

# GWS

TOOL GROUP

MILLING TURNING HOLEMAKING  
PRODUCT CATALOG





GWS Tool Group is a US-based, vertically integrated manufacturer of highly engineered custom, standard, and modified standard cutting tools, primarily servicing the aerospace and defense, power generation, automotive and medical sectors. GWS Tool Group has acquired multiple businesses in the course of its growth which now serve as the respective manufacturing divisions for the company, and include **GW Schultz Tool (Tavares, FL)**, **CGI Tool Chesterfield, IN**), **Alliance CNC (Grand Rapids, MI)** and **Benchmark Carbide (Springfield, MA)**.

The continued expansion of GWS Tool Group by way of acquisitions and constant investment in the business' capabilities has created an explosive value proposition for customers to leverage in all advanced machining environments. We remain committed to the expansion of this value proposition always and in all ways.







## **AS9100 / ISO9001**

**GWS Tool Group is accredited  
under the Aerospace Registration  
Management Program and under  
the ICOP scheme.**



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## ULTIMATE PERFORMANCE SERIES

**ECODRILL**

28

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**PACREAMER**

30

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**ALUMIGATOR**  
HIGH PERFORMANCE ALUMINUM END MILLS

34

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**HURRIMILL**

41

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**DM<sup>2</sup>**

58

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**PYSTL**<sub>series</sub>



59

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# CORE PRODUCTS

Check out any of these on-line resources today at [www.gwstoolgroup.com](http://www.gwstoolgroup.com)

## CUSTOM TOOLS

Specially designed cutting tools are required for a variety of reasons; be it a little extra length for reach or specialized forms and tight tolerances to meet difficult part requirements. At GWS, we have built our capabilities around the necessity for high precision, fast turnaround service. By combining talented engineering and design staff with the latest in automation technology, GWS can output custom tooling for high production facilities in a matter of a few weeks or even a few days.



## END MILLS

GWS Tool Group has a large portfolio of stocked standard solid carbide end mills, designed for metal cutting applications in an array of industries including Medical, Aerospace, Automotive, Heavy Industry and General Engineering. We feature both Performance and Ultimate Performance milling series to address materials ranging from mild steels to exotic materials like Titanium and Inconel.



## HOLEMAKING

New to the GWS lineup is the addition of precision holemaking tools, which includes our self-centering PAC reamers and ECO drill offering, ideal for automotive and medical industry applications. In addition to our standard holemaking tools, GWS offers custom quick turnaround holemaking solutions like step drills, deep hole drills and step reamers made to your specifications.



## TURNING INSERTS

A complete offering of high performance ISO turning inserts is available through the GWS Tool Group. From Cast Iron to Titanium, roughing or finishing, we have the designs and grades you need for the application. Need a special modification to an insert or a complete custom insert like PCD-tipped, CBN or thread-whirling inserts, GWS has you covered.





# ICON GUIDE

## Tool Specifications

 <b>CC</b>	Center Cutting	 <b>90°</b>	Reduced Neck	 <b>5FL</b>	Flutes	 <b>RAD</b>	Radius
 <b>NC</b>	Non-Center Cutting	 <b>NEW</b>	New Product Line	 <b>VAR</b>	Variable Helix	 <b>SQ</b>	Square End
 <b>CB</b>	Chip Breakers	 <b>CT</b>	Coolant Through	 <b>30°</b>	Helix	 <b>BALL</b>	Ball Nose
 <b>H6</b>	Shank	 <b>P198</b>	Speed & Feed				

## Endmill Coatings

 <b>Bright</b>	Uncoated
 <b>TiN</b>	Titanium Nitride(TiN)
 <b>TiAlN</b>	Titanium Aluminium Nitride (TiAlN)
 <b>Advatech</b>	Advatech
 <b>ZrN</b>	Zirconium Nitride (ZrN)
 <b>AlTiN</b>	Aluminum Titanium Nitride(AlTiN)
 <b>nACo</b>	nACo
 <b>nACRo</b>	nACRo
 <b>Alcromax</b>	Alcromax

## Insert Coatings

 <b>CG91</b>	CG91 - HT-P15   HT-M10   HT-K10
 <b>CG92</b>	CG92 - HC-P15   HC-K25   HC-M10
 <b>CG93</b>	CG93 - HC-P25   HC-K30   HC-M20
 <b>CG94</b>	G94 - HC-P35   HC-M25   HC-S25
 <b>CG95</b>	CG95 - HC-M20   HC-K20
 <b>CG96</b>	CG96 - HC-M25   HC-P35   HC-S25
 <b>CG97</b>	CG97 - HC-M35   HC-P35
 <b>CG98</b>	CG98 - HC-M15   HC-S15
 <b>CG99</b>	CG99 - HC-K20   HC-P10
 <b>CG910</b>	CG910 - HW-N15   HW-K15
 <b>CG911</b>	CG911 - HC-S15   HC-M15
 <b>CG912</b>	CG912 - HC-S15   HC-M15

# MATERIAL OVERVIEW

## ISO Materials

**P** Steel

**N** Cast Iron

**S** High-Temp Alloys

**M** Stainless Steel

**S** Non-Ferrous

**H** Hardened Materials

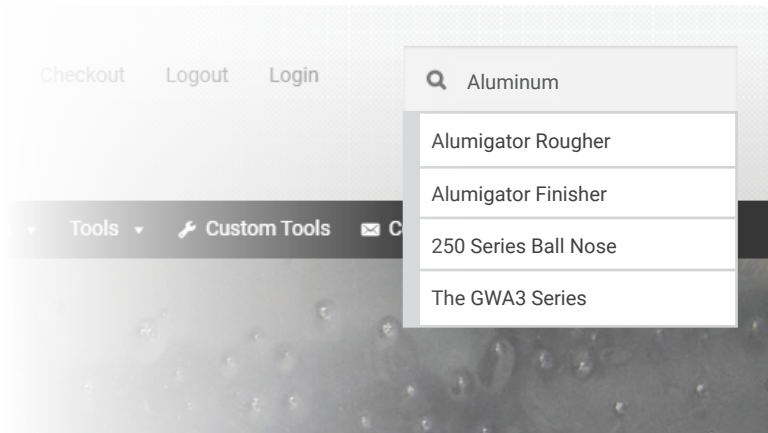
Icon	Material Family	Tensile Strength	Hardness HB	Hardness HRC	Material Number
<b>P1</b>	Low, Medium & High-Carbon Steels, Long Chipping, Short Chipping, Free Machining	>600	<220	<25	A36, 1008, 1010, 1018 through 1029; 1108, 1117, 10L18, 1200, 1213, 12L14, 1035, 1045, 10L45, 1050, 10L50, 1080, 1137, 1144, 11L44, 1525, 1545, 1572
<b>P2</b>	Alloy Steels and Tool Steels	600-1400	<450	<48	1300, 2000, 3000, 4000, 500, 800, P20, SAE:A, D, H, O, S, M, T
<b>P3</b>	Ferretic, Martensitic, and PH Stainless Steels, High-Strength	600-1350	330-450	35-48	15-5 PH, 13-8 PH, 17-4 PH, 400 and 500 Series
<b>M1</b>	Austenitic Stainless Steel	<600	130-200	-	200 Series, 301, 302, 304, 304L, 309
<b>M2</b>	High-Strength, Austenitic Stainless and Cast Stainless Steels, Duplex Stainless Steel	600-800	135-275	<25	310, 316, 316L, 321, 347, 384ASTM Cast XM-1, XM-5, XM-7, XM-21, 323, 329, F55, 2205, S329000
<b>K1</b>	Gray Cast Iron, Low- and Medium-Strength Ductile Irons (Nodular Irons) and Compacted Graphite Irons (CG)	125-600	120-290	<32	class 20, 25, 30, 40, 45, 50, 60, G1800, G3000, G3500, G4000, 60-40-18, 65-42-12, 80-55-06, SAE J434:D4018, D4512, D5506, Grade 250, 300, 350, 400, 450
<b>K2</b>	High-Strength Ductile Irons and Austempered Ductile Iron (ADI)	>600	180-350	<43	ASTM A536: 100-70-03, 120-90-02, SAE J434: D7003, SAE J158: Grade M8501AST A897: 125-80-10, 150-100-7, 175-125-4, 200-150-1, 230-185
<b>N1</b>	Wrought Aluminum, Low-Silicon Aluminum Alloys and Magnesium Alloys	-	-	-	2025, 5050, 7050, 1000, 2017, 2024, 6061, 7075
<b>N2</b>	High-Silicon Aluminum Alloys and Magnesium Alloys	-	-	-	-
<b>S1</b>	Iron-Based, Heat-Resistant Alloys, Cobalt-Based, Heat Resistant Alloys, Nickel-Based, Heat-Resistant Alloys	100-1700	160-450	25-48	A-286, INCOLOY® 800 Series, A608, A567, INVAR®, N-155, A-351, A-567, A-608, Haynes® 25(L605), Haynes 188, J-1570, Stellite®, Haynes 21, MAR-M302 MAR-M509, Hastelloy®, INCONEL® 600 and 700 Series, INCOLOY 900 Series, Rene 41, Waspalloy®, Monel®,
<b>S2</b>	Titanium and Titanium Alloys	900-1600	300-400	33-48	Pure: Ti 98.8, Ti 98.9, Ti99.9; Alloyed: Ti 5Al-2.5Sn, Ti6Al-4V, Ti6Al-2Sn-4Zr-2Mo, Ti-3Al-8V-6Cr-4Mo-4Zr, Ti-10V-2Fe-3Al, Ti-13V-11Cr-3Al
<b>H1</b>	Hardened Materials	-	-	44-48	Tool Steel H10, H11, H13, D2, D3, 4340, P20
<b>H2</b>	Hardened Materials	-	-	56-60	Tool Steel, S7, A2 D2, D3, CPM-10V

# ONLINE RESOURCES

Check out any of these on-line resources today at [www.gwstoolgroup.com](http://www.gwstoolgroup.com)

## SEARCH WIZARD

Search by part number, series number or product description to quickly find the GWS tool you are looking for.



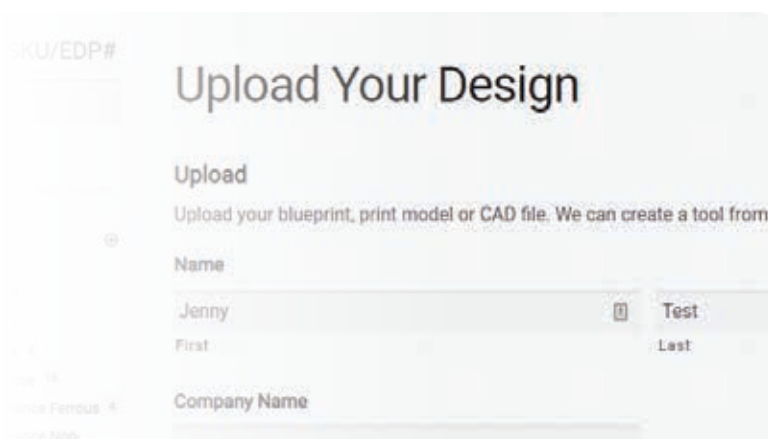
## QUICK QUOTE

Simply select the tool type you are looking for, fill in your required dimensional data, provide your contact information, and click submit. Typically within 24 hours you will have your quote complete with pricing and delivery information.



## QUOTE PER PRINT

Have an existing tool or part drawing that you want to have our engineers use for quoting a custom solution, no problem! With GWS, you have the option to upload tool drawings and part prints directly.





The GWS Tool Group website is mobile responsive - adapting seamlessly to your desktop computer or mobile device. Stop by now for a quick reference, tech support or fast quote request.

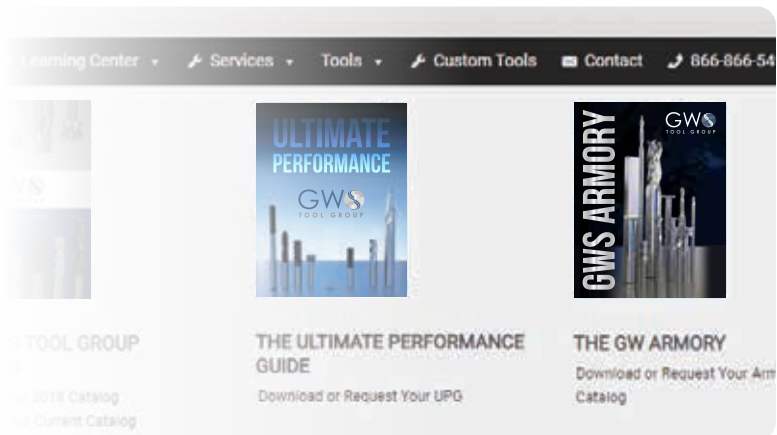
## LIVE CHAT SUPPORT

Looking for some quick, no-hassle assistance? Skip the phone during regular business hours and chat live with our knowledgeable support staff. From technical questions to website support, our team is online and ready to help.



## LITERATURE

Need to get the latest products brochures or catalog from GWS? You can download all of our latest literature direct from our website.



## STOCK & PRICING

Stock and pricing on all our catalog items are available online. Visit [www.GWSToolGroup.com](http://www.GWSToolGroup.com) and select your tool from our online shop for the latest inventory data.

SKU	Length	Length of Cut	Cutting Diameter	Coating	Stock	Price
<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search C"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>
103443	Extra Long	3	1	AITIN	0	\$472.15
103747	Stub	0.078	0.0312	NONE	14	\$19.29
105142	Stub	0.078	0.0312	AITIN	0	\$21.96
103750	Stub	0.125	0.0625	NONE	1	\$23.14
108786	Stub	0.125	0.0625	AITIN	0	\$25.83

# CUSTOM TOOLS

## CUSTOMIZED TOOLS TO FIT ANY APPLICATION

Specialty cutting tools come in a variety of shapes and sizes; every application is different and GWS Tool Group is prepared to help you with your particular situation. The information required is basic and will enable us to design the best tool for your application. From the beginning, GWS Tool Group has specialized in custom design and we look forward to working with you in creating a unique tool that meets and often exceeds your expectations.

Minimum quantity order required on Specialty/Custom tools may be required. Please call for more information. If possible, please provide us with a 3D solid model, CAD drawing, or sketch, including the profile you need to cut, and any additional information you have for your custom tool design.

### TYPICAL LEAD TIMES

#### ONE WEEK OR LESS

Standard or modified standard end mills, inserts & drills. Modify existing stock (add flat, undercut, radius, etc).

#### TWO WEEKS OR LESS

Standard or modified standard end mills with material in stock. Repeat special/custom with program and material.

#### THREE WEEKS OR LESS

Repeat orders of special tools without material in stock.

#### FOUR WEEKS OR LESS

Repeat specials requiring pre-form material in stock.

#### FIVE TO SIX WEEKS OR LESS

Special/custom requiring pre-form materials that are not in stock.

Coating: Add available in-house coating only (3 day max)  
Individual lead times subject to change at any time.



ORDER TOLL FREE:  
877.497.8665



# REQUEST A CUSTOM TOOL

Submit your custom tool request today using our easy form, or contact us directly to speak to a design consultant.

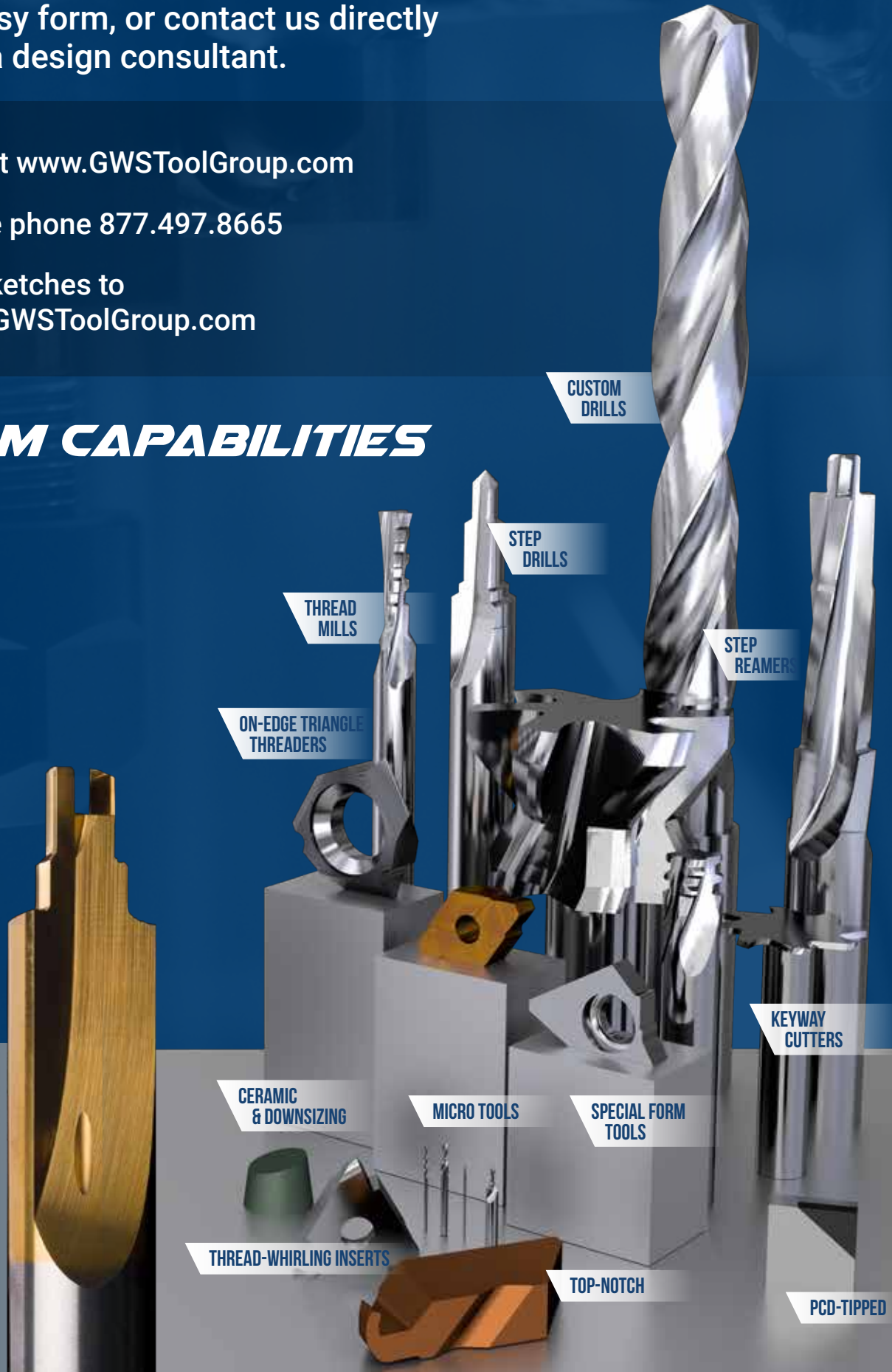
⚡ Online at [www.GWSToolGroup.com](http://www.GWSToolGroup.com)

📞 Over the phone 877.497.8665

✉ Email sketches to [Sales@GWSToolGroup.com](mailto:Sales@GWSToolGroup.com)

## CUSTOM CAPABILITIES

The unique trepan geometry on this tool demonstrates our capability to produce difficult and tight tolerance geometries on a wide range of custom applications. ▶



CUSTOM DRILLS

STEP DRILLS

THREAD MILLS

ON-EDGE TRIANGLE THREADERS

STEP REAMERS

KEYWAY CUTTERS

CERAMIC & DOWNSIZING

MICRO TOOLS

SPECIAL FORM TOOLS

THREAD-WHIRLING INSERTS

TOP-NOTCH

PCD-TIPPED



# ***DESIGNED FOR YOUR APPLICATION***

## **Root Form Cutter | Turbine Blades**

This root form cutter is designed for machining the critical root shape on turbine blades for both power generation and aviation. The overall design allows for repeatably tight tolerances, extensive tool life and in some cases, more than 50 regrinds.



**.0005" FORM TOLERANCE TO ACHIEVE  
CRITICAL FEATURE PROFILE TOLERANCES**

**POLISHED SURFACES FOR SMOOTH  
CHIP EVACUATION AND SUPERIOR  
SURFACE FINISHES**

**HELICAL FORM TO PREVENT  
PADDLING AND CHATTER**

**BEEFY DESIGN TO INCREASE  
RIGIDITY AND REGRIND-ABILITY**

***DELIVERED IN 6 WEEKS*** \*

# ***DESIGNED FOR YOUR APPLICATION***

## **Trepan Tool | Engine Frame Mounting Holes**

The unique trepan geometry on this tool demonstrates our capability to produce difficult and tight tolerance geometries for a wide range of custom applications.

**SPECIAL TREPAN DESIGN TO CREATE BOTH  
INTERNAL AND EXTERNAL COMPLEX FEATURES**

**MULTI FEATURE DESIGN REDUCING THE  
NUMBER OF OPERATIONS REQUIRED TO  
COMPLETE COMPLEX PARTS**

**INTERNAL COOLANT SUPPLY FOR  
IMPROVED TOOL LIFE AND CHIP  
EVACUATION**

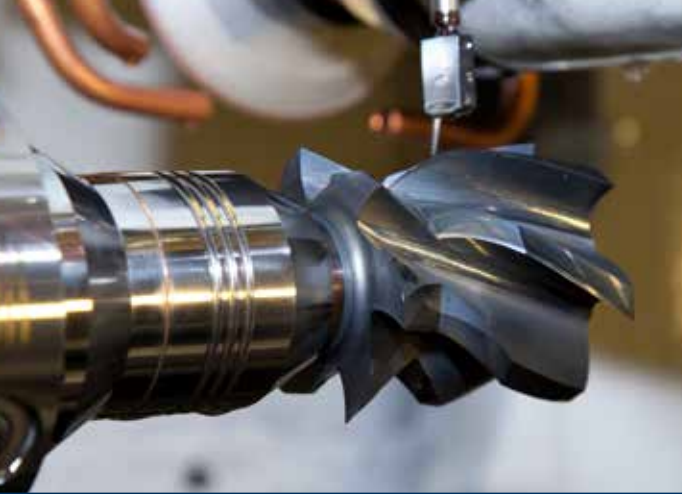
**APPLICATION SPECIFIC HIGH  
PERFORMANCE COATINGS FOR  
OPTIMAL TOOL LIFE**



***DELIVERED IN 2 WEEKS*** \*

\*Delivery subject to change at any time  
based on capacity and blank availability

# GWS REGRIND

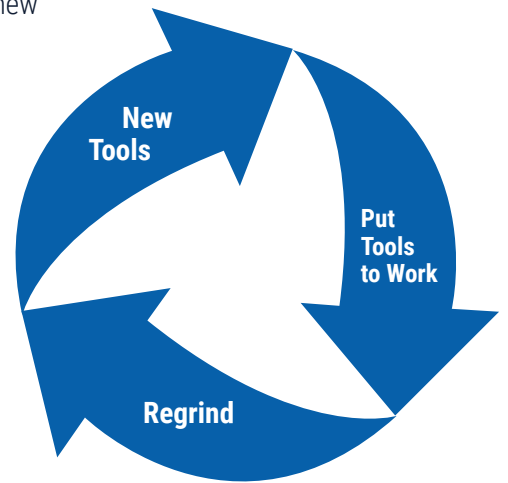


## WHY REGRIND?

## QUALITY & PERFORMANCE

The **Regrind Program** ensures your tools will be reconditioned to perform as good as a new manufactured tool.

- Customer portal to track process to and from manufacturer
- Custom etching on regrinds to ensure operator has the correct tools
- Free or reduced shipping based on quantity
- Standard, Custom, or non GWS Tools
- Geometries on regrinds superior to others
- Soft cost savings on reduction of administrative time
- Hard cost savings for materials
- Reduction of inventory
- Direct communication for manufacturing specific products



## TRACK YOUR REGRIND

## IN THE CLOUD

The **GWST Portal** - Track your current regrinds & order new ones. We customize your portal and tailor it to your needs.

Regrind Tracker

	CW PO#	CW Tool #	EDP#	QTY	Expected Arrival in Florida	Actual Arrival to GWS	GWS Sales Order #	PRD	Requested Completion Date	QTY Proj. Comp. Date
1	XXXXXXXX	XXXXXXXX	99999	1	10/20/2014	10/15/2014	4000	PRD000000	11/11/2014	11
2	XXXXXXXX	XXXXXXXX	99999	1	10/20/2014	10/15/2014	4000	PRD000000	11/11/2014	11
3	XXXXXXXX	XXXXXXXX	99999	2	10/20/2014	10/15/2014	4000	PRD000000	11/11/2014	11
4	XXXXXXXX	XXXXXXXX	99999	2	10/20/2014	10/20/2014	4000	PRD000000	11/22/2014	11
5	XXXXXXXX	XXXXXXXX	99999	1	10/20/2014	10/20/2014	4000	PRD000000	11/22/2014	11
6	XXXXXXXX	XXXXXXXX	99999	1	10/20/2014	10/20/2014	4000	PRD000000	11/22/2014	11
7	XXXXXXXX	XXXXXXXX	99999	1	11/19/2014	11/12/2014	4000	PRD000000	11/25/2014	11





The GWS Tool Group Reconditioning program regrinds your worn out, chipped and used tools back to newly manufactured tool quality.

## QUICK TURNAROUND

Typically reduced material removal, thus shortening grind time and associated lead time.

## INVENTORY MANAGEMENT

We can accurately predict the number of regrinds of which your tool is capable, in turn, reducing new tool inventory. We also provide custom laser etching/labeling for your regrinds.

## COMMUNICATION

Our Tool Tracking System gives you a customized communication experience. We provide live to the minute information on your tools regrind process and keep everything accessible through the cloud.

## QUALITY

Our regrinds aren't just made to be as good as your brand new tools, they're reground via your exact specifications, and if applicable, recoated in house with GWS premium coatings.

## COST SAVINGS

Material costs, manufacturing process time, volume shipping and inventory reduction prove the cost savings of a GW Regrind. Our cost savings are data-driven, not anecdotal. The Regrind Portal tracks and provides real-time comparisons between regrinds and the purchase of new tools.

**Ready to Regrind?**  
**Call 877.497.8665**

## The GWS Tool Group Tool Reconditioning Program



**WORN OUT TOOL**



**REGRIND**



Original 1/2"



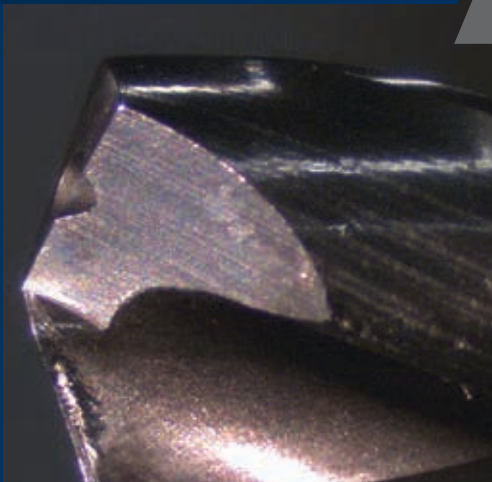
3/8"



1/4"

**WORN OUT INSERT**

**REGRIND**



**WORN OUT DRILL**


























**REGRIND**

[Sales@GWSToolGroup.com](mailto:Sales@GWSToolGroup.com)

[www.GWSRegrind.com](http://www.GWSRegrind.com)

# APPLICATION INDEX

## Tooling Application Guide - Details

Series No.	Image	Inch/ Metric	Flutes	Description	Coating	Size Range	Product Page	Tech Page
4005		IN/M	2	5D Solid Drill	AlTiN	2.5 - 18.5mm	28	176
4105		IN/M	2	5D Coolant Through Drill	Advatech, AlTiN	2.5 - 18.5mm	29	177
4050		IN/M	1	Reamer	AlTiN	0.1240 - 0.7510	30	178
1010		IN	3	Ramping	ZrN, Bright	3/16 - 3/4	34	179
1015		IN	3	Slotting & Roughing	ZrN, Bright	3/16 - 3/4	35	179
1020		IN	3	Finishing	ZrN, Bright	3/16 - 3/4	36	179
1025		IN	3	Finishing	ZrN, Bright	3/32 - 1/0	37	180
1026		IN	3	Finishing Reduced Neck	ZrN, Bright	1/8 - 1.0	38	180
1027		IN	3	Ball Nose	ZrN, Bright	1/8 - 1.0	39	180
1028		IN	3	Ball Nose Reduced Neck	ZrN, Bright	1/8 - 1.0	40	180
1030		IN	4	Variable Helix/Index	nACo	1/8 - 1.0	41	182
1032		IN	4	Variable Helix/Index	nACo	1/8 - 1.0	46	182
1035		IN	5	Variable Helix/Index	nACo	1/8 - 1.0	47	183
1040		IN	7	Variable Helix/Index	nACo	1/8 - 1.0	52	184
1031		IN	4	Rougher/Finisher	nACo	1/8 - 1.0	57	185
1050		IN	2	Die Mold	nACo	1/32 - 1/2	58	186
2100		IN	4	Variable Index	Alcromax	1/8 - 1-1/4	59	187
2105		IN	4	Variable Index Reduced Neck	Alcromax	1/8 - 1-1/4	65	187
2115		IN	4	Variable Index Ball Nose	Alcromax	1/8 - 1.0	70	187
2117		IN	4	Variable Index Reduced Neck	Alcromax	1/8 - 1.0	71	187
2205		IN	5	Variable Index	Alcromax	1/8 - 1-1/4	72	188
2213		IN	5	Variable Index Reduced Neck	Alcromax	1/8 - 1-1/4	78	188
2215		IN	7	Variable Index	Alcromax	3/8 - 1-1/4	83	189



# APPLICATION INDEX







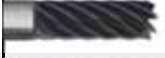
## Tooling Application Guide - Work Material

Series No.	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
4005	★	★	☆	☆	☆	★	★	★	★				
4105	★	★	☆	☆	☆	★	★	★	★				
4050	★	★	☆	☆	☆	★	★						
1010								★	★				
1015								★	★				
1020								★	★				
1025								★	★				
1026								★	★				
1027								★	★				
1028								★	★				
1030	★	★	☆		☆	☆	☆			☆		★	☆
1032	★	★	☆		☆	☆	☆			☆		★	☆
1035	★	★	☆		☆	☆	☆			☆		★	☆
1040	★	★	☆		☆	☆	☆			☆		★	☆
1031	★	★	☆	★	☆	☆	☆			☆	☆		
1050	☆	★	☆									★	★
2100	★	★	☆	☆	★	☆	☆				☆		
2105	★	★	☆	☆	★	☆	☆				☆		
2115	★	★	☆	☆	★	☆	☆				☆		
2117	★	★	☆	☆	★	☆	☆				☆		
2205	★	★	☆	☆	★	☆	☆				☆		
2213	★	★	☆	☆	★	☆	☆				☆		
2215	★	★	☆	☆	★	☆	☆				☆		

★ Best ☆ Good

# APPLICATION INDEX

## Tooling Application Guide - Details

Series No.	Image	Inch/Metric	Flutes	Description	Coating	Size Range	Product Page	Tech Page
2010		IN	2	General Milling	ZrN, Bright	1/8 - 1-1/4	88	181
2015		IN	2	General Milling Ball	ZrN, Bright	1/8 - 1.0	92	181
2012		IN	2	General Milling RN	ZrN, Bright	1/8 - 1.0	93	181
2014		IN	2	General Milling RN BN	ZrN, Bright	1/4 - 1.0	96	181
2030		IN	3	General Milling	ZrN, Bright	1/8 - 1-1/4	97	181
2031		IN	3	General Milling WF	ZrN, Bright	1/8 - 1.0	101	181
2045		IN	3	General Milling BN	ZrN, Bright	1/4 - 1.0	102	181
2032		IN	3	General Milling RN	ZrN, Bright	1/8 - 1.0	103	181
2050		IN	3	General Milling RN BN	ZrN, Bright	1/4 - 1.0	102	181
2060		IN	5	Finishing	ZrN, Bright	1/4 - 1.0	107	181
250		IN	4	Variable Index	Alcromax	1/4 - 1.0	108	190
252		IN	4	Variable Index Ball Nose	Alcromax	1/4 - 1.0	110	190
255		IN	4	Variable Index	Alcromax	1/4 - 1.0	111	191
260		IN	4	Variable Index	Alcromax	1/8 - 1.0	113	192
265		IN	5	Variable index	Alcromax	1/4 - 1.0	116	193
270		IN	6-12	Variable Helix/Index	Alcromax	3/8 - 1.0	119	194
280		IN	8-10	Variable Index	Alcromax	1/2 - 1.0	121	195
285		IN	8-10	Variable Index Reduced Neck	Alcromax	1/2 - 1.0	122	195
210		IN	3	Semi-Roughing & Finishing	Bright, AlTiN, TiCN	1/8 - 1.0	124	196
215		IN	3	Semi-Roughing & Finishing BN	Bright, AlTiN, TiCN	1/8 - 1.0	125	196
220		IN	5	Finishing	Bright, AlTiN, TiCN	1/8 - 1-1/4	126	197
225		IN	4	General Milling	Bright	3/64 - 1.0	130	198
227		IN	2	General Milling Ball Nose	Bright	3/64 - 1.0	132	198

# APPLICATION INDEX







## Tooling Application Guide - Work Material

Series No.	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
2010								★	★				
2015								★	★				
2012								★	★				
2014								★	★				
2030								★	★				
2031								★	★				
2045								★	★				
2032								★	★				
2050								★	★				
2060								★	★				
250	★	★	☆	★	★	☆	☆			☆	☆		
252	★	★	☆	★	★	☆	☆			☆	☆		
255	★	★	☆	★	☆	☆	☆			☆	☆		
260	★	★	☆	☆	☆	☆	☆			★		★	★
265	★	★	☆	☆	☆	☆	☆			★		★	★
270			★		★					★		★	★
280	☆	☆		☆							★		
285	☆	☆		☆		☆	☆				★		
210	☆	☆	☆	☆	☆	☆	☆	☆	☆				
215	☆	☆	☆	☆	☆	☆	☆	☆	☆				
220	☆	☆	☆	☆	☆	☆	☆	☆	☆				
225	☆	☆	☆	☆	☆	☆	☆	☆	☆				
227	☆	☆		☆		☆	☆	☆	☆				

★ Best ☆ Good

# APPLICATION INDEX

## Milling, Drilling & Holemaking

Series No.	Image	Inch/Metric	Flutes	Description	Coating	Size Range	Product Page	Tech Page
230		IN	4	General Milling	Bright, AlTiN	3/64 - 1.0	134	199
237		IN	4	General Milling Ball Nose	Bright	3/64 - 1.0	137	199
240		IN	2	Chamfering	Bright, AlTiN, TiCN	1/8 - 3/4	139	200
241		IN	4	Chamfering	Bright, AlTiN, TiCN	1/4 - 3/4	140	201
243		IN	2	Chamfering	Bright, AlTiN	3/32 - 1-1/4	141	200
244		IN	4	Chamfering	Bright, AlTiN	3/32 - 1-1/4	142	201

# APPLICATION INDEX

## Tooling Application Guide - Work Material

Series No.	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
230	☆	☆		☆		☆	☆	☆	☆				
237	☆	☆		☆		☆	☆	☆	☆				
240	☆	☆		☆		☆	☆	☆	☆		☆		
241	☆	☆		☆		☆	☆	☆	☆		☆		
243	☆	☆		☆		☆	☆	☆	☆		☆		
244	☆	☆		☆		☆	☆	☆	☆		☆		

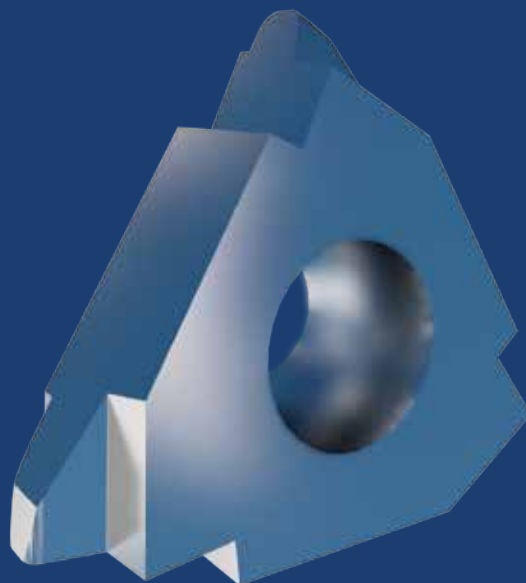
★ Best ☆ Good



# APPLICATION INDEX

## Tooling Application Guide - Inserts

Material Class	Grade	Grain Size	Hardness (HV)	Coating Method	Coating Composition	Geometry	Application
<b>K</b>	CG99-D	1µm	HV 1630	CVD	TICN-AL2O3	Positive	For Turning of Cast Iron
	CG99-D	1µm	HV 1630	CVD	TICN-AL2O3	Negative	For Medium Turning of Cast Iron
	CG99-M	1µm	HV 1630	CVD	TICN-AL2O3	Negative	Light Roughing of Cast Iron
<b>M1</b>	CG96-E	1-2 µm	HV 1400	PVD	TiAlTaN	Positive	For Turning of Stainless Steel - Extreme Finishing
	CG95-C	1-2 µm	HV 1460	PVD	TiAlTaN	Positive	For Turning of Stainless Steel - Finishing
	CG97-D	1.5-3 µm	HV 1330	PVD	Dark Grey	Positive	For Turning of Stainless Steel - Medium
	CG93-M	1-2 µm	HV 1450	CVD	TICN-AL2O3	Negative	For Turning Steel - Semi-Roughing
	CG94-M	1-2 µm	HV 1460	CVD	TICN-AL2O3	Negative	For Turning of Steel (Interrupted) - Roughing
<b>M2</b>	CG95-D	1-2 µm	HV 1460	PVD	TiAlTaN	Positive	For Turning of Stainless Steel - Semi Finishing
	CG96-J	1-2 µm	HV 1400	PVD	TiAlTaN	Negative	For Turning of Stainless Steel - Finishing
	CG96-K	1-2 µm	HV 1400	PVD	TiAlTaN	Negative	For Turning of Stainless Steel - General
	CG97-A	1.5-3 µm	HV 1330	PVD	Dark Grey	Positive	For Turning of Stainless Steel - Extreme Finishing
	CG97-I	1.5-3 µm	HV 1330	PVD	Dark Grey	Negative	For Turning of Stainless Steel - Roughing
<b>P1</b>	CG92-C	1-2 µm	HV 1550	CVD	TICN-AL2O3	Positive	For Turning of Steel - Finishing
	CG92-BB	1-2 µm	HV 1550	CVD	TICN-AL2O3	Positive	For Turning of Steel - Semi-Finishing
	CG92-D	1-2 µm	HV 1550	CVD	TICN-AL2O3	Positive	For Turning of Steel - Semi-Finishing
	CG92-I	1-2 µm	HV 1550	CVD	TICN-AL2O3	Negative	For Turning of Steel - Roughing
	CG92-F	1-2 µm	HV 1550	CVD	TICN-AL2O3	Negative	For Turning of Steel - Extreme Finishing
	CG92-H	1-2 µm	HV 1550	CVD	TICN-AL2O3	Negative	For Turning of Steel - Semi-Finishing
	CG92-P,Q	1-2 µm	HV 1550	CVD	TICN-AL2O3	Negative	For Turning of Steel - Heavy Roughing
<b>P2</b>	CG93-C	1-2 µm	HV 1450	CVD	TICN-AL2O3	Positive	For Turning of Steel - Finishing
	CG93-BB	1-2 µm	HV 1450	CVD	TICN-AL2O3	Positive	For Turning of Steel - Semi-Finishing
	CG93-D	1-2 µm	HV 1450	CVD	TICN-AL2O3	Positive	For Turning of Steel - Semi-Finishing
	CG93-I	1-2 µm	HV 1450	CVD	TICN-AL2O3	Negative	For Turning of Steel - Roughing
	CG93-H	1-2 µm	HV 1450	CVD	TICN-AL2O3	Negative	For Turning of Steel - Semi-Finishing
	CG93-Q	1-2 µm	HV 1450	CVD	TICN-AL2O3	Negative	For Turning of Steel - Heavy Roughing
	CG94-D	1-2 µm	HV 1460	CVD	TICN-AL2O3	Positive	For Turning of Steel (Interrupted) - Semi Finishing
	CG94-D	1-2 µm	HV 1460	CVD	TICN-AL2O3	Negative	For Turning of Steel (Interrupted) - Semi Finishing
CG95-P	1.5-3 µm	HV 1330	PVD	Dark Grey	Negative	For Turning of Stainless Steel - Heavy Roughing	
<b>H</b>	CG91-B		HV 1620	Uncoated		Positive	For Turning of Hardened Steel - Finishing (Cermets)
	CG91-B		HV 1620	Uncoated		Negative	For Turning of Hardened Steel - Finishing (Cermets)
<b>N</b>	CG910-AA	1µm	HV 1630	Uncoated		Positive	For Turning of Non-Ferrous Materials
<b>S</b>	CG911-N	0.8 µm	HV 1820	PVD	TiAlN	Negative	For Turning of Titanium and Heat Resistant Super Alloys
	CG912-N	0.8 µm	HV 1820	PVD	TiAlN-TiN	Negative	For Turning of Titanium and Heat Resistant Super Alloys



## YOU JUST CAN'T KILL THE ZOMBIE

Precise geometries make GWS thread whirlers leaders in high performance single-point threading.

- ▮ Single Pass Threading
- ▮ Shorter cycle times
- ▮ Multiple cutting edges

# ***ULTIMATE PERFORMANCE***

*When nothing less than the best will do, you need cutting tools that yield only the Ultimate in Performance.*

The Ultimate Performance series of cutting tools from GWS feature the finest grades of micrograin carbide, application specific geometries and a multitude of advanced PVD coatings that align with the intended work material.



# ULTIMATE PERFORMANCE

Premium High Performance Carbide Drills



## Series 4005 ECO | 2FL | 5xD | Solid | Inch & Metric

Diameter	Shank Dia.	LOC	OAL	EDP
2.5	3	12.5	69	427001
4	4	20	80	427002
5	5	25	88	427004
5.5	6	27.5	91	427007
6	6	30	95	427010
1/4	1/4	1-1/4	3-7/8	427014
7	7	35	103	427016
7.5	8	37.5	106	427018
5/16	5/16	1-9/16	4-11/32	427020
8	8	40	110	427021
9	10	45	118	427023
9.5	10	47.5	121	427027
3/8	3/8	1-7/8	4-13/16	427028
10	10	50	125	427029
10.5	12	52.5	129	427032
11.5	12	57.5	136	427034
12	12	60	140	427037
1/2	1/2	2-1/2	5-3/4	427040
13.5	14	67.5	151	427044
15	15	75	163	427045
15.5	16	77.5	166	427047
18.5	20	92.5	189	427048

### ECODRILL

#### More About the Series 4005

##### Every Cut Optimized.

Self-centering drill point design means no pre-drilling operations are required

The ECO drill sizes are designed to be combined with our PAC reamers as a perfect "1-2" combination



★ Best ☆ Good



# ULTIMATE PERFORMANCE

Premium High Performance Carbide Drills



## Series 4105 | ECO | 2FL | 5xD | Coolant-through | Inch & Metric

Diameter	Shank Dia.	LOC	OAL	AdvaTech EDP	AITiN EDP
2.5	3	12.5	69	400355	427051
4	4	20	80	400357	427055
5	5	25	88	400361	427057
5.5	6	27.5	91	400365	427060
6	6	30	95	400368	427064
1/4	1/4	1-1/4	3-7/8	400369	427065
7	7	35	103	400373	427069
7.5	8	37.5	106	400377	427071
5/16	5/16	1-9/16	4-11/32	400378	427075
8	8	40	110	400382	427079
9	10	45	118	400385	427082
9.5	10	47.5	121	400386	427084
3/8	3/8	1-7/8	4-13/16	400388	427087
10	10	50	125	400390	427089
10.5	12	52.5	129	400393	427092
11.5	12	57.5	136	400397	427093
12	12	60	140	400399	427096
1/2	1/2	2-1/2	5-3/4	400402	427097
13.5	14	67.5	151	400403	427100
15	15	75	163	400407	427104
15.5	16	77.5	166	400408	427107
18.5	20	92.5	189	400411	427109

## ECODRILL

### More About the Series 4105

**Every Cut Optimized.** Self-centering drill point design means no pre-drilling operations are required

The ECO drill sizes are designed to be combined with our PAC reamers as a perfect "1-2" combination

Coolant-through for increased MRR & tool life.

