10
17/64"	5/16"	3/4"	2 - 1/2"	20449	26.70	20453	35.00	20457	37.70
9/32"	5/16"	3/4"	2 - 1/2"	20461	26.70	20465	35.00	20469	37.70
19/64"	5/16"	13/16"	2 - 1/2"	20473	28.00	20477	36.40	20481	37.70
5/16"	5/16"	13/16"	2 - 1/2"	20497	22.95	20501	29.85	20505	32.84
11/32"	3/8"	1"	2 - 1/2"	20545	35.40	20549	43.70	20553	46.40
3/8"	3/8"	1"	2 - 1/2"	20569	28.40	20573	36.95	20577	40.50
13/32"	7/16"	1"	2- 3/4"	20629	47.50	20633	59.90	20637	63.20
7/16"	7/16"	1"	2- 3/4"	20653	42.30	20657	50.75	20661	52.75
1/2"	1/2"	1"	3"	20701	43.20	20705	52.50	20709	53.16

Continued...



## 2 Flute Square Single End



Tolerance: Shank Dia: h6 & Cutting Dia: h10

### Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
9/16"	9/16"	1- 1/8"	3 - 1/2"	20773	\$ 101.70	20777	\$ 115.90	20781	\$ 121.70
5/8"	5/8"	1- 1/4"	3 - 1/2"	20797	99.20	20801	114.20	20805	119.20
11/16"	3/4"	1- 3/8"	4"	20845	150.00	20849	185.00	20853	190.00
3/4"	3/4"	1- 1/2"	4"	20869	128.30	20873	158.40	20877	163.50
7/8"	7/8"	1- 1/2"	4"	20905	216.70	20909	236.70	20913	243.40
1"	1"	1- 1/2"	4"	20917	235.00	20921	271.70	20925	281.70

### Stub Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/32"	1/8"	1/16"	1-1/2"	20017	\$ 9.20	20021	\$ 11.90	20025	\$ 12.50
3/64"	1/8"	3/32"	1-1/2"	20041	9.20	20045	11.90	20049	12.50
1/16"	1/8"	1/8"	1-1/2"	20065	9.20	20069	11.90	20073	12.50
5/64"	1/8"	3/16"	1-1/2"	20086	9.20	20087	11.90	20088	12.50
3/32"	1/8"	3/16"	1-1/2"	20101	9.20	20105	11.90	20109	12.50
7/64"	1/8"	7/32"	1-1/2"	20110	9.20	20111	11.90	20112	12.50
1/8"	1/8"	1/4"	1-1/2"	20137	8.20	20141	10.90	20145	11.50
9/64"	3/16"	9/32"	2"	20197	15.00	20201	18.40	20205	19.20
5/32"	3/16"	5/16"	2"	20221	15.00	20225	18.40	20229	19.20
11/64"	3/16"	3/8"	2"	20230	15.00	20231	18.40	20232	19.20
3/16"	3/16"	3/8"	2"	20257	14.40	20261	17.70	20265	18.50
7/32"	1/4"	7/16"	2"	20341	20.00	20345	25.90	20349	28.40
1/4"	1/4"	1/2"	2"	20377	16.50	20381	22.40	20385	24.90
5/16"	5/16"	1/2"	2"	20485	22.90	20489	31.20	20493	34.50
3/8"	3/8"	5/8"	2"	20557	29.40	20561	37.70	20565	41.00
7/16"	7/16"	5/8"	2-1/2"	20641	42.50	20645	52.50	20649	55.90
1/2"	1/2"	5/8"	2-1/2"	20689	43.40	20693	53.40	20697	56.70
5/8"	5/8"	3/4"	3"	20785	91.70	20789	105.00	20793	111.70
3/4"	3/4"	1"	3"	20857	140.00	20861	156.70	20865	163.40

## 2 Flute Square Single End



Tolerance: Shank Dia: h6 & Cutting Dia: h10

## Long & Extra Long Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/8"	1/8"	3/4"	2-1/4"	20161	\$ 16.70	20165	\$ 20.00	20169	\$ 20.90
1/8"	1/8"	1"	3"	20173	20.00	20177	23.40	20181	24.20
1/8"	1/8"	1-1/8"	4"	20185	30.00	20189	36.00	20193	36.70
3/16"	3/16"	3/4"	2-1/2"	20281	21.70	20285	25.90	20289	27.50
3/16"	3/16"	1-1/8"	3"	20293	23.90	20297	28.00	20301	29.70
3/16"	3/16"	1-1/2"	4"	20305	38.40	20309	45.00	20313	46.70
3/16"	3/16"	1-1/2"	6"	20317	46.70	20321	56.00	20325	58.40
1/4"	1/4"	1-1/8"	3"	20401	26.00	20405	31.90	20409	32.70
1/4"	1/4"	1-1/2"	4"	20413	33.20	20417	39.90	20421	41.50
1/4"	1/4"	1-1/2"	6"	20425	50.00	20429	58.40	20433	61.70
1/4"	1/4"	2 - 1/2"	6"	20437	60.00	20441	68.40	20445	71.70
5/16"	5/16"	1-1/8"	3"	20509	36.50	20513	44.90	20517	46.50
5/16"	5/16"	1-5/8"	4"	20521	43.40	20525	53.40	20529	56.70
5/16"	5/16"	2 - 1/2"	6"	20533	81.70	20537	95.00	20541	100.00
3/8"	3/8"	1-1/8"	3"	20581	40.00	20585	48.40	20589	50.00
3/8"	3/8"	1-3/4"	4"	20593	51.70	20597	61.70	20601	65.00
3/8"	3/8"	1-1/2"	6"	20605	58.40	20609	71.70	20613	76.70
3/8"	3/8"	2 - 1/2"	6"	20617	66.70	20619	80.00	20621	85.00
7/16"	7/16"	2"	4"	20665	70.00	20669	83.40	20673	86.70
7/16"	7/16"	3"	6"	20677	103.40	20681	120.00	20685	126.70
1/2"	1/2"	2"	4"	20713	80.00	20717	93.40	20721	96.70
1/2"	1/2"	3"	6"	20725	116.70	20729	133.40	20733	140.00
1/2"	1/2"	1- 1/2"	6"	20737	113.40	20741	130.00	20745	136.70
1/2"	1/2"	4"	7"	20749	241.70	20753	263.40	20757	268.40
1/2"	1/2"	4"	8"	20761	291.70	20765	316.70	20769	320.00
5/8"	5/8"	2-1/4"	5"	20809	160.00	20813	176.70	20817	183.40
5/8"	5/8"	3"	6"	20821	183.40	20825	203.40	20829	210.00
5/8"	5/8"	4"	7"	20833	326.70	20837	351.70	20841	358.40
3/4"	3/4"	2-1/4"	5"	20881	196.70	20885	216.70	20889	223.40
3/4"	3/4"	3"	6"	20893	266.70	20897	290.00	20901	296.70
3/4"	3/4"	4"	7"	20902	480.00	20903	515.70	20904	530.00
3/4"	3/4"	5"	8"	20906	600.00	20907	690.00	20908	724.50
1"	1"	2-1/4"	5"	20929	336.70	20933	365.00	20937	371.70
1"	1"	3"	6"	20941	400.00	20945	433.40	20949	440.00
1"	1"	4"	7"	20953	500.00	20957	536.70	20961	545.00

## 2 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

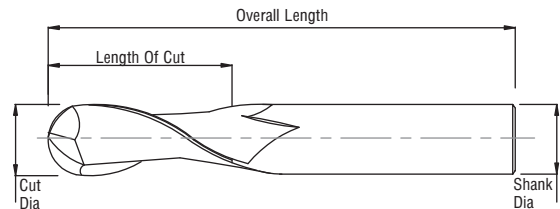
### Features

- Center cutting geometry.
- Design for increased chip removal rate.
- Designed for slotting, profiling & plunging operations.
- Used for semi-finishing operation.
- Manufactured from premium sub micron grain carbide.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/64"	1/8"	1/32"	1-1/2"	21100	\$ 25.58	21102	\$ 28.85	21104	\$ 29.95
1/32"	1/8"	1/8"	1-1/2"	21112	14.70	21116	17.40	21120	18.00
3/64"	1/8"	1/8"	1-1/2"	21124	14.70	21128	17.40	21132	18.00
1/16"	1/8"	3/16"	1-1/2"	21148	10.90	21152	13.75	21156	15.10
5/64"	1/8"	1/4"	1-1/2"	21160	13.40	21164	16.00	21168	16.70
3/32"	1/8"	3/8"	1-1/2"	21184	10.90	21188	13.75	21192	15.10
7/64"	1/8"	3/8"	1-1/2"	21208	12.40	21212	15.00	21216	15.70
1/8"	1/8"	1/2"	1-1/2"	21232	9.45	21236	11.90	21240	13.10
9/64"	3/16"	9/16"	2"	21280	18.20	21284	21.50	21288	22.50
5/32"	3/16"	9/16"	2"	21304	18.20	21308	21.50	21312	22.50
11/64"	3/16"	5/8"	2"	21328	18.70	21332	22.00	21336	23.00
3/16"	3/16"	5/8"	2"	21352	16.60	21356	20.75	21360	21.80
13/64"	1/4"	5/8"	2 - 1/2"	21400	25.00	21404	31.70	21408	32.50
7/32"	1/4"	5/8"	2 - 1/2"	21424	25.00	21428	31.70	21432	32.50
15/64"	1/4"	3/4"	2 - 1/2"	21434	25.00	21436	31.70	21438	32.50
1/4"	1/4"	3/4"	2 - 1/2"	21460	20.85	21464	26.10	21468	28.75
17/64"	5/16"	3/4"	2 - 1/2"	21494	32.40	21496	40.70	21498	43.20
9/32"	5/16"	3/4"	2 - 1/2"	21508	31.70	21512	40.00	21516	42.50
19/64"	5/16"	13/16"	2 - 1/2"	21517	33.70	21518	42.00	21519	44.50
5/16"	5/16"	13/16"	2 - 1/2"	21532	27.60	21536	35.90	21540	39.45
11/32"	3/8"	1"	2 - 1/2"	21580	41.70	21584	49.90	21588	52.50
3/8"	3/8"	1"	2 - 1/2"	21604	34.75	21608	45.00	21612	49.50
13/32"	7/16"	1"	2- 3/4"	21652	60.00	21656	70.00	21660	73.40
7/16"	7/16"	1"	2- 3/4"	21676	53.75	21680	67.20	21684	71.50
1/2"	1/2"	1"	3"	21724	57.55	21728	64.75	21732	68.75

Continued...

## 2 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
9/16"	9/16"	1- 1/8"	3 - 1/2"	21760	\$ 110.70	21764	\$ 124.75	21768	\$ 130.75
5/8"	5/8"	1- 1/4"	3 - 1/2"	21784	113.80	21788	126.25	21792	132.50
11/16"	3/4"	1- 3/8"	4"	21808	153.40	21812	170.00	21816	175.00
3/4"	3/4"	1- 1/2"	4"	21832	175.00	21836	185.00	21840	195.00
7/8"	7/8"	1- 1/2"	4"	21880	250.00	21884	270.00	21888	280.00
1"	1"	1- 1/2"	4"	21892	300.00	21896	315.00	21900	325.00

### Stub Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/32"	1/8"	1/16"	1-1/2"	21108	\$ 15.00	21109	\$ 16.70	21110	\$ 17.50
3/64"	1/8"	3/32"	1-1/2"	21121	15.00	21122	16.70	21123	17.50
1/16"	1/8"	1/8"	1-1/2"	21136	11.70	21140	14.40	21144	15.00
5/64"	1/8"	3/16"	1-1/2"	21157	12.40	21158	15.00	21159	15.70
3/32"	1/8"	3/16"	1-1/2"	21172	12.40	21176	15.00	21180	15.70
7/64"	1/8"	7/32"	1-1/2"	21196	12.40	21200	15.00	21204	15.70
1/8"	1/8"	1/4"	1-1/2"	21220	12.70	21224	14.40	21228	15.00
9/64"	3/16"	9/32"	2"	21268	18.20	21272	21.50	21276	22.40
5/32"	3/16"	5/16"	2"	21292	18.20	21296	21.50	21300	22.40
11/64"	3/16"	3/8"	2"	21316	18.70	21320	22.00	21324	23.00
3/16"	3/16"	3/8"	2"	21340	17.20	21344	20.50	21348	21.40
7/32"	1/4"	7/16"	2"	21412	25.00	21416	31.70	21420	33.40
1/4"	1/4"	1/2"	2"	21448	21.70	21452	28.40	21456	30.00
5/16"	5/16"	1/2"	2"	21520	30.00	21524	38.40	21528	41.70
3/8"	3/8"	1/2"	2"	21592	37.50	21596	45.90	21600	51.90
7/16"	7/16"	5/8"	2-1/2"	21664	56.70	21668	66.90	21672	70.50
1/2"	1/2"	5/8"	2-1/2"	21712	61.70	21716	71.70	21720	75.00
5/8"	5/8"	3/4"	3"	21772	116.70	21776	130.00	21780	136.70
3/4"	3/4"	1"	3"	21820	176.70	21824	193.40	21828	198.40