AdvaTech nano PVD coating increases wear resistance and lubricity over traditional drill coatings for ultimate drilling performance



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide Reamers



## Series 4050 PAC | 1FL | Solid Carbide | Inch & Metric

Cutting Diameter mm	Diameter decimal	Shank Dia.	LOC	OAL	EDP	ECO Drill Size
3.1496	0.1240	1/8	1-3/4	3	<b>427113</b>	Use 2.5mm ECO DRILL
3.1623	0.1245	1/8	1-3/4	3	<b>427115</b>	Use 2.5mm ECO DRILL
3.1750	0.1250	1/8	1-3/4	3	<b>427118</b>	Use 2.5mm ECO DRILL
3.1877	0.1255	1/8	1-3/4	3	<b>427122</b>	Use 2.5mm ECO DRILL
3.2004	0.1260	1/8	1-3/4	3	<b>427123</b>	Use 2.5mm ECO DRILL
4.7371	0.1865	3/16	2-3/4	4	<b>427126</b>	Use 4.0mm ECO DRILL
4.7498	0.1870	3/16	2-3/4	4	<b>427127</b>	Use 4.0mm ECO DRILL
4.7625	0.1875	3/16	2-3/4	4	<b>427130</b>	Use 4.0mm ECO DRILL
4.7752	0.1880	3/16	2-3/4	4	<b>427131</b>	Use 4.0mm ECO DRILL
4.7879	0.1885	3/16	2-3/4	4	<b>427134</b>	Use 4.0mm ECO DRILL
5.9750	0.2352	6	69.65	101	<b>427136</b>	Use 5.5mm ECO DRILL
5.9870	0.2357	6	69.65	101	<b>427137</b>	Use 5.5mm ECO DRILL
6.0000	0.2362	6	69.65	101	<b>427141</b>	Use 5.5mm ECO DRILL
6.0130	0.2367	6	69.65	101	<b>427142</b>	Use 5.5mm ECO DRILL
6.0250	0.2372	6	69.65	101	<b>427145</b>	Use 5.5mm ECO DRILL
6.3246	0.2490	1/4	2-3/4	4	<b>427147</b>	Use 6.0mm ECO DRILL
6.3373	0.2495	1/4	2-3/4	4	<b>427151</b>	Use 6.0mm ECO DRILL
6.3500	0.2500	1/4	2-3/4	4	<b>427154</b>	Use 6.0mm ECO DRILL
6.3627	0.2505	1/4	2-3/4	4	<b>427157</b>	Use 6.0mm ECO DRILL
6.3754	0.2510	1/4	2-3/4	4	<b>427161</b>	Use 6.0mm ECO DRILL
7.9121	0.3115	5/16	2-3/4	4	<b>427163</b>	Use 7.5mm ECO DRILL
7.9121	0.3115	5/16	3-3/4	6	<b>427164</b>	Use 7.5mm ECO DRILL
7.9248	0.3120	5/16	2-3/4	4	<b>427168</b>	Use 7.5mm ECO DRILL
7.9248	0.3120	5/16	3-3/4	6	<b>427170</b>	Use 7.5mm ECO DRILL
7.9375	0.3125	5/16	2-3/4	4	<b>427173</b>	Use 7.5mm ECO DRILL
7.9375	0.3125	5/16	3-3/4	6	<b>427177</b>	Use 7.5mm ECO DRILL
7.9502	0.3130	5/16	2-3/4	4	<b>427178</b>	Use 7.5mm ECO DRILL
7.9502	0.3130	5/16	3-3/4	6	<b>427179</b>	Use 7.5mm ECO DRILL
7.9629	0.3135	5/16	2-3/4	4	<b>427181</b>	Use 7.5mm ECO DRILL
7.9629	0.3135	5/16	3-3/4	6	<b>427182</b>	Use 7.5mm ECO DRILL
7.9750	0.3140	8	69.65	101	<b>427185</b>	Use 7.5mm ECO DRILL
7.9750	0.3140	8	94.65	152	<b>427188</b>	Use 7.5mm ECO DRILL
7.9870	0.3144	8	69.65	101	<b>427192</b>	Use 7.5mm ECO DRILL
7.9870	0.3144	8	94.65	152	<b>427196</b>	Use 7.5mm ECO DRILL
8.0000	0.3150	8	69.65	101	<b>427198</b>	Use 7.5mm ECO DRILL
8.0000	0.3150	8	94.65	152	<b>427199</b>	Use 7.5mm ECO DRILL
8.0130	0.3155	8	69.65	101	<b>427202</b>	Use 7.5mm ECO DRILL
8.0130	0.3155	8	94.65	152	<b>427204</b>	Use 7.5mm ECO DRILL
8.0250	0.3159	8	69.65	101	<b>427206</b>	Use 7.5mm ECO DRILL

### PACREAMER

#### More About the Series 4050

**Precise. Accurate. Concentric.** The PAC reamer design is self-locating, thereby able to provide straightness and true position for dowel pin holes

Ideally coupled with the ECO drill series.

Diameter Tolerance: +0 / - .0002"



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide Reamers



## Series 4050 PAC | 1FL | Solid Carbide | Inch & Metric

Cutting Diameter mm decimal	Shank Dia.	LOC	OAL	EDP	ECO Drill Size
8.0250	0.3159	8	94.65	152	<b>427207</b> Use 7.5mm ECO DRILL
9.4996	0.3740	3/8	2-3/4	4	<b>427210</b> Use 9.0mm ECO DRILL
9.4996	0.3740	3/8	3-3/4	6	<b>427214</b> Use 9.0mm ECO DRILL
9.5123	0.3745	3/8	2-3/4	4	<b>427215</b> Use 9.0mm ECO DRILL
9.5123	0.3745	3/8	3-3/4	6	<b>427219</b> Use 9.0mm ECO DRILL
9.5250	0.3750	3/8	2-3/4	4	<b>427222</b> Use 9.0mm ECO DRILL
9.5250	0.3750	3/8	3-3/4	6	<b>427225</b> Use 9.0mm ECO DRILL
9.5377	0.3755	3/8	2-3/4	4	<b>427226</b> Use 9.0mm ECO DRILL
9.5377	0.3755	3/8	3-3/4	6	<b>427229</b> Use 9.0mm ECO DRILL
9.5504	0.3760	3/8	2-3/4	4	<b>427231</b> Use 9.0mm ECO DRILL
9.5504	0.3760	3/8	3-3/4	6	<b>427233</b> Use 9.0mm ECO DRILL
9.9750	0.3927	10	94.65	152	<b>427235</b> Use 9.5mm ECO DRILL
9.9870	0.3932	10	94.65	152	<b>427238</b> Use 9.5mm ECO DRILL
10.0000	0.3937	10	94.65	152	<b>427239</b> Use 9.5mm ECO DRILL
10.0130	0.3942	10	94.65	152	<b>427242</b> Use 9.5mm ECO DRILL
10.0250	0.3947	10	94.65	152	<b>427243</b> Use 9.5mm ECO DRILL
11.0871	0.4365	7/16	3-3/4	6	<b>427247</b> Use 10.5mm ECO DRILL
11.0998	0.4370	7/16	3-3/4	6	<b>427250</b> Use 10.5mm ECO DRILL
11.1125	0.4375	7/16	3-3/4	6	<b>427252</b> Use 10.5mm ECO DRILL
11.1252	0.4380	7/16	3-3/4	6	<b>427255</b> Use 10.5mm ECO DRILL
11.1379	0.4385	7/16	3-3/4	6	<b>427256</b> Use 10.5mm ECO DRILL
11.9750	0.4715	12	94.7	152	<b>427257</b> Use 11.5mm ECO DRILL
11.9870	0.4719	12	94.7	152	<b>427258</b> Use 11.5mm ECO DRILL
12.0000	0.4724	12	94.7	152	<b>427262</b> Use 11.5mm ECO DRILL
12.0130	0.4730	12	94.7	152	<b>427266</b> Use 11.5mm ECO DRILL
12.0250	0.4734	12	94.7	152	<b>427269</b> Use 11.5mm ECO DRILL
12.6746	0.4990	1/2	3-3/4	6	<b>427271</b> Use 12mm ECO DRILL
12.6873	0.4995	1/2	3-3/4	6	<b>427273</b> Use 12mm ECO DRILL
12.7000	0.5000	1/2	3-3/4	6	<b>427275</b> Use 12mm ECO DRILL
12.7127	0.5005	1/2	3-3/4	6	<b>427277</b> Use 12mm ECO DRILL
12.7254	0.5010	1/2	3-3/4	6	<b>427279</b> Use 12mm ECO DRILL
13.9750	0.5502	14	94.65	152	<b>427281</b> Use 13.5mm ECO DRILL
13.9870	0.5507	14	94.65	152	<b>427285</b> Use 13.5mm ECO DRILL
14.0000	0.5512	14	94.65	152	<b>427289</b> Use 13.5mm ECO DRILL
14.0130	0.5517	14	94.65	152	<b>427293</b> Use 13.5mm ECO DRILL
14.0250	0.5522	14	94.65	152	<b>427297</b> Use 13.5mm ECO DRILL
15.8496	0.6240	5/8	3-3/4	6	<b>427300</b> Use 15mm ECO DRILL
15.8623	0.6245	5/8	3-3/4	6	<b>427302</b> Use 15mm ECO DRILL
15.8750	0.6250	5/8	3-3/4	6	<b>427305</b> Use 15mm ECO DRILL
15.8877	0.6255	5/8	3-3/4	6	<b>427308</b> Use 15mm ECO DRILL

## PACREAMER

### More About the Series 4050

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Diameter Tolerance: +0 /- .0002"



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide Reamers



## Series 4050 PAC | 1FL | Solid Carbide | Inch & Metric

Cutting Diameter mm	Diameter decimal	Shank Dia.	LOC	OAL	EDP	ECO Drill Size
15.9004	0.6260	5/8	3-3/4	6	<b>427312</b>	Use 15mm ECO DRILL
15.9750	0.6289	16	94.65	152	<b>427316</b>	Use 15.5mm ECO DRILL
15.9870	0.6294	16	94.65	152	<b>427320</b>	Use 15.5mm ECO DRILL
16.0000	0.6299	16	94.65	152	<b>427324</b>	Use 15.5mm ECO DRILL
16.0130	0.6304	16	94.65	152	<b>427325</b>	Use 15.5mm ECO DRILL
16.0250	0.6309	16	94.65	152	<b>427329</b>	Use 15.5mm ECO DRILL
19.0246	0.7490	3/4	3-3/4	6	<b>427333</b>	Use 18.5mm ECO DRILL
19.0373	0.7495	3/4	3-3/4	6	<b>427337</b>	Use 18.5mm ECO DRILL
19.0500	0.7500	3/4	3-3/4	6	<b>427339</b>	Use 18.5mm ECO DRILL
19.0627	0.7505	3/4	3-3/4	6	<b>427341</b>	Use 18.5mm ECO DRILL
19.0754	0.7510	3/4	3-3/4	6	<b>427344</b>	Use 18.5mm ECO DRILL

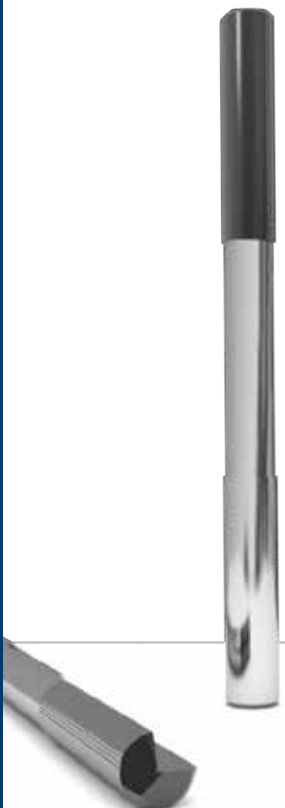
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**Precise. Accurate. Concentric.** The PAC reamer design is self-locating, thereby able to provide straightness and true position for dowel pin holes

Ideally coupled with the ECO drill series.

Diameter Tolerance: +0 /- .0002"



★ Best ☆ Good



# ONE SOURCE HOLEMAKING

ECO Drills & PAC Reamers working together are ideal for close tolerance, round-hole applications that require a micro-finish. Order the perfect pair today.





# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Non-Ferrous Alloys



## More About the Series 1010

**Alumigator Ramping Tool.** Ideal for pocketing, profiling and ramping up to 45 degrees

When the absolute highest in Metal Removal Rates is the goal

### Series 1010 ART | 3FL | Chip Breaker | Radius | Alumigator

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/16	3/16	5/8	2	0.010	118482
3/16	3/16	5/8	2	0.030	118300
1/4	1/4	3/4	2-1/2	0.010	118483
1/4	1/4	3/4	2-1/2	0.040	118484
5/16	5/16	3/4	2-1/2	0.010	118485
5/16	5/16	3/4	2-1/2	0.050	118486
3/8	3/8	1	2-1/2	0.015	118083
3/8	3/8	1	2-1/2	0.060	118084
1/2	1/2	1-1/4	3	0.015	118043
1/2	1/2	1-1/4	3	0.060	117601
1/2	1/2	1-1/4	3	0.080	118695
5/8	5/8	1-5/8	3-1/2	0.020	118487
5/8	5/8	1-5/8	3-1/2	0.060	118301
5/8	5/8	1-5/8	3-1/2	0.100	119594
3/4	3/4	1-5/8	4	0.030	118488
3/4	3/4	1-5/8	4	0.120	119621



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Non-Ferrous Alloys



## Series 1015 AST | 3FL | Chip Breaker | Square & Radius | Alumigator

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/16	3/16	5/8	2	-	120650
3/16	3/16	5/8	2	0.010	120651
3/16	3/16	5/8	2	0.030	120652
1/4	1/4	3/4	2-1/2	-	120653
1/4	1/4	3/4	2-1/2	0.010	120654
1/4	1/4	3/4	2-1/2	0.040	120655
5/16	5/16	3/4	2-1/2	-	120656
5/16	5/16	3/4	2-1/2	0.010	120657
5/16	5/16	3/4	2-1/2	0.050	120658
3/8	3/8	1	2-1/2	-	120659
3/8	3/8	1	2-1/2	0.015	120660
3/8	3/8	1	2-1/2	0.060	120661
1/2	1/2	1-1/4	3	-	120662
1/2	1/2	1-1/4	3	0.015	120663
1/2	1/2	1-1/4	3	0.080	120664
5/8	5/8	1-5/8	3-1/2	-	120665
5/8	5/8	1-5/8	3-1/2	0.020	120666
5/8	5/8	1-5/8	3-1/2	0.100	120667
3/4	3/4	1-5/8	4	-	120668
3/4	3/4	1-5/8	4	0.030	120669
3/4	3/4	1-5/8	4	0.060	123610
3/4	3/4	1-5/8	4	0.090	123397
3/4	3/4	1-5/8	4	0.120	120670



### More About the Series 1015

**Alumigator Slotting & Roughing Tool.** High speed slotting up to two times diameter

Staggered chip breakers for easy chip management and high quality surface finishes



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Non-Ferrous Alloys



## More About the Series 1020

### Alumigator Finishing

**Tool.** Wiper flat for high quality floor finish

Designed to finish parts at roughing speeds and feeds

## Series 1020 | AFT | 3FL | Square & Radius | Alumigator

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/16	3/16	5/8	2	-	120671
3/16	3/16	5/8	2	0.010	120672
3/16	3/16	5/8	2	0.030	120673
1/4	1/4	3/4	2-1/2	-	120674
1/4	1/4	3/4	2-1/2	0.010	120675
1/4	1/4	3/4	2-1/2	0.040	120676
5/16	5/16	3/4	2-1/2	-	120677
5/16	5/16	3/4	2-1/2	0.010	120678
5/16	5/16	3/4	2-1/2	0.050	120679
3/8	3/8	1	2-1/2	-	120680
3/8	3/8	1	2-1/2	0.015	120681
3/8	3/8	1	2-1/2	0.060	120682
1/2	1/2	1-1/4	3	-	120683
1/2	1/2	1-1/4	3	0.015	120684
1/2	1/2	1-1/4	3	0.080	120685
5/8	5/8	1-5/8	3-1/2	-	120686
5/8	5/8	1-5/8	3-1/2	0.020	120687
5/8	5/8	1-5/8	3-1/2	0.100	120688
3/4	3/4	1-5/8	4	-	120689
3/4	3/4	1-5/8	4	0.030	120690
3/4	3/4	1-5/8	4	0.120	120691



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Non-Ferrous Alloys



## Series 1025 | GWA3 | 3FL | Square | Alumigator

Diameter	Shank Dia.	LOC	OAL	Bright EDP	ZrN EDP
3/32	1/8	3/16	1-1/2	102537	103123
1/8	1/8	1/4	1-1/2	101035	101037
1/8	1/8	1/2	1-1/2	100942	105059
5/32	3/16	1/2	2	106407	108028
3/16	3/16	3/16	2	101039	101040
3/16	3/16	5/8	3	100947	100952
1/4	1/4	3/8	2-1/2	101044	101045
1/4	1/4	3/4	2-1/2	100955	103126
1/4	1/4	1-1/8	2-1/2	100994	100996
5/16	5/16	7/16	2-1/2	101046	101048
5/16	5/16	3/4	2-1/2	100960	100963
5/16	5/16	1-1/8	3	100997	100998
3/8	3/8	1/2	2-1/2	101049	101053
3/8	3/8	1	2-1/2	100964	100971
3/8	3/8	1-1/2	4	100999	101002
1/2	1/2	5/8	3	101054	101056
1/2	1/2	1-1/4	3	100972	104458
1/2	1/2	2-1/4	4	101003	101011
5/8	5/8	3/4	3-1/2	101057	101058
5/8	5/8	1-5/8	3-1/2	100986	100987
5/8	5/8	2-1/2	5	101012	101013
3/4	3/4	1	4	101061	101062
3/4	3/4	1-5/8	4	100988	105058
3/4	3/4	2-1/2	5	101014	101018
1	1	1-1/4	4	101063	101065
1	1	2	4	100992	100993
1	1	2-1/2	6	101020	101022



### More About the Series 1025

Wiper flat and circular land for high quality floor and wall finishes

Special radii available on request



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Non-Ferrous Alloys



## Series 1026 | GWA3 | 3FL | Reduced Neck | Square | Alumigator

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Neck Dia.	Bright EDP	ZrN EDP
1/8	1/8	1/4	1-1/2	3/4	0.115	101066	109102
1/8	1/8	1/4	2	1-1/4	0.115	101023	109101
3/16	3/16	5/16	2	1	0.170	101067	109103
3/16	3/16	5/16	3	1-1/2	0.170	101024	103152
1/4	1/4	3/8	2-1/2	1-1/8	0.235	101068	109104
1/4	1/4	3/8	4	2-1/8	0.235	101026	103153
1/4	1/4	3/8	4	2-7/8	0.235	101091	109110
5/16	5/16	7/16	2-1/2	1-1/8	0.295	101069	108136
5/16	5/16	7/16	4	2-1/8	0.295	101028	103154
5/16	5/16	7/16	4	2-7/8	0.295	101092	103161
3/8	3/8	1/2	2-1/2	1-1/8	0.335	101070	109105
3/8	3/8	1/2	4	2-1/8	0.335	101029	103155
3/8	3/8	1/2	6	3-3/8	0.335	101093	109111
1/2	1/2	5/8	3	1-3/8	0.460	101071	109106
1/2	1/2	5/8	4	2-1/8	0.460	101030	103156
1/2	1/2	5/8	6	3-3/8	0.460	101094	109112
5/8	5/8	3/4	3-1/2	1-5/8	0.590	101073	109107
5/8	5/8	3/4	6	2-3/8	0.590	101031	103157
5/8	5/8	3/4	6	3-3/8	0.590	101095	109113
3/4	3/4	1	4	1-5/8	0.715	101074	109108
3/4	3/4	1	6	2-1/2	0.715	101032	103158
3/4	3/4	1	6	3-3/8	0.715	101096	109114
1	1	1-1/4	4	2	0.960	101080	109109
1	1	1-1/4	6	3-3/8	0.960	101034	103159
1	1	1-1/4	6	4-1/2	0.960	101097	109115



### More About the Series 1026

Wiper flat and circular land for high quality floor and wall finishes

Special radii available on request



★ Best ☆ Good



# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Non-Ferrous Alloys



## Series 1027 BNA3 | 3FL | Ball Nose | Alumigator

Diameter	Shank Dia.	LOC	OAL	Bright EDP	ZrN EDP
1/8	1/8	1/4	1-1/2	104730	107510
1/8	1/8	1/2	1-1/2	105116	108708
3/16	3/16	5/16	2	106293	108734
3/16	3/16	5/8	2	106332	108709
1/4	1/4	3/8	2-1/2	104777	108735
1/4	1/4	3/4	2-1/2	104778	108710
1/4	1/4	1-1/8	3	104779	108715
5/16	5/16	7/16	2-1/2	104714	108736
5/16	5/16	3/4	2-1/2	106331	108711
5/16	5/16	1-1/8	3	106602	108716
3/8	3/8	1/2	2-1/2	106905	107853
3/8	3/8	1	2-1/2	103918	107737
3/8	3/8	1-1/2	4	104775	108717
1/2	1/2	5/8	3	104847	106555
1/2	1/2	1-1/4	3	104594	107488
1/2	1/2	2-1/4	4	104776	106558
5/8	5/8	3/4	3-1/2	106868	108737
5/8	5/8	1-5/8	3-1/2	105935	108712
5/8	5/8	2-1/2	5	108718	108719
3/4	3/4	1	4	104737	108738
3/4	3/4	1-5/8	4	100332	112468
3/4	3/4	2-1/2	5	108720	108721
1	1	1-1/4	4	-	108739
1	1	2	4	104740	108714
1	1	2-1/2	6	104738	108722



### More About the Series 1027

Circular land for exceptional wall finishes

Great for 3D surfacing non-ferrous alloys from Aluminum to Beryllium



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Non-Ferrous Alloys



## Series 1028 | BNA3 | 3FL | Reduced Neck | Ball Nose | Alumigator

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Bright EDP	ZrN EDP
1/8	1/8	1/4	1-1/2	3/4	105617	108740
1/8	1/8	1/4	2	1-1/4	107231	108723
3/16	3/16	5/16	2	1	108741	108742
3/16	3/16	5/16	3	1-1/2	105419	108724
1/4	1/4	3/8	2-1/2	1-1/8	104680	108067
1/4	1/4	3/8	4	2-1/8	104681	108725
1/4	1/4	3/8	4	2-7/8	105329	108751
5/16	5/16	7/16	2-1/2	1-1/8	108743	108744
5/16	5/16	7/16	4	2-1/8	108726	108727
5/16	5/16	7/16	4	2-7/8	105803	108752
3/8	3/8	1/2	2-1/2	1-1/8	107411	108745
3/8	3/8	1/2	4	2-1/8	106535	108728
3/8	3/8	1/2	6	3-3/8	105731	108753
1/2	1/2	5/8	3	1-3/8	107457	106556
1/2	1/2	5/8	4	2-1/8	104889	106557
1/2	1/2	5/8	6	3-3/8	103847	108754
5/8	5/8	3/4	3-1/2	1-5/8	108746	108747
5/8	5/8	3/4	6	2-3/8	108729	108730
5/8	5/8	3/4	6	3-3/8	107412	108755
3/4	3/4	1	4	1-5/8	108748	108749
3/4	3/4	1	6	2-1/2	108731	108732
3/4	3/4	1	6	3-3/8	108756	108757
1	1	1-1/4	4	2	107363	108750
1	1	1-1/4	6	2-3/8	105169	108733
1	1	1-1/4	7	4-1/2	108758	108759



### More About the Series 1028

Designed for High Speed Machining of Aluminum

Ramp, plunge, profile milling

Reduced neck for extended reach



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1030 HGW4 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/8	1/8	1/4	1-1/2	-	120432
1/8	1/8	1/4	1-1/2	0.005	120542
1/8	1/8	1/4	1-1/2	0.015	121556
1/8	1/8	1/4	1-1/2	0.030	121557
1/8	1/8	1/2	2	-	119342
1/8	1/8	1/2	2	0.005	119333
1/8	1/8	1/2	2	0.015	121425
1/8	1/8	1/2	2	0.030	121426
3/16	3/16	5/16	2	-	120433
3/16	3/16	5/16	2	0.005	120543
3/16	3/16	5/16	2	0.015	121558
3/16	3/16	5/16	2	0.030	121559
3/16	3/16	5/8	2	-	119343
3/16	3/16	5/8	2	0.005	119334
3/16	3/16	5/8	2	0.015	121427
3/16	3/16	5/8	2	0.030	121428
3/16	3/16	3/4	2	-	120151
3/16	3/16	3/4	2	0.005	120159
3/16	3/16	3/4	2	0.015	121518
3/16	3/16	3/4	2	0.030	121519
3/16	3/16	3/4	2	0.060	120550
1/4	1/4	5/16	2	-	121555
1/4	1/4	5/16	2	0.005	121560
1/4	1/4	5/16	2	0.010	121561
1/4	1/4	5/16	2	0.015	121562
1/4	1/4	5/16	2	0.030	121563
1/4	1/4	5/16	2	0.060	121564
1/4	1/4	1/2	2-1/2	-	120434
1/4	1/4	1/2	2-1/2	0.005	121565
1/4	1/4	1/2	2-1/2	0.010	120544
1/4	1/4	1/2	2-1/2	0.015	121566
1/4	1/4	1/2	2-1/2	0.030	121567
1/4	1/4	1/2	2-1/2	0.060	121568
1/4	1/4	3/4	2-1/2	-	119344
1/4	1/4	3/4	2-1/2	0.005	121429
1/4	1/4	3/4	2-1/2	0.010	119335
1/4	1/4	3/4	2-1/2	0.015	121430
1/4	1/4	3/4	2-1/2	0.030	120697
1/4	1/4	3/4	2-1/2	0.060	120473
1/4	1/4	1-1/8	3	-	120152



### More About the Series 1030

Ideal for Tool Steels and Hard Alloys

Variable helix/unequal index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## More About the Series 1030

Ideal for Tool Steels and Hard Alloys

Variable helix/unequal index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request

### Series 1030 HGW4 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/4	1/4	1-1/8	3	0.005	121521
1/4	1/4	1-1/8	3	0.010	120160
1/4	1/4	1-1/8	3	0.015	121522
1/4	1/4	1-1/8	3	0.030	121523
1/4	1/4	1-1/8	3	0.060	121524
5/16	5/16	1/2	2	-	120435
5/16	5/16	1/2	2	0.010	120545
5/16	5/16	1/2	2	0.015	121569
5/16	5/16	1/2	2	0.030	121570
5/16	5/16	1/2	2	0.060	121571
5/16	5/16	13/16	2-1/2	-	119345
5/16	5/16	13/16	2-1/2	0.010	119336
5/16	5/16	13/16	2-1/2	0.015	121432
5/16	5/16	13/16	2-1/2	0.030	121433
5/16	5/16	13/16	2-1/2	0.060	121434
5/16	5/16	1-1/8	3	-	120153
5/16	5/16	1-1/8	3	0.010	120161
5/16	5/16	1-1/8	3	0.015	121525
5/16	5/16	1-1/8	3	0.030	121526
5/16	5/16	1-1/8	3	0.060	121527
3/8	3/8	7/16	2	-	122483
3/8	3/8	7/16	2	0.015	121572
3/8	3/8	7/16	2	0.030	121573
3/8	3/8	7/16	2	0.060	121574
3/8	3/8	5/8	2	-	120436
3/8	3/8	5/8	2	0.015	120546
3/8	3/8	5/8	2	0.030	121575
3/8	3/8	5/8	2	0.060	121576
3/8	3/8	7/8	2-1/2	-	119346
3/8	3/8	7/8	2-1/2	0.010	119315
3/8	3/8	7/8	2-1/2	0.015	119337
3/8	3/8	7/8	2-1/2	0.030	121435
3/8	3/8	7/8	2-1/2	0.060	121488
3/8	3/8	1-1/8	3	-	120154
3/8	3/8	1-1/8	3	0.010	120162
3/8	3/8	1-1/8	3	0.015	121528
3/8	3/8	1-1/8	3	0.030	121529
3/8	3/8	1-1/8	3	0.060	121530
3/8	3/8	1-1/8	3	0.090	121531
3/8	3/8	1-1/8	3	0.120	121532



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1030 HGW4 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/2	1/2	5/8	2-1/2	-	120437
1/2	1/2	5/8	2-1/2	0.015	120547
1/2	1/2	5/8	2-1/2	0.030	120551
1/2	1/2	5/8	2-1/2	0.060	121577
1/2	1/2	5/8	2-1/2	0.090	121578
1/2	1/2	5/8	2-1/2	0.120	121579
1/2	1/2	1	3	-	119347
1/2	1/2	1	3	0.015	119338
1/2	1/2	1	3	0.020	121516
1/2	1/2	1	3	0.030	119546
1/2	1/2	1	3	0.060	120076
1/2	1/2	1	3	0.090	121489
1/2	1/2	1	3	0.120	121490
1/2	1/2	1-1/4	3	-	121515
1/2	1/2	1-1/4	3	0.015	121491
1/2	1/2	1-1/4	3	0.030	121492
1/2	1/2	1-1/4	3	0.060	121493
1/2	1/2	1-1/4	3	0.090	121494
1/2	1/2	1-1/4	3	0.120	121495
1/2	1/2	1-1/2	3	-	122282
1/2	1/2	1-1/2	3	0.015	121496
1/2	1/2	1-1/2	3	0.030	121497
1/2	1/2	1-1/2	3	0.060	121498
1/2	1/2	1-1/2	3	0.090	121499
1/2	1/2	1-1/2	3	0.120	121500
1/2	1/2	1-3/4	4	-	121517
1/2	1/2	1-3/4	4	0.015	121533
1/2	1/2	1-3/4	4	0.030	121534
1/2	1/2	1-3/4	4	0.060	121535
1/2	1/2	1-3/4	4	0.090	121536
1/2	1/2	1-3/4	4	0.120	121537
1/2	1/2	2	4	-	120155
1/2	1/2	2	4	0.015	120163
1/2	1/2	2	4	0.030	121538
1/2	1/2	2	4	0.060	121539
1/2	1/2	2	4	0.090	121540
1/2	1/2	2	4	0.120	121541
5/8	5/8	3/4	3	-	120438
5/8	5/8	3/4	3	0.015	121580
5/8	5/8	3/4	3	0.020	120548



### More About the Series 1030

Ideal for Tool Steels and Hard Alloys

Variable helix/unequal index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## More About the Series 1030

Ideal for Tool Steels and Hard Alloys

Variable helix/unequal index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request

### Series 1030 HGW4 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
5/8	5/8	3/4	3	0.030	121581
5/8	5/8	3/4	3	0.060	121582
5/8	5/8	3/4	3	0.090	121583
5/8	5/8	3/4	3	0.120	121584
5/8	5/8	1-1/4	3-1/2	-	119348
5/8	5/8	1-1/4	3-1/2	0.015	121502
5/8	5/8	1-1/4	3-1/2	0.020	119339
5/8	5/8	1-1/4	3-1/2	0.030	121503
5/8	5/8	1-1/4	3-1/2	0.060	121504
5/8	5/8	1-1/4	3-1/2	0.090	121505
5/8	5/8	1-1/4	3-1/2	0.120	121506
5/8	5/8	2-1/4	5	-	120156
5/8	5/8	2-1/4	5	0.015	121542
5/8	5/8	2-1/4	5	0.020	120164
5/8	5/8	2-1/4	5	0.030	121543
5/8	5/8	2-1/4	5	0.060	121544
5/8	5/8	2-1/4	5	0.090	121545
5/8	5/8	2-1/4	5	0.120	121546
3/4	3/4	7/8	3	-	120439
3/4	3/4	7/8	3	0.015	121585
3/4	3/4	7/8	3	0.030	120486
3/4	3/4	7/8	3	0.060	121586
3/4	3/4	7/8	3	0.090	121587
3/4	3/4	7/8	3	0.120	121588
3/4	3/4	1-1/2	4	-	119349
3/4	3/4	1-1/2	4	0.020	121507
3/4	3/4	1-1/2	4	0.030	119340
3/4	3/4	1-1/2	4	0.060	121508
3/4	3/4	1-1/2	4	0.090	121509
3/4	3/4	1-1/2	4	0.120	121510
3/4	3/4	2-1/4	5	-	119722
3/4	3/4	2-1/4	5	0.015	121547
3/4	3/4	2-1/4	5	0.030	119723
3/4	3/4	2-1/4	5	0.060	121548
3/4	3/4	2-1/4	5	0.090	121549
3/4	3/4	2-1/4	5	0.120	121550
1	1	1	4	-	120440
1	1	1	4	0.015	121589
1	1	1	4	0.030	120549
1	1	1	4	0.060	121590



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1030 HGW4 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1	1	1	4	0.090	121591
1	1	1	4	0.120	121592
1	1	1-1/2	4	-	119350
1	1	1-1/2	4	0.015	121511
1	1	1-1/2	4	0.030	119341
1	1	1-1/2	4	0.060	121512
1	1	1-1/2	4	0.090	121513
1	1	1-1/2	4	0.120	121514
1	1	2-1/4	5	-	120158
1	1	2-1/4	5	0.015	121551
1	1	2-1/4	5	0.030	120166
1	1	2-1/4	5	0.060	121552
1	1	2-1/4	5	0.090	121553
1	1	2-1/4	5	0.120	121554



### More About the Series 1030

Ideal for Tool Steels and Hard Alloys

Variable helix/unequal index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## More About the Series 1032

Ideal for Tool Steels and Hard Alloys

Variable helix/variable index design reduces vibration and enables higher metal removal rates

### Series 1032 HGW4BN | 4FL | Ball Nose

Diameter	Shank Dia.	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	122963
1/8	1/8	1/2	2	120360
3/16	3/16	5/16	2	123087
3/16	3/16	5/8	2	120361
3/16	3/16	3/4	2	123098
1/4	1/4	5/16	2	123088
1/4	1/4	1/2	2-1/2	122983
1/4	1/4	3/4	2-1/2	120362
1/4	1/4	1-1/8	3	123099
5/16	5/16	1/2	2	123089
5/16	5/16	13/16	2-1/2	120363
5/16	5/16	1-1/8	3	123100
3/8	3/8	7/16	2	123090
3/8	3/8	5/8	2	120364
3/8	3/8	1-1/8	3	122969
1/2	1/2	5/8	2-1/2	123091
1/2	1/2	1	3	120526
1/2	1/2	1-1/4	3	123095
1/2	1/2	1-1/2	3	123096
1/2	1/2	1-3/4	4	122971
1/2	1/2	2	4	123101
5/8	5/8	3/4	3	123092
5/8	5/8	1-1/4	3-1/2	120365
5/8	5/8	2-1/4	5	123102
3/4	3/4	7/8	3	123093
3/4	3/4	1-1/2	4	120366
3/4	3/4	2-1/4	5	123103
1	1	1	4	123094
1	1	1-1/2	4	123097
1	1	2-1/4	5	123104



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1035 HGW5 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/8	1/8	1/4	1-1/2	-	120988
1/8	1/8	1/4	1-1/2	0.005	121373
1/8	1/8	1/4	1-1/2	0.015	121374
1/8	1/8	1/4	1-1/2	0.030	120979
1/8	1/8	1/2	2	-	120954
1/8	1/8	1/2	2	0.005	120945
1/8	1/8	1/2	2	0.015	121298
1/8	1/8	1/2	2	0.030	121299
3/16	3/16	5/16	2	-	120980
3/16	3/16	5/16	2	0.005	120989
3/16	3/16	5/16	2	0.015	121375
3/16	3/16	5/16	2	0.030	121376
3/16	3/16	5/8	2	-	120955
3/16	3/16	5/8	2	0.005	120946
3/16	3/16	5/8	2	0.015	121300
3/16	3/16	5/8	2	0.030	121301
3/16	3/16	3/4	2	-	120963
3/16	3/16	3/4	2	0.005	120971
3/16	3/16	3/4	2	0.015	121341
3/16	3/16	3/4	2	0.030	121342
3/16	3/16	3/4	2	0.060	121343
1/4	1/4	5/16	2	-	120184
1/4	1/4	5/16	2	0.005	121472
1/4	1/4	5/16	2	0.010	121481
1/4	1/4	5/16	2	0.015	121482
1/4	1/4	5/16	2	0.030	121483
1/4	1/4	5/16	2	0.060	121484
1/4	1/4	1/2	2-1/2	-	120981
1/4	1/4	1/2	2-1/2	0.005	121377
1/4	1/4	1/2	2-1/2	0.010	120990
1/4	1/4	1/2	2-1/2	0.015	121380
1/4	1/4	1/2	2-1/2	0.030	121381
1/4	1/4	1/2	2-1/2	0.060	121382
1/4	1/4	3/4	2-1/2	-	120956
1/4	1/4	3/4	2-1/2	0.005	121302
1/4	1/4	3/4	2-1/2	0.010	120947
1/4	1/4	3/4	2-1/2	0.015	121303
1/4	1/4	3/4	2-1/2	0.030	121304
1/4	1/4	3/4	2-1/2	0.060	121305
1/4	1/4	1-1/8	3	-	120964



### More About the Series 1035

Ideal for Tool Steels and Hard Alloys

Variable helix/variable index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



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### Series 1035 HGW5 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/4	1/4	1-1/8	3	0.005	121344
1/4	1/4	1-1/8	3	0.010	120972
1/4	1/4	1-1/8	3	0.015	121345
1/4	1/4	1-1/8	3	0.030	121346
1/4	1/4	1-1/8	3	0.060	121347
5/16	5/16	1/2	2	-	120982
5/16	5/16	1/2	2	0.010	120991
5/16	5/16	1/2	2	0.015	121383
5/16	5/16	1/2	2	0.030	121385
5/16	5/16	1/2	2	0.060	121386
5/16	5/16	13/16	2-1/2	-	120957
5/16	5/16	13/16	2-1/2	0.010	120948
5/16	5/16	13/16	2-1/2	0.015	121312
5/16	5/16	13/16	2-1/2	0.030	121313
5/16	5/16	13/16	2-1/2	0.060	121314
5/16	5/16	1-1/8	3	-	120965
5/16	5/16	1-1/8	3	0.010	120973
5/16	5/16	1-1/8	3	0.015	121348
5/16	5/16	1-1/8	3	0.030	121349
5/16	5/16	1-1/8	3	0.060	121350
3/8	3/8	7/16	2	-	122484
3/8	3/8	7/16	2	0.015	121485
3/8	3/8	7/16	2	0.030	121486
3/8	3/8	7/16	2	0.060	121487
3/8	3/8	5/8	2	-	120983
3/8	3/8	5/8	2	0.015	120992
3/8	3/8	5/8	2	0.030	121387
3/8	3/8	5/8	2	0.060	121388
3/8	3/8	7/8	2-1/2	-	120958
3/8	3/8	7/8	2-1/2	0.010	120481
3/8	3/8	7/8	2-1/2	0.015	120949
3/8	3/8	7/8	2-1/2	0.030	121315
3/8	3/8	7/8	2-1/2	0.060	121316
3/8	3/8	1-1/8	3	-	120966
3/8	3/8	1-1/8	3	0.010	120974
3/8	3/8	1-1/8	3	0.015	121351
3/8	3/8	1-1/8	3	0.030	121352
3/8	3/8	1-1/8	3	0.060	121353
3/8	3/8	1-1/8	3	0.090	121354
3/8	3/8	1-1/8	3	0.120	121355



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1035 HGW5 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/2	1/2	5/8	2-1/2	-	120984
1/2	1/2	5/8	2-1/2	0.015	120993
1/2	1/2	5/8	2-1/2	0.030	121389
1/2	1/2	5/8	2-1/2	0.060	121390
1/2	1/2	5/8	2-1/2	0.090	121391
1/2	1/2	5/8	2-1/2	0.120	121392
1/2	1/2	1	3	-	119762
1/2	1/2	1	3	0.015	120950
1/2	1/2	1	3	0.020	122033
1/2	1/2	1	3	0.030	120648
1/2	1/2	1	3	0.060	121317
1/2	1/2	1	3	0.090	121318
1/2	1/2	1	3	0.120	121319
1/2	1/2	1-1/4	3	-	123121
1/2	1/2	1-1/4	3	0.015	121457
1/2	1/2	1-1/4	3	0.030	121458
1/2	1/2	1-1/4	3	0.060	121459
1/2	1/2	1-1/4	3	0.090	121460
1/2	1/2	1-1/4	3	0.120	121461
1/2	1/2	1-1/2	3	-	121600
1/2	1/2	1-1/2	3	0.015	121462
1/2	1/2	1-1/2	3	0.030	121463
1/2	1/2	1-1/2	3	0.060	121464
1/2	1/2	1-1/2	3	0.090	121465
1/2	1/2	1-1/2	3	0.120	121466
1/2	1/2	1-3/4	4	-	121520
1/2	1/2	1-3/4	4	0.015	121467
1/2	1/2	1-3/4	4	0.030	121468
1/2	1/2	1-3/4	4	0.060	121469
1/2	1/2	1-3/4	4	0.090	121470
1/2	1/2	2	4	-	120967
1/2	1/2	2	4	0.015	120975
1/2	1/2	2	4	0.030	121356
1/2	1/2	2	4	0.060	121357
1/2	1/2	2	4	0.090	121358
1/2	1/2	2	4	0.120	121359
1/2	1/2	1-3/4	4	0.120	121471
5/8	5/8	3/4	3	-	120985
5/8	5/8	3/4	3	0.015	121393
5/8	5/8	3/4	3	0.020	120994



### More About the Series 1035

Ideal for Tool Steels and Hard Alloys

Variable helix/variable index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



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Premium High Performance Carbide End Mills for Ferrous Materials



## More About the Series 1035

Ideal for Tool Steels and Hard Alloys

Variable helix/variable index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request

### Series 1035 HGW5 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
5/8	5/8	3/4	3	0.030	121394
5/8	5/8	3/4	3	0.060	121395
5/8	5/8	3/4	3	0.090	121396
5/8	5/8	3/4	3	0.120	121398
5/8	5/8	1-1/4	3-1/2	-	119764
5/8	5/8	1-1/4	3-1/2	0.015	121320
5/8	5/8	1-1/4	3-1/2	0.020	119756
5/8	5/8	1-1/4	3-1/2	0.030	121321
5/8	5/8	1-1/4	3-1/2	0.060	121324
5/8	5/8	1-1/4	3-1/2	0.090	121325
5/8	5/8	1-1/4	3-1/2	0.120	121326
5/8	5/8	2-1/4	5	-	120968
5/8	5/8	2-1/4	5	0.015	121360
5/8	5/8	2-1/4	5	0.020	120976
5/8	5/8	2-1/4	5	0.030	121361
5/8	5/8	2-1/4	5	0.060	121362
5/8	5/8	2-1/4	5	0.090	121363
5/8	5/8	2-1/4	5	0.120	121364
3/4	3/4	7/8	3	-	120986
3/4	3/4	7/8	3	0.015	121399
3/4	3/4	7/8	3	0.030	120995
3/4	3/4	7/8	3	0.060	121400
3/4	3/4	7/8	3	0.090	121401
3/4	3/4	7/8	3	0.120	121402
3/4	3/4	1-1/2	4	-	119765
3/4	3/4	1-1/2	4	0.020	121327
3/4	3/4	1-1/2	4	0.030	119758
3/4	3/4	1-1/2	4	0.060	121328
3/4	3/4	1-1/2	4	0.090	121329
3/4	3/4	1-1/2	4	0.120	121330
3/4	3/4	2-1/4	5	-	120969
3/4	3/4	2-1/4	5	0.015	121365
3/4	3/4	2-1/4	5	0.030	120977
3/4	3/4	2-1/4	5	0.060	121366
3/4	3/4	2-1/4	5	0.090	121367
3/4	3/4	2-1/4	5	0.120	121368
1	1	1	4	-	120987
1	1	1	4	0.015	121403
1	1	1	4	0.030	120996
1	1	1	4	0.060	121404



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Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1035 HGW5 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1	1	1	4	0.090	121405
1	1	1	4	0.120	121406
1	1	1-1/2	4	-	119766
1	1	1-1/2	4	0.015	121336
1	1	1-1/2	4	0.030	119760
1	1	1-1/2	4	0.060	121338
1	1	1-1/2	4	0.090	121339
1	1	1-1/2	4	0.120	121340
1	1	2-1/4	5	-	120970
1	1	2-1/4	5	0.015	121369
1	1	2-1/4	5	0.030	120978
1	1	2-1/4	5	0.060	121370
1	1	2-1/4	5	0.090	121371
1	1	2-1/4	5	0.120	121372



### More About the Series 1035

Ideal for Tool Steels and Hard Alloys

Variable helix/variable index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## More About the Series 1040

Ideal for Tool Steels and Hard Alloys

Variable helix/variable index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request

### Series 1040 HGW7 | 7FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/8	1/8	1/4	1-1/2	-	122664
1/8	1/8	1/4	1-1/2	0.005	122612
1/8	1/8	1/4	1-1/2	0.015	122613
1/8	1/8	1/4	1-1/2	0.030	122614
1/8	1/8	1/2	2	-	122876
1/8	1/8	1/2	2	0.005	122798
1/8	1/8	1/2	2	0.015	122799
1/8	1/8	1/2	2	0.030	122800
3/16	3/16	5/16	2	-	122665
3/16	3/16	5/16	2	0.005	122615
3/16	3/16	5/16	2	0.015	122616
3/16	3/16	5/16	2	0.030	122617
3/16	3/16	5/8	2	-	122877
3/16	3/16	5/8	2	0.005	122801
3/16	3/16	5/8	2	0.015	122802
3/16	3/16	5/8	2	0.030	122803
3/16	3/16	3/4	2	-	122930
3/16	3/16	3/4	2	0.005	122885
3/16	3/16	3/4	2	0.015	122886
3/16	3/16	3/4	2	0.030	122887
3/16	3/16	3/4	2	0.060	122888
1/4	1/4	5/16	2	-	122666
1/4	1/4	5/16	2	0.005	122618
1/4	1/4	5/16	2	0.010	122619
1/4	1/4	5/16	2	0.015	122620
1/4	1/4	5/16	2	0.030	122621
1/4	1/4	5/16	2	0.060	122622
1/4	1/4	1/2	2-1/2	-	122667
1/4	1/4	1/2	2-1/2	0.005	122623
1/4	1/4	1/2	2-1/2	0.010	122624
1/4	1/4	1/2	2-1/2	0.015	122625
1/4	1/4	1/2	2-1/2	0.030	122626
1/4	1/4	1/2	2-1/2	0.060	122627
1/4	1/4	3/4	2-1/2	-	122878
1/4	1/4	3/4	2-1/2	0.005	122804
1/4	1/4	3/4	2-1/2	0.010	122805
1/4	1/4	3/4	2-1/2	0.015	122806
1/4	1/4	3/4	2-1/2	0.030	122807
1/4	1/4	3/4	2-1/2	0.060	122808
1/4	1/4	1-1/8	3	-	122931