## 2 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

## Long & Extra Long Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAIN EDP #	List Price
1/8"	1/8"	3/4"	2-1/4"	21244	\$ 20.00	21248	\$ 23.40	21252	\$ 24.20
1/8"	1/8"	1"	3"	21253	23.50	21254	26.70	21255	27.50
1/8"	1/8"	1-1/8"	4"	21256	33.45	21260	38.46	21264	40.45
3/16"	3/16"	3/4"	2-1/2"	21364	27.50	21368	31.70	21372	33.40
3/16"	3/16"	1-1/8"	3"	21376	29.00	21380	33.20	21384	34.90
3/16"	3/16"	1-1/2"	4"	21386	39.00	21388	44.80	21390	47.00
3/16"	3/16"	1-1/2"	6"	21392	53.90	21394	61.98	21396	65.00
1/4"	1/4"	1-1/8"	3"	21472	31.70	21476	37.50	21480	38.40
1/4"	1/4"	1-1/2"	4"	21484	39.90	21488	46.50	21492	48.20
1/4"	1/4"	1-1/2"	6"	21500	55.00	21501	63.40	21502	66.70
1/4"	1/4"	2-1/2"	6"	21503	72.00	21504	82.80	21505	86.94
5/16"	5/16"	1-1/8"	3"	21544	48.40	21548	56.70	21552	58.40
5/16"	5/16"	1-5/8"	4"	21556	55.00	21560	65.00	21564	70.00
5/16"	5/16"	1-1/2"	6"	21568	83.40	21572	97.90	21576	102.90
3/8"	3/8"	1-1/8"	3"	21616	50.00	21620	58.40	21624	60.00
3/8"	3/8"	1-3/4"	4"	21628	66.70	21632	76.70	21636	80.00
3/8"	3/8"	1-1/2"	6"	21640	76.00	21644	87.40	21648	91.77
3/8"	3/8"	2 - 1/2"	6"	21649	85.00	21650	102.00	21651	107.10
7/16"	7/16"	2"	4"	21688	83.40	21692	96.70	21696	100.00
7/16"	7/16"	3"	6"	21700	113.40	21704	130.00	21708	136.70
1/2"	1/2"	2"	4"	21736	91.70	21740	105.00	21744	113.40
1/2"	1/2"	3"	6"	21748	148.40	21752	165.00	21756	171.70
1/2"	1/2"	1- 1/2"	6"	21749	141.70	21750	158.40	21751	165.00
1/2"	1/2"	4"	7"	21753	268.40	21754	290.00	21755	295.00
1/2"	1/2"	4"	8"	21757	350.04	21758	402.54	21759	422.67
5/8"	5/8"	2-1/4"	5"	21796	183.40	21800	200.00	21804	206.70
5/8"	5/8"	3"	6"	21805	233.40	21806	253.40	21807	260.00
5/8"	5/8"	4"	7"	21801	375.00	21802	400.00	21803	406.70
3/4"	3/4"	2-1/4"	5"	21844	233.40	21848	226.70	21852	233.40
3/4"	3/4"	3"	6"	21856	300.00	21860	323.40	21864	330.00
3/4"	3/4"	4"	7"	21868	633.40	21872	665.00	21876	675.00
3/4"	3/4"	5"	8"	21877	728.40	21878	837.67	21879	875.50
1"	1"	2-1/4"	5"	21904	373.40	21908	400.00	21912	408.40
1"	1"	3"	6"	21916	493.40	21920	525.00	21924	536.40
1"	1"	4"	7"	21928	600.00	21932	690.00	21936	724.5

## 4 Flute Square Single End



Tolerance: Shank Dia: h6 & Cut Dia: h10

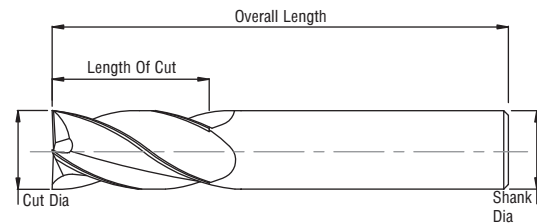
### Features

- Center cutting geometry.
- Design for increased chip removal rate.
- Capable to do slotting, profiling & plunging operations.
- Used for finishing operation.
- Manufactured from premium sub micron grain carbide.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/64"	1/8"	1/32"	1-1/2"	22004	\$ 22.25	22008	\$ 26.75	22012	\$ 27.85
1/32"	1/8"	1/8"	1-1/2"	22028	12.50	22032	15.20	22036	15.90
3/64"	1/8"	1/8"	1-1/2"	22052	12.50	22056	15.20	22060	15.90
1/16"	1/8"	3/16"	1-1/2"	22076	8.95	22080	11.20	22084	11.95
5/64"	1/8"	1/4"	1-1/2"	22090	11.70	22092	14.40	22096	15.00
3/32"	1/8"	3/8"	1-1/2"	22112	8.95	22116	11.20	22120	11.95
7/64"	1/8"	3/8"	1-1/2"	22124	11.70	22128	14.40	22132	15.00
1/8"	1/8"	1/2"	1-1/2"	22148	7.45	22152	9.50	22156	10.40
9/64"	3/16"	9/16"	2"	22196	15.20	22200	18.50	22204	19.70
5/32"	3/16"	9/16"	2"	22220	15.20	22224	18.50	22228	19.70
11/64"	3/16"	5/8"	2"	22232	15.70	22236	19.00	22240	20.20
3/16"	3/16"	5/8"	2"	22256	13.75	22260	17.20	22264	18.10
13/64"	1/4"	5/8"	2 - 1/2"	22316	21.66	22320	28.40	22324	30.40
7/32"	1/4"	5/8"	2 - 1/2"	22340	20.70	22344	26.70	22348	28.40
15/64"	1/4"	3/4"	2 - 1/2"	22352	21.66	22356	28.50	22360	30.90
1/4"	1/4"	3/4"	2 - 1/2"	22376	15.20	22380	19.10	22384	21.10
17/64"	5/16"	3/4"	2 - 1/2"	22436	26.70	22440	35.00	22444	37.70
9/32"	5/16"	3/4"	2 - 1/2"	22448	26.70	22452	35.00	22456	37.70
19/64"	5/16"	13/16"	2 - 1/2"	22460	28.00	22464	36.40	22468	37.70
5/16"	5/16"	13/16"	2 - 1/2"	22484	22.95	22488	29.85	22492	32.84
11/32"	3/8"	1"	2 - 1/2"	22532	35.40	22536	43.70	22540	46.40
3/8"	3/8"	1"	2 - 1/2"	22556	28.40	22560	36.95	22564	40.50
13/32"	7/16"	1"	2- 3/4"	22616	47.50	22620	59.90	22624	63.20
7/16"	7/16"	1"	2- 3/4"	22640	42.30	22644	50.75	22648	52.75
1/2"	1/2"	1"	3"	22688	43.20	22692	52.50	22696	53.16

Continued...

## 4 Flute Square Single End



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
9/16"	9/16"	1- 1/8"	3 - 1/2"	22760	\$ 101.70	22764	\$ 115.90	22768	\$ 121.70
5/8"	5/8"	1- 1/4"	3 - 1/2"	22784	99.20	22788	114.20	22792	119.20
11/16"	3/4"	1- 3/8"	4"	22832	150.00	22836	185.00	22840	190.00
3/4"	3/4"	1- 1/2"	4"	22856	128.30	22860	158.40	22864	163.50
7/8"	7/8"	1- 1/2"	4"	22904	216.70	22908	236.70	22912	243.40
1"	1"	1- 1/2"	4"	22916	235.00	22920	271.70	22924	281.70

### Stub Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/32"	1/8"	1/16"	1-1/2"	22016	\$ 9.20	22020	\$ 11.90	22024	\$ 12.50
3/64"	1/8"	3/32"	1-1/2"	22040	9.20	22044	11.90	22048	12.50
1/16"	1/8"	1/8"	1-1/2"	22064	9.20	22068	11.90	22072	12.50
5/64"	1/8"	3/16"	1-1/2"	22086	9.20	22087	11.90	22088	12.50
3/32"	1/8"	3/16"	1-1/2"	22100	9.20	22104	11.90	22108	12.50
7/64"	1/8"	7/32"	1-1/2"	22121	9.20	22122	11.90	22123	12.50
1/8"	1/8"	1/4"	1-1/2"	22136	8.20	22140	10.90	22144	11.50
9/64"	3/16"	9/32"	2	22193	15.00	22194	18.40	22195	19.20
5/32"	3/16"	5/16"	2"	22208	15.00	22212	18.40	22216	19.20
11/64"	3/16"	3/8"	2"	22241	15.00	22242	18.40	22243	19.20
3/16"	3/16"	3/8"	2"	22244	14.40	22248	17.70	22252	18.50
7/32"	1/4"	7/16"	2"	22328	20.00	22332	25.90	22336	28.40
1/4"	1/4"	1/2"	2"	22364	16.50	22368	22.40	22372	24.90
5/16"	5/16"	1/2"	2"	22472	22.90	22476	31.20	22480	34.50
3/8"	3/8"	5/8"	2"	22544	29.40	22548	37.70	22552	41.00
7/16"	7/16"	5/8"	2 1/2	22628	42.50	22632	52.50	22636	55.90
1/2"	1/2"	5/8"	2-1/2"	22676	43.40	22680	53.40	22684	56.70
5/8"	5/8"	3/4"	3"	22772	91.70	22776	105.00	22780	111.70
3/4"	3/4"	1"	3"	22844	140.00	22848	156.70	22852	163.40

## 4 Flute Square Single End



Tolerance: Shank Dia: h6 & Cut Dia: h10

## Long & Extra Long Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/8"	1/8"	3/4"	2-1/4"	22160	\$ 16.70	22164	\$ 20.00	22168	\$ 20.90
1/8"	1/8"	1"	3"	22172	20.00	22176	23.40	22180	24.20
1/8"	1/8"	1-1/8"	4"	22184	30.00	22188	36.00	22192	36.70
3/16"	3/16"	3/4"	2-1/2"	22268	21.70	22272	25.90	22276	27.50
3/16"	3/16"	1-1/8"	3"	22280	23.90	22284	28.00	22288	29.70
3/16"	3/16"	1-1/2"	4"	22292	38.40	22296	45.00	22300	46.70
3/16"	3/16"	1-1/2"	6"	22304	46.70	22308	56.00	22312	58.40
1/4"	1/4"	1-1/8"	3"	22388	26.00	22392	31.90	22396	32.70
1/4"	1/4"	1-1/2"	4"	22400	33.20	22404	39.90	22408	41.50
1/4"	1/4"	1-1/2"	6"	22412	50.00	22416	58.40	22420	61.70
1/4"	1/4"	2 - 1/2"	6"	22424	60.00	22428	68.40	22432	71.70
5/16"	5/16"	1-1/8"	3"	22496	36.50	22500	44.90	22504	46.50
5/16"	5/16"	1-5/8"	4"	22508	43.40	22512	53.40	22516	56.70
5/16"	5/16"	2 - 1/2"	6"	22520	81.70	22524	95.00	22528	100.00
3/8"	3/8"	1-1/8"	3"	22568	40.00	22572	48.40	22576	50.00
3/8"	3/8"	1-3/4"	4"	22580	51.70	22584	61.70	22588	65.00
3/8"	3/8"	1-1/2"	6"	22592	58.40	22596	71.70	22600	76.70
3/8"	3/8"	2 - 1/2"	6"	22604	66.70	22608	80.00	22612	85.00
7/16"	7/16"	2"	4"	22652	70.00	22656	83.40	22660	86.70
7/16"	7/16"	3"	6"	22664	103.40	22668	120.00	22672	126.70
1/2"	1/2"	2"	4"	22700	80.00	22704	93.40	22708	96.70
1/2"	1/2"	3"	6"	22712	116.70	22716	133.40	22720	140.00
1/2"	1/2"	1- 1/2"	6"	22724	113.40	22728	130.00	22732	136.70
1/2"	1/2"	4"	7"	22736	241.70	22740	263.40	22744	268.40
1/2"	1/2"	4"	8"	22748	291.70	22752	316.70	22756	320.00
5/8"	5/8"	2-1/4"	5"	22796	160.00	22800	176.70	22804	183.40
5/8"	5/8"	3"	6"	22808	183.40	22812	203.40	22816	210.00
5/8"	5/8"	4"	7"	22820	326.70	22824	351.70	22828	358.40
3/4"	3/4"	2-1/4"	5"	22868	196.70	22872	216.70	22876	223.40
3/4"	3/4"	3"	6"	22880	266.70	22884	290.00	22888	296.70
3/4"	3/4"	4"	7"	22892	480.00	22896	515.70	22900	530.00
3/4"	3/4"	5"	8"	22901	600.00	22902	690.00	22903	724.50
1"	1"	2-1/4"	5"	22928	336.70	22932	365.00	22936	371.70
1"	1"	3"	6"	22940	400.00	22944	433.40	22948	440.00
1"	1"	4"	7"	22952	500.00	22956	536.70	22960	545.00



## 4 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

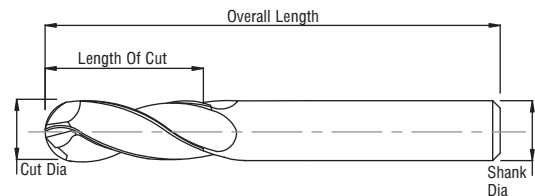
- Center cutting geometry.
- Designed for milling, slotting, profiling & trace milling.
- Used for finishing operation.
- Manufactured from premium sub micron grain carbide.



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/64"	1/8"	1/32"	1-1/2"	23006	\$ 25.58	23010	\$ 28.85	23014	\$ 29.95
1/32"	1/8"	1/8"	1-1/2"	23018	14.70	23022	17.40	23026	18.00
3/64"	1/8"	1/8"	1-1/2"	23042	14.70	23046	17.40	23050	18.00
1/16"	1/8"	3/16"	1-1/2"	23066	10.90	23070	13.75	23074	15.10
5/64"	1/8"	1/4"	1-1/2"	23090	13.40	23094	16.00	23098	16.70
3/32"	1/8"	3/8"	1-1/2"	23114	10.90	23118	13.75	23122	15.10
7/64"	1/8"	3/8"	1-1/2"	23138	12.40	23142	15.00	23146	15.70
1/8"	1/8"	1/2"	1-1/2"	23162	9.45	23166	11.90	23170	13.10
9/64"	3/16"	9/16"	2"	23222	18.20	23226	21.50	23230	22.50
5/32"	3/16"	9/16"	2"	23246	18.20	23250	21.50	23254	22.50
11/64"	3/16"	5/8"	2"	23258	18.70	23262	22.00	23266	23.00
3/16"	3/16"	5/8"	2"	23282	16.60	23286	20.75	23290	21.80
13/64"	1/4"	5/8"	2 - 1/2"	23318	25.00	23322	31.70	23326	32.50
7/32"	1/4"	5/8"	2 - 1/2"	23342	25.00	23346	31.70	23350	32.50
15/64"	1/4"	3/4"	2 - 1/2"	23354	25.00	23358	31.70	23362	32.50
1/4"	1/4"	3/4"	2 - 1/2"	23378	20.85	23382	26.10	23386	28.75
17/64"	5/16"	3/4"	2 - 1/2"	23426	32.40	23430	40.70	23434	43.20
9/32"	5/16"	3/4"	2 - 1/2"	23438	31.70	23442	40.00	23446	42.50
19/64"	5/16"	13/16"	2 - 1/2"	23450	33.70	23454	42.00	23458	44.50
5/16"	5/16"	13/16"	2 - 1/2"	23474	27.60	23478	35.90	23482	39.45
11/32"	3/8"	1"	2 - 1/2"	23510	41.70	23514	49.90	23518	52.50
3/8"	3/8"	1"	2 - 1/2"	23534	34.75	23538	45.00	23542	49.50
13/32"	7/16"	1"	2- 3/4"	23558	60.00	23562	70.00	23566	73.40
7/16"	7/16"	1"	2- 3/4"	23582	53.75	23586	67.20	23590	71.50
1/2"	1/2"	1"	3"	23630	57.55	23634	64.75	23638	68.75

Continued...

## 4 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
9/16"	9/16"	1- 1/8"	3 - 1/2"	23690	\$ 110.70	23694	\$ 124.75	23698	\$ 130.75
5/8"	5/8"	1- 1/4"	3 - 1/2"	23714	113.80	23718	126.25	23722	132.50
11/16"	3/4"	1- 3/8"	4"	23762	153.40	23766	170.00	23770	175.00
3/4"	3/4"	1- 1/2"	4"	23786	175.00	23790	185.00	23794	195.00
7/8"	7/8"	1- 1/2"	4"	23834	250.00	23838	270.00	23842	280.00
1"	1"	1- 1/2"	4"	23846	300.00	23850	315.00	23854	325.00

### Stub Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/32"	1/8"	1/16"	1-1/2"	23015	\$ 15.00	23016	\$ 16.70	23017	\$ 17.50
3/64"	1/8"	3/32"	1-1/2"	23030	15.00	23034	16.70	23038	17.50
1/16"	1/8"	1/8"	1-1/2"	23054	11.70	23058	14.40	23062	15.00
5/64"	1/8"	5/32"	1-1/2"	23078	12.40	23082	15.00	23086	15.70
3/32"	1/8"	3/16"	1-1/2"	23102	12.40	23106	15.00	23110	15.70
7/64"	1/8"	7/32"	1-1/2"	23126	12.40	23130	15.00	23134	15.70
1/8"	1/8"	1/4"	1-1/2"	23150	11.70	23154	14.40	23158	15.00
9/64"	3/16"	9/32"	2"	23210	18.20	23214	21.50	23218	22.40
5/32"	3/16"	5/16"	2"	23234	18.20	23238	21.50	23242	22.40
11/64"	3/16"	3/8"	2"	23258	18.70	23262	22.00	23266	23.00
3/16"	3/16"	3/8"	2"	23270	17.20	23274	20.50	23278	21.40
7/32"	1/4"	7/16"	2"	23330	25.00	23334	31.70	23338	33.40
1/4"	1/4"	1/2"	2"	23366	21.70	23370	28.40	23374	30.00
5/16"	5/16"	1/2"	2"	23462	30.00	23466	38.40	23470	41.70
3/8"	3/8"	1/2"	2"	23522	37.50	23526	45.90	23530	51.90
7/16"	7/16"	5/8"	2-1/2"	23579	56.70	23580	66.90	23581	70.50
1/2"	1/2"	5/8"	2-1/2"	23618	61.70	23622	71.70	23626	75.00
5/8"	5/8"	3/4"	3"	23702	116.70	23706	130.00	23710	136.70
3/4"	3/4"	1"	3"	23774	176.70	23778	193.40	23782	198.40

## 4 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

## Long & Extra Long Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/8"	1/8"	3/4"	2-1/4"	23174	\$ 20.00	23178	\$ 23.40	23182	\$ 24.20
1/8"	1/8"	1"	3"	23186	23.50	23190	26.70	23194	27.50
1/8"	1/8"	1-1/8"	4"	23196	33.45	23198	38.46	23200	40.45
3/16"	3/16"	3/4"	2-1/2"	23294	27.50	23298	31.70	23302	33.40
3/16"	3/16"	1-1/8"	3"	23306	29.00	23310	33.20	23314	34.90
3/16"	3/16"	1-1/2"	4"	23315	39.00	23316	44.80	23317	47.00
3/16"	3/16"	1-1/2"	6"	23319	53.90	23320	61.98	23321	65.00
1/4"	1/4"	1-1/8"	3"	23390	31.70	23394	37.50	23398	38.40
1/4"	1/4"	1-1/2"	4"	23402	39.90	23406	46.50	23410	48.20
1/4"	1/4"	1-1/2"	6"	23414	55.00	23418	63.40	23422	66.70
1/4"	1/4"	2-1/2"	6"	23424	72.00	23425	82.80	23427	86.94
5/16"	5/16"	1-1/8"	3"	23486	48.40	23490	56.70	23494	58.40
5/16"	5/16"	1-5/8"	4"	23498	55.00	23502	65.00	23506	70.00
5/16"	5/16"	1-1/2"	6"	23508	83.40	23509	97.90	23511	102.90
3/8"	3/8"	1-1/8"	3"	23546	50.00	23550	58.40	23554	60.00
3/8"	3/8"	1-3/4"	4"	23568	66.70	23570	76.70	23572	80.00
3/8"	3/8"	1-1/2"	6"	23574	76.00	23576	87.40	23578	91.77
3/8"	3/8"	2-1/2"	6"	23555	85.00	23556	102.00	23557	107.10
7/16"	7/16"	2"	4"	23594	83.40	23598	96.70	23602	100.00
7/16"	7/16"	3"	6"	23606	113.40	23610	130.00	23614	136.70
1/2"	1/2"	2"	4"	23642	91.70	23646	105.00	23650	113.4
1/2"	1/2"	3"	6"	23654	148.40	23658	165.00	23662	171.70
1/2"	1/2"	1-1/2"	6"	23666	141.70	23670	158.40	23674	165.00
1/2"	1/2"	4"	7"	23678	268.40	23682	290.00	23686	295.00
1/2"	1/2"	4"	8"	23687	350.04	23688	402.54	23689	422.67
5/8"	5/8"	2-1/4"	5"	23726	183.40	23730	200.00	23734	206.70
5/8"	5/8"	3"	6"	23738	233.40	23742	253.40	23746	260.00
5/8"	5/8"	4"	7"	23750	375.00	23754	400.00	23758	406.70
3/4"	3/4"	2-1/4"	5"	23798	223.40	23802	226.70	23806	233.40
3/4"	3/4"	3"	6"	23810	300.00	23814	323.40	23818	330.00
3/4"	3/4"	4"	7"	23819	633.40	23820	665.00	23821	675.00
3/4"	3/4"	5"	8"	23822	728.40	23826	837.67	23830	875.00
1"	1"	2-1/4"	5"	23858	373.40	23862	400.00	23866	408.40
1"	1"	3"	6"	23870	493.40	23874	525.00	23878	536.70
1"	1"	4"	7"	23880	600.00	23882	690.00	23884	724.50

## 3 Flute 30° Helix



Tolerance: Shank Dia: h6 & Cut Dia: h10

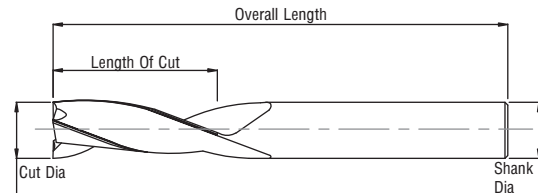
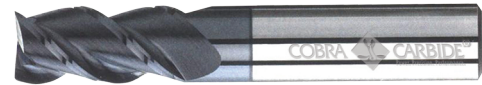
### Features

- Single Center cutting geometry
- Design offers more chip space than four flute & better finish than 2 flute.
- Designed for milling, slotting & profiling.
- Used for roughing & finishing operation.
- Manufactured from premium sub micron grain carbide.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
3/64"	1/8"	1/8"	1-1/2"	27001	\$ 12.50	27003	\$ 15.80
1/16"	1/8"	1/4"	1-1/2"	27004	11.70	27008	15.00
3/32"	1/8"	3/8"	1-1/2"	27012	11.70	27016	15.00
1/8"	1/8"	1/2"	1-1/2"	27020	9.50	27024	12.80
9/64"	3/16"	9/16"	2"	27025	15.20	27027	19.70
5/32"	3/16"	9/16"	2"	27028	15.20	27032	19.70
3/16"	3/16"	5/8"	2"	27036	14.50	27040	18.70
13/64"	1/4"	5/8"	2-1/2"	27041	23.40	27043	28.20
7/32"	1/4"	5/8"	2-1/2"	27044	20.70	27048	28.70
1/4"	1/4"	3/4"	2-1/2"	27052	16.60	27056	24.30
5/16"	5/16"	13/16"	2-1/2"	27060	23.80	27064	34.80
3/8"	3/8"	1"	2-1/2"	27068	30.00	27072	41.00
25/64"	7/16"	1"	2-3/4"	27073	49.80	27075	58.00
7/16"	7/16"	1"	2-3/4"	27076	44.70	27080	58.00
1/2"	1/2"	1"	3"	27084	44.80	27088	58.00
9/16"	9/16"	1-1/8"	3-1/2"	27092	101.70	27096	121.70
5/8"	5/8"	1-1/4"	3-1/2"	27100	99.20	27104	119.20
5/8"	5/8"	2-1/4"	4"	27108	106.70	27112	133.30
11/16"	3/4"	1-1/2"	4"	27113	168.30	27115	190.00
3/4"	3/4"	1-1/2"	4"	27116	148.30	27120	171.70
7/8"	7/8"	1-1/2"	4"	27121	256.70	27123	286.70
1"	1"	1-1/2"	4"	27124	175.00	27128	281.70
1"	1"	2-1/4"	5"	27132	336.70	27136	371.70

## 2 Flute Double End Square



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

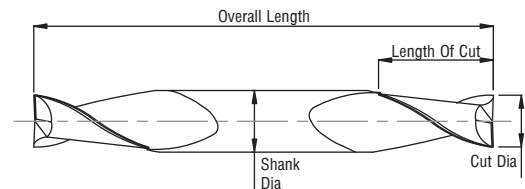
- Center cutting geometry.
- Designed for milling, slotting, profiling & trace milling.
- Used for roughing & finishing operation.
- Made from premium sub micron grain carbide.



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Stub Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/32"	1/8"	5/64"	1-1/2"	28502	\$ 17.70	28505	\$ 21.00	28508	\$ 21.83
3/64"	1/8"	3/32"	1-1/2"	28511	17.70	28514	21.00	28517	21.83
1/16"	1/8"	1/8"	1-1/2"	28520	15.00	28523	18.33	28526	19.20
5/64"	1/8"	5/32"	1-1/2"	28529	17.00	28532	20.33	28535	21.20
3/32"	1/8"	3/16"	1-1/2"	28538	15.00	28541	18.33	28544	19.20
7/64"	1/8"	7/32"	1-1/2"	28547	17.00	28550	20.33	28553	21.20
1/8"	1/8"	1/4"	1-1/2"	28556	14.33	28559	19.70	28562	20.50
9/64"	3/16"	9/32"	2"	28565	19.20	28568	23.33	28571	24.20
5/32"	3/16"	5/16"	2"	28574	23.20	28577	27.33	28580	28.20
11/64"	3/16"	3/8"	2"	28583	24.20	28586	28.33	28589	30.00
3/16"	3/16"	3/8"	2"	28592	19.90	28595	24.00	28598	25.90
7/32"	1/4"	1/2"	2-1/2"	28601	26.33	28604	33.00	28607	34.70
15/64"	1/4"	1/2"	2-1/2"	28608	28.75	28609	37.95	28611	39.95
1/4"	1/4"	1/2"	2-1/2"	28610	30.95	28613	40.33	28616	42.00
9/32"	5/16"	1/2"	2-1/2"	28617	32.50	28618	42.50	28620	45.90
5/16"	5/16"	1/2"	2-1/2"	28619	38.33	28622	48.33	28625	50.00
3/8"	3/8"	1/2"	2-1/2"	28628	44.90	28631	53.88	28634	56.57
7/16"	7/16"	9/16"	2-1/2"	28637	54.20	28640	62.50	28643	65.00
1/2"	1/2"	5/8"	3"	28646	63.33	28649	71.70	28652	75.00



## 2 Flute Double End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

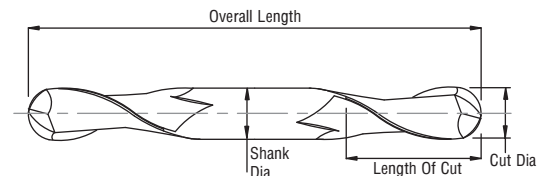
- Center cutting geometry.
- Designed for milling, slotting, profiling & trace milling.
- Used for roughing & finishing operation.
- Made from premium sub micron grain carbide.