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1040 HGW7 | 7FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/4	1/4	1-1/8	3	0.005	122889
1/4	1/4	1-1/8	3	0.010	122890
1/4	1/4	1-1/8	3	0.015	122891
1/4	1/4	1-1/8	3	0.030	122892
1/4	1/4	1-1/8	3	0.060	122893
5/16	5/16	1/2	2	-	122668
5/16	5/16	1/2	2	0.010	122628
5/16	5/16	1/2	2	0.015	122629
5/16	5/16	1/2	2	0.030	122630
5/16	5/16	1/2	2	0.060	122631
5/16	5/16	13/16	2-1/2	-	122879
5/16	5/16	13/16	2-1/2	0.010	122809
5/16	5/16	13/16	2-1/2	0.015	122810
5/16	5/16	13/16	2-1/2	0.030	122811
5/16	5/16	13/16	2-1/2	0.060	122812
5/16	5/16	1-1/8	3	-	122932
5/16	5/16	1-1/8	3	0.010	122894
5/16	5/16	1-1/8	3	0.015	122895
5/16	5/16	1-1/8	3	0.030	122896
5/16	5/16	1-1/8	3	0.060	122897
3/8	3/8	7/16	2	-	122670
3/8	3/8	7/16	2	0.015	122632
3/8	3/8	7/16	2	0.030	122633
3/8	3/8	7/16	2	0.060	122634
3/8	3/8	5/8	2	-	122669
3/8	3/8	5/8	2	0.015	122635
3/8	3/8	5/8	2	0.030	122636
3/8	3/8	5/8	2	0.060	122637
3/8	3/8	7/8	2-1/2	-	122880
3/8	3/8	7/8	2-1/2	0.010	122813
3/8	3/8	7/8	2-1/2	0.015	122814
3/8	3/8	7/8	2-1/2	0.030	122815
3/8	3/8	7/8	2-1/2	0.060	122816
3/8	3/8	1-1/8	3	-	122933
3/8	3/8	1-1/8	3	0.010	122898
3/8	3/8	1-1/8	3	0.015	122899
3/8	3/8	1-1/8	3	0.030	122900
3/8	3/8	1-1/8	3	0.060	122901
3/8	3/8	1-1/8	3	0.090	122902
3/8	3/8	1-1/8	3	0.120	122903



### More About the Series 1040

Ideal for Tool Steels and Hard Alloys

Variable helix/variable index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



★ Best ☆ Good



# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## More About the Series 1040

Ideal for Tool Steels and Hard Alloys

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### Series 1040 HGW7 | 7FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/2	1/2	5/8	2-1/2	-	122671
1/2	1/2	5/8	2-1/2	0.015	122638
1/2	1/2	5/8	2-1/2	0.030	122639
1/2	1/2	5/8	2-1/2	0.060	122640
1/2	1/2	5/8	2-1/2	0.090	121901
1/2	1/2	5/8	2-1/2	0.120	122641
1/2	1/2	1	3	-	121242
1/2	1/2	1	3	0.015	124462
1/2	1/2	1	3	0.020	122823
1/2	1/2	1	3	0.030	122824
1/2	1/2	1	3	0.060	122825
1/2	1/2	1	3	0.090	122826
1/2	1/2	1	3	0.120	122827
1/2	1/2	1-1/4	3	-	122268
1/2	1/2	1-1/4	3	0.015	122828
1/2	1/2	1-1/4	3	0.030	122829
1/2	1/2	1-1/4	3	0.060	122830
1/2	1/2	1-1/4	3	0.090	122831
1/2	1/2	1-1/4	3	0.120	122832
1/2	1/2	1-1/2	3	-	122881
1/2	1/2	1-1/2	3	0.015	122833
1/2	1/2	1-1/2	3	0.030	122835
1/2	1/2	1-1/2	3	0.060	122836
1/2	1/2	1-1/2	3	0.090	122837
1/2	1/2	1-1/2	3	0.120	122838
1/2	1/2	1-3/4	4	-	122934
1/2	1/2	1-3/4	4	0.015	122904
1/2	1/2	1-3/4	4	0.030	122905
1/2	1/2	1-3/4	4	0.060	122906
1/2	1/2	1-3/4	4	0.090	122907
1/2	1/2	1-3/4	4	0.120	122908
1/2	1/2	2	4	-	122935
1/2	1/2	2	4	0.015	122909
1/2	1/2	2	4	0.030	122910
1/2	1/2	2	4	0.060	122911
1/2	1/2	2	4	0.090	122912
1/2	1/2	2	4	0.120	122913
5/8	5/8	3/4	3	-	122715
5/8	5/8	3/4	3	0.015	122642
5/8	5/8	3/4	3	0.020	122643



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1040 | HGW7 | 7FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
5/8	5/8	3/4	3	0.030	122644
5/8	5/8	3/4	3	0.060	122645
5/8	5/8	3/4	3	0.090	122646
5/8	5/8	3/4	3	0.120	122647
5/8	5/8	1-1/4	3-1/2	-	122882
5/8	5/8	1-1/4	3-1/2	0.015	122839
5/8	5/8	1-1/4	3-1/2	0.020	122840
5/8	5/8	1-1/4	3-1/2	0.030	122841
5/8	5/8	1-1/4	3-1/2	0.060	122851
5/8	5/8	1-1/4	3-1/2	0.090	122852
5/8	5/8	1-1/4	3-1/2	0.120	122853
5/8	5/8	2-1/4	5	-	122936
5/8	5/8	2-1/4	5	0.015	122914
5/8	5/8	2-1/4	5	0.020	122915
5/8	5/8	2-1/4	5	0.030	122916
5/8	5/8	2-1/4	5	0.060	122917
5/8	5/8	2-1/4	5	0.090	122918
5/8	5/8	2-1/4	5	0.120	122919
3/4	3/4	7/8	3	-	122716
3/4	3/4	7/8	3	0.015	122648
3/4	3/4	7/8	3	0.030	122651
3/4	3/4	7/8	3	0.060	122654
3/4	3/4	7/8	3	0.090	122655
3/4	3/4	7/8	3	0.120	122656
3/4	3/4	1-1/2	4	-	122883
3/4	3/4	1-1/2	4	0.020	122854
3/4	3/4	1-1/2	4	0.030	122866
3/4	3/4	1-1/2	4	0.060	122867
3/4	3/4	1-1/2	4	0.090	122868
3/4	3/4	1-1/2	4	0.120	122761
3/4	3/4	2-1/4	5	-	122937
3/4	3/4	2-1/4	5	0.015	122920
3/4	3/4	2-1/4	5	0.030	122921
3/4	3/4	2-1/4	5	0.060	122922
3/4	3/4	2-1/4	5	0.090	122923
3/4	3/4	2-1/4	5	0.120	122924
1	1	1	4	-	122797
1	1	1	4	0.015	122659
1	1	1	4	0.030	122660
1	1	1	4	0.060	122661



### More About the Series 1040

Ideal for Tool Steels and Hard Alloys

Variable helix/variable index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



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### Series 1040 HGW7 | 7FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1	1	1	4	0.090	122662
1	1	1	4	0.120	122663
1	1	1-1/2	4	-	122884
1	1	1-1/2	4	0.015	122869
1	1	1-1/2	4	0.030	122871
1	1	1-1/2	4	0.060	122872
1	1	1-1/2	4	0.090	122873
1	1	1-1/2	4	0.120	122875
1	1	2-1/4	5	-	122938
1	1	2-1/4	5	0.015	122925
1	1	2-1/4	5	0.030	122926
1	1	2-1/4	5	0.060	122927
1	1	2-1/4	5	0.090	122928
1	1	2-1/4	5	0.120	122929



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 1031 SRF4 | 4FL | Square & Radius

Diameter	Shank Dia	LOC	OAL	EDP
1/8	1/8	1/4	1.5	107988
1/8	1/8	1/2	1.5	111235
3/16	3/16	5/16	2	111252
3/16	3/16	5/8	2	111236
1/4	1/4	1/2	2	107794
1/4	1/4	3/4	2.5	111237
1/4	1/4	1-1/8	3	111244
5/16	5/16	1/2	2	107990
5/16	5/16	13/16	2.5	111238
5/16	5/16	1-1/8	3	111245
3/8	3/8	5/8	2	111253
3/8	3/8	7/8	2.5	111239
3/8	3/8	1-1/8	3	111246
1/2	1/2	5/8	2.5	107904
1/2	1/2	1	3	107905
1/2	1/2	2	4	111247
5/8	5/8	3/4	3	107992
5/8	5/8	1-1/4	3.5	111277
5/8	5/8	2-1/4	5	111248
3/4	3/4	7/8	3	107919
3/4	3/4	1-1/2	4	111242
3/4	3/4	2-1/4	5	111249
1	1	1	4	107997
1	1	1-1/2	4	111243
1	1	2-1/4	5	111250



### More About the Series 1031

Ideal for Stainless and Hardened Steels

Variable helix/variable index design reduces vibration and enables higher metal removal rates

Special corner radii available upon request



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## More About the Series 1050

Ideal for Die/Mold applications in alloy and hardened steels

5-micron radius tolerance

Special modifications available upon request

### Series 1050 BND2 | DM2 | 2FL | Ball Nose | Die/Mold | MoldMaster

Diameter	Shank Dia.	LOC	OAL	EDP
1/32	1/8	1/32	3	100333
1/16	1/8	1/16	3	100334
3/32	1/8	3/32	3	100335
1/8	1/8	1/8	3	100336
5/32	3/16	5/32	3	100338
3/16	3/16	3/16	3	100342
1/4	1/4	1/4	3	100346
5/16	5/16	5/16	3	100348
3/8	3/8	3/8	3.5	100349
1/2	1/2	1/2	4	100351



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2100 438 | 4FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/8	1/8	1/4	1-1/2	-	310001
1/8	1/8	1/4	1-1/2	0.010	310005
1/8	1/8	1/4	1-1/2	0.020	310007
1/8	1/8	1/4	1-1/2	0.030	310009
1/8	1/8	1/2	2	-	310013
1/8	1/8	1/2	2	0.010	310017
1/8	1/8	1/2	2	0.020	310019
1/8	1/8	1/2	2	0.030	310023
1/8	1/8	3/4	2-1/2	-	310025
1/8	1/8	3/4	2-1/2	0.010	310029
1/8	1/8	3/4	2-1/2	0.020	310031
1/8	1/8	3/4	2-1/2	0.030	310034
3/16	3/16	5/16	2	-	310037
3/16	3/16	5/16	2	0.010	310040
3/16	3/16	5/16	2	0.020	310044
3/16	3/16	5/16	2	0.030	310048
3/16	3/16	9/16	2	-	310050
3/16	3/16	9/16	2	0.010	310054
3/16	3/16	9/16	2	0.020	310058
3/16	3/16	9/16	2	0.030	310060
3/16	3/16	3/4	2-1/2	-	310063
3/16	3/16	3/4	2-1/2	0.010	310066
3/16	3/16	3/4	2-1/2	0.020	310069
3/16	3/16	3/4	2-1/2	0.030	310071
1/4	1/4	3/8	2	-	310074
1/4	1/4	3/8	2	0.010	310078
1/4	1/4	3/8	2	0.020	310081
1/4	1/4	3/8	2	0.030	310085
1/4	1/4	3/8	2	0.060	310089
1/4	1/4	1/2	2-1/2	-	310093
1/4	1/4	1/2	2-1/2	0.010	310097
1/4	1/4	1/2	2-1/2	0.020	310100
1/4	1/4	1/2	2-1/2	0.030	310103
1/4	1/4	1/2	2-1/2	0.060	310105
1/4	1/4	3/4	2-1/2	-	310109
1/4	1/4	3/4	2-1/2	0.010	310113
1/4	1/4	3/4	2-1/2	0.020	310115
1/4	1/4	3/4	2-1/2	0.030	310117
1/4	1/4	3/4	2-1/2	0.060	310121
1/4	1/4	1	3	-	310125

# PYSTL<sub>series</sub>

### More About the Series 2100

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Ideally suited for gummy materials like Titanium and Stainless Steel



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

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Series 2100		438   4FL   Square & Radius   PYSTL			
Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/4	1/4	1	3	0.010	310128
1/4	1/4	1	3	0.020	310130
1/4	1/4	1	3	0.030	310133
1/4	1/4	1	3	0.060	310136
1/4	1/4	1-1/4	3	-	310139
1/4	1/4	1-1/4	3	0.010	310141
1/4	1/4	1-1/4	3	0.020	310144
1/4	1/4	1-1/4	3	0.030	310147
1/4	1/4	1-1/4	3	0.060	310150
5/16	5/16	7/16	2	-	310154
5/16	5/16	7/16	2	0.010	310158
5/16	5/16	7/16	2	0.020	310160
5/16	5/16	7/16	2	0.030	310162
5/16	5/16	7/16	2	0.060	310166
5/16	5/16	13/16	2-1/2	-	310168
5/16	5/16	13/16	2-1/2	0.010	310172
5/16	5/16	13/16	2-1/2	0.020	310176
5/16	5/16	13/16	2-1/2	0.030	310180
5/16	5/16	13/16	2-1/2	0.060	310182
5/16	5/16	1	3	-	310186
5/16	5/16	1	3	0.010	310190
5/16	5/16	1	3	0.020	310194
5/16	5/16	1	3	0.030	310198
5/16	5/16	1	3	0.060	310201
3/8	3/8	1/2	2	-	310203
3/8	3/8	1/2	2	0.010	310205
3/8	3/8	1/2	2	0.020	310207
3/8	3/8	1/2	2	0.030	310210
3/8	3/8	1/2	2	0.060	310212
3/8	3/8	1/2	2	0.090	310214
3/8	3/8	1	2-1/2	-	310217
3/8	3/8	1	2-1/2	0.010	310220
3/8	3/8	1	2-1/2	0.020	310222
3/8	3/8	1	2-1/2	0.030	310224
3/8	3/8	1	2-1/2	0.060	310226
3/8	3/8	1	2-1/2	0.090	310229
3/8	3/8	1-1/4	3	-	310231
3/8	3/8	1-1/4	3	0.010	310233
3/8	3/8	1-1/4	3	0.020	310236
3/8	3/8	1-1/4	3	0.030	310238



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2100 438 | 4FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/8	3/8	1-1/4	3	0.060	310240
3/8	3/8	1-1/4	3	0.090	310243
3/8	3/8	1-1/2	3	-	310245
3/8	3/8	1-1/2	3	0.010	310247
3/8	3/8	1-1/2	3	0.020	310251
3/8	3/8	1-1/2	3	0.030	310255
3/8	3/8	1-1/2	3	0.060	310257
3/8	3/8	1-1/2	3	0.090	310259
1/2	1/2	5/8	2-1/2	-	310263
1/2	1/2	5/8	2-1/2	0.020	310267
1/2	1/2	5/8	2-1/2	0.030	310269
1/2	1/2	5/8	2-1/2	0.060	310273
1/2	1/2	5/8	2-1/2	0.090	310275
1/2	1/2	5/8	2-1/2	0.120	310279
1/2	1/2	1	3	-	310281
1/2	1/2	1	3	0.020	310284
1/2	1/2	1	3	0.030	310288
1/2	1/2	1	3	0.060	310290
1/2	1/2	1	3	0.090	310293
1/2	1/2	1	3	0.120	310295
1/2	1/2	1-1/4	3	-	310297
1/2	1/2	1-1/4	3	0.020	310301
1/2	1/2	1-1/4	3	0.030	310303
1/2	1/2	1-1/4	3	0.060	310307
1/2	1/2	1-1/4	3	0.090	310310
1/2	1/2	1-1/4	3	0.120	310312
1/2	1/2	1-5/8	4	-	310316
1/2	1/2	1-5/8	4	0.020	310318
1/2	1/2	1-5/8	4	0.030	310322
1/2	1/2	1-5/8	4	0.060	310325
1/2	1/2	1-5/8	4	0.090	310328
1/2	1/2	1-5/8	4	0.120	310332
1/2	1/2	2	4	-	310334
1/2	1/2	2	4	0.020	310338
1/2	1/2	2	4	0.030	310342
1/2	1/2	2	4	0.060	310346
1/2	1/2	2	4	0.090	310350
1/2	1/2	2	4	0.120	310354
5/8	5/8	3/4	3	-	310356
5/8	5/8	3/4	3	0.030	310360

# PYSTL<sub>series</sub>

### More About the Series 2100

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Ideally suited for gummy materials like Titanium and Stainless Steel



★ Best ☆ Good

# ULTIMATE PERFORMANCE

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## PYSTL<sub>series</sub>

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Series 2100		438   4FL   Square & Radius   PYSTL			
Diameter	Shank Dia.	LOC	OAL	Radius	EDP
5/8	5/8	3/4	3	0.060	310364
5/8	5/8	3/4	3	0.090	310367
5/8	5/8	3/4	3	0.120	310370
5/8	5/8	1-1/4	3-1/2	-	310374
5/8	5/8	1-1/4	3-1/2	0.030	310376
5/8	5/8	1-1/4	3-1/2	0.060	310379
5/8	5/8	1-1/4	3-1/2	0.090	310383
5/8	5/8	1-1/4	3-1/2	0.120	310385
5/8	5/8	1-5/8	3-1/2	-	310388
5/8	5/8	1-5/8	3-1/2	0.030	310392
5/8	5/8	1-5/8	3-1/2	0.060	310395
5/8	5/8	1-5/8	3-1/2	0.090	310397
5/8	5/8	1-5/8	3-1/2	0.120	310400
5/8	5/8	2-1/8	4	-	310403
5/8	5/8	2-1/8	4	0.030	310407
5/8	5/8	2-1/8	4	0.060	310410
5/8	5/8	2-1/8	4	0.090	310412
5/8	5/8	2-1/8	4	0.120	310414
5/8	5/8	2-1/2	5	-	310416
5/8	5/8	2-1/2	5	0.030	310420
5/8	5/8	2-1/2	5	0.060	310422
5/8	5/8	2-1/2	5	0.090	310425
5/8	5/8	2-1/2	5	0.120	310429
3/4	3/4	1	3	-	310431
3/4	3/4	1	3	0.030	310434
3/4	3/4	1	3	0.060	310437
3/4	3/4	1	3	0.090	310441
3/4	3/4	1	3	0.120	310444
3/4	3/4	1	3	0.250	310447
3/4	3/4	1-5/8	4	-	310451
3/4	3/4	1-5/8	4	0.030	310455
3/4	3/4	1-5/8	4	0.060	310458
3/4	3/4	1-5/8	4	0.090	310461
3/4	3/4	1-5/8	4	0.120	310463
3/4	3/4	1-5/8	4	0.250	310467
3/4	3/4	2-1/4	5	-	310469
3/4	3/4	2-1/4	5	0.030	310473
3/4	3/4	2-1/4	5	0.060	310476
3/4	3/4	2-1/4	5	0.090	310479
3/4	3/4	2-1/4	5	0.120	310483



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2100 438 | 4FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/4	3/4	2-1/4	5	0.250	310485
3/4	3/4	2-3/4	5	-	310489
3/4	3/4	2-3/4	5	0.030	310491
3/4	3/4	2-3/4	5	0.060	310494
3/4	3/4	2-3/4	5	0.090	310496
3/4	3/4	2-3/4	5	0.120	310498
3/4	3/4	2-3/4	5	0.250	310502
3/4	3/4	3-1/4	6	-	310505
3/4	3/4	3-1/4	6	0.030	310509
3/4	3/4	3-1/4	6	0.060	310513
3/4	3/4	3-1/4	6	0.090	310515
3/4	3/4	3-1/4	6	0.120	310519
3/4	3/4	3-1/4	6	0.250	310521
1	1	1-1/4	4	-	310525
1	1	1-1/4	4	0.030	310529
1	1	1-1/4	4	0.060	310531
1	1	1-1/4	4	0.090	310534
1	1	1-1/4	4	0.120	310536
1	1	1-1/4	4	0.250	310538
1	1	2	4	-	310541
1	1	2	4	0.030	310545
1	1	2	4	0.060	310549
1	1	2	4	0.090	310553
1	1	2	4	0.120	310557
1	1	2	4	0.250	310559
1	1	2-5/8	5	-	310562
1	1	2-5/8	5	0.030	310565
1	1	2-5/8	5	0.060	310567
1	1	2-5/8	5	0.090	310569
1	1	2-5/8	5	0.120	310573
1	1	2-5/8	5	0.250	310576
1	1	3-1/4	6	-	310578
1	1	3-1/4	6	0.030	310582
1	1	3-1/4	6	0.060	310586
1	1	3-1/4	6	0.090	310590
1	1	3-1/4	6	0.120	310592
1	1	3-1/4	6	0.250	310596
1	1	4-1/4	7	-	310600
1	1	4-1/4	7	0.030	310602
1	1	4-1/4	7	0.060	310605

# PYSTL<sub>series</sub>

### More About the Series 2100

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Ideally suited for gummy materials like Titanium and Stainless Steel



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

### More About the Series 2100

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

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Series 2100		438   4FL   Square & Radius   PYSTL			
Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1	1	4-1/4	7	0.090	310609
1	1	4-1/4	7	0.120	310613
1	1	4-1/4	7	0.250	310617
1-1/4	1-1/4	1-1/2	4-1/2	-	310621
1-1/4	1-1/4	1-1/2	4-1/2	0.030	310624
1-1/4	1-1/4	1-1/2	4-1/2	0.060	310628
1-1/4	1-1/4	1-1/2	4-1/2	0.090	310630
1-1/4	1-1/4	1-1/2	4-1/2	0.120	310632
1-1/4	1-1/4	1-1/2	4-1/2	0.250	310636
1-1/4	1-1/4	2	4-1/2	-	310640
1-1/4	1-1/4	2	4-1/2	0.030	310642
1-1/4	1-1/4	2	4-1/2	0.060	310644
1-1/4	1-1/4	2	4-1/2	0.090	310648
1-1/4	1-1/4	2	4-1/2	0.120	310651
1-1/4	1-1/4	2	4-1/2	0.250	310654
1-1/4	1-1/4	2-5/8	6	-	310657
1-1/4	1-1/4	2-5/8	6	0.030	310661
1-1/4	1-1/4	2-5/8	6	0.060	310664
1-1/4	1-1/4	2-5/8	6	0.090	310667
1-1/4	1-1/4	2-5/8	6	0.120	310671
1-1/4	1-1/4	2-5/8	6	0.250	310673
1-1/4	1-1/4	4-1/2	7	-	310676
1-1/4	1-1/4	4-1/2	7	0.030	310680
1-1/4	1-1/4	4-1/2	7	0.060	310683
1-1/4	1-1/4	4-1/2	7	0.090	310687
1-1/4	1-1/4	4-1/2	7	0.120	310690
1-1/4	1-1/4	4-1/2	7	0.250	310693



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2105 438RN | 4FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
1/8	1/8	5/32	2	-	3/8	310697
1/8	1/8	5/32	2	0.010	3/8	310701
1/8	1/8	5/32	2	0.020	3/8	310704
1/8	1/8	5/32	2	0.030	3/8	310706
1/8	1/8	5/32	2	-	1/2	310709
1/8	1/8	5/32	2	0.010	1/2	310711
1/8	1/8	5/32	2	0.020	1/2	310714
1/8	1/8	5/32	2	0.030	1/2	310717
1/8	1/8	5/32	2	-	3/4	310719
1/8	1/8	5/32	2	0.010	3/4	310722
1/8	1/8	5/32	2	0.020	3/4	310724
1/8	1/8	5/32	2	0.030	3/4	310727
3/16	3/16	7/32	2	-	1/2	310729
3/16	3/16	7/32	2	0.010	1/2	310732
3/16	3/16	7/32	2	0.020	1/2	310735
3/16	3/16	7/32	2	0.030	1/2	310738
3/16	3/16	7/32	2-1/2	-	3/4	310741
3/16	3/16	7/32	2-1/2	0.010	3/4	310745
3/16	3/16	7/32	2-1/2	0.020	3/4	310748
3/16	3/16	7/32	2-1/2	0.030	3/4	310750
3/16	3/16	7/32	2-1/2	-	1-1/8	310754
3/16	3/16	7/32	2-1/2	0.010	1-1/8	310758
3/16	3/16	7/32	2-1/2	0.020	1-1/8	310760
3/16	3/16	7/32	2-1/2	0.030	1-1/8	310762
1/4	1/4	3/8	4	-	3/4	310765
1/4	1/4	3/8	4	0.010	3/4	310767
1/4	1/4	3/8	4	0.020	3/4	310769
1/4	1/4	3/8	4	0.030	3/4	310772
1/4	1/4	3/8	4	0.060	3/4	310776
1/4	1/4	3/8	4	-	1-1/8	310780
1/4	1/4	3/8	4	0.010	1-1/8	310783
1/4	1/4	3/8	4	0.020	1-1/8	310787
1/4	1/4	3/8	4	0.030	1-1/8	310791
1/4	1/4	3/8	4	0.060	1-1/8	310794
1/4	1/4	3/8	4	-	2-1/8	310798
1/4	1/4	3/8	4	0.010	2-1/8	310802
1/4	1/4	3/8	4	0.020	2-1/8	310806
1/4	1/4	3/8	4	0.030	2-1/8	310810
1/4	1/4	3/8	4	0.060	2-1/8	310814
3/8	3/8	1/2	4	-	1-1/8	310817
3/8	3/8	1/2	4	0.020	1-1/8	310819
3/8	3/8	1/2	4	0.030	1-1/8	310821

# PYSTL<sub>series</sub>

### More About the Series 2105

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Reduced neck for extended reach



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2105 438RN | 4FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
3/8	3/8	1/2	4	0.060	1-1/8	310823
3/8	3/8	1/2	4	0.090	1-1/8	310825
3/8	3/8	1/2	4	-	2-1/8	310829
3/8	3/8	1/2	4	0.020	2-1/8	310831
3/8	3/8	1/2	4	0.030	2-1/8	310835
3/8	3/8	1/2	4	0.060	2-1/8	310837
3/8	3/8	1/2	4	0.090	2-1/8	310839
3/8	3/8	1/2	6	-	3-1/8	310841
3/8	3/8	1/2	6	0.020	3-1/8	310843
3/8	3/8	1/2	6	0.030	3-1/8	310845
3/8	3/8	1/2	6	0.060	3-1/8	310848
3/8	3/8	1/2	6	0.090	3-1/8	310850
3/8	3/8	1/2	6	-	4-1/8	310853
3/8	3/8	1/2	6	0.020	4-1/8	310857
3/8	3/8	1/2	6	0.030	4-1/8	310860
3/8	3/8	1/2	6	0.060	4-1/8	310863
3/8	3/8	1/2	6	0.090	4-1/8	310866
1/2	1/2	5/8	4	-	1-1/2	310870
1/2	1/2	5/8	4	0.020	1-1/2	310874
1/2	1/2	5/8	4	0.060	1-1/2	310878
1/2	1/2	5/8	4	0.090	1-1/2	310881
1/2	1/2	5/8	4	0.120	1-1/2	310884
1/2	1/2	5/8	4	-	2-1/4	310888
1/2	1/2	5/8	4	0.020	2-1/4	310890
1/2	1/2	5/8	4	0.030	2-1/4	310893
1/2	1/2	5/8	4	0.060	2-1/4	310895
1/2	1/2	5/8	4	0.090	2-1/4	310897
1/2	1/2	5/8	4	0.120	2-1/4	310900
1/2	1/2	5/8	6	-	3-3/8	310903
1/2	1/2	5/8	6	0.020	3-3/8	310906
1/2	1/2	5/8	6	0.030	3-3/8	310910
1/2	1/2	5/8	6	0.060	3-3/8	310912
1/2	1/2	5/8	6	0.090	3-3/8	310915
1/2	1/2	5/8	6	0.120	3-3/8	310917
1/2	1/2	5/8	6	-	4-1/8	310921
1/2	1/2	5/8	6	0.020	4-1/8	310925
1/2	1/2	5/8	6	0.030	4-1/8	310927
1/2	1/2	5/8	6	0.060	4-1/8	310929
1/2	1/2	5/8	6	0.090	4-1/8	310933

# PYSTL<sub>series</sub>

### More About the Series 2105

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Reduced neck for extended reach



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2105 | 438RN | 4FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
5/8	5/8	3/4	4	-	1-5/8	310937
5/8	5/8	3/4	4	0.030	1-5/8	310941
5/8	5/8	3/4	4	0.060	1-5/8	310943
5/8	5/8	3/4	4	0.090	1-5/8	310945
5/8	5/8	3/4	4	0.120	1-5/8	310949
5/8	5/8	3/4	6	-	2-3/8	310951
5/8	5/8	3/4	6	0.030	2-3/8	310955
5/8	5/8	3/4	6	0.060	2-3/8	310957
5/8	5/8	3/4	6	0.090	2-3/8	310961
5/8	5/8	3/4	6	0.120	2-3/8	310964
5/8	5/8	3/4	6	-	3-3/8	310968
5/8	5/8	3/4	6	0.030	3-3/8	310972
5/8	5/8	3/4	6	0.060	3-3/8	310975
5/8	5/8	3/4	6	0.090	3-3/8	310979
5/8	5/8	3/4	6	0.120	3-3/8	310982
5/8	5/8	3/4	6	-	4-1/8	310985
5/8	5/8	3/4	6	0.030	4-1/8	310987
5/8	5/8	3/4	6	0.060	4-1/8	310989
5/8	5/8	3/4	6	0.090	4-1/8	310992
5/8	5/8	3/4	6	0.120	4-1/8	310994
3/4	3/4	1	4	-	2	310997
3/4	3/4	1	4	0.030	2	310999
3/4	3/4	1	4	0.060	2	311002
3/4	3/4	1	4	0.090	2	311006
3/4	3/4	1	4	0.120	2	311010
3/4	3/4	1	4	0.190	2	311013
3/4	3/4	1	4	0.250	2	311016
3/4	3/4	1	6	-	2-1/2	311019
3/4	3/4	1	6	0.030	2-1/2	311023
3/4	3/4	1	6	0.060	2-1/2	311027
3/4	3/4	1	6	0.090	2-1/2	311031
3/4	3/4	1	6	0.120	2-1/2	311034
3/4	3/4	1	6	0.190	2-1/2	311037
3/4	3/4	1	6	0.250	2-1/2	311041
3/4	3/4	1	6	-	3-3/8	311043
3/4	3/4	1	6	0.030	3-3/8	311045
3/4	3/4	1	6	0.060	3-3/8	311049
3/4	3/4	1	6	0.090	3-3/8	311051
3/4	3/4	1	6	0.120	3-3/8	311053
3/4	3/4	1	6	0.190	3-3/8	311056
3/4	3/4	1	6	0.250	3-3/8	311059
3/4	3/4	1	6	-	4-1/8	311063

# PYSTL<sub>series</sub>

### More About the Series 2105

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Reduced neck for extended reach



# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2105 438RN | 4FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
3/4	3/4	1	6	0.030	4-1/8	311067
3/4	3/4	1	6	0.060	4-1/8	311071
3/4	3/4	1	6	0.090	4-1/8	311075
3/4	3/4	1	6	0.120	4-1/8	311077
3/4	3/4	1	6	0.190	4-1/8	311079
3/4	3/4	1	6	0.250	4-1/8	311082
1	1	1-1/4	4	-	2-1/4	311084
1	1	1-1/4	4	0.030	2-1/4	311088
1	1	1-1/4	4	0.060	2-1/4	311090
1	1	1-1/4	4	0.090	2-1/4	311092
1	1	1-1/4	4	0.120	2-1/4	311096
1	1	1-1/4	4	0.190	2-1/4	311099
1	1	1-1/4	4	0.250	2-1/4	311102
1	1	1-1/4	6	-	2-5/8	311104
1	1	1-1/4	6	0.030	2-5/8	311108
1	1	1-1/4	6	0.060	2-5/8	311110
1	1	1-1/4	6	0.090	2-5/8	311114
1	1	1-1/4	6	0.120	2-5/8	311118
1	1	1-1/4	6	0.190	2-5/8	311121
1	1	1-1/4	6	0.250	2-5/8	311124
1	1	1-1/4	6	-	3-3/8	311127
1	1	1-1/4	6	0.030	3-3/8	311131
1	1	1-1/4	6	0.060	3-3/8	311135
1	1	1-1/4	6	0.090	3-3/8	311138
1	1	1-1/4	6	0.120	3-3/8	311142
1	1	1-1/4	6	0.190	3-3/8	311144
1	1	1-1/4	6	0.250	3-3/8	311146
1	1	1-1/4	6	-	4-1/8	311149

# PYSTL<sub>series</sub>

### More About the Series 2105

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Reduced neck for extended reach



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2105 | 438RN | 4FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
1	1	1-1/4	6	0.030	4-1/8	311152
1	1	1-1/4	6	0.060	4-1/8	311156
1	1	1-1/4	6	0.090	4-1/8	311158
1	1	1-1/4	6	0.120	4-1/8	311160
1	1	1-1/4	6	0.190	4-1/8	311163
1	1	1-1/4	6	0.250	4-1/8	311167

# PYSTL<sub>series</sub>

### More About the Series 2105

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

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Reduced neck for extended reach



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

### More About the Series 2115

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

### Series 2115 438 | 4FL | Ball Nose | PYSTL

Diameter	Shank Dia.	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	311169
1/8	1/8	1/2	2	311171
3/16	3/16	5/16	2	311174
3/16	3/16	9/16	2	311176
1/4	1/4	3/8	2	311179
1/4	1/4	1/2	2-1/2	311183
1/4	1/4	3/4	2-1/2	311186
5/16	5/16	7/16	2	311190
5/16	5/16	13/16	2-1/2	311193
3/8	3/8	1/2	2	311197
3/8	3/8	1	2-1/2	311201
1/2	1/2	5/8	2-1/2	311204
1/2	1/2	1	3	311208
1/2	1/2	1-1/4	3	311210
5/8	5/8	1-1/4	3-1/2	311214
5/8	5/8	1-5/8	3-1/2	311216
3/4	3/4	1	3	311219
3/4	3/4	1-5/8	4	311222
1	1	1-1/4	4	311224
1	1	2	4	311226



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2117 438CB | 4FL | Radius | Chip Breaker | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/8	1/8	1/4	1-1/2	0.010	311228
1/8	1/8	1/2	2	0.010	311231
1/8	1/8	3/4	2-1/2	0.010	311235
3/16	3/16	5/16	2	0.010	311237
3/16	3/16	9/16	2	0.010	311241
3/16	3/16	3/4	2-1/2	0.010	311245
1/4	1/4	3/8	2	0.020	311248
1/4	1/4	1/2	2-1/2	0.020	311250
1/4	1/4	3/4	2-1/2	0.020	311254
1/4	1/4	1	3	0.020	311258
5/16	5/16	7/16	2	0.020	311262
5/16	5/16	13/16	2-1/2	0.020	311265
5/16	5/16	1	3	0.020	311268
3/8	3/8	1/2	2	0.020	311271
3/8	3/8	7/8	2-1/2	0.020	311275
3/8	3/8	1	2-1/2	0.020	311278
3/8	3/8	1-1/4	3	0.020	311280
3/8	3/8	1-1/2	3	0.020	311282
1/2	1/2	5/8	2-1/2	0.030	311284
1/2	1/2	1	3	0.030	311287
1/2	1/2	1-1/4	3	0.030	311290
1/2	1/2	1-5/8	4	0.020	311292
1/2	1/2	1-5/8	4	0.030	311294
1/2	1/2	2	4	0.030	311297
5/8	5/8	3/4	3	0.030	311300
5/8	5/8	1-1/4	3-1/2	0.030	311302
5/8	5/8	1-5/8	3-1/2	0.030	311305
5/8	5/8	2-1/8	4	0.030	311307
5/8	5/8	2-1/2	5	0.030	311310
3/4	3/4	1	3	0.030	311314
3/4	3/4	1-5/8	4	0.030	311317
3/4	3/4	2-1/4	5	0.030	311320
3/4	3/4	2-3/4	5	0.030	311324
3/4	3/4	3-1/4	6	0.030	311327
1	1	1-1/4	4	0.030	311330
1	1	2	4	0.030	311333
1	1	2-5/8	5	0.030	311337
1	1	3-1/4	6	0.030	311340
1	1	4-1/4	7	0.030	311344

# PYSTL<sub>series</sub>

### More About the Series 2117

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Roughing nicks along the cutting edge act as chip breakers that produce smaller chips and reduce overall machine load. Ideal for roughing applications.



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

### More About the Series 2205

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

### Series 2205 538 | 5FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/8	1/8	1/4	1-1/2	-	311348
1/8	1/8	1/4	1-1/2	0.010	311351
1/8	1/8	1/4	1-1/2	0.020	311353
1/8	1/8	1/4	1-1/2	0.030	311356
1/8	1/8	1/2	2	-	311358
1/8	1/8	1/2	2	0.010	311360
1/8	1/8	1/2	2	0.020	311362
1/8	1/8	1/2	2	0.030	311364
1/8	1/8	3/4	2-1/2	-	311367
1/8	1/8	3/4	2-1/2	0.010	311369
1/8	1/8	3/4	2-1/2	0.020	311371
3/16	3/16	5/16	2	-	311373
3/16	3/16	5/16	2	0.010	311375
3/16	3/16	5/16	2	0.020	311378
3/16	3/16	9/16	2	-	311381
3/16	3/16	9/16	2	0.010	311384
3/16	3/16	9/16	2	0.020	311388
3/16	3/16	9/16	2	0.030	311392
3/16	3/16	3/4	2-1/2	-	311395
3/16	3/16	3/4	2-1/2	0.010	311398
3/16	3/16	3/4	2-1/2	0.020	311401
3/16	3/16	3/4	2-1/2	0.030	311403
1/4	1/4	3/8	2	-	311405
1/4	1/4	3/8	2	0.010	311408
1/4	1/4	3/8	2	0.020	311410
1/4	1/4	3/8	2	0.030	311413
1/4	1/4	3/8	2	0.060	311417
1/4	1/4	1/2	2-1/2	-	311421
1/4	1/4	1/2	2-1/2	0.010	311423
1/4	1/4	1/2	2-1/2	0.020	311425
1/4	1/4	1/2	2-1/2	0.030	311427
1/4	1/4	1/2	2-1/2	0.060	311430
1/4	1/4	3/4	2-1/2	-	311432
1/4	1/4	3/4	2-1/2	0.010	311434
1/4	1/4	3/4	2-1/2	0.020	311438
1/4	1/4	3/4	2-1/2	0.030	311440
1/4	1/4	3/4	2-1/2	0.060	311444
1/4	1/4	1	3	-	311446
1/4	1/4	1	3	0.010	311448
1/4	1/4	1	3	0.020	311452



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2205 | 538 | 5FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/4	1/4	1	3	0.030	311454
1/4	1/4	1	3	0.060	311458
1/4	1/4	1-1/4	3	-	311461
1/4	1/4	1-1/4	3	0.010	311464
1/4	1/4	1-1/4	3	0.020	311467
1/4	1/4	1-1/4	3	0.030	311469
1/4	1/4	1-1/4	3	0.060	311473
5/16	5/16	7/16	2	-	311477
5/16	5/16	7/16	2	0.010	311480
5/16	5/16	7/16	2	0.020	311484
5/16	5/16	7/16	2	0.030	311486
5/16	5/16	7/16	2	0.060	311489
5/16	5/16	13/16	2-1/2	-	311491
5/16	5/16	13/16	2-1/2	0.010	311495
5/16	5/16	13/16	2-1/2	0.020	311499
5/16	5/16	13/16	2-1/2	0.030	311501
5/16	5/16	13/16	2-1/2	0.060	311503
5/16	5/16	1	3	-	311505
5/16	5/16	1	3	0.010	311509
5/16	5/16	1	3	0.020	311512
5/16	5/16	1	3	0.030	311514
5/16	5/16	1	3	0.060	311518
3/8	3/8	1/2	2	-	311522
3/8	3/8	1/2	2	0.010	311524
3/8	3/8	1/2	2	0.020	311528
3/8	3/8	1/2	2	0.030	311531
3/8	3/8	1/2	2	0.060	311535
3/8	3/8	1/2	2	0.090	311537
3/8	3/8	1	2-1/2	-	311540
3/8	3/8	1	2-1/2	0.010	311543
3/8	3/8	1	2-1/2	0.020	311547
3/8	3/8	1	2-1/2	0.030	311550
3/8	3/8	1	2-1/2	0.060	311553
3/8	3/8	1	2-1/2	0.090	311556
3/8	3/8	1-1/4	3	-	311558
3/8	3/8	1-1/4	3	0.010	311562
3/8	3/8	1-1/4	3	0.020	311566
3/8	3/8	1-1/4	3	0.030	311568
3/8	3/8	1-1/4	3	0.060	311570
3/8	3/8	1-1/4	3	0.090	311574

# PYSTL<sub>series</sub>

### More About the Series 2205

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

### More About the Series 2205

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

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Series 2205		538   5FL   Square & Radius   PYSTL				
Diameter	Shank Dia.	LOC	OAL	Radius	EDP	
3/8	3/8	1-1/2	3	-	311576	
3/8	3/8	1-1/2	3	0.010	311578	
3/8	3/8	1-1/2	3	0.020	311582	
3/8	3/8	1-1/2	3	0.030	311586	
3/8	3/8	1-1/2	3	0.060	311588	
3/8	3/8	1-1/2	3	0.090	311590	
1/2	1/2	5/8	2-1/2	-	311594	
1/2	1/2	5/8	2-1/2	0.020	311597	
1/2	1/2	5/8	2-1/2	0.030	311601	
1/2	1/2	5/8	2-1/2	0.060	311604	
1/2	1/2	5/8	2-1/2	0.090	311606	
1/2	1/2	5/8	2-1/2	0.120	311610	
1/2	1/2	1	3	-	311613	
1/2	1/2	1	3	0.020	311615	
1/2	1/2	1	3	0.030	311619	
1/2	1/2	1	3	0.060	311622	
1/2	1/2	1	3	0.090	311626	
1/2	1/2	1	3	0.120	311630	
1/2	1/2	1-1/4	3	-	311634	
1/2	1/2	1-1/4	3	0.020	311637	
1/2	1/2	1-1/4	3	0.030	311640	
1/2	1/2	1-1/4	3	0.060	311642	
1/2	1/2	1-1/4	3	0.090	311644	
1/2	1/2	1-1/4	3	0.120	311648	
1/2	1/2	1-5/8	4	-	311652	
1/2	1/2	1-5/8	4	0.020	311654	
1/2	1/2	1-5/8	4	0.030	311658	
1/2	1/2	1-5/8	4	0.060	311660	
1/2	1/2	1-5/8	4	0.090	311664	
1/2	1/2	1-5/8	4	0.120	311666	
1/2	1/2	2	4	-	311670	
1/2	1/2	2	4	0.020	311674	
1/2	1/2	2	4	0.030	311678	
1/2	1/2	2	4	0.060	311681	
1/2	1/2	2	4	0.090	311683	
1/2	1/2	2	4	0.120	311687	
5/8	5/8	3/4	3	-	311691	
5/8	5/8	3/4	3	0.030	311695	
5/8	5/8	3/4	3	0.060	311699	
5/8	5/8	3/4	3	0.090	311703	



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2205 538 | 5FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
5/8	5/8	3/4	3	0.120	311705
5/8	5/8	1-1/4	3-1/2	-	311708
5/8	5/8	1-1/4	3-1/2	0.030	311712
5/8	5/8	1-1/4	3-1/2	0.060	311715
5/8	5/8	1-1/4	3-1/2	0.090	311719
5/8	5/8	1-1/4	3-1/2	0.120	311723
5/8	5/8	1-5/8	3-1/2	-	311725
5/8	5/8	1-5/8	3-1/2	0.030	311727
5/8	5/8	1-5/8	3-1/2	0.060	311730
5/8	5/8	1-5/8	3-1/2	0.090	311734
5/8	5/8	1-5/8	3-1/2	0.120	311737
5/8	5/8	2-1/8	4	-	311741
5/8	5/8	2-1/8	4	0.030	311743
5/8	5/8	2-1/8	4	0.060	311745
5/8	5/8	2-1/8	4	0.090	311748
5/8	5/8	2-1/8	4	0.120	311750
5/8	5/8	2-1/2	5	-	311754
5/8	5/8	2-1/2	5	0.030	311756
5/8	5/8	2-1/2	5	0.060	311759
5/8	5/8	2-1/2	5	0.090	311761
5/8	5/8	2-1/2	5	0.120	311764
3/4	3/4	1	3	-	311767
3/4	3/4	1	3	0.030	311771
3/4	3/4	1	3	0.060	311773
3/4	3/4	1	3	0.090	311776
3/4	3/4	1	3	0.120	311778
3/4	3/4	1	3	0.250	311780
3/4	3/4	1-5/8	4	-	311782
3/4	3/4	1-5/8	4	0.030	311785
3/4	3/4	1-5/8	4	0.060	311787
3/4	3/4	1-5/8	4	0.090	311789
3/4	3/4	1-5/8	4	0.120	311793
3/4	3/4	1-5/8	4	0.250	311796
3/4	3/4	2-1/4	5	-	311800
3/4	3/4	2-1/4	5	0.030	311804
3/4	3/4	2-1/4	5	0.060	311808
3/4	3/4	2-1/4	5	0.090	311810
3/4	3/4	2-1/4	5	0.120	311812
3/4	3/4	2-1/4	5	0.250	311814
3/4	3/4	2-3/4	5	-	311818