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Stub Length

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/32"	1/8"	5/64"	1-1/2"	28702	\$ 25.70	28705	\$ 29.83
3/64"	1/8"	3/32"	1-1/2"	28711	25.70	28714	29.83
1/16"	1/8"	1/8"	1-1/2"	28720	20.00	28723	24.20
5/64"	1/8"	5/32"	1-1/2"	28729	22.50	28732	26.70
3/32"	1/8"	3/16"	1-1/2"	28738	20.00	28741	24.20
7/64"	1/8"	7/32"	1-1/2"	28747	22.50	28750	26.70
1/8"	1/8"	1/4"	1-1/2"	28756	18.33	28759	24.50
9/64"	3/16"	9/32"	2"	28765	24.20	28768	29.20
5/32"	3/16"	5/16"	2"	28774	27.00	28777	32.00
11/64"	3/16"	3/8"	2"	28783	27.50	28786	33.33
3/16"	3/16"	3/8"	2"	28792	24.20	28795	30.00
7/32"	1/4"	1/2"	2-1/2"	28801	31.70	28804	40.00
15/64"	1/4"	1/2"	2-1/2"	28810	30.00	28813	36.70
1/4"	1/4"	1/2"	2-1/2"	28819	36.70	28822	45.00
9/32"	5/16"	1/2"	2-1/2"	28824	36.70	28826	45.00
5/16"	5/16"	1/2"	2-1/2"	28828	48.60	28831	60.00
3/8"	3/8"	1/2"	2-1/2"	28837	53.33	28840	65.00
7/16"	7/16"	9/16"	2-1/2"	28846	65.00	28849	77.50
1/2"	1/2"	5/8"	3"	28855	83.33	28858	95.00

## 4 Flute Double End Square



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

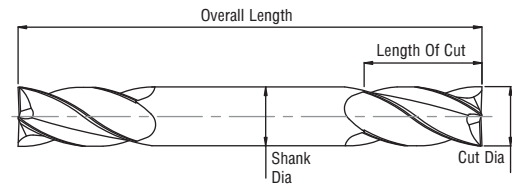
- Center cutting geometry.
- Designed for milling, slotting, profiling & trace milling.
- Used for roughing & finishing operation.
- Made from premium sub micron grain carbide.



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Stub Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1/32"	1/8"	5/64"	1-1/2"	28002	\$ 17.70	28005	\$ 21.00	28008	\$ 21.83
3/64"	1/8"	3/32"	1-1/2"	28011	17.70	28014	21.00	28017	21.83
1/16"	1/8"	1/8"	1-1/2"	28020	15.00	28023	18.33	28026	19.20
5/64"	1/8"	5/32"	1-1/2"	28029	17.00	28032	20.33	28035	21.20
3/32"	1/8"	3/16"	1-1/2"	28038	15.00	28041	18.33	28044	19.20
7/64"	1/8"	7/32"	1-1/2"	28047	17.00	28050	20.33	28053	21.20
1/8"	1/8"	1/4"	1-1/2"	28056	14.33	28059	19.70	28062	20.50
9/64"	3/16"	9/32"	2"	28065	19.20	28068	23.33	28071	24.20
5/32"	3/16"	5/16"	2"	28074	23.20	28077	27.33	28080	28.20
11/64"	3/16"	3/8"	2"	28083	24.20	28086	28.33	28089	30.00
3/16"	3/16"	3/8"	2"	28092	19.90	28095	24.00	28098	25.90
7/32"	1/4"	1/2"	2-1/2"	28101	26.33	28104	33.00	28107	34.70
15/64"	1/4"	1/2"	2-1/2"	28108	28.75	28109	37.95	28111	39.95
1/4"	1/4"	1/2"	2-1/2"	28110	30.95	28113	40.33	28116	42.00
9/32"	5/16"	1/2"	2-1/2"	28117	32.50	28118	42.50	28120	45.90
5/16"	5/16"	1/2"	2-1/2"	28119	38.33	28122	48.33	28125	50.00
3/8"	3/8"	1/2"	2-1/2"	28128	44.90	28131	53.88	28134	56.57
7/16"	7/16"	9/16"	2-1/2"	28137	54.20	28140	62.50	28143	65.00
1/2"	1/2"	5/8"	3"	28146	63.33	28149	71.70	28152	75.00

## 4 Flute Double End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

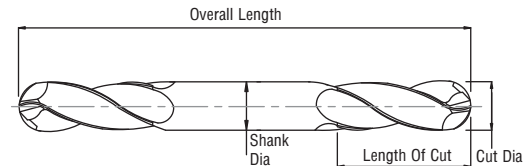
- Center cutting geometry.
- Designed for milling, slotting, profiling & trace milling.
- Used for roughing & finishing operation.
- Made from premium sub micron grain carbide.



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Stub Length

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/32"	1/8"	5/64"	1-1/2"	28202	\$ 25.70	28205	\$ 29.83
3/64"	1/8"	3/32"	1-1/2"	28211	25.70	28214	29.83
1/16"	1/8"	1/8"	1-1/2"	28220	20.00	28223	24.20
5/64"	1/8"	5/32"	1-1/2"	28229	22.50	28232	26.70
3/32"	1/8"	3/16"	1-1/2"	28238	20.00	28241	24.20
7/64"	1/8"	7/32"	1-1/2"	28247	22.50	28250	26.70
1/8"	1/8"	1/4"	1-1/2"	28256	18.33	28259	24.50
9/64"	3/16"	9/32"	2"	28265	24.20	28268	29.20
5/32"	3/16"	5/16"	2"	28274	27.00	28277	32.00
11/64"	3/16"	3/8"	2"	28283	27.50	28286	33.33
3/16"	3/16"	3/8"	2"	28292	24.20	28295	30.00
7/32"	1/4"	1/2"	2-1/2"	28301	31.70	28304	40.00
15/64"	1/4"	1/2"	2-1/2"	28307	30.00	28309	36.70
1/4"	1/4"	1/2"	2-1/2"	28310	36.70	28313	45.00
9/32"	5/16"	1/2"	2-1/2"	28316	36.70	28317	45.00
5/16"	5/16"	1/2"	2-1/2"	28319	48.60	28322	60.00
3/8"	3/8"	1/2"	2-1/2"	28328	53.33	28331	65.00
7/16"	7/16"	9/16"	2-1/2"	28337	65.00	28340	77.50
1/2"	1/2"	5/8"	3"	28346	83.33	28349	95.00

## Square & Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

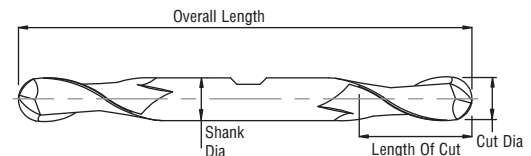
### Features

- Center cutting geometry.
- Designed for milling, slotting, profiling & trace milling.
- Used for roughing & finishing operation.
- Made from premium sub micron grain carbide.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



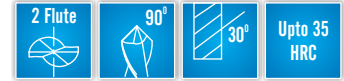
## 2 Flute - Uncoated

Description				Square End		Ball End	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/8"	3/8"	3/8"	3-1/16"	28904	\$ 58.40	28908	\$ 70.00
5/32"	3/8"	7/16"	3-1/8"	28912	60.00	28916	73.40
3/16"	3/8"	1/2"	3-1/4"	28920	60.00	28924	73.40
7/32"	3/8"	9/16"	3-3/8"	28928	66.70	28932	80.00
1/4"	3/8"	5/8"	3-3/8"	28936	66.70	28940	80.00
9/32"	3/8"	11/16"	3-3/8"	28944	73.40	28948	90.00
5/16"	3/8"	3/4"	3-1/2"	28952	83.40	28956	100.00
11/32"	3/8"	3/4"	3-1/2"	28960	86.70	28964	106.70
3/8"	3/8"	3/4"	3-1/2"	28968	89.45	28972	110.00
7/16"	1/2"	7/8"	4"	28976	120.00	28980	143.40
1/2"	1/2"	1"	4"	28984	126.70	28988	153.40

## 4 Flute - Uncoated

Description				Square End		Ball End	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/8"	3/8"	3/8"	3-1/16"	28404	\$ 58.40	28408	\$ 70.00
5/32"	3/8"	7/16"	3-1/8"	28412	60.00	28416	73.40
3/16"	3/8"	1/2"	3-1/4"	28420	60.00	28424	73.40
7/32"	3/8"	9/16"	3-3/8"	28428	66.70	28432	80.00
1/4"	3/8"	5/8"	3-3/8"	28436	66.70	28440	80.00
9/32"	3/8"	11/16"	3-3/8"	28444	73.40	28448	90.00
5/16"	3/8"	3/4"	3-1/2"	28452	83.40	28456	100.00
11/32"	3/8"	3/4"	3-1/2"	28460	86.70	28464	106.70
3/8"	3/8"	3/4"	3-1/2"	28468	89.45	28472	110.00
7/16"	1/2"	7/8"	4"	28476	120.00	28480	143.40
1/2"	1/2"	1"	4"	28484	126.70	28488	153.40

## Regular Length



Tolerance: Shank Dia: h6 & Cut Dia: h10

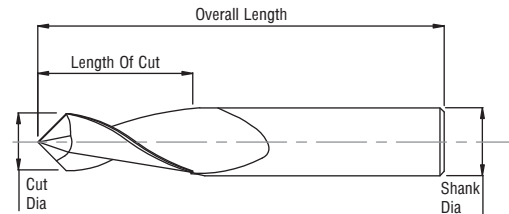
### Features

- Manufactured from premium sub micro grain carbide.
- Can be used for drilling, slotting, chamfering and profile milling.
- Available In 82°point angle also.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●		●				●	

● Excellent    ● Good



## 2 Flute - 90° Drill Point

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/16"	1/8"	3/16"	1-1/2"	15400	\$ 18.80	15404	\$ 23.30
3/32"	1/8"	3/8"	1-1/2"	15406	18.80	15410	23.30
1/8"	1/8"	1/2"	1-1/2"	15412	17.50	15416	22.00
3/16"	3/16"	5/8"	2"	15418	25.00	15422	30.50
1/4"	1/4"	3/4"	2-1/2"	15424	32.20	15428	42.20
5/16"	5/16"	13/16"	2-1/2"	15430	40.70	15434	54.80
3/8"	3/8"	1"	2-1/2"	15436	50.50	15440	64.80
7/16"	7/16"	1"	2-3/4"	15442	69.00	15446	86.50
1/2"	1/2"	1"	3"	15448	83.80	15452	101.30
5/8"	5/8"	1-1/4"	3-1/2"	15454	161.70	15458	184.70
3/4"	3/4"	1-1/2"	4"	15460	238.30	15464	267.70

## 4 Flute - 90° Drill Point

Description				Uncoated		TiAlN Coated	
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	EDP #	List Price
1/16"	1/8"	3/16"	1-1/2"	15466	\$ 18.80	15470	\$ 23.30
3/32"	1/8"	3/8"	1-1/2"	15472	18.80	15476	23.30
1/8"	1/8"	1/2"	1-1/2"	15478	17.50	15482	22.00
3/16"	3/16"	5/8"	2"	15484	25.00	15488	30.50
1/4"	1/4"	3/4"	2-1/2"	15490	32.20	15494	42.20
5/16"	5/16"	13/16"	2-1/2"	15496	40.70	15500	54.80
3/8"	3/8"	1"	2-1/2"	15502	50.50	15506	64.80
7/16"	7/16"	1"	2-3/4"	15508	69.00	15512	86.50
1/2"	1/2"	1"	3"	15514	83.80	15518	101.30
5/8"	5/8"	1-1/4"	3-1/2"	15520	161.70	15524	184.70
3/4"	3/4"	1-1/2"	4"	15526	238.30	15530	267.70



## 2 & 4 Flute



Tolerance: Shank Dia: h6 & Cut Dia: h10

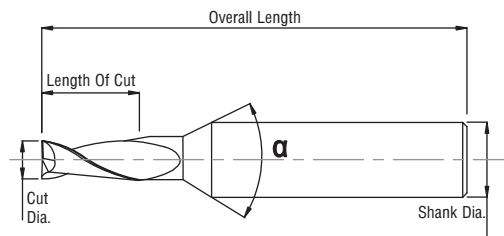
### Features

- Manufactured from premium sub micro grain carbide.
- General purpose milling in most materials of medium hardness such as steel, brass, iron etc....
- Shank Diameter 1/8"

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●		●	●	●	

● Excellent    ● Good



## Square & Ball End

Description			Square End			Ball Nose		
Cut Dia	Metric Dia	Length Of Cut	2 Flute EDP #	4 Flute EDP #	List Price	2 Flute EDP #	4 Flute EDP #	List Price
0.005	-	0.015	26005	26009	\$ 53.40	26400	26600	\$ 66.80
0.006	0.15	0.018	26013	26011	53.40	26404	26604	66.80
0.007	-	0.012	26021	26025	53.40	26408	26608	66.80
0.008	0.20	0.024	26029	26033	53.40	26412	26612	66.80
0.009	-	0.027	26037	26039	47.90	26416	26616	59.80
0.010	0.25	0.030	26045	26049	47.90	26420	26620	59.80
0.011	-	0.033	26053	26057	42.80	26424	26624	53.50
0.012	0.30	0.036	26061	26065	42.80	26428	26628	53.50
0.013	-	0.039	26069	26073	35.40	26432	26632	44.30
0.014	0.35	0.042	26077	26081	35.40	26436	26636	44.30
0.015	-	0.045	26085	26089	22.00	26440	26640	27.50
0.016	0.40	0.048	26093	26097	22.00	26444	26644	27.50
0.017	-	0.051	26101	26105	22.00	26448	26648	27.50
0.018	-	0.054	26109	26113	22.00	26452	26652	27.50
0.019	-	0.057	26117	26121	22.00	26456	26656	27.50
0.020	0.50	0.060	26125	26129	20.00	26460	26660	25.00
0.021	-	0.063	26133	26137	20.00	26464	26664	25.00
0.022	-	0.066	26141	26145	20.00	26468	26668	25.00
0.023	-	0.069	26149	26154	20.00	26472	26672	25.00
0.024	0.60	0.072	26157	26161	20.00	26476	26676	25.00
0.025	-	0.075	26165	26169	20.00	26480	26680	25.00
0.026	-	0.078	26173	26177	18.80	26484	26684	23.50
0.027	-	0.081	26181	26185	18.80	26488	26688	23.50
0.028	-	0.084	26189	26193	18.80	26492	26692	23.50
0.029	-	0.087	26197	26201	18.80	26496	26696	23.50
0.030	-	0.090	26205	26209	18.80	26500	26700	23.50
0.035	0.90	0.105	26213	26217	18.80	26504	26704	22.00

Continued...