# PYSTL<sub>series</sub>

### More About the Series 2205

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

### More About the Series 2205

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling



Series 2205		538   5FL   Square & Radius   PYSTL			
Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/4	3/4	2-3/4	5	0.030	311820
3/4	3/4	2-3/4	5	0.060	311824
3/4	3/4	2-3/4	5	0.090	311826
3/4	3/4	2-3/4	5	0.120	311828
3/4	3/4	2-3/4	5	0.250	311831
3/4	3/4	3-1/4	6	-	311833
3/4	3/4	3-1/4	6	0.030	311837
3/4	3/4	3-1/4	6	0.060	311839
3/4	3/4	3-1/4	6	0.090	311842
3/4	3/4	3-1/4	6	0.120	311846
3/4	3/4	3-1/4	6	0.250	311848
1	1	1-1/4	4	-	311852
1	1	1-1/4	4	0.030	311855
1	1	1-1/4	4	0.060	311857
1	1	1-1/4	4	0.090	311860
1	1	1-1/4	4	0.120	311864
1	1	1-1/4	4	0.250	311868
1	1	2	4	-	311872
1	1	2	4	0.030	311876
1	1	2	4	0.060	311878
1	1	2	4	0.090	311881
1	1	2	4	0.120	311884
1	1	2	4	0.250	311888
1	1	2-5/8	5	-	311890
1	1	2-5/8	5	0.030	311893
1	1	2-5/8	5	0.060	311896
1	1	2-5/8	5	0.090	311900
1	1	2-5/8	5	0.120	311902
1	1	2-5/8	5	0.250	311905
1	1	3-1/4	6	-	311909
1	1	3-1/4	6	0.030	311913
1	1	3-1/4	6	0.060	311915
1	1	3-1/4	6	0.090	311918
1	1	3-1/4	6	0.120	311920
1	1	3-1/4	6	0.250	311924
1	1	4-1/4	7	-	311927
1	1	4-1/4	7	0.030	311931
1	1	4-1/4	7	0.060	311933
1	1	4-1/4	7	0.090	311935
1	1	4-1/4	7	0.120	311937



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2205 538 | 5FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1	1	4-1/4	7	0.250	<b>311940</b>
1-1/4	1-1/4	1-1/2	4-1/2	-	<b>311943</b>
1-1/4	1-1/4	1-1/2	4-1/2	0.030	<b>311947</b>
1-1/4	1-1/4	1-1/2	4-1/2	0.060	<b>311949</b>
1-1/4	1-1/4	1-1/2	4-1/2	0.090	<b>311951</b>
1-1/4	1-1/4	1-1/2	4-1/2	0.120	<b>311955</b>
1-1/4	1-1/4	1-1/2	4-1/2	0.250	<b>311957</b>
1-1/4	1-1/4	2	4-1/2	-	<b>311961</b>
1-1/4	1-1/4	2	4-1/2	0.030	<b>311964</b>
1-1/4	1-1/4	2	4-1/2	0.060	<b>311966</b>
1-1/4	1-1/4	2	4-1/2	0.090	<b>311968</b>
1-1/4	1-1/4	2	4-1/2	0.120	<b>311971</b>
1-1/4	1-1/4	2	4-1/2	0.250	<b>311975</b>
1-1/4	1-1/4	2-5/8	6	-	<b>311977</b>
1-1/4	1-1/4	2-5/8	6	0.030	<b>311979</b>
1-1/4	1-1/4	2-5/8	6	0.060	<b>311983</b>
1-1/4	1-1/4	2-5/8	6	0.090	<b>311985</b>
1-1/4	1-1/4	2-5/8	6	0.120	<b>311987</b>
1-1/4	1-1/4	2-5/8	6	0.250	<b>311991</b>
1-1/4	1-1/4	4-1/2	7	-	<b>311993</b>
1-1/4	1-1/4	4-1/2	7	0.030	<b>311995</b>
1-1/4	1-1/4	4-1/2	7	0.060	<b>311998</b>
1-1/4	1-1/4	4-1/2	7	0.090	<b>312001</b>
1-1/4	1-1/4	4-1/2	7	0.120	<b>312003</b>
1-1/4	1-1/4	4-1/2	7	0.250	<b>312005</b>

# PYSTL<sub>series</sub>

### More About the Series 2205

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

### More About the Series 2213

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Reduced neck for extended reach

### Series 2213 538RN | 5FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
1/8	1/8	5/32	2	0.020	3/8	312009
1/8	1/8	5/32	2	0.030	3/8	312011
1/8	1/8	5/32	2	-	1/2	312013
1/8	1/8	5/32	2	0.010	1/2	312015
1/8	1/8	5/32	2	0.020	1/2	312018
1/8	1/8	5/32	2	0.030	1/2	312022
1/8	1/8	5/32	2	-	3/4	312025
1/8	1/8	5/32	2	0.010	3/4	312029
1/8	1/8	5/32	2	0.020	3/4	312033
1/8	1/8	5/32	2	0.030	3/4	312036
3/16	3/16	7/32	2	-	1/2	312038
3/16	3/16	7/32	2	0.010	1/2	312041
3/16	3/16	7/32	2	0.020	1/2	312044
3/16	3/16	7/32	2	0.030	1/2	312046
3/16	3/16	7/32	2-1/2	-	3/4	312050
3/16	3/16	7/32	2-1/2	0.010	3/4	312053
3/16	3/16	7/32	2-1/2	0.020	3/4	312056
3/16	3/16	7/32	2-1/2	0.030	3/4	312060
3/16	3/16	7/32	2-1/2	-	1-1/8	312064
3/16	3/16	7/32	2-1/2	0.010	1-1/8	312066
3/16	3/16	7/32	2-1/2	0.020	1-1/8	312068
3/16	3/16	7/32	2-1/2	0.030	1-1/8	312071
1/4	1/4	3/8	4	-	3/4	312073
1/4	1/4	3/8	4	0.010	3/4	312075
1/4	1/4	3/8	4	0.020	3/4	312079
1/4	1/4	3/8	4	0.030	3/4	312082
1/4	1/4	3/8	4	0.060	3/4	312086
1/4	1/4	3/8	4	-	1-1/8	312090
1/4	1/4	3/8	4	0.010	1-1/8	312093
1/4	1/4	3/8	4	0.020	1-1/8	312096
1/4	1/4	3/8	4	0.030	1-1/8	312099
1/4	1/4	3/8	4	0.060	1-1/8	312103
1/4	1/4	3/8	4	-	2-1/8	312106
1/4	1/4	3/8	4	0.010	2-1/8	312109
1/4	1/4	3/8	4	0.020	2-1/8	312113
1/4	1/4	3/8	4	0.030	2-1/8	312116
1/4	1/4	3/8	4	0.060	2-1/8	312118
3/8	3/8	1/2	4	-	1-1/8	312122
3/8	3/8	1/2	4	0.020	1-1/8	312126



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2213 | 538RN | 5FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
3/8	3/8	1/2	4	0.030	1-1/8	312130
3/8	3/8	1/2	4	0.060	1-1/8	312134
3/8	3/8	1/2	4	0.090	1-1/8	312137
3/8	3/8	1/2	4	-	2-1/8	312140
3/8	3/8	1/2	4	0.020	2-1/8	312143
3/8	3/8	1/2	4	0.030	2-1/8	312145
3/8	3/8	1/2	4	0.060	2-1/8	312149
3/8	3/8	1/2	4	0.090	2-1/8	312153
3/8	3/8	1/2	6	-	3-1/8	312155
3/8	3/8	1/2	6	0.020	3-1/8	312157
3/8	3/8	1/2	6	0.030	3-1/8	312159
3/8	3/8	1/2	6	0.060	3-1/8	312161
3/8	3/8	1/2	6	0.090	3-1/8	312164
3/8	3/8	1/2	6	-	4-1/8	312168
3/8	3/8	1/2	6	0.020	4-1/8	312171
3/8	3/8	1/2	6	0.030	4-1/8	312174
3/8	3/8	1/2	6	0.060	4-1/8	312176
3/8	3/8	1/2	6	0.090	4-1/8	312180
1/2	1/2	5/8	4	-	1-1/2	312182
1/2	1/2	5/8	4	0.020	1-1/2	312184
1/2	1/2	5/8	4	0.060	1-1/2	312187
1/2	1/2	5/8	4	0.090	1-1/2	312190
1/2	1/2	5/8	4	0.120	1-1/2	312193
1/2	1/2	5/8	4	-	2-1/4	312197
1/2	1/2	5/8	4	0.020	2-1/4	312199
1/2	1/2	5/8	4	0.030	2-1/4	312203
1/2	1/2	5/8	4	0.060	2-1/4	312207
1/2	1/2	5/8	4	0.090	2-1/4	312209
1/2	1/2	5/8	4	0.120	2-1/4	312212
1/2	1/2	5/8	6	-	3-3/8	312214
1/2	1/2	5/8	6	0.020	3-3/8	312217
1/2	1/2	5/8	6	0.030	3-3/8	312220
1/2	1/2	5/8	6	0.060	3-3/8	312222
1/2	1/2	5/8	6	0.090	3-3/8	312226
1/2	1/2	5/8	6	0.120	3-3/8	312228
1/2	1/2	5/8	6	-	4-1/8	312230
1/2	1/2	5/8	6	0.020	4-1/8	312233
1/2	1/2	5/8	6	0.030	4-1/8	312237
1/2	1/2	5/8	6	0.060	4-1/8	312241
1/2	1/2	5/8	6	0.090	4-1/8	312244
1/2	1/2	5/8	6	0.120	4-1/8	312248
5/8	5/8	3/4	4	-	1-5/8	312251

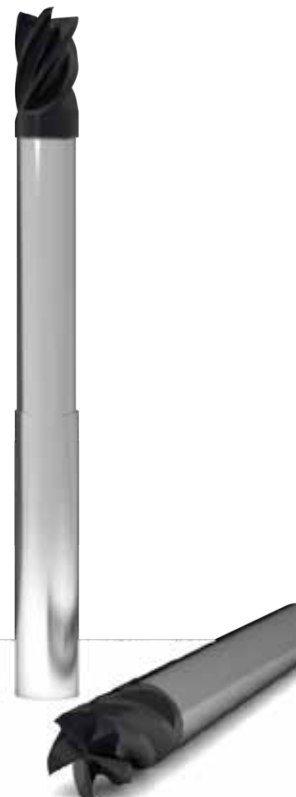
# PYSTL<sub>series</sub>

### More About the Series 2213

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Reduced neck for extended reach



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

### More About the Series 2213

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

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Reduced neck for extended reach

### Series 2213 538RN | 5FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
5/8	5/8	3/4	4	0.030	1-5/8	312253
5/8	5/8	3/4	4	0.060	1-5/8	312256
5/8	5/8	3/4	4	0.090	1-5/8	312259
5/8	5/8	3/4	4	0.120	1-5/8	312261
5/8	5/8	3/4	6	-	2-3/8	312263
5/8	5/8	3/4	6	0.030	2-3/8	312267
5/8	5/8	3/4	6	0.060	2-3/8	312270
5/8	5/8	3/4	6	0.090	2-3/8	312273
5/8	5/8	3/4	6	0.120	2-3/8	312275
5/8	5/8	3/4	6	-	3-3/8	312277
5/8	5/8	3/4	6	0.030	3-3/8	312279
5/8	5/8	3/4	6	0.060	3-3/8	312282
5/8	5/8	3/4	6	0.090	3-3/8	312286
5/8	5/8	3/4	6	0.120	3-3/8	312290
5/8	5/8	3/4	6	-	4-1/8	312293
5/8	5/8	3/4	6	0.030	4-1/8	312297
5/8	5/8	3/4	6	0.060	4-1/8	312300
5/8	5/8	3/4	6	0.090	4-1/8	312302
5/8	5/8	3/4	6	0.120	4-1/8	312306
3/4	3/4	1	4	-	2	312309
3/4	3/4	1	4	0.030	2	312312
3/4	3/4	1	4	0.060	2	312314
3/4	3/4	1	4	0.090	2	312318
3/4	3/4	1	4	0.120	2	312322
3/4	3/4	1	4	0.190	2	312325
3/4	3/4	1	4	0.250	2	312329
3/4	3/4	1	6	-	2-1/2	312333
3/4	3/4	1	6	0.030	2-1/2	312335
3/4	3/4	1	6	0.060	2-1/2	312338
3/4	3/4	1	6	0.090	2-1/2	312340
3/4	3/4	1	6	0.120	2-1/2	312342
3/4	3/4	1	6	0.190	2-1/2	312345
3/4	3/4	1	6	0.250	2-1/2	312349
3/4	3/4	1	6	-	3-3/8	312353
3/4	3/4	1	6	0.030	3-3/8	312357
3/4	3/4	1	6	0.060	3-3/8	312360
3/4	3/4	1	6	0.090	3-3/8	312364
3/4	3/4	1	6	0.120	3-3/8	312366
3/4	3/4	1	6	0.190	3-3/8	312370



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# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2213 538RN | 5FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
3/4	3/4	1	6	-	4-1/8	312374
3/4	3/4	1	6	0.030	4-1/8	312378
3/4	3/4	1	6	0.060	4-1/8	312381
3/4	3/4	1	6	0.090	4-1/8	312385
3/4	3/4	1	6	0.120	4-1/8	312388
3/4	3/4	1	6	0.190	4-1/8	312391
3/4	3/4	1	6	0.250	4-1/8	312394
1	1	1-1/4	4	-	2-1/4	312398
1	1	1-1/4	4	0.030	2-1/4	312401
1	1	1-1/4	4	0.060	2-1/4	312404
1	1	1-1/4	4	0.090	2-1/4	312408
1	1	1-1/4	4	0.120	2-1/4	312411
1	1	1-1/4	4	0.190	2-1/4	312415
1	1	1-1/4	4	0.250	2-1/4	312417
1	1	1-1/4	6	-	2-5/8	312419
1	1	1-1/4	6	0.030	2-5/8	312423
1	1	1-1/4	6	0.060	2-5/8	312425
1	1	1-1/4	6	0.090	2-5/8	312428
1	1	1-1/4	6	0.120	2-5/8	312432
1	1	1-1/4	6	0.190	2-5/8	312436
1	1	1-1/4	6	0.250	2-5/8	312438
1	1	1-1/4	6	-	3-3/8	312441
1	1	1-1/4	6	0.030	3-3/8	312444
1	1	1-1/4	6	0.060	3-3/8	312448
1	1	1-1/4	6	0.090	3-3/8	312451
1	1	1-1/4	6	0.120	3-3/8	312455
1	1	1-1/4	6	0.190	3-3/8	312458
1	1	1-1/4	6	0.250	3-3/8	312461
1	1	1-1/4	6	-	4-1/8	312463
1	1	1-1/4	6	0.030	4-1/8	312467
1	1	1-1/4	6	0.060	4-1/8	312470
1	1	1-1/4	6	0.090	4-1/8	312474
1	1	1-1/4	6	0.120	4-1/8	312477
1	1	1-1/4	6	0.190	4-1/8	312480
1	1	1-1/4	6	0.250	4-1/8	312484
1-1/4	1-1/4	1-1/2	5	-	2-1/4	312487
1-1/4	1-1/4	1-1/2	5	0.030	2-1/4	312490
1-1/4	1-1/4	1-1/2	5	0.060	2-1/4	312493
1-1/4	1-1/4	1-1/2	5	0.090	2-1/4	312495
1-1/4	1-1/4	1-1/2	5	0.120	2-1/4	312499
1-1/4	1-1/4	1-1/2	5	0.190	2-1/4	312501
1-1/4	1-1/4	1-1/2	5	0.250	2-1/4	312505

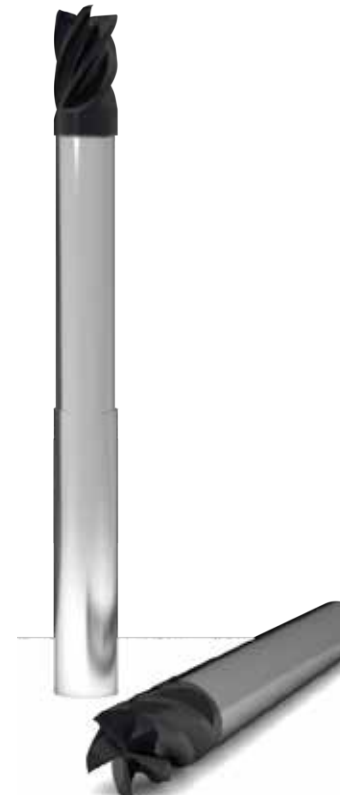
# PYSTL<sub>series</sub>

### More About the Series 2213

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling

Reduced neck for extended reach



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2213 | 538RN | 5FL | Reduced Neck | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	Length Below Shank	EDP
1-1/4	1-1/4	1-1/2	6	-	2-5/8	312507
1-1/4	1-1/4	1-1/2	6	0.030	2-5/8	312510
1-1/4	1-1/4	1-1/2	6	0.060	2-5/8	312514
1-1/4	1-1/4	1-1/2	6	0.090	2-5/8	312517
1-1/4	1-1/4	1-1/2	6	0.120	2-5/8	312521
1-1/4	1-1/4	1-1/2	6	0.190	2-5/8	312525
1-1/4	1-1/4	1-1/2	6	0.250	2-5/8	312528
1-1/4	1-1/4	1-1/2	6	-	3-3/8	312532
1-1/4	1-1/4	1-1/2	6	0.030	3-3/8	312536
1-1/4	1-1/4	1-1/2	6	0.060	3-3/8	312540
1-1/4	1-1/4	1-1/2	6	0.090	3-3/8	312544
1-1/4	1-1/4	1-1/2	6	0.120	3-3/8	312547
1-1/4	1-1/4	1-1/2	6	0.190	3-3/8	312549
1-1/4	1-1/4	1-1/2	6	0.250	3-3/8	312551
1-1/4	1-1/4	1-1/2	6	-	4-1/8	312553
1-1/4	1-1/4	1-1/2	6	0.030	4-1/8	312556
1-1/4	1-1/4	1-1/2	6	0.060	4-1/8	312558
1-1/4	1-1/4	1-1/2	6	0.090	4-1/8	312560
1-1/4	1-1/4	1-1/2	6	0.120	4-1/8	312564
1-1/4	1-1/4	1-1/2	6	0.190	4-1/8	312568
1-1/4	1-1/4	1-1/2	6	0.250	4-1/8	312571

# PYSTL<sub>series</sub>

### More About the Series 2213

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Reduced neck for extended reach



★ Best ☆ Good



# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2215 738 | 7FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/8	3/8	1/2	2	-	312575
3/8	3/8	1/2	2	0.030	312577
3/8	3/8	1/2	2	0.060	312581
3/8	3/8	1	2-1/2	-	312585
3/8	3/8	1	2-1/2	0.030	312589
3/8	3/8	1	2-1/2	0.060	312591
3/8	3/8	1-1/4	3	-	312595
3/8	3/8	1-1/4	3	0.030	312597
3/8	3/8	1-1/4	3	0.060	312599
3/8	3/8	1-1/2	4	-	312603
3/8	3/8	1-1/2	4	0.030	312606
3/8	3/8	1-1/2	4	0.060	312608
3/8	3/8	2-1/2	6	-	312610
3/8	3/8	2-1/2	6	0.030	312612
3/8	3/8	2-1/2	6	0.060	312614
1/2	1/2	3/4	2-1/2	-	312616
1/2	1/2	3/4	2-1/2	0.030	312620
1/2	1/2	3/4	2-1/2	0.060	312624
1/2	1/2	3/4	2-1/2	0.090	312628
1/2	1/2	1-1/4	3	-	312632
1/2	1/2	1-1/4	3	0.030	312636
1/2	1/2	1-1/4	3	0.060	312638
1/2	1/2	1-1/4	3	0.090	312642
1/2	1/2	2	4	-	312645
1/2	1/2	2	4	0.030	312649
1/2	1/2	2	4	0.060	312652
1/2	1/2	2	4	0.090	312654
1/2	1/2	3-1/4	6	-	312657
1/2	1/2	3-1/4	6	0.030	312659
1/2	1/2	3-1/4	6	0.060	312662
1/2	1/2	3-1/4	6	0.090	312664
5/8	5/8	3/4	3	-	312666
5/8	5/8	3/4	3	0.030	312669
5/8	5/8	3/4	3	0.060	312672
5/8	5/8	3/4	3	0.090	312674
5/8	5/8	3/4	3	0.120	312676
5/8	5/8	1-5/8	3-1/2	-	312679
5/8	5/8	1-5/8	3-1/2	0.030	312681
5/8	5/8	1-5/8	3-1/2	0.060	312684
5/8	5/8	1-5/8	3-1/2	0.090	312688

# PYSTL<sub>series</sub>

### More About the Series 2215

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a 38 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## PYSTL<sub>series</sub>

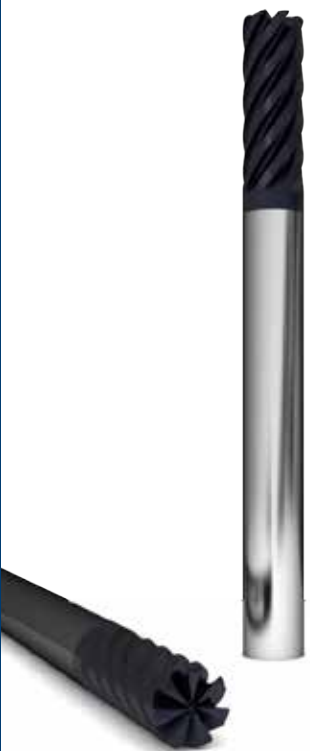
### More About the Series 2215

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a 38 degree helix that reduces chatter and enables more aggressive and stable milling

### Series 2215 738 | 7FL | Square & Radius | PYSTL

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
5/8	5/8	1-5/8	3-1/2	0.120	312692
5/8	5/8	2	5	-	312695
5/8	5/8	2	5	0.030	312697
5/8	5/8	2	5	0.060	312699
5/8	5/8	2	5	0.090	312701
5/8	5/8	2	5	0.120	312705
5/8	5/8	3-1/4	6	-	312708
5/8	5/8	3-1/4	6	0.030	312710
5/8	5/8	3-1/4	6	0.060	312714
5/8	5/8	3-1/4	6	0.090	312718
5/8	5/8	3-1/4	6	0.120	312720
3/4	3/4	1	3	-	312724
3/4	3/4	1	3	0.030	312726
3/4	3/4	1	3	0.060	312728
3/4	3/4	1	3	0.090	312730
3/4	3/4	1	3	0.120	312732
3/4	3/4	1-5/8	4	-	312736
3/4	3/4	1-5/8	4	0.030	312739
3/4	3/4	1-5/8	4	0.060	312742
3/4	3/4	1-5/8	4	0.090	312744
3/4	3/4	1-5/8	4	0.120	312746
3/4	3/4	2-1/4	5	-	312749
3/4	3/4	2-1/4	5	0.030	312753
3/4	3/4	2-1/4	5	0.060	312757
3/4	3/4	2-1/4	5	0.090	312759
3/4	3/4	2-1/4	5	0.120	312761
3/4	3/4	3-1/4	6	-	312764
3/4	3/4	3-1/4	6	0.030	312766
3/4	3/4	3-1/4	6	0.060	312770
3/4	3/4	3-1/4	6	0.090	312773
3/4	3/4	3-1/4	6	0.120	312777
1	1	1-1/4	4	-	312781
1	1	1-1/4	4	0.030	312783
1	1	1-1/4	4	0.060	312787
1	1	1-1/4	4	0.090	312791
1	1	1-1/4	4	0.120	312793
1	1	2	5	-	312795
1	1	2	5	0.030	312798
1	1	2	5	0.060	312800
1	1	2	5	0.090	312802



★ Best ☆ Good

# ULTIMATE PERFORMANCE

Premium High Performance Carbide End Mills for Ferrous Materials



## Series 2215 | 738 | 7FL | Square & Radius | PYSTL

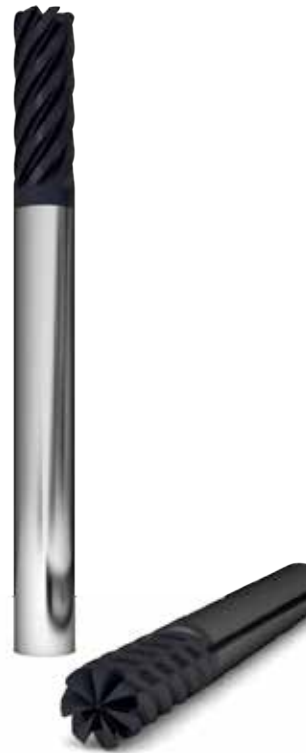
Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1	1	2	5	0.120	312804
1	1	3-1/4	6	-	312807
1	1	3-1/4	6	0.030	312809
1	1	3-1/4	6	0.060	312811
1	1	3-1/4	6	0.090	312815
1	1	3-1/4	6	0.120	312818
1	1	4-1/8	7	-	312821
1	1	4-1/8	7	0.030	312824
1	1	4-1/8	7	0.060	312828
1	1	4-1/8	7	0.090	312830
1	1	4-1/8	7	0.120	312834
1-1/4	1-1/4	2	4-1/2	-	312836
1-1/4	1-1/4	2	4-1/2	0.030	312839
1-1/4	1-1/4	2	4-1/2	0.060	312842
1-1/4	1-1/4	2	4-1/2	0.090	312846
1-1/4	1-1/4	2	4-1/2	0.120	312848
1-1/4	1-1/4	2-5/8	6	-	312851
1-1/4	1-1/4	2-5/8	6	0.030	312855
1-1/4	1-1/4	2-5/8	6	0.060	312858
1-1/4	1-1/4	2-5/8	6	0.090	312861
1-1/4	1-1/4	2-5/8	6	0.120	312863
1-1/4	1-1/4	3-1/4	6	-	312867
1-1/4	1-1/4	3-1/4	6	0.030	312869
1-1/4	1-1/4	3-1/4	6	0.060	312871
1-1/4	1-1/4	3-1/4	6	0.090	312874
1-1/4	1-1/4	3-1/4	6	0.120	312877
1-1/4	1-1/4	5	7-1/2	-	312880
1-1/4	1-1/4	5	7-1/2	0.030	312884
1-1/4	1-1/4	5	7-1/2	0.060	312887
1-1/4	1-1/4	5	7-1/2	0.090	312889
1-1/4	1-1/4	5	7-1/2	0.120	312893

# PYSTL<sub>series</sub>

### More About the Series 2215

Special edge preparation makes this an ideal tool for a broad spectrum of work materials

PYSTL features a 38 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# ***PERFORMANCE***

When versatility and utility are a necessity, look to GWS Performance series cutting tools. The capability you need for everyday applications.



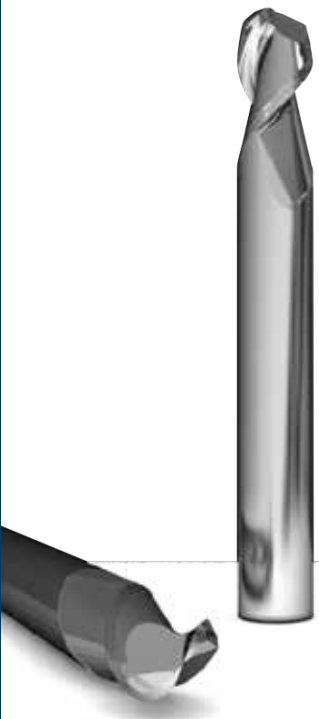
# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2010 250 | 2FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
1/8	1/8	1/4	1-1/2	-	312896	312900
1/8	1/8	1/4	1-1/2	0.010	-	312902
1/8	1/8	5/16	1-1/2	-	312904	312908
1/8	1/8	3/8	1-1/2	-	312911	312924
1/8	1/8	3/8	1-1/2	0.010	-	312915
1/8	1/8	3/8	1-1/2	0.020	-	312918
1/8	1/8	3/8	1-1/2	0.030	-	312922
1/8	1/8	1/2	2	-	312926	312928
1/8	1/8	5/8	2	-	312930	312934
1/8	1/8	3/4	2	-	312937	312939
1/8	1/8	1	2-1/2	-	312942	312944
5/32	3/16	5/16	2	-	312946	312948
5/32	3/16	9/16	2	-	312952	312955
3/16	3/16	5/16	2	-	312958	312960
3/16	3/16	5/16	2	0.020	-	312964
3/16	3/16	5/16	3	-	-	312966
3/16	3/16	3/8	2	-	312970	312973
3/16	3/16	5/8	2-1/2	-	312976	312979
3/16	3/16	5/8	2-1/2	0.010	-	312981
3/16	3/16	5/8	2-1/2	0.020	-	312984
3/16	3/16	5/8	2-1/2	0.030	-	312986
3/16	3/16	3/4	2-1/2	-	312988	312990
3/16	3/16	1	2-1/2	-	312993	312995
7/32	1/4	3/8	2-1/2	-	312997	313000
7/32	1/4	3/4	2-1/2	-	313002	313006
1/4	1/4	3/8	2-1/2	-	313010	313013
1/4	1/4	3/8	2-1/2	0.015	-	313015
1/4	1/4	3/8	2-1/2	0.020	-	313017
1/4	1/4	3/8	2-1/2	0.030	-	313021
1/4	1/4	3/8	2-1/2	0.060	-	313024
1/4	1/4	1/2	2-1/2	-	313028	313031
1/4	1/4	5/8	2-1/2	-	313033	313035
1/4	1/4	3/4	2-1/2	-	313037	313039
1/4	1/4	3/4	2-1/2	0.010	-	313042
1/4	1/4	3/4	2-1/2	0.015	-	313044
1/4	1/4	3/4	2-1/2	0.020	-	313047
1/4	1/4	3/4	2-1/2	0.030	-	313049
1/4	1/4	3/4	2-1/2	0.045	-	313052
1/4	1/4	3/4	2-1/2	0.060	-	313054
1/4	1/4	1	2-1/2	-	313056	313060



★ Best ☆ Good



# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys

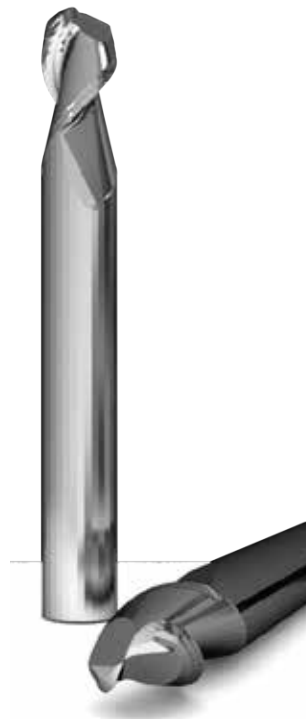


## Series 2010 | 250 | 2FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
1/4	1/4	1-1/8	2-1/2	-	313063	313067
1/4	1/4	1-1/4	3	-	313070	313072
1/4	1/4	1-1/2	3	-	313074	313077
1/4	1/4	2	4	-	313079	313083
9/32	5/16	7/16	2-1/2	-	313087	313089
9/32	5/16	13/16	2-1/2	-	313091	313094
5/16	5/16	7/16	2-1/2	-	313096	313098
5/16	5/16	7/16	2-1/2	0.020	-	313100
5/16	5/16	7/16	2-1/2	0.030	-	313102
5/16	5/16	1/2	2-1/2	-	313104	313108
5/16	5/16	13/16	2-1/2	-	313111	313114
5/16	5/16	13/16	2-1/2	0.020	-	313117
5/16	5/16	13/16	2-1/2	0.030	-	313120
5/16	5/16	13/16	2-1/2	0.060	-	313122
5/16	5/16	1-1/8	2-1/2	-	313124	313127
5/16	5/16	1-1/4	3-1/2	-	313129	313133
5/16	5/16	1-1/2	3-1/2	-	313136	313140
5/16	5/16	2-1/8	4	-	313144	313148
11/32	3/8	1/2	2-1/2	-	313150	313153
11/32	3/8	1	2-1/2	-	313157	313159
3/8	3/8	1/2	2-1/2	-	313162	313164
3/8	3/8	1/2	2-1/2	0.020	-	313166
3/8	3/8	1/2	2-1/2	0.030	-	313169
3/8	3/8	1/2	2-1/2	0.040	-	313172
3/8	3/8	5/8	2-1/2	-	313175	313177
3/8	3/8	3/4	2-1/2	-	313181	313183
3/8	3/8	1	2-1/2	-	313187	313189
3/8	3/8	1	2-1/2	0.020	-	313192
3/8	3/8	1	2-1/2	0.030	-	313194
3/8	3/8	1	2-1/2	0.045	-	313198
3/8	3/8	1	2-1/2	0.060	-	313201
3/8	3/8	1-1/4	3	-	313203	313207
3/8	3/8	1-1/2	4	-	313209	313212
3/8	3/8	2	4	-	313215	313218
3/8	3/8	2-1/2	6	-	313222	313225
13/32	7/16	9/16	2-3/4	-	313229	313231
13/32	7/16	1	2-3/4	-	313234	313238
7/16	7/16	9/16	2-3/4	-	313241	313244
7/16	7/16	1	2-3/4	-	313246	313249
7/16	7/16	2	4	-	313252	313254



★ Best ☆ Good



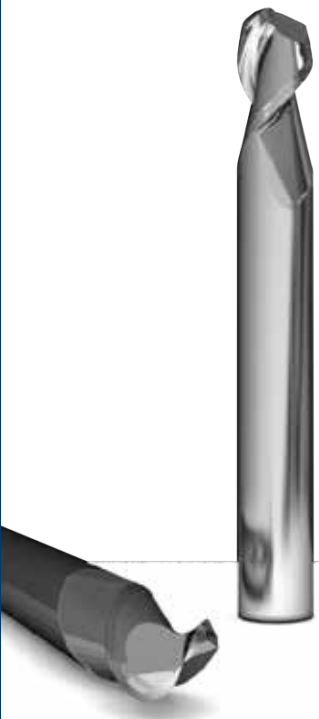
# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2010 250 | 2FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
15/32	1/2	5/8	3	-	313257	313260
15/32	1/2	1-1/4	3	-	313264	313266
1/2	1/2	5/8	3	-	313270	313274
1/2	1/2	5/8	3	0.015	-	313276
1/2	1/2	5/8	3	0.020	-	313278
1/2	1/2	5/8	3	0.030	-	313281
1/2	1/2	5/8	3	0.060	-	313284
1/2	1/2	5/8	3	0.090	-	313288
1/2	1/2	3/4	3	-	313291	313293
1/2	1/2	1	3	-	313297	313300
1/2	1/2	1-1/4	3	-	313302	313304
1/2	1/2	1-1/4	3	0.015	-	313307
1/2	1/2	1-1/4	3	0.020	-	313311
1/2	1/2	1-1/4	3	0.030	-	313315
1/2	1/2	1-1/4	3	0.060	-	313317
1/2	1/2	1-1/4	3	0.090	-	313321
1/2	1/2	1-1/4	3	0.120	-	313325
1/2	1/2	1-1/2	4	-	313329	313331
1/2	1/2	2	4	-	313333	313337
1/2	1/2	2-1/4	6	-	313339	313341
1/2	1/2	2-1/2	6	-	313344	313346
1/2	1/2	3-1/4	6	-	313348	313350
1/2	1/2	4	8	-	313353	313356
5/8	5/8	3/4	3-1/2	-	313358	313362
5/8	5/8	1-1/4	3-1/2	-	313366	313370
5/8	5/8	1-5/8	3-1/2	-	313372	313374
5/8	5/8	1-5/8	3-1/2	0.030	-	313378
5/8	5/8	1-5/8	3-1/2	0.060	-	313381
5/8	5/8	1-5/8	3-1/2	0.090	-	313383
5/8	5/8	1-5/8	3-1/2	0.120	-	313385
5/8	5/8	2	5	-	313389	313392
5/8	5/8	2-1/2	5	-	313395	313397
5/8	5/8	2-3/4	5	-	313399	313401
5/8	5/8	3-1/4	6	-	313403	313406
5/8	5/8	4	8	-	313410	313414
3/4	3/4	1	4	-	313418	313422
3/4	3/4	1	4	0.060	-	313424
3/4	3/4	1	4	0.090	-	313427
3/4	3/4	1	4	0.120	-	313429
3/4	3/4	1-1/2	4	-	313431	313435



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2010 | 250 | 2FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
3/4	3/4	1-5/8	4	-	313439	313443
3/4	3/4	1-5/8	4	0.060	-	313447
3/4	3/4	1-5/8	4	0.090	-	313450
3/4	3/4	1-5/8	4	0.120	-	313453
3/4	3/4	2	5	-	313456	313458
3/4	3/4	2-1/4	5	-	313461	313463
3/4	3/4	2-1/2	5	-	313465	313469
3/4	3/4	3	6	-	313473	313477
3/4	3/4	3-1/4	6	-	313479	313483
3/4	3/4	3-1/2	6	-	313487	313489
3/4	3/4	4	7	-	313492	313496
3/4	3/4	5	8	-	313499	313502
1	1	1-1/4	5	-	313506	313509
1	1	1-1/2	5	-	313511	313514
1	1	2	5	-	313517	313519
1	1	2	5	0.060	-	313523
1	1	2	5	0.090	-	313526
1	1	2	5	0.120	-	313528
1	1	2-1/2	5	-	313531	313533
1	1	3	6	-	313535	313537
1	1	3-1/2	6	-	313541	313543
1	1	4-1/8	7	-	313546	313548
1	1	5-1/2	8	-	313550	313553
1-1/4	1-1/4	1-1/4	4-1/2	-	-	313555
1-1/4	1-1/4	2	4-1/2	-	-	313557
1-1/4	1-1/4	5	7-1/2	-	-	313560



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2015 250BN | 2FL | Ball Nose

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
1/8	1/8	1/2	2	-	-	313563
1/8	1/8	1/4	1-1/2	-	-	313567
1/8	1/8	3/4	2	-	-	313571
3/16	3/16	5/16	2	-	-	313573
3/16	3/16	5/8	2-1/2	-	-	313576
3/16	3/16	1	2-1/2	-	-	313580
1/4	1/4	3/8	2-1/2	-	313584	313588
1/4	1/4	3/4	2-1/2	-	313592	313596
1/4	1/4	1-1/4	3	-	313598	313602
5/16	5/16	7/16	2-1/2	-	313604	313607
5/16	5/16	13/16	2-1/2	-	313609	313612
5/16	5/16	1-1/4	3	-	313615	313617
3/8	3/8	1/2	2-1/2	-	313621	313624
3/8	3/8	1	2-1/2	-	313628	313630
3/8	3/8	1-1/2	4	-	313632	313636
7/16	7/16	9/16	2-3/4	-	313640	313643
7/16	7/16	1	2-3/4	-	313645	313649
7/16	7/16	2	4	-	313652	313655
1/2	1/2	5/8	3	-	313659	313662
1/2	1/2	1-1/4	3	-	313666	313668
1/2	1/2	2	4	-	313671	313674
5/8	5/8	3/4	3-1/2	-	313678	313682
5/8	5/8	1-5/8	3-1/2	-	313685	313687
5/8	5/8	2-1/2	5	-	313691	313693
3/4	3/4	1	4	-	313697	313700
3/4	3/4	1-5/8	4	-	313704	313707
3/4	3/4	3-1/4	6	-	313709	313711
1	1	1-1/4	5	-	313714	313717
1	1	2	5	-	313721	313723
1	1	3-1/4	6	-	313725	313729



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2012 | 250 | 2FL | Reduced Neck | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Radius	Bright EDP	ZrN EDP
1/8	1/8	1/4	1-1/2	-	-	313733	313736
1/8	1/8	1/4	1-1/2	1/2	-	313739	313743
1/8	1/8	1/4	1-1/2	1/2	0.020	-	313745
1/8	1/8	1/4	1-1/2	1/2	0.030	-	313749
1/8	1/8	1/4	3	-	-	313751	313755
1/8	1/8	1/4	3	1-3/8	-	313758	313761
1/8	1/8	1/4	3	1-3/8	0.020	-	313763
1/8	1/8	1/4	3	1-3/8	0.030	-	313766
3/16	3/16	5/16	2	-	-	313768	313771
3/16	3/16	5/16	2	1/2	-	313773	313777
3/16	3/16	5/16	2	1/2	0.010	-	313781
3/16	3/16	5/16	2	1/2	0.030	-	313785
3/16	3/16	5/16	3	-	-	313788	-
3/16	3/16	5/16	3	1-3/8	-	313792	313794
3/16	3/16	5/16	3	1-3/8	0.010	-	313797
3/16	3/16	5/16	3	1-3/8	0.030	-	313800
1/4	1/4	3/8	2-1/2	-	-	313802	313805
1/4	1/4	3/8	2-1/2	1-1/8	-	313808	-
1/4	1/4	3/8	2-1/2	1-1/8	0.015	-	313811
1/4	1/4	3/8	2-1/2	1-1/8	0.030	-	313813
1/4	1/4	3/8	2-1/2	1-1/8	0.060	-	313817
1/4	1/4	3/8	2-1/2	1-1/8	0.090	-	313819
1/4	1/4	3/8	4	-	-	313822	313826
1/4	1/4	3/8	4	2-1/8	-	313828	313831
1/4	1/4	3/8	4	2-1/8	0.015	-	313834
1/4	1/4	3/8	4	2-1/8	0.030	-	313836
1/4	1/4	3/8	4	2-1/8	0.060	-	313839
1/4	1/4	3/8	4	2-1/8	0.090	-	313843
1/4	1/4	3/4	4	2-1/8	0.015	-	313847
1/4	1/4	3/4	4	2-1/8	0.030	-	313851
1/4	1/4	3/4	4	2-1/8	0.060	-	313855
1/4	1/4	3/4	4	2-1/8	0.090	-	313858
5/16	5/16	7/16	2-1/2	-	-	313862	313864
5/16	5/16	7/16	2-1/2	1-1/8	-	313867	313869
5/16	5/16	7/16	2-1/2	1-1/8	0.015	-	313873
5/16	5/16	7/16	4	-	-	313877	313879
5/16	5/16	7/16	4	2-1/8	-	313882	313886
5/16	5/16	13/16	4	2-1/8	0.015	-	313888
3/8	3/8	1/2	2-1/2	-	-	313892	313894
3/8	3/8	1/2	2-1/2	1-1/8	-	313897	-

### More About the Series 2012

Reduced neck for extended reach



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys

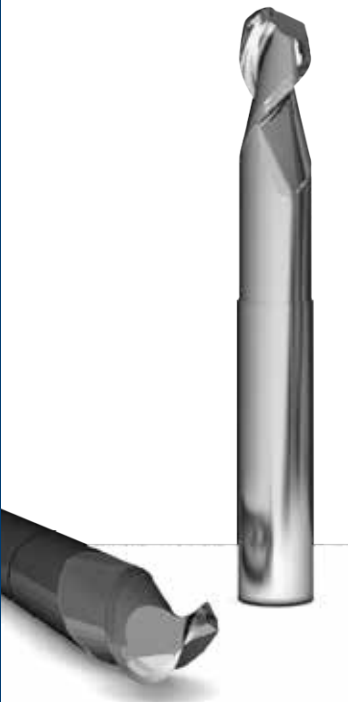


## Series 2012 | 250 | 2FL | Reduced Neck | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Radius	Bright EDP	ZrN EDP
3/8	3/8	1/2	4	-	-	313900	313904
3/8	3/8	1/2	4	2-1/8	-	313907	313909
3/8	3/8	1/2	4	2-1/8	0.030	-	313913
1/2	1/2	5/8	3	-	-	313917	313920
1/2	1/2	5/8	3	1-3/8	-	313924	313927
1/2	1/2	5/8	3	1-3/8	0.015	-	313929
1/2	1/2	5/8	3	1-3/8	0.020	-	313932
1/2	1/2	5/8	3	1-3/8	0.030	-	313936
1/2	1/2	5/8	3	1-3/8	0.060	-	313938
1/2	1/2	5/8	3	1-3/8	0.090	-	313941
1/2	1/2	5/8	3	1-3/8	0.120	-	313943
1/2	1/2	5/8	4	-	-	313947	313949
1/2	1/2	5/8	4	2-3/8	-	313953	313957
1/2	1/2	5/8	4	2-3/8	0.015	-	313961
1/2	1/2	5/8	4	2-3/8	0.020	-	313963
1/2	1/2	5/8	4	2-3/8	0.030	-	313967
1/2	1/2	5/8	4	2-3/8	0.060	-	313969
1/2	1/2	5/8	4	2-3/8	0.090	-	313972
1/2	1/2	5/8	4	2-3/8	0.120	-	313974
1/2	1/2	5/8	6	-	-	313978	313982
1/2	1/2	5/8	6	3-3/8	0.015	-	313986
1/2	1/2	5/8	6	3-3/8	0.020	-	313989
1/2	1/2	5/8	6	3-3/8	0.030	-	313992
1/2	1/2	5/8	6	3-3/8	0.060	-	313994
1/2	1/2	5/8	6	3-3/8	0.090	-	313996
1/2	1/2	5/8	6	3-3/8	0.120	-	313999
1/2	1/2	1-1/4	6	3-3/8	0.015	-	314001
1/2	1/2	1-1/4	6	3-3/8	0.030	-	314004
1/2	1/2	1-1/4	6	3-3/8	0.060	-	314008
1/2	1/2	1-1/4	6	3-3/8	0.090	-	314010
1/2	1/2	1-1/4	6	3-3/8	0.120	-	314014
5/8	5/8	3/4	3-1/2	-	-	314017	314019
5/8	5/8	3/4	3-1/2	1-5/8	-	314022	314024
5/8	5/8	3/4	5	-	-	314027	314030
5/8	5/8	3/4	5	2-3/8	-	314032	314035
5/8	5/8	3/4	6	-	-	314037	314039
5/8	5/8	3/4	6	3-3/8	-	314043	314045
3/4	3/4	1	4	-	-	314049	314053
3/4	3/4	1	4	1-5/8	-	314057	314060
3/4	3/4	1	4	1-5/8	0.030	-	314064

### More About the Series 2012

Reduced neck for extended reach



★ Best ☆ Good



# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys

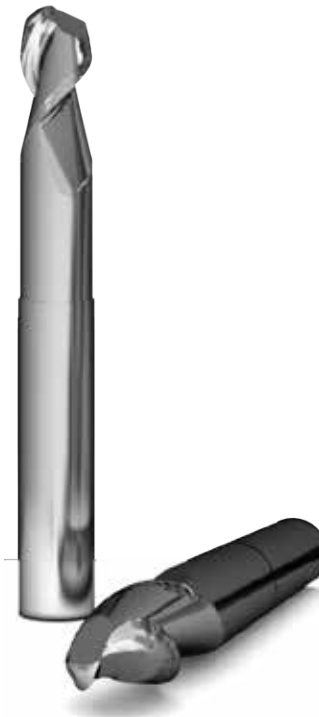


## Series 2012 250 | 2FL | Reduced Neck | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Radius	Bright EDP	ZrN EDP
3/4	3/4	1	4	1-5/8	0.060	-	314067
3/4	3/4	1	4	1-5/8	0.090	-	314071
3/4	3/4	1	4	1-5/8	0.120	-	314074
3/4	3/4	1	5	-	-	314077	314079
3/4	3/4	1	5	2-1/2	-	314082	314086
3/4	3/4	1	5	2-1/2	0.030	-	314088
3/4	3/4	1	5	2-1/2	0.060	-	314091
3/4	3/4	1	5	2-1/2	0.090	-	314095
3/4	3/4	1	5	2-1/2	0.120	-	314098
3/4	3/4	1	6	-	-	314101	314105
3/4	3/4	1	6	3-3/8	-	314109	314111
3/4	3/4	1	6	3-3/8	0.030	-	314114
3/4	3/4	1	6	3-3/8	0.060	-	314116
3/4	3/4	1	6	3-3/8	0.090	-	314119
3/4	3/4	1	6	3-3/8	0.120	-	314122
3/4	3/4	1-5/8	6	3-3/8	0.030	-	314126
3/4	3/4	1-5/8	6	3-3/8	0.060	-	314128
3/4	3/4	1-5/8	6	3-3/8	0.090	-	314130
3/4	3/4	1-5/8	6	3-3/8	0.120	-	314133
1	1	1-1/4	5	-	-	314136	314140
1	1	1-1/4	5	2-1/8	-	314142	314144
1	1	1-1/4	6	-	-	314146	314149
1	1	1-1/4	6	3-3/8	-	314153	314157
1	1	1-1/4	6	3-3/8	0.030	-	314161
1	1	1-1/4	6	3-3/8	0.060	-	314165
1	1	1-1/4	6	3-3/8	0.090	-	314167
1	1	1-1/4	6	3-3/8	0.120	-	314170
1	1	1-1/4	7	-	-	314172	314176
1	1	1-1/4	7	4-3/8	-	314179	314181
1	1	1-1/4	7	4-3/8	0.030	-	314184
1	1	1-1/4	7	4-3/8	0.060	-	314186
1	1	1-1/4	7	4-3/8	0.090	-	314190
1	1	1-1/4	7	4-3/8	0.120	-	314193
1	1	2	7	4-3/8	0.030	-	314197
1	1	2	7	4-3/8	0.060	-	314199
1	1	2	7	4-3/8	0.090	-	314202
1	1	2	7	4-3/8	0.120	-	314206

### More About the Series 2012

Reduced neck for extended reach



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2014 | 250BN | 2FL | Reduced Neck | Ball Nose

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Bright EDP	ZrN EDP
1/4	1/4	3/8	2-1/2	-	314210	314214
1/4	1/4	3/8	4	-	314218	314220
1/4	1/4	3/8	2-1/2	1-1/8	314223	314227
1/4	1/4	3/8	4	2-1/8	314231	314229
1/4	1/4	3/8	4	2-1/8	314231	314229
5/16	5/16	7/16	2-1/2	-	314233	314237
5/16	5/16	7/16	4	-	314239	314243
5/16	5/16	7/16	2-1/2	1-1/8	314245	314249
5/16	5/16	7/16	4	2-1/8	314253	314255
3/8	3/8	1/2	2-1/2	-	314259	314263
3/8	3/8	1/2	4	-	314266	314269
3/8	3/8	1/2	2-1/2	1-1/8	314273	314275
3/8	3/8	1/2	4	2-1/8	314278	314280
1/2	1/2	5/8	3	-	314282	314285
1/2	1/2	5/8	4	-	314289	314293
1/2	1/2	5/8	6	-	314297	314301
1/2	1/2	5/8	3	1-3/8	314303	314307
1/2	1/2	5/8	4	2-3/8	314309	314312
1/2	1/2	5/8	6	3-3/8	314316	314319
5/8	5/8	3/4	3-1/2	-	314323	314326
5/8	5/8	3/4	5	-	314330	314333
5/8	5/8	3/4	6	-	314336	314340
5/8	5/8	3/4	3-1/2	1-5/8	314343	314346
5/8	5/8	3/4	5	2-3/8	314350	314353
5/8	5/8	3/4	6	3-3/8	314357	314359
3/4	3/4	1	4	-	314361	314363
3/4	3/4	1	5	-	314367	314370
3/4	3/4	1	6	-	314374	314376
3/4	3/4	1	4	1-5/8	314378	314382
3/4	3/4	1	5	2-3/8	314386	314390
3/4	3/4	1	6	3-3/8	314392	314396
1	1	1-1/4	5	-	314398	314401
1	1	1-1/4	6	-	314403	314407
1	1	1-1/4	7	-	314410	314413
1	1	1-1/4	5	2-1/8	314415	314417
1	1	1-1/4	6	3-3/8	314421	314425
1	1	1-1/4	7	4-3/8	314428	314431

### More About the Series 2014

Reduced neck for extended reach



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2030 350 | 3FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
1/8	1/8	1/4	1-1/2	-	314434	314436
1/8	1/8	1/4	1-1/2	0.010	314440	-
1/8	1/8	5/16	1-1/2	-	314442	314445
1/8	1/8	3/8	1-1/2	-	314447	314450
1/8	1/8	3/8	1-1/2	0.010	314453	-
1/8	1/8	3/8	1-1/2	0.020	314456	-
1/8	1/8	3/8	1-1/2	0.030	314458	-
1/8	1/8	1/2	2	-	314462	314466
1/8	1/8	5/8	2	-	314468	314472
1/8	1/8	3/4	2	-	314476	314479
1/8	1/8	1	2-1/2	-	314483	314487
5/32	3/16	5/16	2	-	314491	314493
5/32	3/16	9/16	2	-	314496	-
3/16	3/16	5/16	2	-	314498	314502
3/16	3/16	5/16	2	0.020	-	314504
3/16	3/16	3/8	2	-	314508	314512
3/16	3/16	5/8	2-1/2	-	314516	314518
3/16	3/16	5/8	2-1/2	0.010	-	314520
3/16	3/16	5/8	2-1/2	0.020	-	314523
3/16	3/16	5/8	2-1/2	0.030	-	314527
3/16	3/16	3/4	2-1/2	-	314531	314534
3/16	3/16	1	2-1/2	-	314536	314539
7/32	1/4	3/8	2-1/2	-	314542	314545
7/32	1/4	3/4	2-1/2	-	314547	314549
1/4	1/4	3/8	2-1/2	-	314551	314553
1/4	1/4	3/8	2-1/2	0.015	-	314556
1/4	1/4	3/8	2-1/2	0.020	-	314558
1/4	1/4	3/8	2-1/2	0.030	-	314560
1/4	1/4	3/8	2-1/2	0.060	-	314564
1/4	1/4	1/2	2-1/2	-	314568	314570
1/4	1/4	5/8	2-1/2	-	314572	314575
1/4	1/4	3/4	2-1/2	-	314577	314581
1/4	1/4	3/4	2-1/2	0.010	-	314584
1/4	1/4	3/4	2-1/2	0.015	-	314586
1/4	1/4	3/4	2-1/2	0.020	-	314590
1/4	1/4	3/4	2-1/2	0.030	-	314592
1/4	1/4	3/4	2-1/2	0.045	-	314596
1/4	1/4	3/4	2-1/2	0.060	-	314598
1/4	1/4	1	2-1/2	-	314600	314602
1/4	1/4	1-1/8	2-1/2	-	314605	314607



★ Best ☆ Good



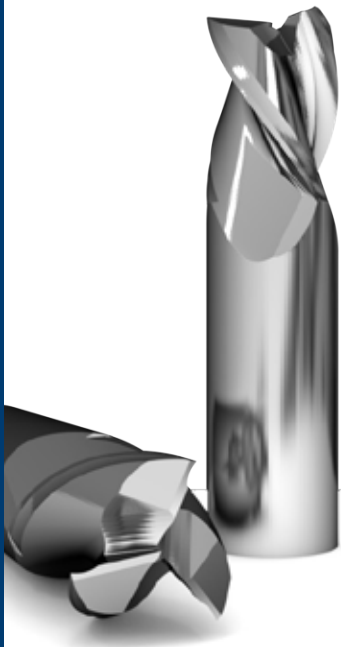
# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2030 350 | 3FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
1/4	1/4	1-1/4	3	-	314610	314614
1/4	1/4	1-1/2	3	-	314616	314618
1/4	1/4	2	4	-	314622	314624
9/32	5/16	7/16	2-1/2	-	314626	314630
9/32	5/16	13/16	2-1/2	-	314633	314636
5/16	5/16	7/16	2-1/2	-	314639	314642
5/16	5/16	7/16	2-1/2	0.020	-	314645
5/16	5/16	7/16	2-1/2	0.030	-	314648
5/16	5/16	1/2	2-1/2	-	314651	314655
5/16	5/16	13/16	2-1/2	-	314657	314661
5/16	5/16	13/16	2-1/2	0.020	-	314663
5/16	5/16	13/16	2-1/2	0.030	-	314666
5/16	5/16	13/16	2-1/2	0.060	-	314670
5/16	5/16	1-1/8	2-1/2	-	314672	314674
5/16	5/16	1-1/4	3-1/2	-	314678	314681
5/16	5/16	1-1/2	3-1/2	-	314684	314687
5/16	5/16	2-1/8	4	-	314690	314692
11/32	3/8	1/2	2-1/2	-	314694	314696
11/32	3/8	1	2-1/2	-	314700	314703
3/8	3/8	1/2	2-1/2	-	314705	314709
3/8	3/8	1/2	2-1/2	0.020	-	314711
3/8	3/8	1/2	2-1/2	0.030	-	314714
3/8	3/8	1/2	2-1/2	0.040	-	314716
3/8	3/8	5/8	2-1/2	-	314719	314723
3/8	3/8	3/4	2-1/2	-	314726	314729
3/8	3/8	1	2-1/2	-	314732	314736
3/8	3/8	1	2-1/2	0.020	-	314738
3/8	3/8	1	2-1/2	0.030	-	314742
3/8	3/8	1	2-1/2	0.045	-	314744
3/8	3/8	1	2-1/2	0.060	-	314747
3/8	3/8	1-1/4	3	-	314749	314753
3/8	3/8	1-1/2	4	-	314755	314758
3/8	3/8	2	4	-	314762	314766
3/8	3/8	2-1/2	6	-	314768	314771
13/32	7/16	9/16	2-3/4	-	314773	314775
13/32	7/16	1	2-3/4	-	314779	314781
7/16	7/16	9/16	2-3/4	-	314783	314786
7/16	7/16	1	2-3/4	-	314790	314793
7/16	7/16	2	4	-	314797	314801
15/32	1/2	5/8	3	-	314803	314805



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2030 350 | 3FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
15/32	1/2	1-1/4	3	-	314808	314810
1/2	1/2	5/8	3	-	314814	314818
1/2	1/2	5/8	3	0.020	-	314821
1/2	1/2	5/8	3	0.030	-	314823
1/2	1/2	5/8	3	0.060	-	314827
1/2	1/2	5/8	3	0.090	-	314830
1/2	1/2	3/4	3	-	314834	314836
1/2	1/2	1	3	-	314838	314840
1/2	1/2	1-1/4	3	-	314843	314845
1/2	1/2	1-1/4	3	0.020	-	314847
1/2	1/2	1-1/4	3	0.030	-	314850
1/2	1/2	1-1/4	3	0.060	-	314854
1/2	1/2	1-1/4	3	0.090	-	314857
1/2	1/2	1-1/4	3	0.120	-	314860
1/2	1/2	1-1/2	4	-	314863	314865
1/2	1/2	2	4	-	314869	314872
1/2	1/2	2-1/4	6	-	314876	314878
1/2	1/2	2-1/2	6	-	314880	314884
1/2	1/2	3-1/4	6	-	314888	314892
1/2	1/2	4	8	-	314896	314900
5/8	5/8	3/4	3-1/2	-	314904	314908
5/8	5/8	1-1/4	3-1/2	-	314912	314914
5/8	5/8	1-5/8	3-1/2	-	314917	314920
5/8	5/8	1-5/8	3-1/2	0.030	-	314924
5/8	5/8	1-5/8	3-1/2	0.060	-	314928
5/8	5/8	1-5/8	3-1/2	0.090	-	314930
5/8	5/8	1-5/8	3-1/2	0.120	-	314934
5/8	5/8	2	5	-	314938	314941
5/8	5/8	2-1/2	5	-	314944	314948
5/8	5/8	2-3/4	5	-	314952	314954
5/8	5/8	3-1/4	6	-	314956	314960
5/8	5/8	4	8	-	314962	314965
3/4	3/4	1	4	-	314969	314972
3/4	3/4	1	4	0.060	-	314975
3/4	3/4	1	4	0.090	-	314978
3/4	3/4	1	4	0.120	-	314981
3/4	3/4	1-1/2	4	-	314983	314987
3/4	3/4	1-5/8	4	-	314991	314994
3/4	3/4	1-5/8	4	0.060	-	314996
3/4	3/4	1-5/8	4	0.090	-	314998



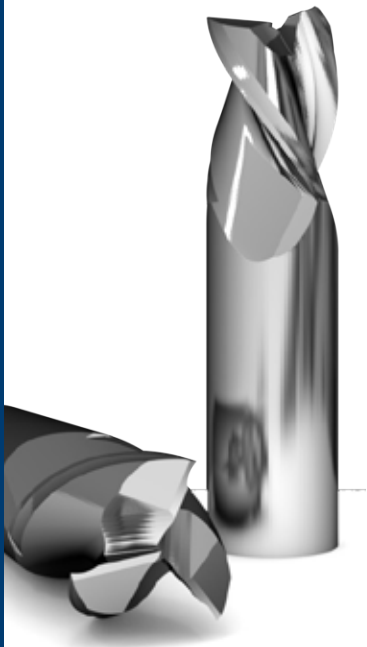
# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2030 350 | 3FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	ZrN EDP
3/4	3/4	1-5/8	4	0.120	-	315002
3/4	3/4	2	5	-	315005	315007
3/4	3/4	2-1/4	5	-	315011	315013
3/4	3/4	2-1/2	5	-	315017	315021
3/4	3/4	3	6	-	315023	315025
3/4	3/4	3-1/4	6	-	315027	315029
3/4	3/4	3-1/2	6	-	315031	315033
3/4	3/4	4	7	-	315036	315039
3/4	3/4	5	8	-	315043	315047
1	1	1-1/4	5	-	315051	315054
1	1	1-1/2	5	-	315057	315060
1	1	2	5	-	315062	315065
1	1	2	5	0.060	-	315067
1	1	2	5	0.090	-	315070
1	1	2	5	0.120	-	315074
1	1	2-1/2	5	-	315077	315081
1	1	3	6	-	315084	315086
1	1	3-1/2	6	-	315090	315093
1	1	4-1/8	7	-	315096	315099
1	1	5-1/2	8	-	315101	315105
1-1/4	1-1/4	1-1/4	4-1/2	-	-	315107
1-1/4	1-1/4	2	4-1/2	-	315109	315112
1-1/4	1-1/4	3-1/4	6	-	315115	315118
1-1/4	1-1/4	5	7-1/2	-	-	315121



★ Best ☆ Good



# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2031 350WF | 3FL | Square | Wiper Flats

Diameter	Shank Dia	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	315123
1/8	1/8	1/2	2	315126
1/8	1/8	3/4	2	315130
3/16	3/16	5/16	2	315133
3/16	3/16	5/8	2-1/2	315137
3/16	3/16	3/4	2-1/2	315140
1/4	1/4	3/8	2-1/2	315143
1/4	1/4	3/4	2-1/2	315147
1/4	1/4	1-1/4	3	315149
5/16	5/16	7/16	2-1/2	315152
5/16	5/16	13/16	2-1/2	315155
5/16	5/16	1-1/4	3-1/2	315159
3/8	3/8	1/2	2-1/2	315162
3/8	3/8	1	2-1/2	315165
3/8	3/8	1-1/2	4	315167
1/2	1/2	5/8	3	315171
1/2	1/2	1-1/4	3	315173
1/2	1/2	2	4	315175
1/2	1/2	3-1/4	6	315178
5/8	5/8	3/4	3-1/2	315180
5/8	5/8	1-5/8	3-1/2	315184
5/8	5/8	2-1/2	5	315188
3/4	3/4	1	4	315190
3/4	3/4	1-5/8	4	315192
3/4	3/4	2-1/2	5	315196
3/4	3/4	3-1/4	6	315200
1	1	1-1/4	5	315203
1	1	2	5	315205
1	1	3	6	315209

### More About the Series 2031

Integrated wiper flat design ideal for finishing operations

Floor finishing



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2045 350BN | 3FL | Ball Nose

Diameter	Shank Dia.	LOC	OAL	Bright EDP	ZrN EDP
1/4	1/4	1-1/4	3	315212	315215
1/4	1/4	3/4	2-1/2	315219	315221
1/4	1/4	3/8	2-1/2	315223	315227
5/16	5/16	1-1/4	3	315229	315232
5/16	5/16	13/16	2-1/2	315236	315238
5/16	5/16	7/16	2-1/2	315240	315244
3/8	3/8	1	2-1/2	315248	315250
3/8	3/8	1/2	2-1/2	315253	315256
3/8	3/8	1-1/2	4	315259	315261
7/16	7/16	1	2-3/4	315265	315268
7/16	7/16	2	4	315271	315274
7/16	7/16	9/16	2-3/4	315277	315280
1/2	1/2	1-1/4	3	315282	315285
1/2	1/2	2	4	315288	315292
1/2	1/2	5/8	3	315296	315299
5/8	5/8	1-5/8	3-1/2	315303	315306
5/8	5/8	2-1/2	5	315308	315312
5/8	5/8	3/4	3-1/2	315316	315318
3/4	3/4	1	4	315320	315322
3/4	3/4	1-5/8	4	315324	315326
3/4	3/4	3-1/4	6	315330	315333
1	1	1-1/4	5	315336	315340
1	1	2	5	315343	315346
1	1	3-1/4	6	315348	315352



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2032 350 | 3FL | Reduced Neck | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Radius	Bright EDP	ZrN EDP
1/8	1/8	1/4	1-1/2	1/2	0.020	-	315355
1/8	1/8	1/4	1-1/2	1/2	0.030	-	315359
1/8	1/8	1/4	3	1-3/8	0.020	-	315363
1/8	1/8	1/4	3	1-3/8	0.030	-	315367
3/16	3/16	5/16	2	1/2	0.010	-	315369
3/16	3/16	5/16	2	1/2	0.030	-	315371
3/16	3/16	5/16	3	1-3/8	0.010	-	315374
3/16	3/16	5/16	3	1-3/8	0.030	-	315377
1/4	1/4	3/8	2-1/2	-	-	315379	315381
1/4	1/4	3/8	2-1/2	1-1/8	-	315384	315388
1/4	1/4	3/8	2-1/2	1-1/8	0.015	-	315392
1/4	1/4	3/8	2-1/2	1-1/8	0.030	-	315394
1/4	1/4	3/8	2-1/2	1-1/8	0.060	-	315397
1/4	1/4	3/8	2-1/2	1-1/8	0.090	-	315399
1/4	1/4	3/8	4	-	-	315403	315405
1/4	1/4	3/8	4	2-1/8	-	315408	315411
1/4	1/4	3/8	4	2-1/8	0.015	-	315413
1/4	1/4	3/8	4	2-1/8	0.030	-	315415
1/4	1/4	3/8	4	2-1/8	0.060	-	315417
1/4	1/4	3/8	4	2-1/8	0.090	-	315419
1/4	1/4	3/4	4	2-1/8	0.015	-	315423
1/4	1/4	3/4	4	2-1/8	0.030	-	315427
1/4	1/4	3/4	4	2-1/8	0.060	-	315429
1/4	1/4	3/4	4	2-1/8	0.090	-	315433
5/16	5/16	7/16	2-1/2	-	-	315437	315441
5/16	5/16	7/16	2-1/2	1-1/8	-	315445	315447
5/16	5/16	7/16	2-1/2	1-1/8	0.015	-	315450
5/16	5/16	7/16	4	-	-	315453	315456
5/16	5/16	7/16	4	2-1/8	-	315458	315460
5/16	5/16	13/16	4	2-1/8	0.015	-	315464
3/8	3/8	1/2	2-1/2	-	-	315466	315469
3/8	3/8	1/2	2-1/2	1-1/8	-	315473	315476
3/8	3/8	1/2	4	-	-	315478	315481
3/8	3/8	1/2	4	2-1/8	-	315483	315486
3/8	3/8	1/2	4	2-1/8	0.030	-	315489
1/2	1/2	5/8	3	-	-	315491	315495
1/2	1/2	5/8	3	1-3/8	-	315498	315502
1/2	1/2	5/8	3	1-3/8	0.015	-	315505
1/2	1/2	5/8	3	1-3/8	0.020	-	315507
1/2	1/2	5/8	3	1-3/8	0.030	-	315511

### More About the Series 2032

Reduced neck for extended reach



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2032 | 350 | 3FL | Reduced Neck | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Radius	Bright EDP	ZrN EDP
1/2	1/2	5/8	3	1-3/8	0.060	-	315515
1/2	1/2	5/8	3	1-3/8	0.090	-	315518
1/2	1/2	5/8	3	1-3/8	0.120	-	315520
1/2	1/2	5/8	4	-	-	315523	315525
1/2	1/2	5/8	4	2-3/8	-	315527	315529
1/2	1/2	5/8	4	2-3/8	0.015	-	315532
1/2	1/2	5/8	4	2-3/8	0.020	-	315535
1/2	1/2	5/8	4	2-3/8	0.030	-	315537
1/2	1/2	5/8	4	2-3/8	0.060	-	315539
1/2	1/2	5/8	4	2-3/8	0.090	-	315542
1/2	1/2	5/8	4	2-3/8	0.120	-	315546
1/2	1/2	5/8	6	-	-	315548	315552
1/2	1/2	5/8	6	3-3/8	-	-	315554
1/2	1/2	5/8	6	3-3/8	0.015	-	315558
1/2	1/2	5/8	6	3-3/8	0.020	-	315562
1/2	1/2	5/8	6	3-3/8	0.030	-	315565
1/2	1/2	5/8	6	3-3/8	0.060	-	315569
1/2	1/2	5/8	6	3-3/8	0.090	-	315572
1/2	1/2	5/8	6	3-3/8	0.120	-	315574
1/2	1/2	1-1/4	6	3-3/8	0.015	-	315578
1/2	1/2	1-1/4	6	3-3/8	0.030	-	315581
1/2	1/2	1-1/4	6	3-3/8	0.060	-	315583
1/2	1/2	1-1/4	6	3-3/8	0.090	-	315586
1/2	1/2	1-1/4	6	3-3/8	0.120	-	315589
5/8	5/8	3/4	3-1/2	-	-	315591	315593
5/8	5/8	3/4	3-1/2	1-5/8	-	315597	315599
5/8	5/8	3/4	5	-	-	315601	315603
5/8	5/8	3/4	5	2-3/8	-	315605	315607
5/8	5/8	3/4	6	-	-	315609	315611
5/8	5/8	3/4	6	3-3/8	-	315615	315618
3/4	3/4	1	4	-	-	315621	315625
3/4	3/4	1	4	1-5/8	-	315627	315629
3/4	3/4	1	4	1-5/8	0.030	-	315632
3/4	3/4	1	4	1-5/8	0.060	-	315636
3/4	3/4	1	4	1-5/8	0.090	-	315640
3/4	3/4	1	4	1-5/8	0.120	-	315642
3/4	3/4	1	5	-	-	-	315644
3/4	3/4	1	5	2-1/2	-	315646	315650
3/4	3/4	1	5	2-1/2	0.030	-	315654
3/4	3/4	1	5	2-1/2	0.060	-	315656

### More About the Series 2032

Reduced neck for extended reach



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2032 350 | 3FL | Reduced Neck | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Radius	Bright EDP	ZrN EDP
3/4	3/4	1	5	2-1/2	0.090	-	315659
3/4	3/4	1	5	2-1/2	0.120	-	315662
3/4	3/4	1	6	-	-	-	315664
3/4	3/4	1	6	3-3/8	-	315667	315669
3/4	3/4	1	6	3-3/8	0.030	-	315671
3/4	3/4	1	6	3-3/8	0.060	-	315673
3/4	3/4	1	6	3-3/8	0.090	-	315675
3/4	3/4	1	6	3-3/8	0.120	-	315677
3/4	3/4	1-5/8	6	3-3/8	0.030	-	315679
3/4	3/4	1-5/8	6	3-3/8	0.060	-	315683
3/4	3/4	1-5/8	6	3-3/8	0.090	-	315686
3/4	3/4	1-5/8	6	3-3/8	0.120	-	315689
1	1	1-1/4	5	-	-	315693	315696
1	1	1-1/4	5	2-1/8	-	315699	315702
1	1	1-1/4	6	-	-	315706	315709
1	1	1-1/4	6	3-3/8	-	315713	315716
1	1	1-1/4	6	3-3/8	0.030	-	315720
1	1	1-1/4	6	3-3/8	0.060	-	315724
1	1	1-1/4	6	3-3/8	0.090	-	315728
1	1	1-1/4	6	3-3/8	0.120	-	315730
1	1	1-1/4	7	-	-	315734	315738
1	1	1-1/4	7	4-3/8	-	315742	315745
1	1	1-1/4	7	4-3/8	0.030	-	315749
1	1	1-1/4	7	4-3/8	0.060	-	315751
1	1	1-1/4	7	4-3/8	0.090	-	315755
1	1	1-1/4	7	4-3/8	0.120	-	315758
1	1	2	7	4-3/8	0.030	-	315761
1	1	2	7	4-3/8	0.060	-	315764
1	1	2	7	4-3/8	0.090	-	315767
1	1	2	7	4-3/8	0.120	-	315771

### More About the Series 2032

Reduced neck for extended reach



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2047 350BN | 3FL | Reduced Neck | Ball Nose

Diameter	Shank Dia.	LOC	OAL	Length Below Shank	Bright EDP	ZrN EDP
1/4	1/4	3/8	2-1/2	-	315774	315776
1/4	1/4	3/8	2-1/2	1-1/8	315779	315781
1/4	1/4	3/8	4	-	315785	315788
1/4	1/4	3/8	4	2-1/8	315790	-
5/16	5/16	7/16	2-1/2	-	315794	315797
5/16	5/16	7/16	2-1/2	1-1/8	315799	315802
5/16	5/16	7/16	4	-	315806	315808
5/16	5/16	7/16	4	2-1/8	315811	315814
3/8	3/8	1/2	2-1/2	-	315817	315821
3/8	3/8	1/2	2-1/2	1-1/8	315823	315825
3/8	3/8	1/2	4	-	315829	315831
3/8	3/8	1/2	4	2-1/8	315835	315838
1/2	1/2	5/8	3	-	315842	315845
1/2	1/2	5/8	3	1-3/8	315848	315852
1/2	1/2	5/8	4	-	315856	315858
1/2	1/2	5/8	4	2-3/8	315860	315864
1/2	1/2	5/8	6	-	315868	315871
1/2	1/2	5/8	6	3-3/8	315873	315877
5/8	5/8	3/4	3-1/2	-	315880	315882
5/8	5/8	3/4	3-1/2	1-5/8	315884	315886
5/8	5/8	3/4	5	-	315888	315892
5/8	5/8	3/4	5	2-3/8	315895	315899
5/8	5/8	3/4	6	-	315902	315906
5/8	5/8	3/4	6	3-3/8	315909	315912
3/4	3/4	1	4	-	315914	315916
3/4	3/4	1	4	1-5/8	315920	315924
3/4	3/4	1	5	-	315928	315932
3/4	3/4	1	5	2-3/8	315935	315938
3/4	3/4	1	6	-	315940	315943
3/4	3/4	1	6	3-3/8	315947	315951
1	1	1-1/4	5	-	315953	315957
1	1	1-1/4	5	2-1/8	315960	315963
1	1	1-1/4	6	-	315967	315970
1	1	1-1/4	6	3-3/8	315973	315977
1	1	1-1/4	7	-	315979	315983
1	1	1-1/4	7	4-3/8	315987	315991

### More About the Series 2047

Reduced neck for extended reach





# PERFORMANCE

Premium Carbide End Mills for Non-Ferrous Alloys



## Series 2060 550 | 5FL | Square

Diameter	Shank Dia.	LOC	OAL	Bright EDP	ZrN EDP
1/4	1/4	3/8	2-1/2	315994	315997
1/4	1/4	3/4	2-1/2	316000	316002
1/4	1/4	1-1/4	3	316005	316009
5/16	5/16	7/16	2-1/2	316013	316016
5/16	5/16	13/16	2-1/2	316019	316021
5/16	5/16	1-1/4	3-1/2	316023	316026
3/8	3/8	1/2	2-1/2	316030	316033
3/8	3/8	1	2-1/2	316035	316039
3/8	3/8	1-1/4	3	316041	316044
3/8	3/8	2	4	316046	316048
1/2	1/2	5/8	3	316052	316056
1/2	1/2	1-1/4	3	316058	316061
1/2	1/2	2	4	316064	316068
1/2	1/2	3-1/4	6	316070	316073
5/8	5/8	3/4	3-1/2	316076	316079
5/8	5/8	1-5/8	3-1/2	316083	316087
5/8	5/8	2-1/2	5	316091	316095
3/4	3/4	1	4	316098	316102
3/4	3/4	1-5/8	4	316105	316108
3/4	3/4	2-1/4	5	316111	316113
3/4	3/4	3	6	316116	316120
1	1	1-1/4	5	316122	316126
1	1	2	5	316130	316132
1	1	2-1/2	5	316136	316139
1	1	3	6	316142	316146

### More About the Series 2060

Designed for High Speed Profiling of Aluminum



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



<b>Series 250</b>		440V   4FL   Square & Radius				
Diameter	Shank Dia.	LOC	OAL	Radius	EDP	
1/4	1/4	3/8	2	-	<b>316148</b>	
1/4	1/4	3/8	2	0.020	<b>316152</b>	
1/4	1/4	3/4	2-1/2	-	<b>316154</b>	
1/4	1/4	3/4	2-1/2	0.020	<b>316158</b>	
1/4	1/4	1-1/4	3	-	<b>316160</b>	
1/4	1/4	1-1/4	3	0.020	<b>316163</b>	
5/16	5/16	7/16	2	-	<b>316167</b>	
5/16	5/16	7/16	2	0.020	<b>316169</b>	
5/16	5/16	13/16	2-1/2	-	<b>316171</b>	
5/16	5/16	13/16	2-1/2	0.020	<b>316175</b>	
5/16	5/16	1-3/8	3	-	<b>316177</b>	
5/16	5/16	1-3/8	3	0.020	<b>316179</b>	
3/8	3/8	1/2	2	-	<b>316183</b>	
3/8	3/8	1/2	2	0.020	<b>316187</b>	
3/8	3/8	1/2	2	0.030	<b>316189</b>	
3/8	3/8	1	2-1/2	-	<b>316191</b>	
3/8	3/8	1	2-1/2	0.020	<b>316194</b>	
3/8	3/8	1	2-1/2	0.030	<b>316196</b>	
3/8	3/8	1-1/2	2-1/2	-	<b>316198</b>	
3/8	3/8	1-1/2	2-1/2	0.020	<b>316200</b>	
3/8	3/8	1-1/2	2-1/2	0.030	<b>316203</b>	
1/2	1/2	5/8	2-1/2	-	<b>316207</b>	
1/2	1/2	5/8	2-1/2	0.030	<b>316209</b>	
1/2	1/2	5/8	2-1/2	0.060	<b>316213</b>	
1/2	1/2	1-1/4	3	-	<b>316216</b>	
1/2	1/2	1-1/4	3	0.030	<b>316219</b>	
1/2	1/2	1-1/4	3	0.060	<b>316223</b>	
1/2	1/2	2	4	-	<b>316227</b>	
1/2	1/2	2	4	0.030	<b>316230</b>	
1/2	1/2	2	4	0.060	<b>316234</b>	
5/8	5/8	3/4	3	-	<b>316236</b>	
5/8	5/8	3/4	3	0.030	<b>316239</b>	
5/8	5/8	3/4	3	0.060	<b>316242</b>	
5/8	5/8	1-5/8	3-1/2	-	<b>316246</b>	
5/8	5/8	1-5/8	3-1/2	0.030	<b>316249</b>	
5/8	5/8	1-5/8	3-1/2	0.060	<b>316253</b>	
5/8	5/8	2-1/4	5	-	<b>316257</b>	
5/8	5/8	2-1/4	5	0.030	<b>316260</b>	
5/8	5/8	2-1/4	5	0.060	<b>316262</b>	
3/4	3/4	1	3	-	<b>316266</b>	

## More About the Series 250

Performance edge treatment

Features a variable helix and unequal index design that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 250 440V | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/4	3/4	1	3	0.030	<b>316270</b>
3/4	3/4	1	3	0.060	<b>316272</b>
3/4	3/4	1-5/8	4	-	<b>316274</b>
3/4	3/4	1-5/8	4	0.030	<b>316276</b>
3/4	3/4	1-5/8	4	0.060	<b>316278</b>
3/4	3/4	2-1/4	5	-	<b>316281</b>
3/4	3/4	2-1/4	5	0.030	<b>316283</b>
3/4	3/4	2-1/4	5	0.060	<b>316285</b>
1	1	1-1/4	3	-	<b>316287</b>
1	1	1-1/4	3	0.030	<b>316290</b>
1	1	1-1/4	3	0.060	<b>316294</b>
1	1	2	4	-	<b>316296</b>
1	1	2	4	0.030	<b>316298</b>
1	1	2	4	0.060	<b>316302</b>
1	1	3-1/4	5	-	<b>316304</b>
1	1	3-1/4	5	0.030	<b>316306</b>
1	1	3-1/4	5	0.060	<b>316309</b>

### More About the Series 250

Performance edge treatment

Features a variable helix and unequal index design that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 252 440VBN | 4FL | Ball Nose

Diameter	Shank Dia.	LOC	OAL	EDP
1/4	1/4	3/8	2	316312
1/4	1/4	3/4	2-1/2	316314
1/4	1/4	1-1/4	3	316318
5/16	5/16	7/16	2	316320
5/16	5/16	13/16	2-1/2	316323
5/16	5/16	1-3/8	3	316327
3/8	3/8	1/2	2	316331
3/8	3/8	1	2-1/2	316335
3/8	3/8	1-1/2	2-1/2	316339
1/2	1/2	5/8	2-1/2	316343
1/2	1/2	1-1/4	3	316345
1/2	1/2	2	4	316349
5/8	5/8	3/4	3	316351
5/8	5/8	1-5/8	3-1/2	316354
5/8	5/8	2-1/4	5	316356
3/4	3/4	1	3	316360
3/4	3/4	1-5/8	4	316362
3/4	3/4	2-1/4	5	316366
1	1	1-1/4	3	316369
1	1	2	4	316372
1	1	3-1/4	6	316376

### More About the Series 252

Performance edge treatment

Features a variable helix design that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 255 540V | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/4	1/4	3/8	2	-	316380
1/4	1/4	3/8	2	0.020	316384
1/4	1/4	3/4	2-1/2	-	316386
1/4	1/4	3/4	2-1/2	0.020	316388
1/4	1/4	1-1/4	3	-	316392
1/4	1/4	1-1/4	3	0.020	316396
5/16	5/16	7/16	2	-	316400
5/16	5/16	7/16	2	0.020	316404
5/16	5/16	13/16	2-1/2	-	316406
5/16	5/16	13/16	2-1/2	0.020	316408
5/16	5/16	1-3/8	3	-	316410
5/16	5/16	1-3/8	3	0.020	316413
3/8	3/8	1/2	2	-	316416
3/8	3/8	1/2	2	0.020	316420
3/8	3/8	1/2	2	0.030	316422
3/8	3/8	1	2-1/2	-	316425
3/8	3/8	1	2-1/2	0.020	316428
3/8	3/8	1	2-1/2	0.030	316432
3/8	3/8	1-1/2	2-1/2	-	316435
3/8	3/8	1-1/2	2-1/2	0.020	316438
3/8	3/8	1-1/2	2-1/2	0.030	316441
1/2	1/2	5/8	2-1/2	-	316445
1/2	1/2	5/8	2-1/2	0.030	316448
1/2	1/2	5/8	2-1/2	0.060	316451
1/2	1/2	1-1/4	3	-	316453
1/2	1/2	1-1/4	3	0.030	316455
1/2	1/2	1-1/4	3	0.060	316457
1/2	1/2	2	4	-	316460
1/2	1/2	2	4	0.030	316463
1/2	1/2	2	4	0.060	316465
5/8	5/8	3/4	3	-	316468
5/8	5/8	3/4	3	0.030	316470
5/8	5/8	3/4	3	0.060	316473
5/8	5/8	1-5/8	3-1/2	-	316476
5/8	5/8	1-5/8	3-1/2	0.030	316479
5/8	5/8	1-5/8	3-1/2	0.060	316483
5/8	5/8	2-1/4	5	-	316486
5/8	5/8	2-1/4	5	0.030	316488
5/8	5/8	2-1/4	5	0.060	316492
3/4	3/4	1	3	-	316495

### More About the Series 255

Performance edge treatment

Features a variable helix design that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



Series 255		540V   4FL   Square & Radius			
Diameter	Shank Dia.	LOC	OAL	Radius	EDP
3/4	3/4	1	3	0.030	316499
3/4	3/4	1	3	0.060	316502
3/4	3/4	1-5/8	4	-	316504
3/4	3/4	1-5/8	4	0.030	316508
3/4	3/4	1-5/8	4	0.060	316511
3/4	3/4	2-1/4	5	-	316515
3/4	3/4	2-1/4	5	0.030	316519
3/4	3/4	2-1/4	5	0.060	316523
1	1	1-1/4	3	-	316525
1	1	1-1/4	3	0.030	316527
1	1	1-1/4	3	0.060	316531
1	1	2	4	-	316533
1	1	2	4	0.030	316537
1	1	2	4	0.060	316541
1	1	3-1/4	5	-	316544
1	1	3-1/4	5	0.030	316548
1	1	3-1/4	5	0.060	316551

## More About the Series 255

Performance edge treatment

Features a variable helix design that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good



# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 260 | 437 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/8	1/8	1/4	2	-	<b>316554</b>
1/8	1/8	1/4	2	0.010	<b>316556</b>
1/8	1/8	1/4	2	0.020	<b>316558</b>
1/8	1/8	1/4	2	0.030	<b>316560</b>
1/8	1/8	1/2	2	-	<b>316562</b>
1/8	1/8	1/2	2	0.010	<b>316566</b>
1/8	1/8	1/2	2	0.020	<b>316569</b>
1/8	1/8	1/2	2	0.030	<b>316573</b>
3/16	3/16	5/16	2	-	<b>316576</b>
3/16	3/16	5/16	2	0.010	<b>316579</b>
3/16	3/16	5/16	2	0.020	<b>316582</b>
3/16	3/16	5/16	2	0.030	<b>316586</b>
3/16	3/16	9/16	2	-	<b>316589</b>
3/16	3/16	9/16	2	0.010	<b>316592</b>
3/16	3/16	9/16	2	0.020	<b>316596</b>
3/16	3/16	9/16	2	0.030	<b>316599</b>
1/4	1/4	3/8	2-1/2	-	<b>316603</b>
1/4	1/4	3/8	2-1/2	0.010	<b>316605</b>
1/4	1/4	3/8	2-1/2	0.020	<b>316609</b>
1/4	1/4	3/8	2-1/2	0.030	<b>316613</b>
1/4	1/4	3/4	2-1/2	-	<b>316617</b>
1/4	1/4	3/4	2-1/2	0.010	<b>316619</b>
1/4	1/4	3/4	2-1/2	0.020	<b>316622</b>
1/4	1/4	3/4	2-1/2	0.030	<b>316626</b>
1/4	1/4	3/4	4	-	<b>316630</b>
1/4	1/4	3/4	4	0.010	<b>316633</b>
1/4	1/4	3/4	4	0.020	<b>316636</b>
5/16	5/16	13/16	2-1/2	-	<b>316639</b>
5/16	5/16	13/16	2-1/2	0.030	<b>316642</b>
1/2	1/2	5/8	3	-	<b>316644</b>
1/2	1/2	5/8	3	0.020	<b>316647</b>
1/2	1/2	5/8	3	0.030	<b>316650</b>
1/2	1/2	5/8	3	0.060	<b>316652</b>
1/2	1/2	5/8	0	0.090	<b>316656</b>
1/2	1/2	5/8	3	0.120	<b>316658</b>
1/2	1/2	1-1/4	3	-	<b>316660</b>
1/2	1/2	1-1/4	3	0.020	<b>316662</b>
1/2	1/2	1-1/4	3	0.030	<b>316664</b>
1/2	1/2	1-1/4	3	0.060	<b>316668</b>
1/2	1/2	1-1/4	3	0.090	<b>316671</b>

### More About the Series 260

Special edge preparation makes this an ideal tool for exotic materials

Features a variable index design with 37 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 260 437 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/2	1/2	1-1/4	3	0.120	316674
1/2	1/2	1-1/4	4	-	316677
1/2	1/2	1-1/4	4	0.020	316679
1/2	1/2	1-1/4	4	0.030	316683
1/2	1/2	1-1/4	4	0.060	316686
1/2	1/2	1-1/4	4	0.090	316688
1/2	1/2	1-1/4	4	0.120	316691
5/8	5/8	3/4	3	-	316693
5/8	5/8	3/4	3	0.030	316696
5/8	5/8	3/4	3	0.060	316699
5/8	5/8	3/4	3	0.090	316701
5/8	5/8	3/4	3	0.120	316705
5/8	5/8	1-5/8	3-1/2	-	316707
5/8	5/8	1-5/8	3-1/2	0.030	316710
5/8	5/8	1-5/8	3-1/2	0.060	316712
5/8	5/8	1-5/8	3-1/2	0.090	316714
5/8	5/8	1-5/8	3-1/2	0.120	316718
3/4	3/4	1	4	-	316720
3/4	3/4	1	4	0.030	316723
3/4	3/4	1	4	0.060	316727
3/4	3/4	1	4	0.090	316730
3/4	3/4	1	4	0.120	316734
3/4	3/4	1	4	0.156	316736
3/4	3/4	1	4	0.190	316740
3/4	3/4	1-5/8	4	-	316742
3/4	3/4	1-5/8	4	0.030	316744
3/4	3/4	1-5/8	4	0.060	316747
3/4	3/4	1-5/8	4	0.090	316751
3/4	3/4	1-5/8	4	0.120	316753
3/4	3/4	1-5/8	4	0.156	316756
3/4	3/4	1-5/8	4	0.190	316758
3/4	3/4	1-5/8	6	-	316760
3/4	3/4	1-5/8	6	0.030	316764
3/4	3/4	1-5/8	6	0.060	316766
3/4	3/4	1-5/8	6	0.090	316769
3/4	3/4	1-5/8	6	0.120	316773
3/4	3/4	1-5/8	6	0.156	316776
3/4	3/4	1-5/8	6	0.190	316778
1	1	1-1/4	4	-	316782
1	1	1-1/4	4	0.030	316786