## 2 & 4 Flute



Tolerance: Shank Dia: h6 & Cut Dia: h10

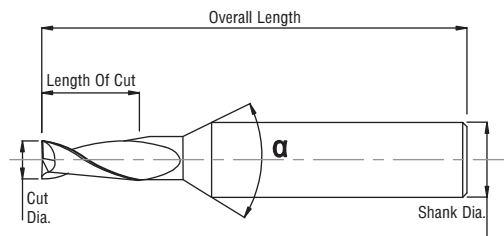
### Features

- Manufactured from premium sub micro grain carbide.
- General purpose milling in most materials of medium hardness such as steel, brass, iron etc....
- Shank Diameter 1/8"

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●		●	●	●	

● Excellent    ● Good



## Square & Ball End

Description			Square End			Ball Nose		
Cut Dia	Metric Dia	Length Of Cut	2 Flute EDP #	4 Flute EDP #	List Price	2 Flute EDP #	4 Flute EDP #	List Price
0.040	-	0.120	26221	26225	\$ 18.80	26508	26708	\$ 22.00
0.045	1.15	0.135	26229	26233	17.20	26512	26712	21.50
0.050	-	0.150	26237	26241	17.20	26516	26716	21.50
0.055	1.40	0.165	26245	26249	17.20	26520	26720	21.50
0.060	-	0.180	26253	26257	17.20	26524	26724	21.50
0.065	1.65	0.195	26261	26265	17.20	26528	26728	21.50
0.070	-	0.210	26269	26273	17.20	26532	26732	21.50
0.075	1.90	0.225	26277	26281	17.20	26536	26736	21.50
0.080	2.05	0.240	26285	26289	17.20	26540	26740	21.50
0.085	2.15	0.255	26293	26297	17.20	26544	26744	21.50
0.090	2.30	0.270	26301	26305	17.20	26548	26748	21.50
0.095	2.40	0.285	26309	26313	17.20	26552	26752	21.50
0.100	2.55	0.300	26317	26321	17.20	26556	26756	21.50
0.105	-	0.315	26325	26329	17.20	26560	26760	21.50
0.110	2.80	0.330	26333	26337	17.20	26564	26764	21.50
0.115	-	0.345	26341	26345	17.20	26568	26768	21.50
0.120		0.360	26349	26353	17.20	26572	26772	21.50

## 2 Flute Square Single End



Tolerance: Shank Dia: h6 & Cutting Dia: h10

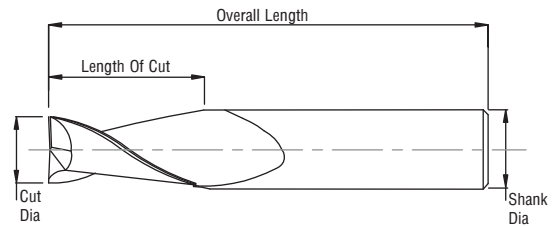
### Features

- Center cutting geometry.
- Design for increased chip removal rate.
- Capable to do slotting, profiling & plunging operations.
- Used for semi-finishing operation.
- Manufactured from premium sub micron grain carbide.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1.0	3	4	38	24000	\$ 13.00	24002	\$ 15.70	24004	\$ 16.30
1.5	3	4.5	38	24008	13.00	24010	15.70	24012	16.30
2.0	3	6.3	38	24016	10.20	24018	12.80	24020	13.50
2.5	3	9.5	38	24024	10.20	24026	12.80	24028	13.50
3.0	3	12	38	24032	10.20	24034	12.80	24036	13.50
3.5	4	12	50	24056	13.80	24058	17.20	24060	18.00
4.0	4	14	50	24064	15.96	24062	19.15	24068	20.10
4.5	6	16	50	24088	16.75	24090	20.12	24092	21.12
5.0	6	16	50	24096	17.59	24098	21.11	24100	22.16
5.5	6	19	50	24099	23.55	24101	29.44	24102	31.72
6.0	6	19	50	24120	20.25	24122	25.20	24124	26.80
7.0	8	20	63	24144	24.50	24146	32.00	24148	26.20
8.0	8	20	63	24152	24.80	24154	32.30	24156	36.50
9.0	10	22	75	24176	34.20	24178	42.50	24180	45.80
10.0	10	22	75	24184	42.50	24186	51.00	24188	53.55
11.0	12	25	75	24208	45.70	24210	55.70	24212	59.00
12.0	12	25	75	24216	50.27	24218	60.32	24220	63.34
13.0	14	32	89	24240	68.30	24242	81.70	24244	86.70
14.0	14	32	89	24248	102.95	24250	115.90	24252	121.85
16.0	16	32	89	24272	104.20	24274	117.50	24276	124.20
18.0	18	38	100	24296	147.50	24298	164.20	24300	167.50
20.0	20	38	100	24320	158.30	24322	175.00	24324	181.70
22.0	22	38	100	24344	241.70	24346	261.70	24348	263.30
25.0	25	38	100	24352	260.00	24354	283.30	24356	293.30

## 2 Flute Square Single End



Tolerance: Shank Dia: h6 &amp; Cutting Dia: h10

## Long and Extra Long

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
3.0	3	19	57	24040	\$ 20.00	24042	\$ 22.50	24044	\$ 24.85
3.0	3	25	75	24048	21.50	24050	24.80	24052	25.70
3.0	3	25	100	24069	32.70	24071	36.80	24072	37.70
4.0	4	20	50	24219	23.00	24221	24.25	24223	25.20
4.0	4	25	75	24080	25.80	24082	30.00	24084	30.80
4.0	4	25	100	24073	33.70	24074	38.25	24075	40.50
4.0	4	50	100	24076	41.30	24077	46.30	24078	47.20
5.0	5	25	63	24104	24.50	24106	26.00	24108	28.00
5.0	5	25	75	24112	27.25	24114	30.25	24116	34.85
5.0	5	30	100	24079	35.30	24097	41.50	24081	43.70
6.0	6	25	75	24128	29.50	24130	35.30	24132	40.25
6.0	6	30	100	24382	39.80	24383	46.50	24384	49.25
6.0	6	38	150	24385	65.00	24386	69.95	24387	75.30
8.0	8	25	75	24168	41.50	24170	49.80	24172	51.50
8.0	8	40	100	24388	49.70	24389	59.70	24390	63.00
8.0	8	40	150	24391	56.80	24392	68.75	24393	75.85
10.0	10	30	75	24192	46.00	24194	49.00	24196	54.00
10.0	10	40	100	24200	57.50	24202	67.50	24204	72.81
10.0	10	75	150	24394	66.30	24395	79.70	24396	85.70
12.0	12	50	100	24232	87.30	24226	100.70	24228	104.00
12.0	12	75	150	24236	129.80	24238	146.50	24241	153.20
14.0	14	50	125	24258	165.80	24260	182.50	24262	189.20
14.0	14	75	150	24264	180.80	24266	197.50	24268	204.20
16.0	16	50	125	24269	175.00	24270	191.70	24271	198.30
16.0	16	75	150	24288	208.30	24290	228.30	24292	235.00
18.0	18	50	125	24304	179.20	24306	188.50	24308	196.70
18.0	18	75	150	24312	248.30	24314	273.30	24316	278.30
20.0	20	50	125	24328	203.30	24330	217.75	24332	223.30
20.0	20	75	150	24336	281.70	24338	308.30	24340	308.30
25.0	25	50	125	24360	406.70	24362	421.50	24364	431.70
25.0	25	75	150	24368	458.30	24370	491.70	24372	500.00

## 4 Flute Square Single End



Tolerance: Shank Dia: h6 & Cut Dia: h10

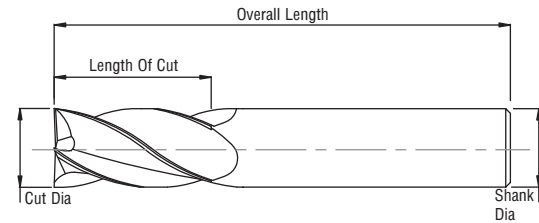
### Features

- Center cutting geometry.
- Design for increased chip removal rate.
- Capable to do slotting, profiling & plunging operations.
- Used for finishing operation.
- Manufactured from premium sub micron grain carbide.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1.0	3	4	38	24400	\$ 13.00	24402	\$ 15.70	24404	\$ 16.30
1.5	3	4.5	38	24408	13.00	24410	15.70	24412	16.30
2.0	3	6.3	38	24416	10.20	24418	12.80	24420	13.50
2.5	3	9.5	38	24424	10.20	24426	12.80	24428	13.50
3.0	3	12	38	24432	10.20	24434	12.80	24436	13.50
3.5	4	12	50	24456	13.80	24458	17.20	24460	18.00
4.0	4	14	50	24464	15.96	24466	19.15	24468	20.10
4.5	6	16	50	24488	16.75	24490	20.12	24492	21.12
5.0	6	16	50	24496	17.59	24498	21.11	24500	22.16
5.5	6	19	50	24517	23.55	24519	29.44	24518	31.72
6.0	6	19	50	24520	20.25	24522	25.20	24524	26.80
7.0	8	20	63	24544	24.50	24546	32.00	24548	36.20
8.0	8	20	63	24552	24.80	24554	32.30	24556	36.50
9.0	10	22	75	24576	34.20	24578	42.50	24580	45.80
10.0	10	22	75	24584	42.50	24586	51.00	24588	53.55
11.0	12	25	75	24608	45.70	24610	55.70	24612	59.00
12.0	12	25	75	24616	50.27	24618	60.32	24620	63.34
13.0	14	32	89	24640	68.30	24642	81.70	24644	86.70
14.0	14	32	89	24648	102.95	24650	115.90	24652	121.85
16.0	16	32	89	24672	104.20	24674	117.50	24676	124.20
18.0	18	38	100	24696	147.50	24698	164.20	24700	167.50
20.0	20	38	100	24720	158.30	24722	175.00	24724	181.70
22.0	22	38	100	24744	241.70	24746	261.70	24748	263.30
25.0	25	38	100	24752	260.00	24754	283.30	24756	293.30



### 4 Flute Square Single End



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Long and Extra Long

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
3.0	3	19	57	24440	\$ 20.00	24442	\$ 21.30	24444	\$ 32.50
3.0	3	25	75	24448	21.50	24450	24.80	24452	25.70
3.0	3	25	100	24780	32.70	24782	36.80	24784	37.70
4.0	4	20	50	24472	23.00	24474	24.25	24476	25.20
4.0	4	25	75	24480	25.80	24482	30.00	24484	30.80
4.0	4	25	100	24786	33.70	24788	38.25	24790	40.50
4.0	4	50	100	24792	41.30	24794	46.30	24796	47.20
5.0	5	25	63	24104	24.50	24106	26.00	24108	28.00
5.0	5	25	75	24512	27.25	24514	30.25	24516	34.85
5.0	5	30	100	24798	35.30	24800	41.50	24802	43.70
6.0	6	25	75	24536	29.50	24538	35.30	24540	40.25
6.0	6	30	100	24804	39.80	24806	46.50	24808	49.25
6.0	6	38	150	24810	65.00	24812	69.95	24814	75.30
8.0	8	25	75	24168	41.50	24170	49.80	24172	51.50
8.0	8	40	100	24816	49.70	24818	59.70	24820	63.00
8.0	8	40	150	24822	56.80	24824	68.75	24826	75.85
10.0	10	30	75	24192	46.00	24194	49.00	24196	54.00
10.0	10	40	100	24600	57.50	24602	67.50	24604	72.81
10.0	10	75	150	24828	66.30	24830	79.70	24832	85.70
12.0	12	50	100	24624	87.30	24626	100.70	24628	104.00
12.0	12	75	150	24834	129.80	24836	146.50	24838	153.20
14.0	14	50	125	24654	165.80	24656	182.50	24658	189.20
14.0	14	75	150	24664	180.80	24666	197.50	24668	204.20
16.0	16	50	125	24680	175.00	24682	191.70	24684	198.30
16.0	16	75	150	24688	208.30	24690	228.30	24692	235.00
18.0	18	50	125	24304	179.20	24306	188.50	24308	196.70
18.0	18	75	150	24712	248.30	24714	273.30	24716	278.30
20.0	20	50	125	24728	203.30	24730	217.75	24732	223.30
20.0	20	75	150	24736	281.70	24738	308.30	24740	308.30
25.0	25	50	125	24760	406.70	24762	421.50	24764	431.70
25.0	25	75	150	24768	458.30	24770	491.70	24772	500.00

## 2 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

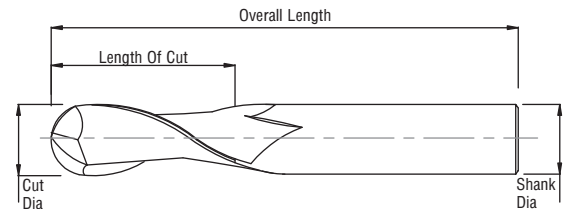
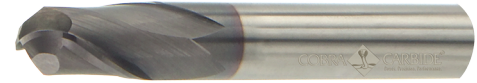
### Features