### More About the Series 260

Special edge preparation makes this an ideal tool for exotic materials

Features a variable index design with 37 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 260 | 437 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1	1	1-1/4	4	0.060	<b>316788</b>
1	1	1-1/4	4	0.090	<b>316791</b>
1	1	1-1/4	4	0.120	<b>316794</b>
1	1	1-1/4	4	0.156	<b>316798</b>
1	1	1-1/4	4	0.190	<b>316802</b>
1	1	2	4	-	<b>316804</b>
1	1	2	4	0.030	<b>316806</b>
1	1	2	4	0.060	<b>316810</b>
1	1	2	4	0.090	<b>316813</b>
1	1	2	4	0.120	<b>316817</b>
1	1	2	4	0.156	<b>316820</b>
1	1	2	4	0.190	<b>316824</b>
1	1	3-1/4	6	-	<b>316827</b>
1	1	3-1/4	6	0.120	<b>316831</b>

### More About the Series 260

Special edge preparation makes this an ideal tool for exotic materials

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★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 265 537 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
1/4	1/4	3/8	2-1/2	-	316835
1/4	1/4	3/8	2-1/2	0.020	316837
1/4	1/4	3/8	2-1/2	0.030	316841
1/4	1/4	3/4	2-1/2	-	316844
1/4	1/4	3/4	2-1/2	0.010	316848
1/4	1/4	3/4	2-1/2	0.020	316852
1/4	1/4	3/4	2-1/2	0.030	316855
1/4	1/4	3/4	4	-	316859
1/4	1/4	3/4	4	0.010	316862
1/4	1/4	3/4	4	0.020	316864
1/4	1/4	3/4	4	0.030	316868
5/16	5/16	13/16	2-1/2	-	316870
5/16	5/16	13/16	2-1/2	0.030	316873
1/2	1/2	5/8	3	-	316875
1/2	1/2	5/8	3	0.020	316878
1/2	1/2	5/8	3	0.030	316880
1/2	1/2	5/8	3	0.060	316883
1/2	1/2	5/8	3	0.090	316885
1/2	1/2	5/8	3	0.120	316887
1/2	1/2	1-1/4	3	-	316891
1/2	1/2	1-1/4	3	0.020	316893
1/2	1/2	1-1/4	3	0.030	316896
1/2	1/2	1-1/4	3	0.060	316898
1/2	1/2	1-1/4	3	0.090	316901
1/2	1/2	1-1/4	3	0.120	316903
1/2	1/2	1-1/4	4	-	316906
1/2	1/2	1-1/4	4	0.020	316910
1/2	1/2	1-1/4	4	0.030	316913
1/2	1/2	1-1/4	4	0.060	316915
1/2	1/2	1-1/4	4	0.090	316918
1/2	1/2	1-1/4	4	0.120	316921
5/8	5/8	3/4	3	-	316923
5/8	5/8	3/4	3	0.030	316927
5/8	5/8	3/4	3	0.060	316929
5/8	5/8	3/4	3	0.090	316931
5/8	5/8	3/4	3	0.120	316933
5/8	5/8	1-5/8	3-1/2	-	316937
5/8	5/8	1-5/8	3-1/2	0.030	316939
5/8	5/8	1-5/8	3-1/2	0.060	316942
5/8	5/8	1-5/8	3-1/2	0.090	316946

### More About the Series 265

Special edge preparation makes this an ideal tool for exotic materials

Features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 265 | 537 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	EDP
5/8	5/8	1-5/8	3-1/2	0.120	<b>316948</b>
3/4	3/4	1	4	-	<b>316952</b>
3/4	3/4	1	4	0.030	<b>316954</b>
3/4	3/4	1	4	0.060	<b>316956</b>
3/4	3/4	1	4	0.090	<b>316960</b>
3/4	3/4	1	4	0.120	<b>316963</b>
3/4	3/4	1	4	0.156	<b>316965</b>
3/4	3/4	1	4	0.190	<b>316969</b>
3/4	3/4	1-5/8	4	-	<b>316973</b>
3/4	3/4	1-5/8	4	0.030	<b>316977</b>
3/4	3/4	1-5/8	4	0.060	<b>316980</b>
3/4	3/4	1-5/8	4	0.090	<b>316983</b>
3/4	3/4	1-5/8	4	0.120	<b>316985</b>
3/4	3/4	1-5/8	4	0.156	<b>316987</b>
3/4	3/4	1-5/8	4	0.190	<b>316991</b>
3/4	3/4	1-5/8	6	-	<b>316994</b>
3/4	3/4	1-5/8	6	0.030	<b>316997</b>
3/4	3/4	1-5/8	6	0.060	<b>316999</b>
3/4	3/4	1-5/8	6	0.090	<b>317003</b>
3/4	3/4	1-5/8	6	0.120	<b>317005</b>
3/4	3/4	1-5/8	6	0.156	<b>317009</b>
3/4	3/4	1-5/8	6	0.190	<b>317012</b>
1	1	1-1/4	4	-	<b>317015</b>
1	1	1-1/4	4	0.030	<b>317018</b>
1	1	1-1/4	4	0.060	<b>317020</b>
1	1	1-1/4	4	0.090	<b>317023</b>
1	1	1-1/4	4	0.120	<b>317025</b>
1	1	1-1/4	4	0.156	<b>317029</b>
1	1	1-1/4	4	0.190	<b>317032</b>
1	1	2	4	-	<b>317036</b>
1	1	2	4	0.030	<b>317038</b>
1	1	2	4	0.060	<b>317041</b>
1	1	2	4	0.090	<b>317045</b>
1	1	2	4	0.120	<b>317047</b>
1	1	2	4	0.156	<b>317049</b>
1	1	2	4	0.190	<b>317053</b>

### More About the Series 265

Special edge preparation makes this an ideal tool for exotic materials

Features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



Series 265		537   5FL   Square & Radius				
Diameter	Shank Dia.	LOC	OAL	Radius	EDP	
1	1	3-1/4	6	-	317057	
1	1	3-1/4	6	0.030	317060	
1	1	3-1/4	6	0.060	317063	
1	1	3-1/4	6	0.090	317066	
1	1	3-1/4	6	0.120	317069	
1	1	3-1/4	6	0.156	317072	
1	1	3-1/4	6	0.190	317076	

## More About the Series 265

Special edge preparation makes this an ideal tool for exotic materials

Features a variable index design with 38 degree helix that reduces chatter and enables more aggressive and stable milling



★ Best ☆ Good



# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 270 815 | Multi Flute | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Flutes	EDP
3/8	3/8	1/2	2-1/2	-	6	317080
3/8	3/8	1/2	2-1/2	0.020	6	317083
3/8	3/8	1/2	2-1/2	0.030	6	317086
3/8	3/8	1	2-1/2	-	6	317088
3/8	3/8	1	2-1/2	0.020	6	317092
3/8	3/8	1	2-1/2	0.030	6	317096
3/8	3/8	1	4	-	6	317099
3/8	3/8	1	4	0.020	6	317102
3/8	3/8	1	4	0.030	6	317106
1/2	1/2	5/8	3	-	8	317110
1/2	1/2	5/8	3	0.030	8	317113
1/2	1/2	5/8	3	0.060	8	317117
1/2	1/2	1-1/4	3	-	8	317119
1/2	1/2	1-1/4	3	0.030	8	317123
1/2	1/2	1-1/4	3	0.060	8	317125
1/2	1/2	1-1/4	4	-	8	317127
5/8	5/8	3/4	3	-	8	317130
5/8	5/8	3/4	3	0.030	8	317132
5/8	5/8	3/4	3	0.060	8	317135
5/8	5/8	1-5/8	3-1/2	-	8	317138
5/8	5/8	1-5/8	3-1/2	0.030	8	317142
5/8	5/8	1-5/8	3-1/2	0.060	8	317146
3/4	3/4	1	4	-	10	317148
3/4	3/4	1	4	0.030	10	317150
3/4	3/4	1	4	0.060	10	317152
3/4	3/4	1-5/8	4	-	10	317155
3/4	3/4	1-5/8	4	0.030	10	317158
3/4	3/4	1-5/8	4	0.060	10	317162
3/4	3/4	1-5/8	6	0.090	10	317164
1	1	1-1/4	4	-	12	317168
1	1	1-1/4	4	0.030	12	317172
1	1	1-1/4	4	0.060	12	317174
1	1	1-1/4	4	0.090	12	317176
1	1	2	4	-	12	317180

### More About the Series 270

Ideal for hardened alloys and steels



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 270 | 815 | Multi Flute | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Flutes	EDP
1	1	2	4	0.030	12	317182
1	1	2	4	0.060	12	317186
1	1	2	4	0.090	12	317190
1	1	3-1/4	6	-	12	317193
1	1	3-1/4	6	0.030	12	317195
1	1	3-1/4	6	0.060	12	317199
1	1	3-1/4	6	0.090	12	317201

### More About the Series 270

Ideal for hardened alloys and steels



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mill for Titanium



## Series 280 840 | Multi Flute | Square & Radius | Titanium

Diameter	Shank Dia.	LOC	OAL	Radius	Flutes	EDP
1/2	1/2	5/8	3	-	8	317204
1/2	1/2	5/8	3	0.030	8	317208
1/2	1/2	5/8	3	0.060	8	317212
1/2	1/2	1-1/4	3	-	8	317216
1/2	1/2	1-1/4	3	0.030	8	317218
1/2	1/2	1-1/4	3	0.060	8	317221
5/8	5/8	3/4	3	-	8	317225
5/8	5/8	3/4	3	0.030	8	317228
5/8	5/8	3/4	3	0.060	8	317232
5/8	5/8	3/4	3	0.090	8	317236
5/8	5/8	1-5/8	3-1/2	-	8	317238
5/8	5/8	1-5/8	3-1/2	0.030	8	317240
5/8	5/8	1-5/8	3-1/2	0.060	8	317243
5/8	5/8	1-5/8	3-1/2	0.090	8	317245
3/4	3/4	1	4	-	10	317247
3/4	3/4	1	4	0.030	10	317249
3/4	3/4	1	4	0.060	10	317253
3/4	3/4	1	4	0.090	10	317257
3/4	3/4	1	4	0.120	10	317260
3/4	3/4	1-5/8	4	-	10	317262
3/4	3/4	1-5/8	4	0.030	10	317264
3/4	3/4	1-5/8	4	0.060	10	317267
3/4	3/4	1-5/8	4	0.090	10	317269
3/4	3/4	1-5/8	4	0.120	10	317272
1	1	1-1/4	4	-	10	317275
1	1	1-1/4	4	0.030	10	317277
1	1	1-1/4	4	0.060	10	317279
1	1	1-1/4	4	0.090	10	317282
1	1	1-1/4	4	0.120	10	317286
1	1	2	4	-	10	317288
1	1	2	4	0.030	10	317291
1	1	2	4	0.060	10	317295
1	1	2	4	0.090	10	317299
1	1	2	4	0.120	10	317302
1	1	3-1/4	6	-	10	317305
1	1	3-1/4	6	0.030	10	317309
1	1	3-1/4	6	0.060	10	317311
1	1	3-1/4	6	0.090	10	317314
1	1	3-1/4	6	0.120	10	317317

### More About the Series 280

Ideal for Titanium and Titanium Alloys



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mill for Titanium



## Series 285 840 | Multi Flute | Square & Radius | Reduced Neck | Titanium

Diameter	Shank Dia.	LOC	OAL	Radius	Flutes	Length Below Shank	EDP
1/2	1/2	5/8	3	-	8	1-1/8	317321
1/2	1/2	5/8	3	0.030	8	1-1/8	317324
1/2	1/2	5/8	3	0.060	8	1-1/8	317326
1/2	1/2	5/8	4	-	8	2-1/8	317329
1/2	1/2	5/8	4	0.030	8	2-1/8	317331
1/2	1/2	5/8	4	0.060	8	2-1/8	317335
1/2	1/2	5/8	6	-	8	3-1/8	317339
1/2	1/2	5/8	6	0.030	8	3-1/8	317343
1/2	1/2	5/8	6	0.060	8	3-1/8	317345
5/8	5/8	3/4	4	-	8	1-5/8	317349
5/8	5/8	3/4	4	0.030	8	1-5/8	317352
5/8	5/8	3/4	4	0.060	8	1-5/8	317354
5/8	5/8	3/4	4	0.090	8	1-5/8	317358
5/8	5/8	3/4	5	-	8	2-5/8	317362
5/8	5/8	3/4	5	0.030	8	2-5/8	317364
5/8	5/8	3/4	5	0.060	8	2-5/8	317368
5/8	5/8	3/4	5	0.090	8	2-5/8	317370
5/8	5/8	3/4	6	-	8	3-5/8	317374
5/8	5/8	3/4	6	0.030	8	3-5/8	317376
5/8	5/8	3/4	6	0.060	8	3-5/8	317378
5/8	5/8	3/4	6	0.090	8	3-5/8	317381
3/4	3/4	1	4	-	10	1-7/8	317385
3/4	3/4	1	4	0.030	10	1-7/8	317388
3/4	3/4	1	4	0.060	10	1-7/8	317391
3/4	3/4	1	4	0.090	10	1-7/8	317395
3/4	3/4	1	4	0.120	10	1-7/8	317398
3/4	3/4	1	5	-	10	2-7/8	317402
3/4	3/4	1	5	0.030	10	2-7/8	317406
3/4	3/4	1	5	0.060	10	2-7/8	317409
3/4	3/4	1	5	0.090	10	2-7/8	317412
3/4	3/4	1	5	0.120	10	2-7/8	317414
3/4	3/4	1	6	-	10	3-7/8	317416
3/4	3/4	1	6	0.030	10	3-7/8	317420
3/4	3/4	1	6	0.060	10	3-7/8	317423
3/4	3/4	1	6	0.090	10	3-7/8	317427
3/4	3/4	1	6	0.120	10	3-7/8	317430
1	1	1-1/4	4	-	10	1-5/8	317433
1	1	1-1/4	4	0.030	10	1-5/8	317435

### More About the Series 285

Ideal for Titanium and Titanium Alloys

Reduced neck for extended reach



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mill for Titanium



## Series 285 | 840 | Multi Flute | Square & Radius | Reduced Neck | Titanium

Diameter	Shank Dia.	LOC	OAL	Radius	Flutes	Length Below Shank	EDP
1	1	1-1/4	4	0.060	10	1-5/8	317439
1	1	1-1/4	4	0.090	10	1-5/8	317441
1	1	1-1/4	4	0.120	10	1-5/8	317444
1	1	1-1/4	5	-	10	2-5/8	317447
1	1	1-1/4	5	0.030	10	2-5/8	317449
1	1	1-1/4	5	0.060	10	2-5/8	317452
1	1	1-1/4	5	0.090	10	2-5/8	317454
1	1	1-1/4	5	0.120	10	2-5/8	317458
1	1	1-1/4	6	-	10	3-5/8	317461
1	1	1-1/4	6	0.030	10	3-5/8	317464
1	1	1-1/4	6	0.060	10	3-5/8	317467
1	1	1-1/4	6	0.090	10	3-5/8	317470
1	1	1-1/4	6	0.120	10	3-5/8	317474

### More About the Series 285

Ideal for Titanium and Titanium Alloys

Reduced neck for extended reach



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 210 335 | 3FL | Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	TiCN EDP	AlTiN EDP
1/8	1/8	1/4	1-1/2	0.010	317477	317480	-
1/8	1/8	1/2	1-1/2	0.010	317483	317488	317486
5/32	5/32	5/16	2	0.010	-	317493	317491
5/32	5/32	9/16	2	0.010	317496	-	317498
3/16	3/16	5/16	2	0.010	317501	317507	317503
3/16	3/16	9/16	2	0.010	317511	317513	-
7/32	7/32	3/8	2	0.015	317515	317520	317517
7/32	7/32	3/4	2-1/2	0.015	-	317526	317522
1/4	1/4	3/8	2	0.015	317529	-	317533
1/4	1/4	3/4	2-1/2	0.015	317535	317539	317537
9/32	9/32	7/16	2	0.015	-	317546	317543
9/32	9/32	13/16	2-1/2	0.015	-	317550	317548
5/16	5/16	7/16	2	0.015	317554	317558	-
5/16	5/16	13/16	2-1/2	0.015	317560	317565	317562
11/32	11/32	1/2	2	0.015	-	317571	317568
11/32	11/32	1	2-1/2	0.015	317575	-	317579
3/8	3/8	1/2	2	0.015	317583	317590	317587
3/8	3/8	1	2-1/2	0.015	317594	317596	-
7/16	7/16	1	2-3/4	0.015	317600	317606	317602
7/16	7/16	9/16	2-1/2	0.015	-	317613	317609
1/2	1/2	5/8	2-1/2	0.030	317617	-	317619
1/2	1/2	1-1/4	3	0.030	317622	317628	317624
5/8	5/8	3/4	3	0.030	317630	317634	-
5/8	5/8	1-5/8	3-1/2	0.030	317637	317643	317639
3/4	3/4	1	3	0.030	-	317649	317645
3/4	3/4	1-5/8	4	0.030	317653	-	317655
1	1	1-1/4	3	0.030	317657	317661	317659
1	1	2	4	0.030	-	317667	317663

### More About the Series 210

Ideal for Semi-Roughing and Finishing



★ Best ☆ Good



# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials

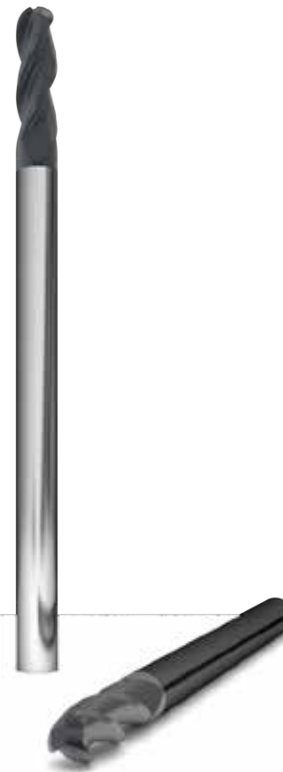


## Series 215 335BN | 3FL | Ball Nose

Diameter	Shank Dia.	LOC	OAL	Bright EDP	TiCN EDP	AlTiN EDP
1/8	1/8	1/4	1-1/2	317671	317677	317675
1/8	1/8	1/2	1-1/2	317681	317685	317683
5/32	5/32	5/16	2	317687	317692	317690
5/32	5/32	9/16	2	317694	317700	317697
3/16	3/16	5/16	2	317702	317709	317705
3/16	3/16	9/16	2	317712	317719	317715
7/32	7/32	3/8	2	317722	317727	317725
7/32	7/32	3/4	2-1/2	317729	317735	317731
1/4	1/4	3/8	2	317738	317744	317740
1/4	1/4	3/4	2-1/2	317746	317752	317749
9/32	9/32	7/16	2	317755	317763	317759
9/32	9/32	13/16	2-1/2	317766	317773	317769
5/16	5/16	7/16	2	317775	317782	317778
5/16	5/16	13/16	2-1/2	317784	317790	317788
11/32	11/32	1/2	2	317794	317801	317798
11/32	11/32	1	2-1/2	317805	317809	317807
3/8	3/8	1/2	2	317811	317815	317813
3/8	3/8	1	2-1/2	317818	317822	317820
7/16	7/16	1	2-3/4	317824	317830	317827
7/16	7/16	9/16	2-1/2	317833	317838	317836
1/2	1/2	5/8	2-1/2	317840	317846	317843
1/2	1/2	1-1/4	3	317850	317858	317854
5/8	5/8	3/4	3	317860	317864	317862
5/8	5/8	1-5/8	3-1/2	317868	317876	317872
3/4	3/4	1	3	317880	317886	317883
3/4	3/4	1-5/8	4	317890	317896	317894
1	1	1-1/4	3	317899	317904	317901
1	1	2	4	317907	317912	317910

### More About the Series 215

Ideal for Semi-Roughing and Finishing



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



Series 220		545   5FL   Square & Radius					
Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	TiCN EDP	AlTiN EDP
1/8	1/8	1/4	1-1/2	-	317915	317923	317919
1/8	1/8	1/2	1-1/2	-	317927	317932	317929
1/8	3/8	1/4	2-1/2	-	317934	-	-
5/32	3/16	5/16	2	-	317936	317940	317938
5/32	3/16	9/16	2	-	317944	317950	317948
3/16	3/16	5/16	2	-	317954	317959	317957
3/16	3/16	9/16	2	-	317962	317969	317965
3/16	3/8	5/16	2-1/2	-	317973	-	-
7/32	5/16	13/16	2-1/2	-	317975	-	-
7/32	1/4	3/8	2	-	317978	317986	317982
7/32	1/4	3/4	2-1/2	-	317988	317994	317990
1/4	1/4	3/8	2	-	317996	318001	317999
1/4	1/4	3/8	2	0.030	-	-	318005
1/4	1/4	3/8	2-1/2	-	318009	-	-
1/4	1/4	3/4	2-1/2	-	318012	318018	318015
1/4	1/4	3/4	2-1/2	0.010	-	-	318021
1/4	1/4	3/4	2-1/2	0.015	-	-	318024
1/4	1/4	3/4	2-1/2	0.020	-	-	318027
1/4	1/4	3/4	2-1/2	0.025	-	-	318031
1/4	1/4	3/4	2-1/2	0.030	-	-	318034
1/4	1/4	3/4	2-1/2	0.035	-	-	318036
1/4	1/4	3/4	2-1/2	0.045	-	-	318038
1/4	1/4	3/4	2-1/2	0.060	-	-	318041
1/4	1/4	1-1/4	4	-	318044	318051	318047
1/4	3/8	3/8	2-1/2	-	318055	-	-
9/32	5/16	7/16	2	-	318059	318066	318063
9/32	5/16	13/16	2-1/2	-	-	318072	318068
5/16	5/16	7/16	2	-	318074	318079	318076
5/16	5/16	13/16	2-1/2	-	318082	318090	318086
5/16	5/16	1-1/4	4	-	318094	318099	318097
11/32	3/8	1/2	2	-	318102	318108	318104
11/32	3/8	1	2-1/2	-	318112	318117	318114
3/8	3/8	1/2	2	-	318119	318127	318123
3/8	3/8	1/2	2	0.030	-	-	318130
3/8	3/8	1/2	2	0.060	-	-	318132
3/8	3/8	1	2-1/2	-	318136	318141	318138
3/8	3/8	1	2-1/2	0.010	-	-	318143
3/8	3/8	1	2-1/2	0.015	-	-	318147
3/8	3/8	1	2-1/2	0.020	-	-	318150
3/8	3/8	1	2-1/2	0.025	-	-	318154
3/8	3/8	1	2-1/2	0.030	-	-	318158

## More About the Series 220

Ideal tool for finishing



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



Series 220		545   5FL   Square & Radius					
Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	TiCN EDP	AlTiN EDP
3/8	3/8	1	2-1/2	0.035	-	-	318160
3/8	3/8	1	2-1/2	0.040	-	-	318164
3/8	3/8	1	2-1/2	0.045	-	-	318166
3/8	3/8	1	2-1/2	0.060	-	-	318168
3/8	3/8	1	2-1/2	0.090	-	-	318171
3/8	3/8	1	2-1/2	0.125	-	-	318174
3/8	3/8	1-1/2	4	-	318178	318184	318181
3/8	3/8	1-1/2	4	0.030	-	-	318186
3/8	3/8	1-1/2	4	0.060	-	-	318190
13/32	7/16	9/16	2-1/2	-	318193	318199	318197
13/32	7/16	1	2-3/4	-	318203	318210	318207
7/16	7/16	9/16	2-1/2	-	318213	318219	318215
7/16	7/16	1	2-3/4	-	318222	318230	318226
7/16	7/16	2	4	-	318232	318238	318234
15/32	1/2	5/8	2-1/2	-	318240	318245	318243
15/32	1/2	1-1/4	3	-	318249	318255	318253
1/2	1/2	5/8	2-1/2	-	318259	318264	318262
1/2	1/2	5/8	2-1/2	0.030	-	-	318267
1/2	1/2	5/8	2-1/2	0.060	-	-	318271
1/2	1/2	5/8	2-1/2	0.090	-	-	318273
1/2	1/2	1-1/4	3	-	318276	318283	318279
1/2	1/2	1-1/4	3	0.010	-	-	318287
1/2	1/2	1-1/4	3	0.015	-	-	318291
1/2	1/2	1-1/4	3	0.020	-	-	318295
1/2	1/2	1-1/4	3	0.025	-	-	318297
1/2	1/2	1-1/4	3	0.030	-	-	318301
1/2	1/2	1-1/4	3	0.035	-	-	318305
1/2	1/2	1-1/4	3	0.040	-	-	318308
1/2	1/2	1-1/4	3	0.045	-	-	318312
1/2	1/2	1-1/4	3	0.060	-	-	318315
1/2	1/2	1-1/4	3	0.090	-	-	318318
1/2	1/2	2	4	-	318320	318325	318323
1/2	1/2	2	4	0.030	-	-	318329
1/2	1/2	2	4	0.060	-	-	318333
1/2	1/2	2	4	0.090	-	-	318336
9/16	5/8	1-1/2	3-1/2	-	318340	318347	318344
5/8	5/8	3/4	3	-	318351	318359	318355
5/8	5/8	3/4	3	0.030	-	-	318362
5/8	5/8	3/4	3	0.060	-	-	318366
5/8	5/8	3/4	3	0.900	-	-	318370
5/8	5/8	1-5/8	3-1/2	-	318373	318381	318377

## More About the Series 220

Ideal tool for finishing



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 220 | 545 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	TiCN EDP	AlTiN EDP
5/8	5/8	1-5/8	3-1/2	0.015	-	-	318383
5/8	5/8	1-5/8	3-1/2	0.020	-	-	318385
5/8	5/8	1-5/8	3-1/2	0.025	-	-	318387
5/8	5/8	1-5/8	3-1/2	0.030	-	-	318390
5/8	5/8	1-5/8	3-1/2	0.045	-	-	318394
5/8	5/8	1-5/8	3-1/2	0.060	-	-	318397
5/8	5/8	1-5/8	3-1/2	0.090	-	-	318399
5/8	5/8	2-1/2	5	-	318403	318407	318405
5/8	5/8	2-1/2	5	0.030	-	-	318409
5/8	5/8	2-1/2	5	0.060	-	-	318411
5/8	5/8	2-1/2	5	0.090	-	-	318413
3/4	3/4	1	3	-	318415	318421	318419
3/4	3/4	1	3	0.030	-	-	318425
3/4	3/4	1	3	0.060	-	-	318427
3/4	3/4	1	3	0.090	-	-	318430
3/4	3/4	1-5/8	4	-	318433	318441	318437
3/4	3/4	1-5/8	4	0.015	-	-	318443
3/4	3/4	1-5/8	4	0.020	-	-	318446
3/4	3/4	1-5/8	4	0.025	-	-	318448
3/4	3/4	1-5/8	4	0.300	-	-	318452
3/4	3/4	1-5/8	4	0.045	-	-	318456
3/4	3/4	1-5/8	4	0.060	-	-	318458
3/4	3/4	1-5/8	4	0.090	-	-	318462
3/4	3/4	1-5/8	4	0.125	-	-	318466
3/4	3/4	1-5/8	4	0.150	-	-	318469
3/4	3/4	3-1/4	6	-	318473	318478	318476
3/4	3/4	3-1/4	6	0.030	-	-	318480
3/4	3/4	3-1/4	6	0.060	-	-	318482
3/4	3/4	3-1/4	6	0.090	-	-	318484
7/8	7/8	2	4	-	318488	318492	318490
1	1	1-1/4	3	-	318496	318503	318500
1	1	1-1/4	3	0.030	-	-	318505
1	1	1-1/4	3	0.060	-	-	318508
1	1	1-1/4	3	0.090	-	-	318512
1	1	2	4	-	318516	318523	318520
1	1	2	4	0.030	-	-	318527
1	1	2	4	0.060	-	-	318531
1	1	2	4	0.090	-	-	318535
1	1	2	4	0.125	-	-	318539
1	1	2	4	0.150	-	-	318542
1	1	3-1/4	6	-	318545	318553	318549

### More About the Series 220

Ideal tool for finishing



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# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials

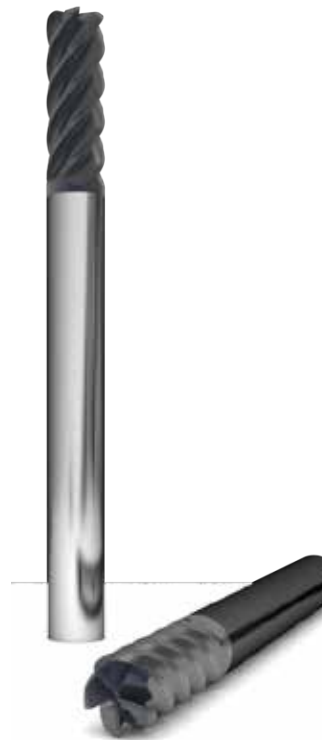


## Series 220 | 545 | 5FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Bright EDP	TiCN EDP	AlTiN EDP
1	1	3-1/4	6	0.060	-	-	318561
1	1	3-1/4	6	0.090	-	-	318563
1-1/4	1-1/4	2	4-1/2	-	-	318568	318566
1-1/4	1-1/4	3-1/4	6	-	318571	318578	318574

### More About the Series 220

Ideal tool for finishing



★ Best ☆ Good

# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



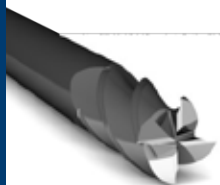
## Series 225 504,504S,564,584 | 4FL | Square

Diameter	Shank Dia.	LOC	OAL	EDP
3/64	1/8	3/32	1-1/2	318582
3/64	1/8	9/64	1-1/2	318586
1/16	1/8	1/8	1-1/2	318588
1/16	1/8	3/16	1-1/2	318590
5/64	1/8	1/4	1-1/2	318592
3/32	1/8	3/16	1-1/2	318594
3/32	1/8	3/8	1-1/2	318596
7/64	1/8	3/8	1-1/2	318600
1/8	1/8	1/4	1-1/2	318603
1/8	1/8	1/2	1-1/2	318605
1/8	1/8	3/4	2.25	318609
1/8	1/8	1	3	318612
9/64	3/16	9/16	2	318615
5/32	3/16	5/16	2	318619
5/32	3/16	9/16	2	318622
11/64	3/16	5/8	2	318625
3/16	3/16	5/16	2	318628
3/16	3/16	5/8	2	318632
3/16	3/16	3/4	2.25	318636
3/16	3/16	1-1/8	3	318639
13/64	1/4	5/8	2-1/2	318641
7/32	1/4	7/16	2	318645
7/32	1/4	5/8	2-1/2	318648
1/4	1/4	1/2	2	318652
1/4	1/4	3/4	2-1/2	318654
1/4	1/4	1	4	318658
1/4	1/4	1.125	3	318660
1/4	1/4	1-1/2	4	318664
1/4	1/4	1-1/2	6	318668
9/32	5/16	3/4	2-1/2	318671
19/64	5/16	13/16	2-1/2	318675
5/16	5/16	1/2	2	318677
5/16	5/16	13/16	2-1/2	318681
5/16	5/16	1.125	3	318683
5/16	5/16	1-5/8	4	318686
21/64	3/8	7/8	2-1/2	318690
11/32	3/8	7/8	2-1/2	318692
3/8	3/8	5/8	2	318696
3/8	3/8	7/8	2-1/2	318698

### More About the Series 225

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Premium Carbide End Mills for Ferrous Materials



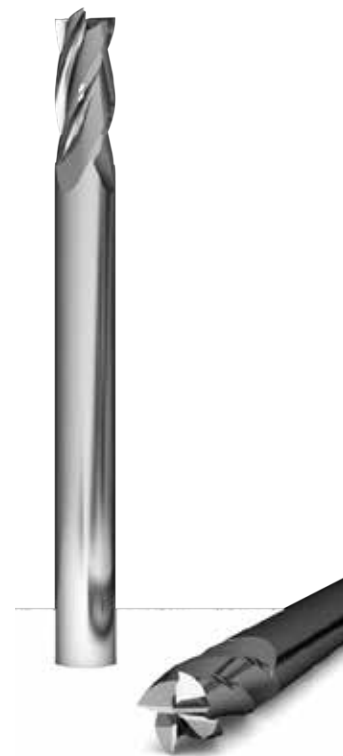
## Series 225 504,504S,564,584 | 4FL | Square

Diameter	Shank Dia	LOC	OAL	EDP
3/8	3/8	1	4	318702
3/8	3/8	1.125	3	318705
3/8	3/8	1-1/2	6	318708
3/8	3/8	1-3/4	4	318711
13/32	7/16	1	2-3/4	318715
7/16	7/16	1	2-3/4	318717
7/16	7/16	3	6	318720
1/2	1/2	5/8	2-1/2	318722
1/2	1/2	1	3	318725
1/2	1/2	1	4	318727
1/2	1/2	1-1/2	6	318729
1/2	1/2	2	4	318731
1/2	1/2	3	6	318733
5/8	5/8	3/4	3	318735
5/8	5/8	1-1/4	3-1/2	318738
5/8	5/8	2.25	5	318742
5/8	5/8	3	6	318745
3/4	3/4	1	3	318748
3/4	3/4	1-1/2	4	318751
3/4	3/4	2.25	5	318755
3/4	3/4	4	7	318758
7/8	7/8	1-1/2	4	318761
1	1	1-1/2	4	318764
1	1	2.25	5	318767
1	1	4	7	318771

### More About the Series 225

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# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



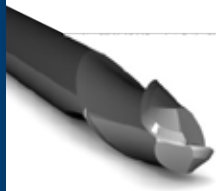
## Series 227 502SBN, 502BN, 562BN, 582BN | 2FL | Ball Nose

Diameter	Shank Dia.	LOC	OAL	EDP
3/64	1/8	3/32	1-1/2	318775
3/64	1/8	9/64	1-1/2	318778
1/16	1/8	1/8	1-1/2	318780
1/16	1/8	3/16	1-1/2	318784
5/64	1/8	1/4	1-1/2	318788
3/32	1/8	3/16	1-1/2	318790
3/32	1/8	3/8	1-1/2	318794
7/64	1/8	3/8	1-1/2	318797
1/8	1/8	1	3	318800
1/8	1/8	1/2	1-1/2	318802
1/8	1/8	1/4	1-1/2	318804
1/8	1/8	3/4	2-1/4	318807
9/64	3/16	9/16	2	318811
5/32	3/16	5/16	2	318815
5/32	3/16	9/16	2	318818
11/64	3/16	5/8	2	318821
3/16	3/16	1-1/8	3	318825
3/16	3/16	3/4	2-1/4	318829
3/16	3/16	5/16	2	318833
3/16	3/16	5/8	2	318836
13/64	1/4	5/8	2-1/2	318840
7/32	1/4	5/8	2-1/2	318844
7/32	1/4	7/16	2	318848
1/4	1/4	1	4	318850
1/4	1/4	1.25	4	318853
1/4	1/4	1.5	6	318857
1/4	1/4	1-1/8	3	318861
1/4	1/4	1/2	2	318865
1/4	1/4	3/4	2-1/2	318869
9/32	5/16	3/4	2-1/2	318872
19/64	5/16	13/16	2-1/2	318875
5/16	5/16	1.625	4	318877
5/16	5/16	1-1/8	3	318879
5/16	5/16	1/2	2	318883
5/16	5/16	13/16	2-1/2	318887
21/64	3/8	7/8	2-1/2	318889
11/32	3/8	7/8	2-1/2	318892
3/8	3/8	1	4	318896
3/8	3/8	1.5	6	318899

### More About the Series 227

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Premium Carbide End Mills for Ferrous Materials



## Series 227 | 502SBN, 502BN, 562BN, 582BN | 2FL | Ball Nose

Diameter	Shank Dia	LOC	OAL	EDP
3/8	3/8	1.75	4	318901
3/8	3/8	1-1/8	3	318905
3/8	3/8	5/8	2	318907
3/8	3/8	7/8	2-1/2	318911
13/32	7/16	1	2-3/4	318913
7/16	7/16	1	2-3/4	318916
7/16	7/16	2	4	318920
7/16	7/16	3	6	318922
1/2	1/2	1	3	318926
1/2	1/2	1	4	318930
1/2	1/2	1.5	6	318933
1/2	1/2	2	4	318935
1/2	1/2	3	6	318938
1/2	1/2	5/8	2-1/2	318941
9/16	9/16	1-1/8	3-1/2	318944
5/8	5/8	3	6	318948
5/8	5/8	1-1/4	3-1/2	318952
5/8	5/8	2-1/4	5	318956
5/8	5/8	3/4	3	318959
3/4	3/4	1	3	318962
3/4	3/4	3	6	318966
3/4	3/4	1-1/2	4	318970
3/4	3/4	2-1/4	5	318972
7/8	7/8	1-1/2	4	318976
1	1	3	6	318978
1	1	1-1/2	4	318982
1	1	2-1/4	5	318986

### More About the Series 227

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Premium Carbide End Mills for Ferrous Materials

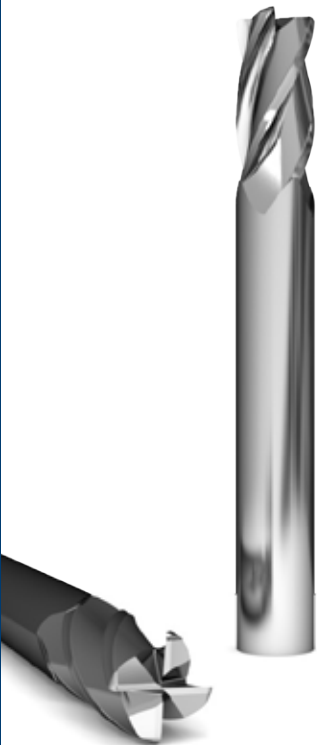


## Series 230 504, 504S 564, 584 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Coating	EDP
3/64	1/8	3/32	1-1/2	-	Bright	318989
3/64	1/8	9/64	1-1/2	-	Bright	318992
1/16	1/8	1/8	1-1/2	-	Bright	318996
1/16	1/8	3/16	1-1/2	-	Bright	319000
5/64	1/8	1/4	1-1/2	-	Bright	319003
3/32	1/8	3/16	1-1/2	-	Bright	319007
3/32	1/8	3/8	1-1/2	-	Bright	319010
7/64	1/8	3/8	1-1/2	-	Bright	319012
1/8	1/8	1/4	1-1/2	-	AlTiN	319014
1/8	1/8	1/2	1-1/2	0.015	AlTiN	319017
1/8	1/8	1/2	1-1/2	0.020	AlTiN	319019
1/8	1/8	1/2	1-1/2	0.030	Bright	319022
1/8	1/8	1/2	1-1/2	-	Bright	319025
1/8	1/8	3/4	2-1/4	-	Bright	319029
1/8	1/8	1	3	-	Bright	319032
9/64	3/16	9/16	2	-	Bright	319034
5/32	3/16	5/16	2	-	Bright	319038
5/32	3/16	9/16	2	-	Bright	319042
11/64	3/16	5/8	2	-	Bright	319044
3/16	3/16	5/16	2	-	AlTiN	319048
3/16	3/16	5/8	2	0.015	AlTiN	319052
3/16	3/16	5/8	2	0.020	AlTiN	319056
3/16	3/16	5/8	2	0.030	Bright	319058
3/16	3/16	5/8	2	-	Bright	319060
3/16	3/16	3/4	2-1/4	-	Bright	319062
3/16	3/16	1-1/8	3	-	Bright	319066
13/64	1/4	5/8	2-1/2	-	Bright	319070
7/32	1/4	7/16	2	-	Bright	319073
7/32	1/4	5/8	2-1/2	-	Bright	319077
1/4	1/4	1/2	2	-	AlTiN	319079
1/4	1/4	3/4	2-1/2	0.015	AlTiN	319083
1/4	1/4	3/4	2-1/2	0.020	AlTiN	319087
1/4	1/4	3/4	2-1/2	0.030	AlTiN	319089
1/4	1/4	3/4	2-1/2	0.045	AlTiN	319092
1/4	1/4	3/4	2-1/2	0.060	Bright	319096
1/4	1/4	3/4	2-1/2	-	AlTiN	319100
1/4	1/4	13/16	2-1/2	0.015	Bright	319104
1/4	1/4	1	4	-	Bright	319106
1/4	1/4	1-1/8	3	-	Bright	319108

### More About the Series 230

Diverse for use in all general machining applications



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Premium Carbide End Mills for Ferrous Materials

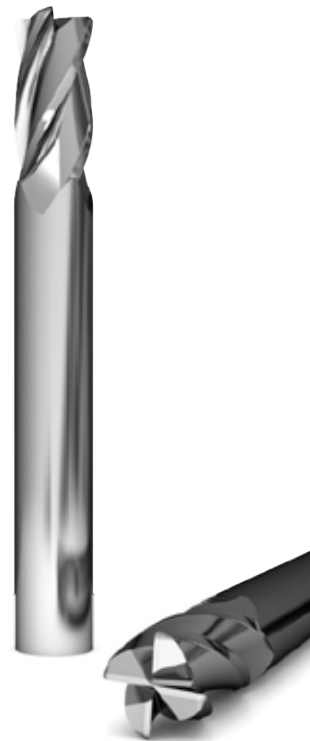


## Series 230 504, 504S 564, 584 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Coating	EDP
1/4	1/4	1-1/2	4	-	Bright	319111
1/4	1/4	1-1/2	6	-	Bright	319113
9/32	5/16	3/4	2-1/2	-	Bright	319115
19/64	5/16	13/16	2-1/2	-	Bright	319119
5/16	5/16	1/2	2	-	AlTiN	319123
5/16	1/4	13/16	2-1/2	0.020	AlTiN	319127
5/16	1/4	13/16	2-1/2	0.030	AlTiN	319131
5/16	1/4	13/16	2-1/2	0.045	AlTiN	319133
5/16	1/4	13/16	2-1/2	0.060	Bright	319137
5/16	5/16	13/16	2-1/2	-	Bright	319140
5/16	5/16	1-1/8	3	-	Bright	319143
5/16	5/16	1-5/8	4	-	Bright	319147
21/64	3/8	7/8	2-1/2	-	Bright	319150
11/32	3/8	7/8	2-1/2	-	Bright	319152
3/8	3/8	5/8	2	-	AlTiN	319154
3/8	3/8	7/8	2-1/2	0.015	AlTiN	319157
3/8	3/8	7/8	2-1/2	0.020	AlTiN	319160
3/8	3/8	7/8	2-1/2	0.030	AlTiN	319162
3/8	3/8	7/8	2-1/2	0.045	AlTiN	319165
3/8	3/8	7/8	2-1/2	0.060	Bright	319169
3/8	3/8	7/8	2-1/2	-	Bright	319173
3/8	3/8	1	4	-	Bright	319175
3/8	3/8	1-1/8	3	-	Bright	319177
3/8	3/8	1-1/2	6	-	Bright	319179
3/8	3/8	1-3/4	4	-	Bright	319183
13/32	7/16	1	2-3/4	-	Bright	319187
7/16	7/16	1	2-3/4	-	Bright	319190
7/16	7/16	3	6	-	Bright	319193
1/2	1/2	5/8	2-1/2	-	AlTiN	319197
1/2	1/2	1	3	0.015	AlTiN	319199
1/2	1/2	1	3	0.020	AlTiN	319203
1/2	1/2	1	3	0.030	AlTiN	319205
1/2	1/2	1	3	0.045	AlTiN	319207
1/2	1/2	1	3	0.060	AlTiN	319209
1/2	1/2	1	3	0.090	AlTiN	319212
1/2	1/2	1	3	0.125	Bright	319215
1/2	1/2	1	3	-	Bright	319218
1/2	1/2	1	4	-	Bright	319222
1/2	1/2	1-1/2	6	-	Bright	319226
1/2	1/2	2	4	-	Bright	319229

### More About the Series 230

Diverse for use in all general machining applications



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Premium Carbide End Mills for Ferrous Materials

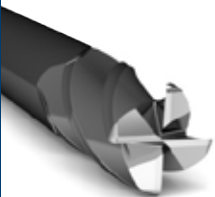


## Series 230 504, 504S 564, 584 | 4FL | Square & Radius

Diameter	Shank Dia.	LOC	OAL	Radius	Coating	EDP
1/2	1/2	3	6	-	Bright	319232
9/16	9/16	1-1/8	3-1/2	-	Bright	319235
5/8	5/8	3/4	3	-	AlTiN	319237
5/8	5/8	1-1/4	3-1/2	0.015	AlTiN	319239
5/8	5/8	1-1/4	3-1/2	0.020	AlTiN	319241
5/8	5/8	1-1/4	3-1/2	0.030	AlTiN	319243
5/8	5/8	1-1/4	3-1/2	0.045	AlTiN	319246
5/8	5/8	1-1/4	3-1/2	0.060	AlTiN	319248
5/8	5/8	1-1/4	3-1/2	0.090	Bright	319252
5/8	5/8	1-1/4	3-1/2	-	Bright	319255
5/8	5/8	2-1/4	5	-	Bright	319259
5/8	5/8	3	6	-	Bright	319262
3/4	3/4	1	3	-	AlTiN	319265
3/4	3/4	1-1/2	4	0.015	AlTiN	319269
3/4	3/4	1-1/2	4	0.020	AlTiN	319271
3/4	3/4	1-1/2	4	0.030	AlTiN	319275
3/4	3/4	1-1/2	4	0.045	AlTiN	319278
3/4	3/4	1-1/2	4	0.060	AlTiN	319282
3/4	3/4	1-1/2	4	0.090	AlTiN	319284
3/4	3/4	1-1/2	4	0.125	Bright	319287
3/4	3/4	1-1/2	4	-	Bright	319290
3/4	3/4	2-1/4	5	-	Bright	319292
3/4	3/4	3	6	-	Bright	319295
3/4	3/4	4	7	-	Bright	319298
7/8	7/8	1-1/2	4	-	AlTiN	319300
1	1	1-1/2	4	0.015	AlTiN	319304
1	1	1-1/2	4	0.020	AlTiN	319307
1	1	1-1/2	4	0.030	AlTiN	319309
1	1	1-1/2	4	0.045	AlTiN	319313
1	1	1-1/2	4	0.060	AlTiN	319316
1	1	1-1/2	4	0.090	AlTiN	319320
1	1	1-1/2	4	0.125	Bright	319324
1	1	1-1/2	4	-	Bright	319327
1	1	2-1/4	5	-	Bright	319330
1	1	3	6	-	Bright	319332
1	1	4	7	-	Bright	319335

### More About the Series 230

Diverse for use in all general machining applications



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Premium Carbide End Mills for Ferrous Materials

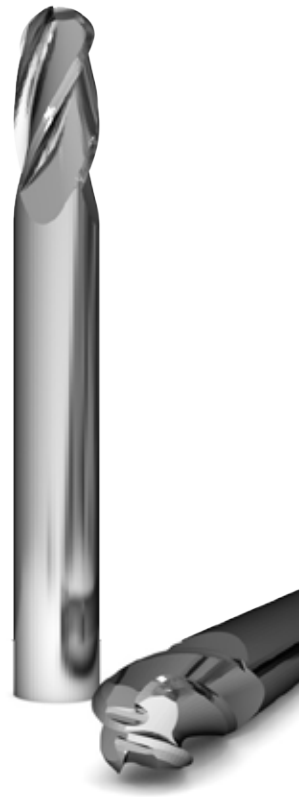


## Series 237 | 504SBN, 504BN, 564BN, 584BN | 4fl | Ball Nose

Diameter	Shank Dia	LOC	OAL	EDP
3/64	1/8	3/32	1-1/2	319337
3/64	1/8	9/64	1-1/2	319340
1/16	1/8	1/8	1-1/2	319344
1/16	1/8	3/16	1-1/2	319346
5/64	1/8	1/4	1-1/2	319350
3/32	1/8	3/16	1-1/2	319353
3/32	1/8	3/8	1-1/2	319356
7/64	1/8	3/8	1-1/2	319358
1/8	1/8	1	3	319360
1/8	1/8	1/2	1-1/2	319364
1/8	1/8	1/4	1-1/2	319368
1/8	1/8	3/4	2-1/4	319371
9/64	3/16	9/16	2	319373
5/32	3/16	5/16	2	319377
5/32	3/16	9/16	2	319379
11/64	3/16	5/8	2	319381
3/16	3/16	1-1/8	3	319385
3/16	3/16	3/4	2-1/4	319389
3/16	3/16	5/16	2	319391
3/16	3/16	5/8	2	319394
13/64	1/4	5/8	2-1/2	319396
7/32	1/4	5/8	2-1/2	319398
7/32	1/4	7/16	2	319402
1/4	1/4	1	4	319405
1/4	1/4	1.25	4	319409
1/4	1/4	1.5	6	319413
1/4	1/4	1-1/8	3	319415
1/4	1/4	1/2	2	319419
1/4	1/4	3/4	2-1/2	319421
9/32	5/16	3/4	2-1/2	319425
19/64	5/16	13/16	2-1/2	319427
5/16	5/16	1.625	4	319430
5/16	5/16	1-1/8	3	319434
5/16	5/16	1/2	2	319436
5/16	5/16	13/16	2-1/2	319438
21/64	3/8	7/8	2-1/2	319440
11/32	3/8	7/8	2-1/2	319442
3/8	3/8	1	4	319445
3/8	3/8	1.5	6	319447
3/8	3/8	1.75	4	319450

### More About the Series 237

Coatings available upon request



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# PERFORMANCE

Premium Carbide End Mills for Ferrous Materials



## Series 237 504SBN, 504BN, 564BN, 584BN | 4fl | Ball Nose

Diameter	Shank Dia.	LOC	OAL	EDP
3/8	3/8	1-1/8	3	319452
3/8	3/8	5/8	2	319455
3/8	3/8	7/8	2-1/2	319459
13/32	7/16	1	2-3/4	319462
7/16	7/16	1	2-3/4	319464
7/16	7/16	2	4	319466
7/16	7/16	3	6	319468
1/2	1/2	1	3	319471
1/2	1/2	1	4	319474
1/2	1/2	1.5	6	319477
1/2	1/2	2	4	319479
1/2	1/2	3	6	319482
1/2	1/2	5/8	2-1/2	319485
9/16	9/16	1-1/8	3-1/2	319488
5/8	5/8	3	6	319491
5/8	5/8	1-1/4	3-1/2	319493
5/8	5/8	2-1/4	5	319496
5/8	5/8	3/4	3	319500
3/4	3/4	1	3	319503
3/4	3/4	3	6	319507
3/4	3/4	1-1/2	4	319511
3/4	3/4	2-1/4	5	319513
7/8	7/8	1-1/2	4	319516
1	1	3	6	319520
1	1	1-1/2	4	319524
1	1	2-1/4	5	319527

### More About the Series 237

Coatings available upon request



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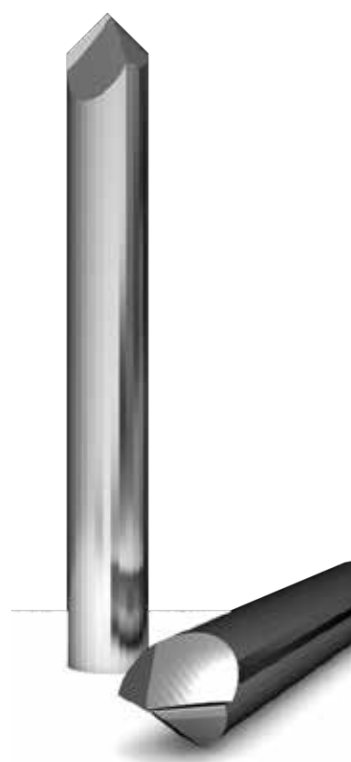
# PERFORMANCE

Premium Carbide Chamfer End Mills for Ferrous Materials



## Series 240 | S94 | 2FL | Chamfer Mill

Diameter	OAL	Angle	Bright EDP	TiCN EDP	AlTiN EDP
1/8	1-1/2	60°	319531	319536	319533
1/8	1-1/2	82°	319540	319544	319542
1/8	1-1/2	90°	319547	319553	319550
1/8	1-1/2	120°	319556	319562	319559
3/16	2	60°	319565	319569	319567
3/16	2	82°	319573	319577	319575
3/16	2	90°	319580	319586	319583
3/16	2	120°	319588	319593	319591
1/4	2-1/2	60°	319595	319601	319597
1/4	2-1/2	82°	319605	319613	319609
1/4	2-1/2	90°	319616	319620	319618
1/4	2-1/2	120°	319623	319631	319627
3/8	2-1/2	60°	319633	319641	319637
3/8	2-1/2	82°	319645	319649	319647
3/8	2-1/2	90°	319652	319656	319654
3/8	2-1/2	120°	319658	319665	319662
1/2	3	60°	319669	319674	319671
1/2	3	82°	319678	319683	319681
1/2	3	90°	319686	319693	319689
1/2	3	120°	319697	319703	319700
3/4	4	60°	319706	319711	319709
3/4	4	82°	319714	319719	319717
3/4	4	90°	319722	319728	319724
3/4	4	120°	319731	319739	319735



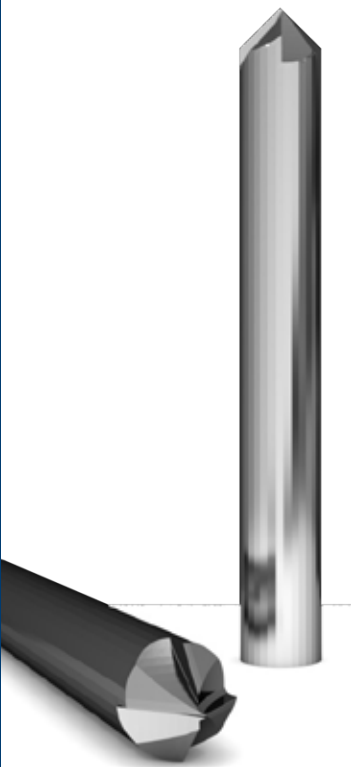
★ Best ☆ Good

# PERFORMANCE

Premium Carbide Chamfer End Mills for Ferrous Materials



<b>Series 241</b>		S94   4FL   Chamfer Mill			
Diameter	OAL	Angle	Bright EDP	TiCN EDP	AlTiN EDP
1/4	2-1/2	60°	319741	319747	319743
1/4	2-1/2	82°	319751	319758	319754
1/4	2-1/2	90°	319761	319767	319764
1/4	2-1/2	120°	319770	319777	319774
3/8	2-1/2	60°	319779	319784	319782
3/8	2-1/2	82°	319787	319791	319789
3/8	2-1/2	90°	319795	319802	319799
3/8	2-1/2	120°	319806	319813	319810
1/2	3	60°	319815	319820	319818
1/2	3	82°	319824	319828	319826
1/2	3	90°	319830	319836	319832
1/2	3	120°	319840	319847	319844
3/4	4	60°	319851	319857	319855
3/4	4	82°	319859	319866	319863
3/4	4	90°	319870	319876	319874
3/4	4	120°	319879	319886	319882



★ Best ☆ Good

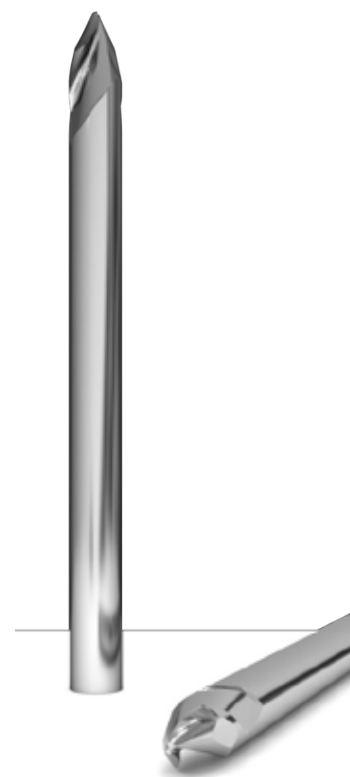
# PERFORMANCE

Premium Carbide Chamfer End Mills for Ferrous Materials



## Series 243 CM2 | 2FL | 90 deg. | Chamfer + End Mill

Diameter	Shank Dia.	LOC	OAL	Bright EDP	AlTiN EDP
3/32	1/8	1-1/2	90	108913	108914
3/32	1/8	1-1/2	90	108873	108874
1/8	1/8	1-1/2	90	108915	108916
1/8	1/8	1-1/2	90	108875	108876
3/16	3/16	2	90	108917	108918
3/16	3/16	2	90	108877	108878
1/4	1/4	2	90	108919	108920
1/4	1/4	2-1/2	90	108879	108880
5/16	5/16	2	90	108921	108922
5/16	5/16	2-1/2	90	108881	108882
3/8	3/8	2	90	108923	108924
3/8	3/8	2-1/2	90	108883	108884
1/2	1/2	2-1/2	90	108925	108926
1/2	1/2	3	90	108885	108886
5/8	5/8	3	90	108927	108928
5/8	5/8	3-1/2	90	108887	108888
3/4	3/4	3	90	108929	108930
3/4	3/4	4	90	108889	108890
1	1	3	90	108931	108932
1	1	4	90	108891	108892
1-1/4	1-1/4	3	90	108933	108934
1-1/4	1-1/4	4	90	108893	108894



★ Best ☆ Good

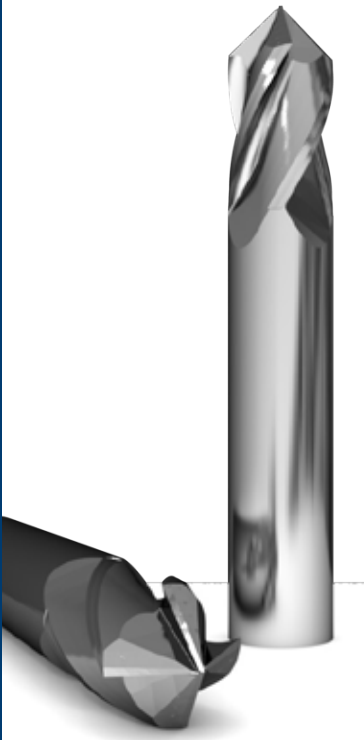
# PERFORMANCE

Premium Carbide Chamfer End Mills for Ferrous Materials



**Series 244** CM4 | 4FL | 90 deg. | Chamfer + End Mill

Diameter	Shank Dia.	LOC	OAL	Bright EDP	AlTiN EDP
3/32	1/8	1-1/2	90	108935	108936
3/32	1/8	1-1/2	90	108895	108896
1/8	1/8	1-1/2	90	108937	108938
1/8	1/8	1-1/2	90	108897	108898
3/16	3/16	2	90	108939	108940
3/16	3/16	2	90	107761	108899
1/4	1/4	2	90	108941	108942
1/4	1/4	2-1/2	90	108106	108900
5/16	5/16	2	90	108943	108944
5/16	5/16	2-1/2	90	108901	108902
3/8	3/8	2	90	108945	108946
3/8	3/8	2-1/2	90	108107	108903
1/2	1/2	2-1/2	90	108947	108948
1/2	1/2	3	90	108108	108904
5/8	5/8	3	90	108949	108950
5/8	5/8	3-1/2	90	108905	108906
3/4	3/4	3	90	108951	108952
3/4	3/4	4	90	108907	108908
1	1	3	90	108953	108954
1	1	4	90	108909	108910
1-1/4	1-1/4	3	90	108955	108956
-	1-1/4	4	90	108911	108912



★ Best ☆ Good





# TRIED & TRUE PERFORMANCE

Versatile cutting tools for  
everyday use. Capability you  
can depend on.



# ***ISO TURNING INSERTS***

From Cast Iron to Titanium, we have the performance ISO turning grades and geometries for your application. Need a special modification to enhance your insert? We can do that too!







# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning








## P - Steel

Finishing P15

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.51	CG92-C	204	<b>126030</b>
	CCMT 32.51	CG92-C	204	<b>126046</b>
	CCMT 32.52	CG92-C	204	<b>126055</b>
	CCMT 431	CG92-C	204	<b>126060</b>
	DCMT 21.5.5	CG92-C	204	<b>126175</b>
	DCMT 21.51	CG92-C	204	<b>126175</b>
	DCMT 32.5.5	CG92-C	204	<b>126181</b>
	DCMT 32.51	CG92-C	204	<b>126189</b>
	VBMT 331	CG92-C	204	<b>126387</b>
	VBMT 332	CG92-C	204	<b>126394</b>
	VCMT 22.5	CG92-C	204	<b>126418</b>
	VCMT 221	CG92-C	204	<b>126424</b>
	VCMT 331	CG92-C	204	<b>126436</b>

## P - Steel

Semi Finishing P15

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.51	CG92-D	205	<b>126024</b>
	CCMT 21.52	CG92-D	205	<b>126031</b>
	CCMT 32.51	CG92-D	205	<b>126039</b>
	CCMT 32.52	CG92-D	205	<b>126049</b>
	DCMT 32.51	CG92-D	205	<b>126184</b>
	DCMT 32.52	CG92-D	205	<b>126194</b>
	SCMT 431	CG92-D	205	<b>126291</b>
	TCMT 21.51	CG92-D	205	<b>126341</b>
	VBMT 331	CG92-BB	205	<b>126390</b>




# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## P - Steel

Finishing P25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.5.5	CG93-C	204	<b>126020</b>
	CCMT 21.51	CG93-C	204	<b>126028</b>
	CCMT 32.5.5	CG93-C	204	<b>126035</b>
	CCMT 32.51	CG93-C	204	<b>126044</b>
	CCMT 32.52	CG93-C	204	<b>126047</b>
	DCMT 21.5.5	CG93-C	204	<b>126165</b>
	DCMT 21.51	CG93-C	204	<b>126173</b>
	DCMT 32.5.5	CG93-C	204	<b>126179</b>
	DCMT 32.51	CG93-C	204	<b>126190</b>
	DCMT 32.52	CG93-C	204	<b>126192</b>
	VCMT 22.5	CG93-C	204	<b>126416</b>
	VCMT 221	CG93-C	204	<b>126425</b>
	VCMT 331	CG93-C	204	<b>126437</b>
	VCMT 332	CG93-C	204	<b>126443</b>

# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



**P - Steel**

Medium P25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.51	CG93-D	205	<b>126025</b>
	CCMT 21.52	CG93-D	205	<b>126032</b>
	CCMT 32.51	CG93-D	205	<b>126040</b>
	CCMT 32.52	CG93-D	205	<b>126050</b>
	CCMT 431	CG93-D	205	<b>126058</b>
	CCMT 432	CG93-D	205	<b>126062</b>
	CCMT 433	CG93-D	205	<b>126065</b>
	DCMT 21.51	CG93-D	205	<b>126170</b>
	DCMT 21.52	CG93-D	205	<b>126176</b>
	DCMT 32.51	CG93-D	205	<b>126185</b>
	DCMT 32.52	CG93-D	205	<b>126195</b>
	SCMT 32.51	CG93-D	205	<b>126285</b>
	SCMT 32.52	CG93-D	205	<b>126288</b>
	SCMT 431	CG93-D	205	<b>126292</b>
	SCMT 432	CG93-D	205	<b>126295</b>
	SCMT 433	CG93-D	205	<b>126298</b>
	TCMT 1.81.51	CG93-D	205	<b>126336</b>
	TCMT 21.51	CG93-D	205	<b>126342</b>
	TCMT 21.52	CG93-D	205	<b>126347</b>
	TCMT 32.51	CG93-D	205	<b>126352</b>
	TCMT 32.52	CG93-D	205	<b>126356</b>
	TCMT 32.53	CG93-D	205	<b>126359</b>
	VBMT 331	CG93-BB	205	<b>126391</b>
	VBMT 332	CG93-BB	205	<b>126396</b>
	VCMT 221	CG93-D	205	<b>126420</b>
	VCMT 222	CG93-D	205	<b>126428</b>
	VCMT 331	CG93-D	205	<b>126433</b>
	VCMT 332	CG93-D	205	<b>126440</b>
	WCMT 21.51	CG93-D	205	<b>126455</b>
	WCMT 21.52	CG93-D	205	<b>126457</b>
	WCMT 32.51	CG93-D	205	<b>126459</b>
	WCMT 32.52	CG93-D	205	<b>126461</b>
	WCMT 431	CG93-D	205	<b>126463</b>
	WCMT 432	CG93-D	205	<b>126465</b>
	WCMT 433	CG93-D	205	<b>126467</b>









# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



**P - Steel**

Medium P35

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.51	CG94-D	205	<b>126026</b>
	CCMT 21.52	CG94-D	205	<b>126033</b>
	CCMT 32.51	CG94-D	205	<b>126041</b>
	CCMT 32.52	CG94-D	205	<b>126051</b>
	DCMT 21.51	CG94-D	205	<b>126171</b>
	DCMT 21.52	CG94-D	205	<b>126177</b>
	DCMT 32.51	CG94-D	205	<b>126186</b>
	DCMT 32.52	CG94-D	205	<b>126196</b>
	RCMT 0803	CG94-D	205	<b>126272</b>
	RCMT 1003	CG94-D	205	<b>126273</b>
	RCMT 1204	CG94-D	205	<b>126274</b>
	SCMT 32.52	CG94-D	205	<b>126289</b>
	SCMT 432	CG94-D	205	<b>126296</b>
	SCMT 433	CG94-D	205	<b>126299</b>
	TCMT 21.51	CG94-D	205	<b>126343</b>
	TCMT 21.52	CG94-D	205	<b>126348</b>
	TCMT 32.51	CG94-D	205	<b>126353</b>
	TCMT 32.52	CG94-D	205	<b>126357</b>
	VCMT 221	CG94-D	205	<b>126421</b>
	VCMT 222	CG94-D	205	<b>126429</b>
	VCMT 331	CG94-D	205	<b>126434</b>
	VCMT 332	CG94-D	205	<b>126441</b>


# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



**P - Steel**

Medium Roughing




Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	RCMT 1606	CG93-S	219	<b>126275</b>
	RCMT 1606	CG94-S	219	<b>126276</b>
	RCMT 2006Z	CG93-S	219	<b>126277</b>
	RCMT 2006Z	CG94-S	219	<b>126278</b>

# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## M - Stainless Steel Extreme Finishing

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCGT 21.5X0	CG96-E	206	<b>126000</b>
	CCGT 21.50	CG96-E	206	<b>126001</b>
	CCGT 32.5X0	CG96-E	206	<b>126008</b>
	CCGT 32.50	CG96-E	206	<b>126009</b>
	DCGT 21.5X0	CG96-E	206	<b>126148</b>
	DCGT 21.50	CG96-E	206	<b>126149</b>
	DCGT 32.5X0	CG96-E	206	<b>126157</b>
	DCGT 32.50	CG96-E	206	<b>126158</b>
	VCGT 22X0	CG96-E	206	<b>126397</b>
	VCGT 220	CG96-E	206	<b>126398</b>
	VCGT 33X0	CG96-E	206	<b>126407</b>
	VCGT 330	CG96-E	206	<b>126408</b>

# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## M - Stainless Steel M15





Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCGT 21.50	CG98-AA	207	<b>126002</b>
	CCGT 21.5.5	CG98-AA	207	<b>126004</b>
	CCGT 21.51	CG98-AA	207	<b>126006</b>
	CCGT 32.5.5	CG98-AA	207	<b>126010</b>
	CCGT 32.51	CG98-AA	207	<b>126012</b>
	CCGT 32.52	CG98-AA	207	<b>126014</b>
	CCGT 431	CG98-AA	207	<b>126016</b>
	CCGT 432	CG98-AA	207	<b>126018</b>
	DCGT 21.50	CG98-AA	207	<b>126150</b>
	DCGT 21.5.5	CG98-AA	207	<b>126152</b>
	DCGT 21.51	CG98-AA	207	<b>126154</b>
	DCGT 32.5.5	CG98-AA	207	<b>126159</b>
	DCGT 32.51	CG98-AA	207	<b>126161</b>
	DCGT 32.52	CG98-AA	207	<b>126163</b>
	SCGT 32.51	CG98-AA	207	<b>126279</b>
	SCGT 32.52	CG98-AA	207	<b>126281</b>
	SCGT 432	CG98-AA	207	<b>126283</b>
	TCGT 21.51	CG98-AA	207	<b>126332</b>
	VCGT 22.5	CG98-AA	207	<b>126399</b>
	VCGT 221	CG98-AA	207	<b>126401</b>
	VCGT 130302	CG98-AA	207	<b>126403</b>
	VCGT 130304	CG98-AA	207	<b>126405</b>
	VCGT 331	CG98-AA	207	<b>126409</b>
	VCGT 332	CG98-AA	207	<b>126411</b>
	VCGT 333	CG98-AA	207	<b>126413</b>

# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## M - Stainless Steel Finishing M25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.5.5	CG95-C	209	<b>126021</b>
	CCMT 21.51	CG95-C	209	<b>126029</b>
	CCMT 32.5.5	CG95-C	209	<b>126036</b>
	CCMT 32.51	CG95-C	209	<b>126045</b>
	CCMT 32.52	CG95-C	209	<b>126054</b>
	DCMT 21.5.5	CG95-C	209	<b>126166</b>
	DCMT 21.51	CG95-C	209	<b>126174</b>
	DCMT 32.5.5	CG95-C	209	<b>126180</b>
	DCMT 32.51	CG95-C	209	<b>126191</b>
	DCMT 32.52	CG95-C	209	<b>126199</b>
	TCMT 21.5.5	CG95-C	209	<b>126338</b>
	VCMT 220.5	CG95-C	209	<b>126417</b>
	VCMT 221	CG95-C	209	<b>126426</b>
	VCMT 331	CG95-C	209	<b>126438</b>

# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## M - Stainless Steel M25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.51	CG95-D	210	<b>126027</b>
	CCMT 21.52	CG95-D	210	<b>126034</b>
	CCMT 32.51	CG95-D	210	<b>126042</b>
	CCMT 32.52	CG95-D	210	<b>126052</b>
	CCMT 431	CG95-D	210	<b>126059</b>
	CCMT 432	CG95-D	210	<b>126063</b>
	CCMT 433	CG95-D	210	<b>126066</b>
	DCMT 21.51	CG95-D	210	<b>126172</b>
	DCMT 21.52	CG95-D	210	<b>126178</b>
	DCMT 32.51	CG95-D	210	<b>126187</b>
	DCMT 32.52	CG95-D	210	<b>126197</b>
	SCMT 32.51	CG95-D	210	<b>126286</b>
	SCMT 32.52	CG95-D	210	<b>126290</b>
	SCMT 431	CG95-D	210	<b>126293</b>
	SCMT 432	CG95-D	210	<b>126297</b>
	SCMT 433	CG95-D	210	<b>126300</b>
	TCMT 1.81.51	CG95-D	210	<b>126337</b>
	TCMT 21.51	CG95-D	210	<b>126344</b>
	TCMT 21.52	CG95-D	210	<b>126349</b>
	TCMT 32.51	CG95-D	210	<b>126354</b>
	TCMT 32.52	CG95-D	210	<b>126358</b>
	TCMT 32.53	CG95-D	210	<b>126360</b>
	VCMT 221	CG95-D	210	<b>126422</b>
	VCMT 222	CG95-D	210	<b>126430</b>
	VCMT 331	CG95-D	210	<b>126435</b>
	VCMT 332	CG95-D	210	<b>126442</b>
	WCMT 21.51	CG95-D	210	<b>126456</b>
	WCMT 21.52	CG95-D	210	<b>126458</b>
	WCMT 32.51	CG95-D	210	<b>126460</b>
	WCMT 32.52	CG95-D	210	<b>126462</b>
	WCMT 431	CG95-D	210	<b>126464</b>
	WCMT 432	CG95-D	210	<b>126466</b>
	WCMT 433	CG95-D	210	<b>126468</b>







# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## M - Stainless Steel Medium

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 32.51	CG97-D	210	<b>126043</b>
	CCMT 32.52	CG97-D	210	<b>126053</b>
	DCMT 32.51	CG97-D	210	<b>126188</b>
	DCMT 32.52	CG97-D	210	<b>126198</b>
	TCMT 21.51	CG97-D	210	<b>126345</b>
	TCMT 21.52	CG97-D	210	<b>126350</b>
	VCMT 221	CG97-D	210	<b>126423</b>
	VCMT 222	CG97-D	210	<b>126431</b>





# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## K - Cast Iron

K20

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.51	CG99-D	211	<b>126023</b>
	CCMT 32.51	CG99-D	211	<b>126038</b>
	CCMT 32.52	CG99-D	211	<b>126048</b>
	CCMT 432	CG99-D	211	<b>126061</b>
	DCMT 21.51	CG99-D	211	<b>126169</b>
	DCMT 32.51	CG99-D	211	<b>126183</b>
	DCMT 32.52	CG99-D	211	<b>126193</b>
	SCMT 32.51	CG99-D	211	<b>126284</b>
	SCMT 32.52	CG99-D	211	<b>126287</b>
	SCMT 432	CG99-D	211	<b>126294</b>
	TCMT 1.81.51	CG99-D	211	<b>126335</b>
	TCMT 21.51	CG99-D	211	<b>126340</b>
	TCMT 21.52	CG99-D	211	<b>126346</b>
	TCMT 32.51	CG99-D	211	<b>126351</b>
	TCMT 32.52	CG99-D	211	<b>126355</b>

# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## N - Non-Ferrous

N15






Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCGT 21.50	CG910-AA	211	<b>126003</b>
	CCGT 21.5.5	CG910-AA	211	<b>126005</b>
	CCGT 21.51	CG910-AA	211	<b>126007</b>
	CCGT 32.5.5	CG910-AA	211	<b>126011</b>
	CCGT 32.51	CG910-AA	211	<b>126013</b>
	CCGT 32.52	CG910-AA	211	<b>126015</b>
	CCGT 431	CG910-AA	211	<b>126017</b>
	CCGT 432	CG910-AA	211	<b>126019</b>
	DCGT 21.50	CG910-AA	211	<b>126151</b>
	DCGT 21.5.5	CG910-AA	211	<b>126153</b>
	DCGT 21.51	CG910-AA	211	<b>126155</b>
	DCGT 21.52	CG910-AA	211	<b>126156</b>
	DCGT 32.5.5	CG910-AA	211	<b>126160</b>
	DCGT 32.51	CG910-AA	211	<b>126162</b>
	DCGT 32.52	CG910-AA	211	<b>126164</b>
	SCGT 32.51	CG910-AA	211	<b>126280</b>
	SCGT 32.52	CG910-AA	211	<b>126282</b>
	TCGT 21.51	CG910-AA	211	<b>126330</b>
	TCGT 32.51	CG910-AA	211	<b>126333</b>
	TCGT 32.52	CG910-AA	211	<b>126334</b>
	VCGT 220.5	CG910-AA	211	<b>126400</b>
	VCGT 221	CG910-AA	211	<b>126402</b>
	VCGT 130302	CG910-AA	211	<b>126404</b>
	VCGT 130304	CG910-AA	211	<b>126406</b>
	VCGT 331	CG910-AA	211	<b>126410</b>
	VCGT 332	CG910-AA	211	<b>126412</b>
	VCGT 333	CG910-AA	211	<b>126414</b>
	VCGT 43.57.5	CG910-AA	211	<b>126415</b>

# PERFORMANCE SERIES - POSITIVE GEOMETRY

Precision Quality Turning



## H - Hardened Steel CERMET | Finishing

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CCMT 21.51	CG91-B	208	<b>126022</b>
	CCMT 32.51	CG91-B	208	<b>126037</b>
	DCMT 21.51	CG91-B	208	<b>126168</b>
	DCMT 32.51	CG91-B	208	<b>126182</b>
	TCGT 21.5.5	CG91-B	208	<b>126331</b>
	TCMT 21.51	CG91-B	208	<b>126339</b>
	WCGT 020102	CG91-B	208	<b>126454</b>







# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning





## P - Steel

Finishing P15

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 431	CG92-D	205	<b>126087</b>
	CNMG 432	CG92-D	205	<b>126099</b>
	CNMG 433	CG92-D	205	<b>126107</b>
	DNMG 331	CG92-D	205	<b>126213</b>
	DNMG 332	CG92-D	205	<b>126216</b>
	DNMG 441	CG92-D	205	<b>126232</b>
	DNMG 442	CG92-D	205	<b>126241</b>
	DNMG 443	CG92-D	205	<b>126249</b>
	SNMG 432	CG92-D	205	<b>126308</b>
	SNMG 433	CG92-D	205	<b>126312</b>
	TNMG 331	CG92-D	205	<b>126363</b>
	TNMG 332	CG92-D	205	<b>126372</b>
	TNMG 333	CG92-D	205	<b>126378</b>
	VNMG 331	CG92-D	205	<b>126447</b>
	VNMG 332	CG92-D	205	<b>126452</b>
	WNMG 331	CG92-D	205	<b>126474</b>
	WNMG 332	CG92-D	205	<b>126477</b>
	WNMG 431	CG92-D	205	<b>126482</b>
	WNMG 432	CG92-D	205	<b>126491</b>
	WNMG 433	CG92-D	205	<b>126499</b>

## P - Steel

Roughing P15

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 432	CG92-I	214	<b>126102</b>
	CNMG 433	CG92-I	214	<b>126102</b>
	DNMG 442	CG92-I	214	<b>126244</b>
	DNMG 442	CG92-I	214	<b>126244</b>
	DNMG 443	CG92-I	214	<b>126252</b>
	DNMG 443	CG92-I	214	<b>126252</b>







# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



**P - Steel**

P25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 431	CG93-D	205	<b>126088</b>
	CNMG 432	CG93-D	205	<b>126100</b>
	CNMG 433	CG93-D	205	<b>126108</b>
	DNMG 331	CG93-D	205	<b>126214</b>
	DNMG 332	CG93-D	205	<b>126217</b>
	DNMG 431	CG92-D	205	<b>126220</b>
	DNMG 431	CG94-D	205	<b>126221</b>
	DNMG 431	CG93-D	205	<b>126222</b>
	DNMG 431	CG93-D	205	<b>126222</b>
	DNMG 432	CG93-D	205	<b>126226</b>
	DNMG 432	CG93-D	205	<b>126226</b>
	DNMG 432	CG94-D	205	<b>126227</b>
	DNMG 432	CG925-D	205	<b>126228</b>
	SNMG 432	CG93-D	205	<b>126309</b>
	SNMG 433	CG93-D	205	<b>126313</b>
	TNMG 331	CG93-D	205	<b>126364</b>
	TNMG 332	CG93-D	205	<b>126373</b>
	TNMG 333	CG93-D	205	<b>126379</b>
	TNMG 431	CG93-D	205	<b>126380</b>
	TNMG 432	CG93-D	205	<b>126382</b>
	VNMG 331	CG93-D	205	<b>126448</b>
	VNMG 332	CG93-D	205	<b>126453</b>
	WNMG 331	CG93-D	205	<b>126475</b>
	WNMG 332	CG93-D	205	<b>126478</b>
	WNMG 431	CG93-D	205	<b>126483</b>
	WNMG 432	CG93-D	205	<b>126492</b>
	WNMG 433	CG93-D	205	<b>126500</b>








# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



## P - Steel

Roughing P25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 432	CG93-I	214	<b>126091</b>
	CNMG 433	CG93-I	214	<b>126104</b>
	DNMG 442	CG93-I	214	<b>126245</b>
	DNMG 443	CG93-I	214	<b>126253</b>
	SNMG 432	CG93-I	214	<b>126303</b>
	SNMG 433	CG93-I	214	<b>126311</b>
	TNMG 333	CG93-I	214	<b>126375</b>
	TNMG 332EN	CG93-I	214	<b>126279</b>
	WNMG 432	CG93-I	214	<b>126485</b>
	WNMG 433	CG93-I	214	<b>126495</b>






# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning




## P - Steel

Medium Roughing P35

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 432	CG94-D	205	<b>126101</b>
	CNMG 433	CG94-D	205	<b>126109</b>
	DNMG 332	CG94-D	205	<b>126218</b>
	DNMG 442	CG94-D	205	<b>126243</b>
	DNMG 443	CG94-D	205	<b>126251</b>
	SNMG 432	CG94-D	205	<b>126310</b>
	SNMG 433	CG94-D	205	<b>126314</b>
	TNMG 332	CG94-D	205	<b>126374</b>
	WNMG 432	CG94-D	205	<b>126493</b>
	WNMG 433	CG94-D	205	<b>126501</b>

## P - Steel

Roughing P35

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	DNMG 442	CG94-I	214	<b>126246</b>
	DNMG 443	CG94-I	214	<b>126254</b>




# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



**P - Steel**

Medium Roughing





Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 542	CG94-M	220	<b>126112</b>
	CNMG 543	CG93-M	220	<b>126114</b>
	CNMG 543	CG94-M	220	<b>126115</b>
	CNMG 643	CG93-M	220	<b>126117</b>
	CNMG 643	CG94-M	220	<b>126118</b>
	CNMG 644	CG93-M	220	<b>126119</b>
	CNMG 644	CG94-M	220	<b>126120</b>
	SNMG 543	CG93-M	220	<b>126315</b>
	SNMG 543	CG94-M	220	<b>126316</b>
	SNMG 643	CG93-M	220	<b>126317</b>
	SNMG 643	CG94-M	220	<b>126318</b>
	TNMG 433	CG93-M	220	<b>126384</b>

# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



## M - Stainless Steel Finishing M25


Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNGP 43.5	CG96-J	214	<b>126071</b>
	CNGP 431	CG96-J	214	<b>126072</b>
	CNGP 432	CG96-J	214	<b>126073</b>
	CNGP 433	CG96-J	214	<b>126074</b>
	DNGP 431	CG96-J	214	<b>126205</b>
	DNGP 44.5	CG96-J	214	<b>126206</b>
	DNGP 441	CG96-J	214	<b>126207</b>
	DNGP 442	CG96-J	214	<b>126208</b>
	VNGP 33.5	CG96-J	214	<b>126444</b>
	VNGP 331	CG96-J	214	<b>126445</b>
	WNGP 431	CG96-J	214	<b>126469</b>
	WNGP 432	CG96-J	214	<b>126470</b>

# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



## M - Stainless Steel M25





Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 321	CG95-K	215	<b>126079</b>
	CNMG 322	CG95-K	215	<b>126080</b>
	CNMG 431	CG95-K	215	<b>126084</b>
	CNMG 432	CG95-K	215	<b>126094</b>
	DNMG 331	CG95-K	215	<b>126210</b>
	DNMG 332	CG95-K	215	<b>126215</b>
	DNMG 431	CG95-K	215	<b>126219</b>
	DNMG 431	CG95-K	215	<b>126219</b>
	DNMG 432	CG96-K	215	<b>126224</b>
	DNMG 432	CG95-K	215	<b>126225</b>
	DNMG 432	CG95-K	215	<b>126225</b>
	DNMG 441	CG95-K	215	<b>126230</b>
	DNMG 442	CG95-K	215	<b>126237</b>
	SNMG 432	CG95-K	215	<b>126306</b>
	TNMG 331	CG95-K	215	<b>126362</b>
	TNMG 332	CG95-K	215	<b>126369</b>
	VNMG 332	CG95-K	215	<b>126451</b>
	WNMG 331	CG95-K	215	<b>126472</b>
	WNMG 332	CG95-K	215	<b>126476</b>
	WNMG 431	CG95-K	215	<b>126480</b>
	WNMG 432	CG95-K	215	<b>126488</b>
	WNMG 433	CG95-K	215	<b>126496</b>

# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



## M - Stainless Steel Roughing M25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 432	CG95-L	216	<b>126095</b>
	CNMG 433	CG95-L	216	<b>126105</b>
	DNMG 442	CG95-L	216	<b>126238</b>
	DNMG 443	CG95-L	216	<b>126247</b>
	TNMG 332	CG95-L	216	<b>126370</b>
	TNMG 333	CG95-L	216	<b>126376</b>
	WNMG 432	CG95-L	216	<b>126489</b>
	WNMG 433	CG95-L	216	<b>126497</b>



# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



## K - Cast Iron

K20

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMA 432	CG99-NCB	220	<b>126075</b>
	CNMA 433	CG99-NCB	220	<b>126076</b>
	CNMA 434	CG99-NCB	220	<b>126077</b>
	CNMG 542	CG99-M	220	<b>126111</b>
	CNMG 432	CG99-M	220	<b>126089</b>
	CNMG 432	CG99-D	211	<b>126098</b>
	CNMG 433	CG99-M	220	<b>126103</b>
	CNMG 433	CG99-D	211	<b>126106</b>
	CNMG 543	CG99-M	220	<b>126113</b>
	CNMG 543	CG99-M	220	<b>126113</b>
	CNMG 643	CG99-M	220	<b>126116</b>
	DNMG 442	CG99-M	220	<b>126234</b>
	DNMG 442	CG99-D	211	<b>126240</b>
	DNMG 443	CG99-D	211	<b>126248</b>
	SNMA 432	CG99-NCB	220	<b>126301</b>
	SNMG 432	CG99-M	220	<b>126302</b>
	SNMG 432	CG99-I	211	<b>126307</b>
	TNMA 332	CG99-NCB	220	<b>126361</b>
	TNMG 332	CG99-M	220	<b>126365</b>
	TNMG 332	CG99-D	211	<b>126371</b>
	TNMG 333	CG99-D	211	<b>126377</b>
	TNMG 432	CG99-D	211	<b>126381</b>
	WNMA 432	CG99-NCB	220	<b>126471</b>
	WNMG 432	CG99-M	220	<b>126484</b>
	WNMG 432	CG99-D	211	<b>126490</b>
	WNMG 433	CG99-M	220	<b>126494</b>
	WNMG 433	CG99-D	211	<b>126498</b>







# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



## S - Titanium

Titanium and HRSA S10



Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 431	CG911-N	217	<b>126082</b>
	CNMG 432	CG911-N	217	<b>126092</b>
	CNMG 431	CG912-N	217	<b>126083</b>
	CNMG 432	CG912-N	217	<b>126093</b>
	DNMG 442	CG911-N	217	<b>126235</b>
	DNMG 442	CG912-N	217	<b>126236</b>
	SNMG 432	CG911-N	217	<b>126304</b>
	SNMG 432	CG912-N	217	<b>126305</b>
	TNMG 332	CG911-N	217	<b>126367</b>
	TNMG 332	CG912-N	217	<b>126368</b>
	VNMG 332	CG911-N	217	<b>126449</b>
	VNMG 332	CG912-N	217	<b>126450</b>
	WNMG 432	CG911-N	217	<b>126486</b>
	WNMG 432	CG912-N	217	<b>126487</b>

# PERFORMANCE SERIES - NEGATIVE GEOMETRY

Precision Quality Turning



## H - Hardened Steel CERMET | Finishing

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 431	CG91-B	208	<b>126081</b>
	CNMG 432	CG91-B	208	<b>126090</b>
	DNMG 331	CG91-B	208	<b>126209</b>
	DNMG 441	CG91-B	208	<b>126229</b>

# PERFORMANCE SERIES - HEAVY DUTY

Precision Quality Turning



## P - Steel

Heavy Steel P15

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 321	CG92-H	213	<b>126078</b>
	CNMG 321	CG92-H	213	<b>126078</b>
	CNMG 431	CG92-H	213	<b>126085</b>
	CNMG 431	CG92-H	213	<b>126085</b>
	CNMG 432	CG92-H	213	<b>126096</b>
	CNMG 432	CG92-H	213	<b>126096</b>
	CNMX 431	CG92-F	212	<b>126146</b>
	CNMX 432	CG92-F	212	<b>126147</b>
	DNMG 331	CG92-H	213	<b>126211</b>
	DNMG 331	CG92-H	213	<b>126211</b>
	DNMG 441	CG92-H	213	<b>126231</b>
	DNMG 442	CG92-H	213	<b>126239</b>
	DNMM 442	CG92-P	218	<b>126255</b>
	DNMM 443	CG92-Q	219	<b>126258</b>
	DNMX 441	CG92-F	212	<b>126261</b>
	DNMX 442	CG92-F	212	<b>126262</b>
	VNMG 331	CG92-H	213	<b>126446</b>
	WNMG 331	CG92-H	213	<b>126473</b>
	WNMG 431	CG92-H	213	<b>126481</b>
	WNMX 431	CG92-F	212	<b>126502</b>
	WNMX 432	CG92-F	212	<b>126503</b>



# PERFORMANCE SERIES - HEAVY DUTY

Precision Quality Turning







## P - Steel

Heavy Steel - P25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	DNMM 443	CG93-Q	219	<b>126259</b>
	SNMM 643 SNMM 644	CG93-Q CG93-Q	219 219	<b>126319</b> <b>126320</b>

## P - Steel

Heavy Steel P25

Insert	Designation	Grade/Chip Breaker	Tech Page	EDP
	CNMG 431 CNMG 432	CG93-H CG93-H	213 213	<b>126086</b> <b>126097</b>
	DNMG 331	CG93-H	213	<b>126212</b>
	DNMM 442	CG93-P	218	<b>126256</b>
	SNMM 644 SNMM 866	CG93-O CG93-O	218 218	<b>126321</b> <b>126326</b>

# ***TECHNICAL INFORMATION***

From cutting speed recommendations and cutting grades to coatings and formulas, you will find it here.





# ROUND TOOL COATINGS

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Advatech

## Advatech

AlTiN based, with a hardness of 35+/-3. Highly stable with optimal balance and improved tool lifetimes.

***Deep-hole drills, Step drills and all standard drills***



ZrN

## Zirconium Nitride (ZrN)

Machining Magnesium and Titanium

***Effectively reduces the built up edges when machining Aluminum and Titanium***



AlTiN

## Aluminum Titanium Nitride(AlTiN)

High Performance Coating, high aluminum content, high heat resistance

***For dry high speed machining, hard machining***



nACo

## nACo

Nano Composite coating, extremely high nano hardness and high heat resistance

***For high performance and normal machining conditions***



nACRo

## nACRo

Nano Composite coating, extremely high scratch and high heat resistance, high coating thickness possible

***Especially for hobbing and forming tools***



Alcromax

## Alcromax

Suitable for tool steel and for wet and MQL conditions. Excellent for titanium, high temp alloys & hardened and tempered tool steels with 35 HRC or greater.