- Center cutting geometry.
- Design for increased chip removal rate.
- Designed for slotting, profiling & plunging operations.
- Used for semi-finishing operation.
- Manufactured from premium sub micron grain carbide.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1.0	3	4	38	25001	\$ 21.70	25003	\$ 24.30	25005	\$ 25.00
1.5	3	4.5	38	25009	21.70	25011	24.30	25013	25.00
2.0	3	6.3	38	25017	16.70	25019	19.30	25021	20.00
2.5	3	9.5	38	25025	16.70	25027	19.30	25029	20.00
3.0	3	12	38	25033	15.80	25035	18.50	25037	19.20
3.5	4	12	50	25057	23.30	25059	26.70	25061	27.50
4.0	4	14	50	25065	23.30	25067	26.70	25069	27.50
4.5	6	16	50	25089	24.20	25091	30.00	25093	31.70
5.0	6	16	50	25097	24.50	25099	30.30	25101	32.00
6.0	6	19	50	25121	25.50	25123	31.30	25125	33.00
7.0	8	20	63	25145	32.80	25147	40.30	25149	44.50
8.0	8	20	63	25153	32.80	25155	40.30	25157	44.50
9.0	10	22	75	25177	39.30	25179	47.70	25181	51.00
10.0	10	22	75	25185	39.20	25187	47.50	25189	51.00
11.0	12	25	75	25209	55.00	25211	65.00	25213	68.30
12.0	12	25	75	25217	65.00	25219	75.00	25221	80.00
13.0	14	32	89	25241	75.70	25243	89.00	25245	92.30
14.0	14	32	89	25249	114.75	25251	128.95	25253	134.80
16.0	16	32	89	25273	116.70	25275	130.00	25277	136.70
18.0	18	38	100	25297	148.30	25299	165.00	25301	171.70
20.0	20	38	100	25321	170.00	25323	190.00	25325	193.30
22.0	22	38	100	25345	243.30	25347	263.30	25349	270.00
25.0	25	38	100	25353	438.30	25355	461.70	25357	471.70

### 2 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Long and Extra Long Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
3.0	3	19	57	25041	24.00	25043	\$ 27.95	25045	\$ 30.25
3.0	3	25	75	25049	35.40	25051	38.70	25053	39.50
3.0	3	25	100	25054	40.80	25055	45.00	25056	45.80
4.0	4	20	50	25074	23.80	25076	27.20	25078	28.00
4.0	4	25	75	25081	36.20	25083	40.30	25085	41.20
4.0	4	25	100	25086	42.50	25087	47.50	25088	48.30
5.0	5	25	63	25105	36.00	25107	41.80	25109	42.70
5.0	5	25	75	25111	39.20	25113	45.00	25115	45.80
5.0	5	30	100	25116	45.75	25118	53.85	25120	57.50
6.0	6	25	75	25129	40.00	25131	45.80	25133	46.70
6.0	6	30	100	25134	46.70	25135	53.30	25136	55.00
6.0	6	38	150	25137	66.50	25138	74.80	25139	78.20
8.0	8	25	75	25161	53.30	25163	61.70	25165	63.30
8.0	8	40	100	25166	61.70	25167	71.70	25168	75.00
8.0	8	40	150	25169	81.70	25170	95.00	25171	98.30
10.0	10	30	75	25190	61.70	25191	70.00	25192	73.50
10.0	10	40	100	25193	78.30	25195	88.30	25197	91.70
10.0	10	75	150	25198	86.70	25199	100.00	25200	105.00
12.0	12	50	100	25225	96.70	25227	110.00	25229	113.30
12.0	12	75	150	25230	151.70	25231	168.30	25232	175.00
14.0	14	50	125	25254	160.00	25255	176.70	25259	183.30
14.0	14	75	150	25265	188.30	25257	205.00	25269	211.70
16.0	16	50	125	25283	211.70	25285	228.30	25287	235.00
16.0	16	75	150	25289	216.70	25291	236.70	25293	243.30
18.0	18	50	125	25303	263.30	25305	286.70	25307	291.70
18.0	18	75	150	25313	295.00	25315	320.00	25317	325.00
20.0	20	50	125	25327	350.00	25329	375.00	25331	381.00
20.0	20	75	150	25337	383.30	25339	410.00	25341	417.00
25.0	25	50	125	25363	516.70	25365	548.30	25367	556.70
25.0	25	75	150	25369	560.00	25371	593.30	25373	601.70

## 4 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Features

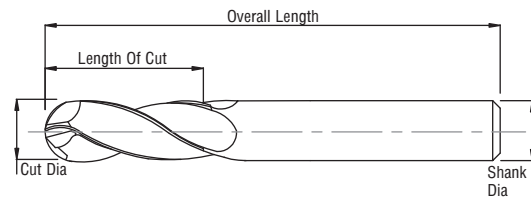
- Center cutting geometry.
- Designed for milling, slotting, profiling & trace milling.
- Used for finishing operation.
- Manufactured from premium sub micron grain carbide.



### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
1.0	3	4	38	25402	\$ 21.70	25404	\$ 24.30	25406	\$ 25.00
1.5	3	4.5	38	25410	21.70	25412	24.30	25414	25.00
2.0	3	6.3	38	25418	16.70	25420	19.30	25422	20.00
2.5	3	9.5	38	25426	16.70	25428	19.30	25430	20.00
3.0	3	12	38	25434	15.80	25436	18.50	25438	19.20
3.5	4	12	50	25458	23.30	25460	26.70	25462	27.50
4.0	4	14	50	25466	23.30	25468	26.70	25470	27.50
4.5	6	16	50	25490	24.20	25492	30.00	25494	31.70
5.0	6	16	50	25498	24.50	25500	30.30	25502	32.00
6.0	6	19	50	25522	25.50	25524	31.30	25526	33.00
7.0	8	20	63	25546	32.80	25548	40.30	25550	44.50
8.0	8	20	63	25554	32.80	25556	40.30	25558	44.50
9.0	10	22	75	25578	39.30	25580	47.70	25582	51.00
10.0	10	22	75	25586	39.20	25588	47.50	25590	51.00
11.0	12	25	75	25610	55.00	25612	65.00	25614	68.30
12.0	12	25	75	25618	65.00	25620	75.00	25622	80.00
13.0	14	32	89	25658	75.70	25644	89.00	25646	92.30
14.0	14	32	89	25650	114.75	25652	128.95	25654	134.80
16.0	16	32	89	25674	116.70	25676	130.00	25678	136.70
18.0	18	38	100	25698	148.30	25700	165.00	25702	171.70
20.0	20	38	100	25722	170.00	25724	190.00	25726	193.30
22.0	22	38	100	25746	243.30	25748	263.30	25750	270.00
25.0	25	38	100	25754	438.30	25756	461.70	25758	471.70

### 4 Flute Single End Ball Nose



Tolerance: Shank Dia: h6 & Cut Dia: h10

### Long and Extra Long Length

Description				Uncoated		Coated			
Cut Dia	Shank Dia	Length Of Cut	Overall Length	EDP #	List Price	TiN EDP #	List Price	TiAlN EDP #	List Price
3.0	3	19	57	25442	24.00	25444	\$ 27.95	25446	\$ 30.25
3.0	3	25	75	25450	35.40	25452	38.70	25454	39.50
3.0	3	25	100	25455	40.80	25456	45.00	25457	45.80
4.0	4	20	50	25474	23.80	25476	27.20	25478	28.00
4.0	4	25	75	25482	36.20	25484	40.30	25486	41.20
4.0	4	25	100	25487	42.50	25488	47.50	25489	48.30
5.0	5	25	63	25503	36.00	25504	41.80	25505	42.70
5.0	5	25	75	25506	39.20	25508	45.00	25510	45.80
5.0	5	30	100	25512	45.75	25514	53.85	25516	57.50
6.0	6	25	75	25530	40.00	25532	45.80	25534	46.70
6.0	6	30	100	25535	46.70	25536	53.30	25537	55.00
6.0	6	38	150	25538	66.50	25539	74.80	25540	78.20
8.0	8	25	75	25562	53.30	25564	61.70	25566	63.30
8.0	8	40	100	25567	61.70	25568	71.70	25570	75.00
8.0	8	40	150	25572	81.70	25574	95.00	25576	98.30
10.0	10	30	75	25591	61.70	25592	70.00	25593	73.50
10.0	10	40	100	25594	78.30	25596	88.30	25598	91.70
10.0	10	75	150	25600	86.70	25602	100.00	25604	105.00
12.0	12	50	100	25626	96.70	25628	110.00	25630	113.30
12.0	12	75	150	25632	151.70	25634	168.30	25636	175.00
14.0	14	50	125	25656	160.00	25642	176.70	25660	183.30
14.0	14	75	150	25666	188.30	25668	205.00	25708	211.70
16.0	16	50	125	25684	211.70	25686	228.30	25688	235.00
16.0	16	75	150	25690	216.70	25692	236.70	25694	243.30
18.0	18	50	125	25704	263.30	25706	286.70	25670	291.70
18.0	18	75	150	25714	295.00	25716	320.00	25718	325.00
20.0	20	50	125	25728	350.00	25730	375.00	25732	381.00
20.0	20	75	150	25738	383.30	25740	410.00	25742	417.00
25.0	25	50	125	25760	516.70	25762	548.30	25764	556.70
25.0	25	75	150	25770	560.00	25776	593.30	25774	601.70



## 2 Flute Corner Radius



Tolerance: Shank Dia: h6 & Cut Dia: h10

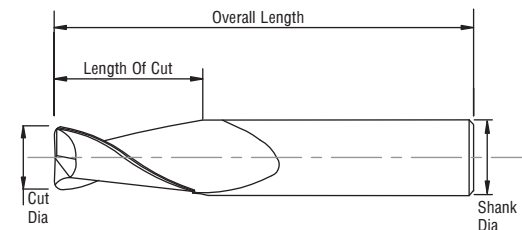
### Features

- Made from premium sub micro grain carbide.
- Corner Radius gives more strength
- Used where a radius is permissible
- Center cutting geometry - Design for slotting & profiling
- Used for roughing & finishing operation

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length - Uncoated

Description				Corner Radius EDP #							List Price
Cut Dia	Shank Dia	Length Of Cut	Overall Length	0.015	0.020	0.030	0.045	0.060	0.090	0.125	
1/8"	1/8"	1/2"	1-1/2"	19004	19012	19020	19028	19036	-----	-----	\$ 17.50
3/16"	3/16"	5/8"	2"	19044	19052	19060	19068	19076	-----	-----	24.50
1/4"	1/4"	3/4"	2 - 1/2"	19084	19092	19100	19108	19116	-----	-----	31.00
5/16"	5/16"	13/16"	2 - 1/2"	19124	19132	19140	19148	19156	-----	-----	36.40
3/8"	3/8"	1"	2 - 1/2"	19164	19172	19180	19188	19196	-----	-----	45.50
1/2"	1/2"	1"	3"	19204	19212	19220	19228	19236	-----	-----	79.50
5/8"	5/8"	1- 1/4"	3 - 1/2"	19244	19252	19260	19268	19276	-----	-----	145.00
3/4"	3/4"	1- 1/2"	4"	-----	19292	19300	19308	19316	19324	19332	214.20
1"	1"	1- 1/2"	4"	-----	19340	19348	19356	19364	19372	19380	376.70

## Regular Length - AlTiN Coated

Description				Corner Radius EDP #							List Price
Cut Dia	Shank Dia	Length Of Cut	Overall Length	0.015	0.020	0.030	0.045	0.060	0.090	0.125	
1/8"	1/8"	1/2"	1-1/2"	19008	19016	19024	19032	19040	-----	-----	\$ 21.20
3/16"	3/16"	5/8"	2"	19048	19056	19064	19072	19080	-----	-----	29.40
1/4"	1/4"	3/4"	2 - 1/2"	19088	19096	19104	19112	19120	-----	-----	37.40
5/16"	5/16"	13/16"	2 - 1/2"	19128	19136	19144	19152	19160	-----	-----	43.70
3/8"	3/8"	1"	2 - 1/2"	19168	19176	19184	19192	19200	-----	-----	54.70
1/2"	1/2"	1"	3"	19208	19216	19224	19232	19240	-----	-----	95.00
5/8"	5/8"	1- 1/4"	3 - 1/2"	19248	19256	19264	19272	19280	-----	-----	174.20
3/4"	3/4"	1- 1/2"	4"	-----	19296	19304	19312	19320	19328	19336	246.20
1"	1"	1- 1/2"	4"	-----	19344	19352	19360	19368	19376	19384	421.70

## 4 Flute Corner Radius



Tolerance: Shank Dia: h6 & Cut Dia: h10

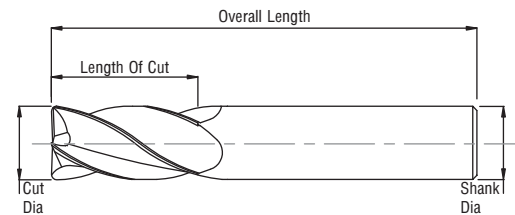
### Features

- Made from premium sub micro grain carbide.
- Corner radius gives more strength.
- Used where a radius is permissible.
- Center cutting geometry. - Designed for slotting & profiling.
- Used for roughing & finishing operation.

### Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	◐		◐	●	

● Excellent ◐ Good



## Regular Length - Uncoated

Description				Corner Radius EDP #							List Price
Cut Dia	Shank Dia	Length Of Cut	Overall Length	0.015	0.020	0.030	0.045	0.060	0.090	0.125	
1/8"	1/8"	1/2"	1-1/2"	19400	19408	19416	19424	19432	-----	-----	\$ 17.50
3/16"	3/16"	5/8"	2"	19440	19448	19456	19464	19472	-----	-----	24.50
1/4"	1/4"	3/4"	2 - 1/2"	19480	19488	19496	19504	19512	-----	-----	31.00
5/16"	5/16"	13/16"	2 - 1/2"	19520	19528	19536	19544	19552	-----	-----	36.40
3/8"	3/8"	1"	2 - 1/2"	19560	19568	19576	19584	19592	-----	-----	45.50
1/2"	1/2"	1"	3"	19600	19608	19616	19624	19632	-----	-----	79.50
5/8"	5/8"	1- 1/4"	3 - 1/2"	19640	19648	19656	19664	19672	-----	-----	145.00
3/4"	3/4"	1- 1/2"	4"	-----	19688	19696	19704	19712	19720	19728	214.20
1"	1"	1- 1/2"	4"	-----	19736	19744	19752	19760	19768	19776	376.70

## Regular Length - AlTiN Coated

Description				Corner Radius EDP #							List Price
Cut Dia	Shank Dia	Length Of Cut	Overall Length	0.015	0.020	0.030	0.045	0.060	0.090	0.125	
1/8"	1/8"	1/2"	1-1/2"	19404	19412	19420	19428	19436	-----	-----	\$ 21.20
3/16"	3/16"	5/8"	2"	19444	19452	19460	19468	19476	-----	-----	29.40
1/4"	1/4"	3/4"	2 - 1/2"	19484	19492	19500	19508	19516	-----	-----	37.40
5/16"	5/16"	13/16"	2 - 1/2"	19524	19532	19540	19548	19556	-----	-----	43.70
3/8"	3/8"	1"	2 - 1/2"	19564	19572	19580	19588	19596	-----	-----	54.70
1/2"	1/2"	1"	3"	19604	19612	19620	19628	19636	-----	-----	95.00
5/8"	5/8"	1- 1/4"	3 - 1/2"	19644	19652	19660	19668	19676	-----	-----	174.20
3/4"	3/4"	1- 1/2"	4"	-----	19692	19700	19708	19716	19724	19732	246.20
1"	1"	1- 1/2"	4"	-----	19740	19748	19756	19764	19772	19780	421.70

New

## Rougher Sets - TiAlN Coated

## Features

- Manufactured from premium sub micron grain carbide.
- Form relieved on high strength carbide for excellent profile milling
- A Free cutting roughing end mill which will produce a smooth finish
- Small corner radius / chamfer for strength

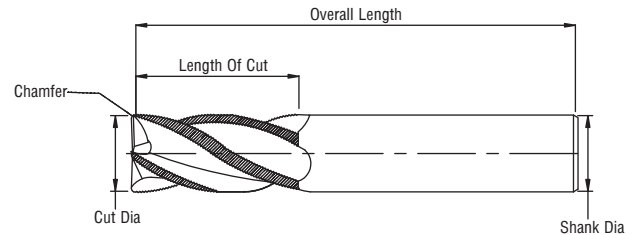
List Price  
\$249<sup>50</sup>

## Regular Length

Description			
Cut Dia	Shank Dia	Length Of Cut	Overall Length
1/4"	1/4"	1/2"	2-1/2"
5/16"	5/16"	5/8"	2-1/2"
3/8"	3/8"	7/8"	3"
1/2"	1/2"	1"	3"



Tolerance: Shank Dia: h6 &amp; Cut Dia: h10



## Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●		●	●	●	●	●	

● Excellent

● Good

New

SUPER

VIPER

## Double Variable Helix Sets

## Features

- Manufactured from premium sub micron grain carbide.
- Double uneven spiral / helix End mill possesses a 28°- 39°-35°-39° spiral / helix angle.
- Uneven spiral angle for high rigidity.
- Effectively suppresses the regenerative effect.
- Increased stability during cutting operation.
- Small corner radius for added strength to cutting edges and smoother cutting operation.
- AlTiN coating for improved tool life and increased productivity.

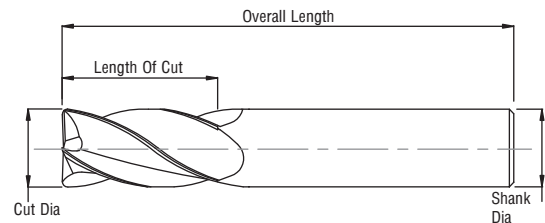
List Price  
\$298<sup>95</sup>

Regular Length  
AlTiN Coated

Description			
Cut Dia	Shank Dia	Length Of Cut	Overall Length
1/4"	1/4"	1"	2-1/2"
5/16"	5/16"	13/16"	2-1/2"
3/8"	3/8"	1"	2-1/2"
1/2"	1/2"	1"	3"



Tolerance: Shank Dia: h6 &amp; Cut Dia: h10



## Work Material

Aluminum Alloy	Carbon Steel	Alloy Steel	Hardened Steel	Nickel / Inconel Alloy	Stainless Steel	Cast Iron	Titanium
●	●	●	●		●	●	

● Excellent

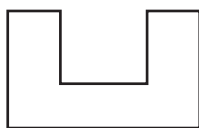
● Good

## Speeds & Feeds

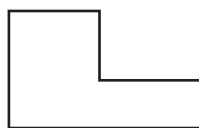
### VIPER - Variable Helix EndMills

### SUPER VIPER - Double Variable Helix EndMills

Material Group	Material Type	Cutting Speed - SFM	
		Viper	Super Viper
Steel	Structural Steel	328-446	557-754
	Free Cutting Steel	262-446	426-754
	Unalloyed Heat Treatable Steel	262-426	426-754
	Unalloyed Case Hard Steel	393-490	656-820
	Alloyed Case Hardened Steel	246-393	393-656
	Nitriding Steel	328-446	525-754
	Stainless Steel, Sulphured Austenitic Steel	246-328	262-393
Acid Resistant / stainless Steel	Martensitic		
High Tensile Steel	Low Carbon Steel	295-328	328-393
	Medium Carbon Steel	196-262	295-328
	Alloyed Heat Treatable Steel	262-393	426-656
	Tool Steel	262-393	426-656
	High Speed Steel	196-246	328-410
	Spring Steel		328-410
Cast Materials	Cast Iron	446-574	
	Spheroidal Graphite & Malleable Ci	328-490	721-984
	Chilled Ci	230-278	557-787
Aluminum & Aluminum Alloys	Aluminum & Ti Alloys		
	Al Wrought Alloys		
	Al Cast Alloys < 10%si		
	Al Cast Alloys > 10%si		
Special Alloys	Special Alloys		196-246
	Ti & Ti Alloys	164-246	262-393
Non Ferrous Metals	Copper Low Alloyed		
	Brass		
	Bronze		
Plastics	Duro Plastics		
	Thermoplastics		
Magnesium Alloys	Mg Alloys		



Close Slot



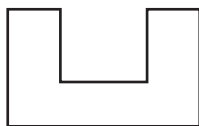
Open Slot

**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%

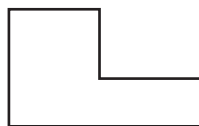
## Speeds & Feeds

### KRAIT - 4 Flute High Feed EndMills

Material Group	Material Type	Cutting Speed - SFM
		Krait
Steel	Structural Steel	278-360
	Free Cutting Steel	196-328
	Unalloyed Heat Treatable Steel	196-328
	Unalloyed Case Hard Steel	328-426
	Alloyed Case Hardened Steel	213 - 328
	Nitriding Steel	246-377
	Stainless Steel, Sulphured Austenitic Steel	196-328
Acid Resistant / stainless Steel	Martensitic	
High Tensile Steel	Low Carbon Steel	262-328
	Medium Carbon Steel	262-295
	Alloyed Heat Treatable Steel	196-328
	Tool Steel	196-328
	High Speed Steel	164-213
	Spring Steel	
	Cast Iron	360-490
Cast Materials	Spheroidal Graphite & Malleable Ci	196-393
	Chilled Ci	196-230
Aluminum & Aluminum Alloys	Aluminum & Ti Alloys	
	Al Wrought Alloys	
	Al Cast Alloys < 10%si	
	Al Cast Alloys > 10%si	
Special Alloys	Special Alloys	164-196
	Ti & Ti Alloys	196-328
Non Ferrous Metals	Copper Low Alloyed	
	Brass	
	Bronze	
Plastics	Duro Plastics	
	Thermoplastics	
Magnesium Alloys	Mg Alloys	



Close Slot



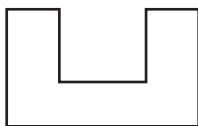
Open Slot

**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%

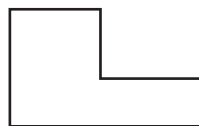
## Speeds & Feeds

### 2 & 3 Flute Aluma EndMills

Material Group	Material Type	Cutting Speed - SFM	
		2 Flute Aluma	3 Flute Aluma
Steel	Structural Steel		
	Free Cutting Steel		
	Unalloyed Heat Treatable Steel		
	Unalloyed Case Hard Steel		
	Alloyed Case Hardened Steel		
	Nitriding Steel		
Acid Resistant / stainless Steel	Stainless Steel, Sulphured Austenitic Steel		
	Martensitic		
High Tensile Steel	Low Carbon Steel		
	Medium Carbon Steel		
	Alloyed Heat Treatable Steel		
	Tool Steel		
	High Speed Steel		
	Spring Steel		
Cast Materials	Cast Iron		
	Spheroidal Graphite & Malleable Ci		
	Chilled Ci		
Aluminum & Aluminum Alloys	Aluminum & Ti Alloys	984-1148	1049-1230
	Al Wrought Alloys	1148-1410	1148-1448
	Al Cast Alloys < 10%si	328-574	328-590
	Al Cast Alloys > 10%si	328-574	328-590
Special Alloys	Special Alloys		
	Ti & Ti Alloys		
Non Ferrous Metals	Copper Low Alloyed	262-328	295-393
	Brass	214-278	246-311
	Bronze	214-278	246-311
Plastics	Duro Plastics	246-328	262-360
	Thermoplastics	246-328	262-360
Magnesium Alloys	Mg Alloys	574-721	606-738



Close Slot



Open Slot

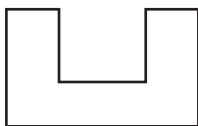
**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%



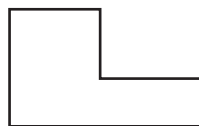
## Speeds & Feeds

### 3 Flute 60°, 6 Flute 45° & Multi Flute

Material Group	Material Type	Cutting Speed - SFM		
		3 Flute 60°	6 Flute 45°	Multi Flute
Steel	Structural Steel	295-393	490-656	490-656
	Free Cutting Steel	230-393	490-656	393-656
	Unalloyed Heat Treatable Steel	230-393	490-656	393-656
	Unalloyed Case Hard Steel	328-393	590-754	590-754
	Alloyed Case Hardened Steel	196-328	360-590	360-590
	Nitriding Steel	295-393	490-656	490-656
	Acid Resistant / stainless Steel	131-196	230-360	230-360
High Tensile Steel	Low Carbon Steel	328-393	131-196	328-393
	Medium Carbon Steel	276-351	328-393	262-328
	Alloyed Heat Treatable Steel	230-328	196-295	393-590
	Tool Steel	230-328	393-590	393-590
	High Speed Steel	164-196	393-590	230-360
	Spring Steel	164-196	295-360	
	Cast Materials			
Cast Materials	Cast Iron	360-490	295-360	328-393
	Spheroidal Graphite & Malleable Ci	295-393	656-853	262-328
	Chilled Ci	230-393	490-720	393-590
Aluminum & Aluminum Alloys	Aluminum & Ti Alloys		2620-3116	393-590
	Al Wrought Alloys		2300-2780	2300-2780
	Al Cast Alloys < 10%si	276-351	1049-1558	1049-1558
	Al Cast Alloys > 10%si	276-351	1049-1558	1049-1558
Special Alloys	Special Alloys	98-131	164-213	164-213
	Ti & Ti Alloys	131-196	246-328	246-328
Non Ferrous Metals	Copper Low Alloyed		656-820	656-820
	Brass		525-787	525-787
	Bronze		525-787	490-787
Plastics	Duro Plastics		656-853	56-853
	Thermoplastics		656-853	656-853
Magnesium Alloys	Mg Alloys		1470-1800	1470-1800



Close Slot



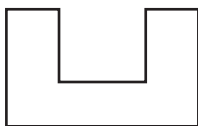
Open Slot

**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%

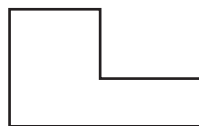
## Speeds & Feeds

### 2 & 4 Flute Corner Radius

Material Group	Material Type	Cutting Speed - SFM	
		Corner Radius	Spherical Ball
Steel	Structural Steel	196-295	226 - 315
	Free Cutting Steel	164-262	226 - 315
	Unalloyed Heat Treatable Steel	164-262	131 - 236
	Unalloyed Case Hard Steel	262-328	131 - 236
	Alloyed Case Hardened Steel	164-230	115 - 177
	Nitriding Steel	164-230	115 - 177
Acid Resistant / stainless Steel	Stainless Steel, Sulphured	20-30	98 - 131
	Austenitic Steel, Martensitic		
High Tensile Steel	Low Carbon Steel	147-196	180 - 276
	Medium Carbon Steel	131-196	131 - 236
	Alloyed Heat Treatable Steel	164-262	164 - 276
	Tool Steel	131-196	131 - 236
	High Speed Steel	98-164	131 - 236
	Spring Steel	98-164	164 - 276
Cast Materials	Cast Iron	82-114	
	Spheroidal Graphite & Malleable CI	82-114	
	Chilled CI	65-98	
Aluminum & Aluminum Alloys	Aluminum	262-393	
	Al Wrought Alloys	262-393	
	AL Cast Alloys < 10%Si	164-196	
	AL Cast Alloys > 10%Si	164-196	
Special Alloys	Special Alloys	49-82	98 - 131
	Ti & Ti Alloys	65-98	164 - 236
Non Ferrous Metals	Copper Low Alloyed	131-196	
	Brass	82-114	
	Bronze	131-196	
Plastics	Duro Plastics		
	Thermoplastics		
Magnesium Alloys	mg Alloys	114-147	
Hardened Steel (45-65 Hrd)	Die & Mold	230-328	230 - 393



Close Slot



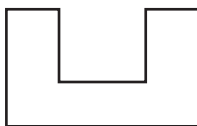
Open Slot

**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%

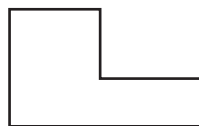
## Speeds & Feeds

### Roughers

Material Group	Material Type	Cutting Speed - SFM
		Roughers
Steel	Structural Steel	295-393
	Free Cutting Steel	230-393
	Unalloyed Heat Treatable Steel	230-393
	Unalloyed Case Hard Steel	328-426
	Alloyed Case Hardened Steel	196-328
	Nitriding Steel	262-393
	Stainless Steel, Sulphured Austenitic Steel	131-196
Acid Resistant / stainless Steel	Martensitic	
High Tensile Steel	Low Carbon Steel	295-360
	Medium Carbon Steel	262-328
	Alloyed Heat Treatable Steel	230-328
	Tool Steel	230-328
	High Speed Steel	
	Spring Steel	
Cast Materials	Cast Iron	328-490
	Spheroidal Graphite & Malleable Ci	295-393
	Chilled Ci	
Aluminum & Aluminum Alloys	Aluminum & Ti Alloys	
	Al Wrought Alloys	
	Al Cast Alloys < 10%si	
	Al Cast Alloys > 10%si	
Special Alloys	Special Alloys	98-131
	Ti & Ti Alloys	131-196
Non Ferrous Metals	Copper Low Alloyed	
	Brass	
	Bronze	
Plastics	Duro Plastics	
	Thermoplastics	
Magnesium Alloys	Mg Alloys	



Close Slot



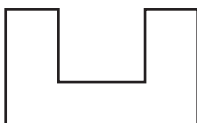
Open Slot

**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%

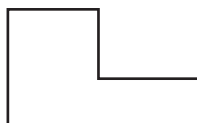
## Speeds & Feeds

### 2, 3 And 4 Flute Square

Material Group	Material Type	Cutting Speed - SFM	
		2 & 4 Flute	3 Flute
Steel	Structural Steel	229 - 328	229 - 328
	Free Cutting Steel	180 - 295	180 - 295
	Unalloyed Heat Treatable Steel	180 - 295	180 - 295
	Unalloyed Case Hard Steel	262 - 328	262 - 328
	Alloyed Case Hardened Steel	164 - 229	164 - 229
	Nitriding Steel	196 - 295	196 - 295
Acid Resistant / stainless Steel	Stainless Steel, Sulphured	98 - 148	98 - 148
	Austenitic Steel, Martensitic		
High Tensile Steel	Low Carbon Steel	164 - 196	180 - 230
	Medium Carbon Steel	131 - 164	164 - 213
	Alloyed Heat Treatable Steel	180 - 262	180 - 262
	Tool Steel	180 - 262	180 - 262
	High Speed Steel	114 - 147	114 - 147
	Spring Steel	114 - 117	114 - 117
Cast Materials	Cast Iron	262 - 360	262 - 360
	Spheroidal Graphite & Malleable CI	230 - 295	230 - 295
	Chilled CI	131 - 164	131 - 164
Aluminum & Aluminum Alloys	Aluminum	1312 - 1476	
	Al Wrought Alloys	1476 - 1800	
	AL Cast Alloys < 10%Si	492-721	
	AL Cast Alloys > 10%Si	492 -721	
Special Alloys	Special Alloys	65 - 98	65 - 98
	Ti & Ti Alloys	98 -147	98 - 148
Non Ferrous Metals	Copper Low Alloyed	295-393	
	Brass	230 - 295	
	Bronze	196 - 295	
Plastics	Duro Plastics	262 - 393	
	Thermoplastics	262 -393	
Magnesium Alloys	mg Alloys	656 - 820	
Hardened Steel (45-65 Hrd)	Die & Mold	196 - 295	



Close Slot



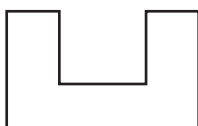
Open Slot

**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%

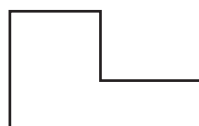
## Speeds & Feeds

### 2 & 4 Flute Ball Nose

Material Group	Material Type	Cutting Speed - SFM	
		2 Flute	4 Flute
Steel	Structural Steel	196 -262	196 -262
	Free Cutting Steel	196 - 262	196 - 262
	Unalloyed Heat Treatable Steel	131 - 196	131 - 196
	Unalloyed Case Hard Steel	131 -196	131 - 196
	Alloyed Case Hardened Steel	114 - 148	114 - 147
	Nitriding Steel	114 -148	114 - 147
Acid Resistant / stainless Steel	Stainless Steel, Sulphured	98 - 131	98 - 131
	Austenitic Steel, Martensitic		
High Tensile Steel	Low Carbon Steel	180 -230	180 - 230
	Medium Carbon Steel	131 - 196	131-196
	Alloyed Heat Treatable Steel	164 - 230	164-230
	Tool Steel	131 - 196	131-196
	High Speed Steel	131 - 196	131-196
	Spring Steel	164 - 230	164-230
Cast Materials	Cast Iron	196 - 246	196-246
	Spheroidal Graphite & Malleable CI	164 - 196	164-196
	Chilled CI	147 - 196	147-196
Aluminum & Aluminum Alloys	Aluminum	1640-2296	
	Al Wrought Alloys	1476-1640	
	AL Cast Alloys < 10%Si	246 - 295	
	AL Cast Alloys > 10%Si	246 - 295	
Special Alloys	Special Alloys	98 - 131	
	Ti & Ti Alloys	164 - 196	
Non Ferrous Metals	Copper Low Alloyed	246 - 295	
	Brass	164 - 196	
	Bronze	246 - 328	
Plastics	Duro Plastics		
	Thermoplastics		
Magnesium Alloys	mg Alloys	230 - 328	
Hardened Steel (45-65 Hrd)	Die & Mold	230 - 393	230-393



Close Slot



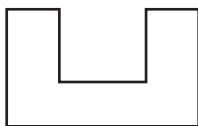
Open Slot

**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%

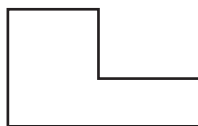
## Speeds & Feeds

### 2 & 4 Flute Decimal Square And Ball Nose EndMills

Material Group	Material Type	Cutting Speed - SFM	
		Decimal EndMills	Taper EndMills
Steel	Structural Steel	296-393	164-230
	Free Cutting Steel	262-328	164-230
	Unalloyed Heat Treatable Steel	197-230	131-197
	Unalloyed Case Hard Steel	197-230	131-164
	Alloyed Case Hardened Steel	164-197	98-131
	Nitriding Steel	164-197	98-147
Acid Resistant / stainless Steel	Stainless Steel, Sulphured	65-98	65-98
	Austenitic Steel, Martensitic		
High Tensile Steel	Low Carbon Steel	296-328	262-328
	Medium Carbon Steel	164-230	246-296
	Alloyed Heat Treatable Steel	164-197	164-230
	Tool Steel	164-197	65-115
	High Speed Steel		98-131
	Spring Steel		
Cast Materials	Cast Iron	492-590	296-328
	Spheroidal Graphite & Malleable CI	246-296	197-262
	Chilled CI		164-246
Aluminum & Aluminum Alloys	Aluminum	754-918	492-590
	Al Wrought Alloys	656-820	393-525
	AL Cast Alloys < 10%Si	918-1050	492-590
	AL Cast Alloys > 10%Si	722-820	328-426
Special Alloys	Special Alloys	65-115	
	Ti & Ti Alloys	82-115	65-98
Non Ferrous Metals	Copper Low Alloyed	656-754	328-393
	Brass	426-590	328-393
	Bronze	328-426	426-492
Plastics	Duro Plastics		
	Thermoplastics		
Magnesium Alloys	mg Alloys	492-590	393-459
Hardened Steel (45-65 Hrd)	Die & Mold		



Close Slot



Open Slot

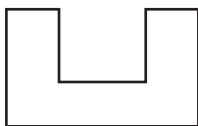
**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%



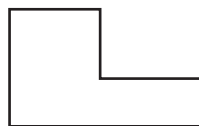
## Speeds & Feeds

### 2 & 4 Double End With Weldon Flat

Material Group	Material Type	Cutting Speed - SFM	
		Square End	Ball Nose
Steel	Structural Steel	252 - 360	216 - 289
	Free Cutting Steel	200 - 325	216 - 289
	Unalloyed Heat Treatable Steel	200 - 325	144 - 216
	Unalloyed Case Hard Steel	289 - 360	144 - 216
	Alloyed Case Hardened Steel	180 - 252	128 - 164
	Nitriding Steel	216 - 352	128 - 164
Acid Resistant / stainless Steel	Stainless Steel, Sulphured	108 - 164	108 - 144
	Austenitic Steel, Martensitic		
High Tensile Steel	Low Carbon Steel	180 - 216	200 - 253
	Medium Carbon Steel	144 - 180	144 - 216
	Alloyed Heat Treatable Steel	200 - 289	180 - 253
	Tool Steel	200 - 289	144 - 216
	High Speed Steel	128 - 164	144 - 216
	Spring Steel	128 - 164	180 - 253
Cast Materials	Cast Iron	289 - 397	216 - 272
	Spheroidal Graphite & Malleable CI	252 - 352	180 - 216
	Chilled CI	144 - 180	
Aluminum & Aluminum Alloys	Aluminum	1083 - 1624	1083 - 1804
	Al Wrought Alloys	1444 - 1805	1083 - 1444
	AL Cast Alloys < 10%Si	541 - 794	272 - 352
	AL Cast Alloys > 10%Si	541 - 794	272 - 352
Special Alloys	Special Alloys	72 - 108	108 - 144
	Ti & Ti Alloys	108 - 164	180 - 216
Non Ferrous Metals	Copper Low Alloyed	352 - 433	272 - 352
	Brass	252 - 352	180 - 216
	Bronze	216 - 352	272 - 360
Plastics	Duro Plastics	289 - 433	
	Thermoplastics	289 - 433	
Magnesium Alloys	mg Alloys	722 - 903	
Hardened Steel (45-65 Hrd)	Die & Mold		



Close Slot



Open Slot

**NOTE:** All the parameters are taken for closed slot & for 1XD(depth).  
For open slot increase speed by 10% & for depth more than 1XD decrease speed by 10%

## Feed Rate Chart

### General Purpose & High Performance EndMills

Material	Feed (mm/tooth) Diameter								
	5/64"	1/8"	13/64"	15/64"	5/16"	13/32"	15/32"	3/4"	1"
Steel	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.005
High Tensile Steels	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.004
Acid Resistant	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.005	0.006
Cast Material	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.004
Aluminium Alloys	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.01	0.012
Titanium Alloys	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.005	0.006
Non Ferrous	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.01	0.012
Plastic	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003
Mg Alloys	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.01	0.012

## Endmills Operating Data

### Endmill Selection

- The more flutes on the endmill will usually improve the surface finish of the part. If work piece finish is important, select four or more flutes.
- Fewer flutes permit greater chip carrying capacity
- Always select the largest diameter end mill for the cut being made. This helps to keep deflection to a minimum, and decreases the chip load.
- Keep tool overhang to a minimum, always insert the shank as far as possible into the holder.  
Collet holders are preferred set up.

### Coolant

- Many operations can be run dry with a blast of air to remove chips.
- Light cutting oil or water-soluble oil may extend tool life and improve surface finishes.
- If coolant is used, you must maintain a heavy flood directed on the cutting edge. This minimizes the chance of intermittent cooling, which can cause thermal cracking of the carbide.
- A heavy flow of coolant or a strong air blast is necessary when machining aluminum.
- Stainless steels require a coolant, which is high in coolant action but low in lubricating qualities.

### Speeds and Feeds

- Proper speeds and feeds will help eliminate chatter and excessive heating of the tool,
- Refer to the chart below for suggested speeds and feeds for various materials
- Speed ranges are dependent on the machinability of the material
- For slotting applications the speed of the cutter should be reduced 20-30%
- Long flute length tools reduce the feed per tooth 50% and speed 20%
- Roughing end mills should increase feed per tooth 50%-100%
- Depths of cut are not to exceed 1-1/2 times the cutter diameter.
- As radial and axial depth of cut increase, chip load should decrease.

## Coating Details

Coating Type	TiAlN Futura Nano (TiAlN)	TiN Titanium Nitride (TiN)	AlTiN Xceed
Micro Hardness(HV0.05)	3300	2300	3300
Co Efficient Of Friction	0.302-0.035	0.4	0.25
Against Steel			
Maximum Service	900	600	1000
Temperature *c			Aubergine Grey
Coating Colour	Violet Grey	Gold Yellow	High Oxidation Resistance
Features	Increased Cutting	Protection	Hot Hardness
	Stability	Against	High Wear Resistance
	Protection	Abrasive &	
	Against Abrasive	Adhesive Wear	
	Wear & Erosion		

Coating Type	CH Helica (AlCr)
Micro Hardness(HV0.05)	3000
Co Efficient Of Friction	0.25
Against Steel	
Maximum Service	1100
Temperature *c	
Coating Colour	Copper
Features	Abrasions Resistance
	Maximum Toughness
	Extra Shear Strength