***Especially for hobbing and forming tools***

# INSERT COATINGS & DESIGNATIONS

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CG91

## CG91 - HT-P15 | HT-M10 | HT-K10

Cermet Co/Ni 12.2 %; WC 15.0 %; TaNbC 10.0 %; TiCN balance | Hardness: HV30 1620

***The uncoated cermet grade for the finishing of hardened steel.***



CG92

## CG92 - HC-P15 | HC-K25 | HC-M10

Co 5.8 %; mixed carbides 6.4 %; WC balance | Grain size: 1 - 2 µm | Hardness: HV30 1550 | Coating specification: CVD TiCN-Al2O3

***The wear-resistant high-performance grade for steel machining.***



CG93

## CG93 - HC-P25 | HC-K30 | HC-M20

Co 7.0 %; mixed carbides 8.0 %; WC balance | Grain size: 1 - 2 µm | Hardness: HV30 1450 | Coating specification: CVD TiCN-Al2O3

***The first choice for the universal machining of steel.***



## CG94 - HC-P35 | HC-M25 | HC-S25

Co 9.6 %; mixed carbides 6.7 %; WC balance | Grain size: 1 - 2  $\mu\text{m}$  | Hardness: HV30 1460 | Coating specification: CVD TiCN-Al<sub>2</sub>O<sub>3</sub> multi-layer

***The tough alternative for heavily interrupted cutting action.***



## CG95 - HC-M20 | HC-K20

Co 10.5 %; mixed carbide 2.0 %; WC balance | Grain size: 1-2  $\mu\text{m}$   
Hardness: HV30 1400 | Coating specification: PVD TiAlTaN

***Particularly suitable for the wet machining of steels.***



## CG96 - HC-M25 | HC-P35 | HC-S25

Co 9.6 %; mixed carbides 7.8 %; others 0.4 %; WC balance | Grain size: 1 - 2  $\mu\text{m}$   
Hardness: HV30 1460 | Coating specification: PVD TiAlTaN

***The first choice for the machining of austenitic steels.***



## CG97 - HC-M35 | HC-P35

Co 8.0 %; WC balance; mixed carbides 4.2 % ; Grain size: 1.5-3.0  $\mu\text{m}$   
Hardness: HV30 1330

***Universal stainless steel turning grade. The best in difficult situations.***



## CG98 - HC-M15 | HC-S15

Co 6.0 %; WC balance | Grain size 0.8-1.3  $\mu\text{m}$  | Hardness HV30 1630  
Coating specification PVD TiAlN

***The first choice for the machining of Stainless Steels and Exotic.***



## CG99 - HC-K20 | HC-P10

Co 6.0 %; TaC 2.0 %; WC balance | Grain size: 1  $\mu\text{m}$   
Hardness: HV30 1630 Coating specification: CVD TiCN-Al<sub>2</sub>O<sub>3</sub>

***Machining cast iron at high cutting speeds & where high toughness is required.***



## CG910 - HW-N15 | HW-K15

Co 6.0 %; WC balance | Grain size: 1  $\mu\text{m}$   
Hardness: HV30 1630

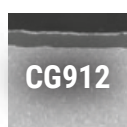
***Uncoated carbide grade for machining of aluminium & other non-ferrous metals.***



## CG911 - HC-S15 | HC-M15

Co 6.0 %; WC balance | Grain size: 0.8  $\mu\text{m}$   
Hardness: HV30 1820 | Coating specification: PVD TiAlN

***The alternative when machining heat-resistant materials.***



## CG912 - HC-S15 | HC-M15

Co 6.0 %; WC balance | Grain size: 0.8  $\mu\text{m}$   
Hardness: HV30 1820 | Coating specification: PVD TiAlN-TiN

***The first choice for the machining of heat-resistant materials.***

# SPEED & FEED GUIDE



Optimum Performance

## Series 4005

ECO | 2FL | 5xD | Solid | Inch & Metric

Work Material	P						M				K				N			
	Carbon Steel		Alloy Steel		Tool Steel		300 & 400 SS		PH SS		Gray		Ductile		6061, 7075		> 10% Si	
SFM	220 - 350		210 - 315		205 - 295		130 - 200		120 - 190		235-390		170 - 300		300 - 460		330 - 385	
Drill Dia.	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR
1	23287	0.0008	21346	0.0008	20376	0.0008	15524	0.0006	14554	0.0006	26683	0.0008	22802	0.0008	33960	0.0014	32019	0.0014
1/16	14669	0.0013	13446	0.0013	12835	0.0013	9779	0.0009	9168	0.0009	16808	0.0013	14363	0.0013	21392	0.0022	20170	0.0022
2	11643	0.0016	10673	0.0016	10188	0.0016	7762	0.0012	7277	0.0012	13341	0.0016	11401	0.0016	16980	0.0028	16010	0.0028
3/32	9779	0.0019	8964	0.0019	8557	0.0019	6519	0.0014	6112	0.0014	11205	0.0019	9575	0.0019	14261	0.0033	13446	0.0033
3	7762	0.0024	7115	0.0024	6792	0.0024	5175	0.0018	4851	0.0018	8894	0.0024	7601	0.0024	11320	0.0041	10673	0.0041
1/8	7334	0.0025	6723	0.0025	6418	0.0025	4890	0.0019	4584	0.0019	8404	0.0025	7182	0.0025	10696	0.0044	10085	0.0044
4	5822	0.0031	5337	0.0031	5094	0.0031	3881	0.0024	3639	0.0024	6671	0.0031	5700	0.0031	8490	0.0055	8005	0.0055
3/16	4890	0.0038	4482	0.0038	4278	0.0038	3260	0.0028	3056	0.0028	5603	0.0038	4788	0.0038	7131	0.0066	6723	0.0066
6	3881	0.0047	3558	0.0047	3396	0.0047	2587	0.0035	2426	0.0035	4447	0.0047	3800	0.0047	5660	0.0083	5337	0.0083
1/4	3667	0.0050	3362	0.0050	3209	0.0050	2445	0.0038	2292	0.0038	4202	0.0050	3591	0.0050	5348	0.0088	5042	0.0088
8	2911	0.0063	2668	0.0063	2547	0.0063	1941	0.0047	1819	0.0047	3335	0.0063	2850	0.0063	4245	0.0110	4002	0.0110
3/8	2445	0.0075	2241	0.0075	2139	0.0075	1630	0.0056	1528	0.0056	2801	0.0075	2394	0.0075	3565	0.0131	3362	0.0131
10	2329	0.0079	2135	0.0079	2038	0.0079	1552	0.0059	1455	0.0059	2668	0.0079	2280	0.0079	3396	0.0138	3202	0.0138
7/16	2096	0.0088	1921	0.0088	1834	0.0088	1397	0.0066	1310	0.0066	2401	0.0088	2052	0.0088	3056	0.0153	2881	0.0153
12	1941	0.0094	1779	0.0094	1698	0.0094	1294	0.0071	1213	0.0071	2224	0.0094	1900	0.0094	2830	0.0165	2668	0.0165
1/2	1834	0.0100	1681	0.0100	1604	0.0100	1222	0.0075	1146	0.0075	2101	0.0100	1795	0.0100	2674	0.0175	2521	0.0175
14	1663	0.0110	1525	0.0110	1455	0.0110	1109	0.0083	1040	0.0083	1906	0.0110	1629	0.0110	2426	0.0193	2287	0.0193
5/8	1467	0.0125	1345	0.0125	1284	0.0125	978	0.0094	917	0.0094	1681	0.0125	1436	0.0125	2139	0.0219	2017	0.0219
18	1294	0.0142	1186	0.0142	1132	0.0142	862	0.0106	809	0.0106	1482	0.0142	1267	0.0142	1887	0.0248	1779	0.0248

# SPEED & FEED GUIDE

Optimum Performance



## Series 4105

ECO | 2FL | 5xD | Coolant-through | Inch & Metric

Work Material	P						M				K				N			
	Carbon Steel		Alloy Steel		Tool Steel		300 & 400 SS		PH SS		Gray		Ductile		6061, 7075		> 10% Si	
SFM	220 - 350		210 - 315		205 - 295		130 - 200		120 - 190		235-390		170 - 300		300 - 460		330 - 385	
Drill Dia.	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR
mm inch																		
1	26780	0.0008	24548	0.0008	23432	0.0008	17853	0.0006	16737	0.0006	30685	0.0008	26222	0.0008	39054	0.0014	36822	0.0014
1/16	16869	0.0013	15463	0.0013	14760	0.0013	11246	0.0009	10543	0.0009	19329	0.0013	16518	0.0013	24601	0.0022	23195	0.0022
2	13390	0.0016	12274	0.0016	11716	0.0016	8927	0.0012	8369	0.0012	15343	0.0016	13111	0.0016	19527	0.0028	18411	0.0028
3/32	11246	0.0019	10309	0.0019	9840	0.0019	7497	0.0014	7029	0.0014	12886	0.0019	11012	0.0019	16401	0.0033	15463	0.0033
3	8927	0.0024	8183	0.0024	7811	0.0024	5951	0.0018	5579	0.0018	10228	0.0024	8741	0.0024	13018	0.0041	12274	0.0041
1/8	8435	0.0025	7732	0.0025	7380	0.0025	5623	0.0019	5272	0.0019	9665	0.0025	8259	0.0025	12300	0.0044	11598	0.0044
4	6695	0.0031	6137	0.0031	5858	0.0031	4463	0.0024	4184	0.0024	7671	0.0031	6555	0.0031	9763	0.0055	9206	0.0055
3/16	5623	0.0038	5154	0.0038	4920	0.0038	3749	0.0028	3514	0.0028	6443	0.0038	5506	0.0038	8200	0.0066	7732	0.0066
6	4463	0.0047	4091	0.0047	3905	0.0047	2976	0.0035	2790	0.0035	5114	0.0047	4370	0.0047	6509	0.0083	6137	0.0083
1/4	4217	0.0050	3866	0.0050	3690	0.0050	2812	0.0038	2636	0.0038	4832	0.0050	4129	0.0050	6150	0.0088	5799	0.0088
8	3347	0.0063	3069	0.0063	2929	0.0063	2232	0.0047	2092	0.0047	3836	0.0063	3278	0.0063	4882	0.0110	4603	0.0110
3/8	2812	0.0075	2577	0.0075	2460	0.0075	1874	0.0056	1757	0.0056	3222	0.0075	2753	0.0075	4100	0.0131	3866	0.0131
10	2678	0.0079	2455	0.0079	2343	0.0079	1785	0.0059	1674	0.0059	3069	0.0079	2622	0.0079	3905	0.0138	3682	0.0138
7/16	2410	0.0088	2209	0.0088	2109	0.0088	1607	0.0066	1506	0.0066	2761	0.0088	2360	0.0088	3514	0.0153	3314	0.0153
12	2232	0.0094	2046	0.0094	1953	0.0094	1488	0.0071	1395	0.0071	2557	0.0094	2185	0.0094	3254	0.0165	3069	0.0165
1/2	2109	0.0100	1933	0.0100	1845	0.0100	1406	0.0075	1318	0.0075	2416	0.0100	2065	0.0100	3075	0.0175	2899	0.0175
14	1913	0.0110	1753	0.0110	1674	0.0110	1275	0.0083	1196	0.0083	2192	0.0110	1873	0.0110	2790	0.0193	2630	0.0193
5/8	1687	0.0125	1546	0.0125	1476	0.0125	1125	0.0094	1054	0.0094	1933	0.0125	1652	0.0125	2460	0.0219	2320	0.0219
18	1488	0.0142	1364	0.0142	1302	0.0142	992	0.0106	930	0.0106	1705	0.0142	1457	0.0142	2170	0.0248	2046	0.0248

# SPEED & FEED GUIDE

Optimum Performance



## Series 4050

ECO | 1FL | Inch & Metric | Solid | PAC Reamers

Work Material	P						M				K				N	
	Carbon Steel		Alloy Steel		Tool Steel		300 & 400 SS		PH SS		Gray		Ductile		> 10% Si	
SFM	220 - 350		210 - 315		205 - 295		130 - 200		120 - 190		300 - 455		170 - 300		330 - 385	
Drill Dia.	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR
1/8	7334	0.0013	6723	0.0013	6418	0.0013	4890	0.0013	4584	0.0013	8404	0.0013	7182	0.0013	10085	0.0013
4	5822	0.0016	5337	0.0016	5094	0.0016	3881	0.0016	3639	0.0016	6671	0.0016	5700	0.0016	8005	0.0016
3/16	4890	0.0019	4482	0.0019	4278	0.0019	3260	0.0019	3056	0.0019	5603	0.0019	4788	0.0019	6723	0.0019
6	3881	0.0024	3558	0.0024	3396	0.0024	2587	0.0024	2426	0.0024	4447	0.0024	3800	0.0024	5337	0.0024
1/4	3667	0.0025	3362	0.0025	3209	0.0025	2445	0.0025	2292	0.0025	4202	0.0025	3591	0.0025	5042	0.0025
8	2911	0.0031	2668	0.0031	2547	0.0031	1941	0.0031	1819	0.0031	3335	0.0031	2850	0.0031	4002	0.0031
3/8	2445	0.0038	2241	0.0038	2139	0.0038	1630	0.0038	1528	0.0038	2801	0.0038	2394	0.0038	3362	0.0038
10	2329	0.0039	2135	0.0039	2038	0.0039	1552	0.0039	1455	0.0039	2668	0.0039	2280	0.0039	3202	0.0039
7/16	2096	0.0044	1921	0.0044	1834	0.0044	1397	0.0044	1310	0.0044	2401	0.0044	2052	0.0044	2881	0.0044
12	1941	0.0047	1779	0.0047	1698	0.0047	1294	0.0047	1213	0.0047	2224	0.0047	1900	0.0047	2668	0.0047
1/2	1834	0.0050	1681	0.0050	1604	0.0050	1222	0.0050	1146	0.0050	2101	0.0050	1795	0.0050	2521	0.0050
14	1663	0.0055	1525	0.0055	1455	0.0055	1109	0.0055	1040	0.0055	1906	0.0055	1629	0.0055	2287	0.0055
5/8	1467	0.0063	1345	0.0063	1284	0.0063	978	0.0063	917	0.0063	1681	0.0063	1436	0.0063	2017	0.0063

# SPEED & FEED GUIDE



Optimum Performance

## Series 1010

### ART 3 FLUTE SERIES NON-FERROUS

Material	Axial ↓	Radial →	3/16		1/4		5/16		3/8		1/2		5/8		3/4	
			RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	0.5 X D	0.7 X D	12000	169	12000	227	12000	283	12000	341	12000	454	12000	568	12000	680
	1 X D	.6 X D	12000	155	12000	208	12000	260	12000	312	12000	416	12000	520	12000	624
	2 X D	.4 X D	12000	141	12000	189	12000	236	12000	284	12000	378	12000	473	12000	567
	0.5 X D	0.7 X D	12000	140	12000	188	12000	235	12000	282	12000	376	12000	470	12000	564
	1 X D	.6 X D	12000	133	12000	179	12000	223	12000	268	12000	357	12000	447	12000	536
	2 X D	.4 X D	12000	127	12000	170	12000	212	12000	256	12000	340	12000	426	12000	510

## Series 1015

### AST 3 FLUTE SERIES NON-FERROUS

Material	Axial ↓	Radial →	3/16		1/4		5/16		3/8		1/2		5/8		3/4	
			RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	1 X D	1.0 X D	12000	98	12000	132	12000	165	12000	198	12000	263	12000	330	12000	395
	2 X D	1.0 X D	12000	74	12000	99	12000	124	12000	149	12000	198	12000	248	12000	297
	2 X D	.4 X D	12000	141	12000	189	12000	236	12000	284	12000	378	12000	473	12000	567
	1 X D	1.0 X D	12000	89	12000	119	12000	148	12000	178	12000	237	12000	297	12000	356
	2 X D	1.0 X D	12000	67	12000	89	12000	112	12000	134	12000	178	12000	223	12000	267
	2 X D	.4 X D	12000	127	12000	170	12000	212	12000	256	12000	340	12000	426	12000	510

## Series 1020

### AFT 3 FLUTE SERIES NON-FERROUS

Material	Axial ↓	Radial →	3/16		1/4		5/16		3/8		1/2		5/8		3/4	
			RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	2 X D	.05 X D	12000	101	12000	135	12000	168	12000	203	12000	270	12000	338	12000	405
	.05 X D	0.65 X D	12000	111	12000	149	12000	185	12000	223	12000	297	12000	372	12000	446
	2 X D	.05 X D	12000	91	12000	122	12000	151	12000	183	12000	243	12000	304	12000	365
	.05 X D	0.65 X D	12000	100	12000	134	12000	166	12000	201	12000	267	12000	335	12000	401

# SPEED & FEED GUIDE



Optimum Performance

## Series 1025, 1026

### GWA 3 FLUTE SERIES NON-FERROUS

Material	Axial ↓	Radial →	SFM	1/8		1/4		5/16		3/8		1/2		5/8		3/4	
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	.5 x D	1 x D	600	18336	66	9168	66	7334	79	6112	79	4584	83	3667	80	3056	80
	1.25 x D	.3 x D	720	22003	99	11002	96	8801	115	7334	115	5501	121	4401	116	3667	116
	1.5 x D	.1 x D	1200	36672	220	18336	193	14669	231	12224	231	9168	243	7334	233	6112	233
	.5 x D	1 x D	600	18336	55	9168	55	7334	66	6112	66	4584	69	3667	67	3056	67
	1.25 x D	.3 x D	720	22003	79	11002	79	8801	95	7334	95	5501	100	4401	96	3667	96
	1.5 x D	.1 x D	1200	36672	176	18336	165	14669	198	12224	198	9168	208	7334	200	6112	200

## Series 1027, 1028

### BNA 3 FLUTE SERIES NON-FERROUS

Material	Axial ↓	Radial →	SFM	1/8		1/4		5/16		3/8		1/2		5/8		3/4	
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	.5 x D	1 x D	600	18336	66	9168	66	7334	79	6112	79	4584	83	3667	80	3056	80
	1.25 x D	.3 x D	720	22003	99	11002	96	8801	115	7334	115	5501	121	4401	116	3667	116
	1.5 x D	.1 x D	1200	36672	220	18336	193	14669	231	12224	231	9168	243	7334	233	6112	233
	.5 x D	1 x D	600	18336	55	9168	55	7334	66	6112	66	4584	69	3667	67	3056	67
	1.25 x D	.3 x D	720	22003	79	11002	79	8801	95	7334	95	5501	100	4401	96	3667	96
	1.5 x D	.1 x D	1200	36672	176	18336	165	14669	198	12224	198	9168	208	7334	200	6112	200



# SPEED & FEED GUIDE



Optimum Performance

## Series 2010, 2012, 2014, 2015

250 2 FLUTE SERIES NON-FERROUS

Material	Axial ↓	Radial →	SFM	1/8		1/4		5/16		3/8		1/2		5/8		3/4	
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	.5 x D	1 x D	600	18336	44	9168	48	7334	53	6112	53	4584	55	3667	53	3056	53
	1.25 x D	.3 x D	720	22003	66	11002	70	8801	77	7334	77	5501	80	4401	77	3667	77
	1.5 x D	.1 x D	1200	36672	147	18336	150	14669	154	12224	154	9168	162	7334	155	6112	155
	.5 x D	1 x D	600	18336	37	9168	40	7334	44	6112	44	4584	46	3667	44	3056	44
	1.25 x D	.3 x D	720	22003	53	11002	56	8801	63	7334	63	5501	67	4401	64	3667	64
	1.5 x D	.1 x D	1200	36672	117	18336	121	14669	132	12224	132	9168	139	7334	133	6112	133

## Series 2030, 2031, 2047, 2032, 2050, 2053

350 3 FLUTE SERIES NON-FERROUS

Material	Axial ↓	Radial →	SFM	1/8		1/4		5/16		3/8		1/2		5/8		3/4	
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	.5 x D	1 x D	600	18336	66	9168	66	7334	79	6112	79	4584	83	3667	80	3056	80
	1.25 x D	.3 x D	720	22003	99	11002	96	8801	115	7334	115	5501	121	4401	116	3667	116
	1.5 x D	.1 x D	1200	36672	220	18336	193	14669	231	12224	231	9168	243	7334	233	6112	233
	.5 x D	1 x D	600	18336	55	9168	55	7334	66	6112	66	4584	69	3667	67	3056	67
	1.25 x D	.3 x D	720	22003	79	11002	79	8801	95	7334	95	5501	100	4401	96	3667	96
	1.5 x D	.1 x D	1200	36672	176	18336	165	14669	198	12224	198	9168	208	7334	200	6112	200

## Series 2060

550 5 FLUTE SERIES NON-FERROUS

Material	Axial ↓	Radial →	SFM	1/8		1/4		5/16		3/8		1/2		5/8		3/4	
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	.5 x D	.5 x D	600	18336	110	9168	110	7334	132	6112	132	4584	139	3667	133	3056	133
	1.25 x D	.3 x D	720	22003	165	11002	160	8801	191	7334	191	5501	201	4401	193	3667	193
	1.5 x D	.1 x D	1200	36672	367	18336	321	14669	385	12224	385	9168	404	7334	388	6112	388
	.5 x D	.5 x D	600	18336	92	9168	92	7334	110	6112	110	4584	116	3667	111	3056	111
	1.25 x D	.3 x D	720	22003	132	11002	132	8801	158	7334	158	5501	166	4401	160	3667	160
	1.5 x D	.1 x D	1200	36672	293	18336	275	14669	330	12224	330	9168	347	7334	333	6112	333

# SPEED & FEED GUIDE



Optimum Performance

## Series 1030, 1032

HGW4

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
				<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	6723	13	3362	13	2241	16	1681	17
1.25 x D	.3 x D	<b>264</b>	8068			19	4034	19	2689	23	2017	24	1614	23	1345	21
1.5 X D	.1 x D	<b>343</b>	10488			42	5244	42	3496	50	2622	53	2098	51	1748	47
<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>		5501	21	2750	16	1834	13	1375	13	1100	13	917	12
	1.25 x D	.3 x D	<b>225</b>		6876	31	3438	24	2292	19	1719	20	1375	19	1146	17
	1.5 X D	.1 x D	<b>270</b>		8251	63	4126	47	2750	38	2063	40	1650	38	1375	35
<b>Tool Steel</b> A2 ,A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>		5501	10	2750	10	1834	13	1375	13	1100	13	917	12
	1.25 x D	.3 x D	<b>225</b>		6876	16	3438	16	2292	19	1719	20	1375	19	1146	17
	1.5 X D	.1 x D	<b>270</b>		8251	31	4126	31	2750	38	2063	40	1650	38	1375	35
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	1 x D	<b>140</b>	4278	7	2139	7	1426	8	1070	9	856	8	713	8
		1.25 x D	.3 x D	<b>185</b>	5654	11	2827	11	1885	13	1413	14	1131	13	942	12
		1.5 x D	.1 x D	<b>230</b>	7039	23	3519	23	2346	28	1760	29	1408	28	1173	25
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-6	2 X D	0.07 X D	<b>393 - 800</b>	12000	50	10696	107	7131	107	5348	107	4270	107	4075	107
		1.5 X D	0.15 X D	<b>393 - 800</b>	12000	55	10696	118	7131	118	5348	118	4270	118	4075	118
		1.0 X D	0.25 X D	<b>393 - 800</b>	12000	62	10696	132	7131	132	5348	132	4270	132	4075	132
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, A286, Waspalloy, CoCr	2 X D	0.1 X D	<b>93 - 125</b>	3820	8	1910	8	1273	5	955	8	764	8	477	6
		1.5 X D	0.15	<b>84 - 112</b>	3438	6	1719	6	1146	4	860	6	688	6	429	5
		1.0 X D	0.25	<b>70-90</b>	2865	5	1433	5	955	3	716	5	573	5	358	4

# SPEED & FEED GUIDE

Optimum Performance



## Series 1035, 1037

HGW5

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	6723	17	3362	17	2241	20	1681	21	1345	20	1121	19
		1.25 x D	.3 x D	<b>264</b>	8068	24	4034	24	2689	29	2017	30	1614	29	1345	27
		1.5 X D	.1 x D	<b>343</b>	10488	52	5244	52	3496	63	2622	66	2098	63	1748	58
	<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>	5501	16	2750	20	1834	16	1375	16	1100	16	917	14
		1.25 x D	.3 x D	<b>225</b>	6876	24	3438	29	2292	24	1719	25	1375	24	1146	22
		1.5 X D	.1 x D	<b>270</b>	8251	47	4126	59	2750	47	2063	49	1650	47	1375	43
	<b>Tool Steel</b> A2, A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>	5501	13	2750	13	1834	16	1375	16	1100	16	917	14
		1.25 x D	.3 x D	<b>225</b>	6876	20	3438	20	2292	24	1719	25	1375	24	1146	22
		1.5 X D	.1 x D	<b>270</b>	8251	39	4126	39	2750	47	2063	49	1650	47	1375	43
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	1 x D	<b>140</b>	4278	9	2139	9	1426	10	1070	11	856	11	713	10
		1.25 x D	.3 x D	<b>185</b>	5654	14	2827	14	1885	17	1413	17	1131	17	942	15
		1.5 x D	.1 x D	<b>230</b>	7039	29	3519	29	2346	34	1760	36	1408	35	1173	32
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-6	2 X D	0.07 X D	<b>393 - 800</b>	12000	60	10696	107	7131	107	5348	107	4270	107	4075	107
		1.5 X D	0.15 X D	<b>393 - 800</b>	12000	66	10696	120	7131	120	5348	120	4270	120	4075	120
		1.0 X D	0.25 X D	<b>393 - 800</b>	12000	74	10696	150	7131	150	5348	150	4270	150	4075	150
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, A286, Waspalloy, CoCr	2 X D	0.07 X D	<b>93 - 125</b>	3820	10	1910	8	1273	5	955	8	764	8	477	6
		1.5 X D	0.15 X D	<b>84 - 112</b>	3438	8	1719	6	1146	4	860	6	688	6	429	5
		1.0 X D	0.25 X D	<b>70-90</b>	2865	6	1433	5	955	3	716	5	573	5	358	4

# SPEED & FEED GUIDE



Optimum Performance

## Series 1040, 1043

HGW7

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	6723	24	3362	24	2241	28	1681	30	1345	28	1121	26
		1.25 x D	.3 x D	<b>264</b>	8068	34	4034	34	2689	41	2017	43	1614	41	1345	38
		1.5 X D	.1 x D	<b>343</b>	10488	73	5244	73	3496	88	2622	93	2098	89	1748	81
	<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>	5501	37	2750	27	1834	22	1375	23	1100	22	917	20
		1.25 x D	.3 x D	<b>225</b>	6876	55	3438	41	2292	33	1719	35	1375	33	1146	30
		1.5 X D	.1 x D	<b>270</b>	8251	110	4126	82	2750	66	2063	69	1650	66	1375	61
	<b>Tool Steel</b> A2 ,A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>	5501	18	2750	18	1834	22	1375	23	1100	22	917	20
		1.25 x D	.3 x D	<b>225</b>	6876	27	3438	27	2292	33	1719	35	1375	33	1146	30
		1.5 X D	.1 x D	<b>270</b>	8251	55	4126	55	2750	66	2063	69	1650	66	1375	61
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	1 x D	<b>140</b>	4278	12	2139	12	1426	15	1070	15	856	15	713	14
		1.25 x D	.3 x D	<b>185</b>	5654	19	2827	19	1885	23	1413	24	1131	23	942	21
		1.5 x D	.1 x D	<b>230</b>	7039	40	3519	40	2346	48	1760	51	1408	49	1173	44
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-6	2 X D	0.07 X D	<b>393 - 800</b>	12000	70	10696	107	7131	107	5348	107	4270	107	4075	107
		1.5 X D	0.15 X D	<b>393 - 800</b>	12000	80	10696	122	7131	122	5348	122	4270	122	4075	122
		1.0 X D	0.25 X D	<b>393 - 800</b>	12000	96	10696	146	7131	146	5348	146	4270	146	4075	146
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, A286, Waspalloy, CoCr	2 X D	0.07 X D	<b>93 - 125</b>	3820	10	1910	8	1273	5	955	8	764	8	477	6
		1.5 X D	0.15 X D	<b>84 - 112</b>	3438	8	1719	6	1146	4	860	6	688	6	429	5
		1.0 X D	0.25 X D	<b>70-90</b>	2865	6	1433	5	955	3	716	5	573	5	358	4

# SPEED & FEED GUIDE



Optimum Performance

## Series 1031

SRF4 4-FLUTE

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	6723	13	3362	13	2241	16	1681	17	1345	16	1121	15
		1.25 x D	.3 x D	<b>264</b>	8068	19	4034	19	2689	23	2017	24	1614	23	1345	21
		1.5 X D	.1 x D	<b>343</b>	10488	42	5244	42	3496	50	2622	53	2098	51	1748	47
	<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>	5501	21	2750	16	1834	13	1375	13	1100	13	917	12
		1.25 x D	.3 x D	<b>225</b>	6876	31	3438	24	2292	19	1719	20	1375	19	1146	17
		1.5 X D	.1 x D	<b>270</b>	8251	63	4126	47	2750	38	2063	40	1650	38	1375	35
	<b>Tool Steel</b> A2, A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>	5501	10	2750	10	1834	13	1375	13	1100	13	917	12
		1.25 x D	.3 x D	<b>225</b>	6876	16	3438	16	2292	19	1719	20	1375	19	1146	17
		1.5 X D	.1 x D	<b>270</b>	8251	31	4126	31	2750	38	2063	40	1650	38	1375	35
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	<b>140</b>	4278	7	2139	7	1426	8	1070	9	856	8	713	8
		1.25 x D	.3 x D	<b>185</b>	5654	11	2827	11	1885	13	1413	14	1131	13	942	12
		1.5 x D	.1 x D	<b>230</b>	7039	23	3519	23	2346	28	1760	29	1408	28	1173	25
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-5	2 X D	0.07 X D	<b>393 - 800</b>	12000	50	10696	107	7131	107	5348	107	4270	107	4075	107
		1.5 X D	0.15 X D	<b>393 - 800</b>	12000	55	10696	118	7131	118	5348	118	4270	118	4075	118
		1.0 X D	0.25 X D	<b>393 - 800</b>	12000	62	10696	132	7131	132	5348	132	4270	132	4075	132
<b>K</b>	<b>Cast Iron- Grey,</b> GG-10, GG-40	1 x D	1 x D	<b>100</b>	3056	6	1528	6	1019	7	764	7	611	7	509	6
		1.25 x D	.3 x D	<b>125</b>	3820	8	1910	8	1273	10	955	10	764	10	637	9
		1.5 X D	.1 x D	<b>163</b>	4966	18	2483	18	1655	22	1242	23	993	22	828	20
	<b>Cast Iron- Ductile</b> GGG-40, GGG-70	.75 x D	1 x D	<b>155</b>	4737	8	2368	8	1579	10	1184	10	947	10	789	9
		1.25 x D	.3 x D	<b>180</b>	5501	11	2750	11	1834	14	1375	14	1100	14	917	13
		1.5 x D	.1 x D	<b>216</b>	6601	23	3300	23	2200	27	1650	29	1320	27	1100	25
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, A286, CoCr	2 X D	0.1 X D	<b>93 - 125</b>	3820	8	1910	8	1273	5	955	8	764	8	477	6
		1.5 X D	0.15	<b>84 - 112</b>	3438	6	1719	6	1146	4	860	6	688	6	429	5
		1.0 X D	0.25	<b>70-90</b>	2865	5	1433	5	955	3	716	5	573	5	358	4

# SPEED & FEED GUIDE



Optimum Performance

## Series 1050

Speed & Feed Recommendations for 3-D Machining with GWS Ball End Mills

### Speeds

Diameter	Roughing & Semi-finishing			Finishing		
	RPM			RPM		
	30-40HRC	40-50HRC	50-60 HRC	30-40 HRC	40-50HRC	50-60HRC
1/32	38,400 - 60,000	32,000 - 50,000	24,600 - 40,000	20,000 - 50,000	20,000 - 50,000	20,000 - 50,000
1/16	26,400 - 42,000	22,000 - 35,000	16,600 - 28,000	20,000 - 50,000	20,000 - 50,000	20,000 - 50,000
3/32	21,600 - 31,200	18,000 - 26,000	13,400 - 20,800	20,000 - 50,000	20,000 - 50,000	20,000 - 50,000
1/8	19,200 - 28,800	16,000 - 24,000	11,800 - 19,200	20,000 - 38,000	20,000 - 50,000	20,000 - 30,500
3/16	15,000 - 19,776	12,500 - 16,480	9,000 - 13,184	20,000 - 26,000	20,000 - 34,000	16,000 - 20,300
1/4	12,120 - 16,800	10,100 - 14,000	7,080 - 11,200	15,000 - 18,000	18,000 - 24,400	12,000 - 15,000
5/16	11,400 - 15,900	9,200 - 13,250	6,360 - 10,600	12,000 - 14,000	14,600 - 19,000	9,700 - 12,000
3/8	10,560 - 14,520	8,800 - 12,100	6,040 - 9,680	10,000 - 12,000	12,000 - 16,200	8,100 - 10,000
7/16	9,480 - 12,480	7,900 - 10,400	5,320 - 8,320	8,700 - 10,400	10,000 - 13,900	6,900 - 8,700
1/2	8,280 - 10,920	6,900 - 9,100	4,520 - 7,280	7,800 - 9,800	9,100 - 12,200	6,100 - 7,600

### Chip Load per Tooth

Diameter	30-40 HRC		40-50 HRC		50-60HRC	
	Rough & Semi	Finishing	Rough&Semi	Finishing	Rough & Semi	Finishing
1/32	0.0006 - 0.0010	0.0006 - 0.0009	0.0006 - 0.0008	0.0005 - 0.0007	0.0004 - 0.0007	0.0004 - 0.0006
1/16	0.0012 - 0.0016	0.0010 - 0.0015	0.0010 - 0.0015	0.0010 - 0.0014	0.0008 - 0.0012	0.0007 - 0.0010
3/32	0.0020 - 0.0025	0.0014 - 0.0024	0.0015 - 0.0022	0.0014 - 0.0020	0.0012 - 0.0020	0.0010 - 0.0014
1/8	0.0025 - 0.0030	0.0019 - 0.0028	0.0020 - 0.0027	0.0019 - 0.0026	0.0017 - 0.0022	0.0015 - 0.0020
3/16	0.0035 - 0.0043	0.0032 - 0.0042	0.0032 - 0.0041	0.0030 - 0.0040	0.0030 - 0.0039	0.0023 - 0.0031
1/4	0.0050 - 0.0060	0.0040 - 0.0053	0.0050 - 0.0057	0.0040 - 0.0051	0.0040 - 0.0050	0.0038 - 0.0048
5/16	0.0063 - 0.0070	0.0053 - 0.0068	0.0052 - 0.0066	0.0052 - 0.0063	0.0051 - 0.0062	0.0046 - 0.0054
3/8	0.0070 - 0.0080	0.0062 - 0.0079	0.0062 - 0.0077	0.0054 - 0.0065	0.0060 - 0.0072	0.0050 - 0.0061
7/16	0.0080 - 0.0087	0.0068 - 0.0086	0.0068 - 0.0084	0.0060 - 0.0078	0.0066 - 0.0080	0.0053 - 0.0070
1/2	0.0087 - 0.0100	0.0080 - 0.0094	0.0080 - 0.0092	0.0070 - 0.0090	0.0078 - 0.0090	0.0062 - 0.0081

#### Axial Depth of Cut

30 - 40 HRC = 0.10 X Diameter

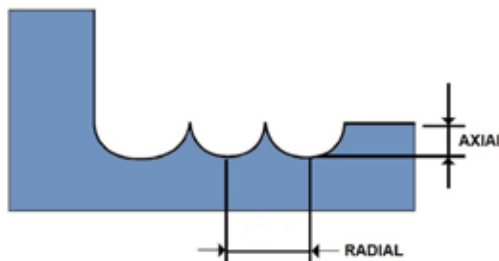
40 - 50 HRC = 0.07 X Diameter

50 - 60 HRC = 0.05 X Diameter

#### Radial Depth of Cut

Roughing - 0.35 X Diameter

Finishing = 0.02 - 0.05 X Diameter



# SPEED & FEED GUIDE



Optimum Performance

## Series 2100,2105, 2115, 2117

438 4 FLUTE

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	6723	13	3362	13	2241	16	1681	17	1345	16	1121	15
		1.25 x D	.3 x D	<b>264</b>	8068	19	4034	19	2689	23	2017	24	1614	23	1345	21
		1.5 X D	.1 x D	<b>343</b>	10488	42	5244	42	3496	50	2622	53	2098	51	1748	47
	<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>	5501	21	2750	16	1834	13	1375	13	1100	13	917	12
		1.25 x D	.3 x D	<b>225</b>	6876	31	3438	24	2292	19	1719	20	1375	19	1146	17
		1.5 X D	.1 x D	<b>270</b>	8251	63	4126	47	2750	38	2063	40	1650	38	1375	35
	<b>Tool Steel</b> A2 ,A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>	5501	10	2750	10	1834	13	1375	13	1100	13	917	12
		1.25 x D	.3 x D	<b>225</b>	6876	16	3438	16	2292	19	1719	20	1375	19	1146	17
		1.5 X D	.1 x D	<b>270</b>	8251	31	4126	31	2750	38	2063	40	1650	38	1375	35
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	<b>140</b>	4278	7	2139	7	1426	8	1070	9	856	8	713	8
		1.25 x D	.3 x D	<b>185</b>	5654	11	2827	11	1885	13	1413	14	1131	13	942	12
		1.5 x D	.1 x D	<b>230</b>	7039	23	3519	23	2346	28	1760	29	1408	28	1173	25
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-5	0.5	1 x D	<b>115</b>	3514	5	1757	5	1171	7	879	7	703	7	586	6
		1.25 x D	.3 x D	<b>180</b>	5501	10	2750	10	1834	12	1375	13	1100	12	917	11
		1.5 x D	.1 x D	<b>250</b>	7640	24	3820	24	2547	28	1910	30	1528	29	1273	26
<b>K</b>	<b>Cast Iron - Grey</b> GG-10 to GG-40	1 x D	1 x D	<b>100</b>	3056	6	1528	6	1019	7	764	7	611	7	509	6
		1.25 x D	.3 x D	<b>125</b>	3820	8	1910	8	1273	10	955	10	764	10	637	9
		1.5 X D	.1 x D	<b>163</b>	4966	18	2483	18	1655	22	1242	23	993	22	828	20
	<b>Cast Iron- Ductile</b> GGG-40, to GGG-70	.75 x D	1 x D	<b>155</b>	4737	8	2368	8	1579	10	1184	10	947	10	789	9
		1.25 x D	.3 x D	<b>180</b>	5501	11	2750	11	1834	14	1375	14	1100	14	917	13
		1.5 x D	.1 x D	<b>216</b>	6601	23	3300	23	2200	27	1650	29	1320	27	1100	25
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, Waspalloy, A286, CoCr	.25 x D	.4 x D	<b>70</b>	2139	3	1070	3	713	4	535	4	428	4	357	3
		1.25 x D	.2 x D	<b>80</b>	2445	4	1222	4	815	5	611	5	489	5	407	5
		1.5 x D	.07 x D	<b>125</b>	3820	11	1910	11	1273	13	955	14	764	14	637	12
	<b>Titanium Alloy</b> Ti-6Al4V Grades (5-38)	0.5	1 x D	<b>180</b>	5501	8	2750	8	1834	9	1375	10	1100	9	917	9
		1.25 x D	.3 x D	<b>225</b>	6876	12	3438	12	2292	14	1719	15	1375	14	1146	13
		1.5 x D	.1 x D	<b>360</b>	11002	31	5501	31	3667	37	2750	39	2200	37	1834	34



# SPEED & FEED GUIDE



Optimum Performance

## Series 2205, 2213

538 5 FLUTE

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	6723	17	3362	17	2241	20	1681	21	1345	20	1121	19
		1.25 x D	.3 x D	<b>264</b>	8068	24	4034	24	2689	29	2017	30	1614	29	1345	27
		1.5 X D	.1 x D	<b>343</b>	10488	52	5244	52	3496	63	2622	66	2098	63	1748	58
	<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>	5501	16	2750	20	1834	16	1375	16	1100	16	917	14
		1.25 x D	.3 x D	<b>225</b>	6876	24	3438	29	2292	24	1719	25	1375	24	1146	22
		1.5 X D	.1 x D	<b>270</b>	8251	47	4126	59	2750	47	2063	49	1650	47	1375	43
	<b>Tool Steel</b> A2 ,A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>	5501	13	2750	13	1834	16	1375	16	1100	16	917	14
		1.25 x D	.3 x D	<b>225</b>	6876	20	3438	20	2292	24	1719	25	1375	24	1146	22
		1.5 X D	.1 x D	<b>270</b>	8251	39	4126	39	2750	47	2063	49	1650	47	1375	43
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	<b>140</b>	4278	9	2139	9	1426	10	1070	11	856	11	713	10
		1.25 x D	.3 x D	<b>185</b>	5654	14	2827	14	1885	17	1413	17	1131	17	942	15
		1.5 x D	.1 x D	<b>230</b>	7039	29	3519	29	2346	34	1760	36	1408	35	1173	32
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-5	0.5	1 x D	<b>115</b>	3514	7	1757	7	1171	8	879	9	703	8	586	8
		1.25 x D	.3 x D	<b>180</b>	5501	13	2750	13	1834	15	1375	16	1100	15	917	14
		1.5 x D	.1 x D	<b>250</b>	7640	30	3820	30	2547	35	1910	37	1528	36	1273	33
<b>K</b>	<b>Cast Iron - Grey</b> GG-10 to GG-40	1 x D	1 x D	<b>100</b>	3056	7	1528	7	1019	8	764	9	611	8	509	8
		1.25 x D	.3 x D	<b>125</b>	3820	10	1910	10	1273	12	955	13	764	13	637	11
		1.5 X D	.1 x D	<b>163</b>	4966	22	2483	22	1655	27	1242	28	993	27	828	25
	<b>Cast Iron- Ductile</b> GGG-40, to GGG-70	.75 x D	1 x D	<b>155</b>	4737	10	2368	10	1579	12	1184	13	947	12	789	11
		1.25 x D	.3 x D	<b>180</b>	5501	14	2750	14	1834	17	1375	18	1100	17	917	16
		1.5 x D	.1 x D	<b>216</b>	6601	28	3300	28	2200	34	1650	36	1320	34	1100	31
<b>S</b>	<b>High Temp Alloys Inconel</b> 718, Hastalloy, Waspalloy, A286, CoCr	.25 x D	.4 x D	<b>70</b>	2139	4	1070	4	713	5	535	5	428	5	357	4
		1.25 x D	.2 x D	<b>80</b>	2445	5	1222	5	815	6	611	7	489	7	407	6
		1.5 x D	.07 x D	<b>125</b>	3820	14	1910	14	1273	17	955	18	764	17	637	16
	<b>Titanium Alloy</b> Ti-6Al4V Grades (5-38)	0.5	1 x D	<b>180</b>	5501	10	2750	10	1834	12	1375	12	1100	12	917	11
		1.25 x D	.3 x D	<b>225</b>	6876	14	3438	14	2292	17	1719	18	1375	17	1146	16
		1.5 x D	.1 x D	<b>360</b>	11002	38	5501	38	3667	46	2750	48	2200	46	1834	43

# SPEED & FEED GUIDE



Optimum Performance

## Series 2215

738 7 FLUTE

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	6723	24	3362	24	2241	28	1681	30	1345	28	1121	26
		1.25 x D	.3 x D	<b>264</b>	8068	34	4034	34	2689	41	2017	43	1614	41	1345	38
		1.5 x D	.1 x D	<b>343</b>	10488	73	5244	73	3496	88	2622	93	2098	89	1748	81
	<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>	5501	37	2750	27	1834	22	1375	23	1100	22	917	20
		1.25 x D	.3 x D	<b>225</b>	6876	55	3438	41	2292	33	1719	35	1375	33	1146	30
		1.5 x D	.1 x D	<b>270</b>	8251	110	4126	82	2750	66	2063	69	1650	66	1375	61
	<b>Tool Steel</b> A2 ,A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>	5501	18	2750	18	1834	22	1375	23	1100	22	917	20
		1.25 x D	.3 x D	<b>225</b>	6876	27	3438	27	2292	33	1719	35	1375	33	1146	30
		1.5 x D	.1 x D	<b>270</b>	8251	55	4126	55	2750	66	2063	69	1650	66	1375	61
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	<b>140</b>	4278	12	2139	12	1426	15	1070	15	856	15	713	14
		1.25 x D	.3 x D	<b>185</b>	5654	19	2827	19	1885	23	1413	24	1131	23	942	21
		1.5 x D	.1 x D	<b>230</b>	7039	40	3519	40	2346	48	1760	51	1408	49	1173	44
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-5	0.5	1 x D	<b>115</b>	3514	10	1757	10	1171	11	879	12	703	12	586	11
		1.25 x D	.3 x D	<b>180</b>	5501	18	2750	18	1834	21	1375	23	1100	22	917	20
		1.5 x D	.1 x D	<b>250</b>	7640	41	3820	41	2547	50	1910	52	1528	50	1273	46
<b>K</b>	<b>Cast Iron - Grey,</b> GG-10 to GG-40	1 x D	1 x D	<b>100</b>	3056	10	1528	10	1019	12	764	12	611	12	509	11
		1.25 x D	.3 x D	<b>125</b>	3820	14	1910	14	1273	17	955	18	764	18	637	16
		1.5 x D	.1 x D	<b>163</b>	4966	31	2483	31	1655	38	1242	40	993	38	828	35
	<b>Cast Iron - Ductile</b> GGG-40, to GGG-70	.75 x D	1 x D	<b>155</b>	4737	14	2368	14	1579	17	1184	18	947	17	789	16
		1.25 x D	.3 x D	<b>180</b>	5501	20	2750	20	1834	24	1375	25	1100	24	917	22
		1.5 x D	.1 x D	<b>216</b>	6601	40	3300	40	2200	48	1650	50	1320	48	1100	44
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, Waspalloy, A286, CoCr	.25 x D	.4 x D	<b>70</b>	2139	6	1070	6	713	7	535	7	428	7	357	6
		1.25 x D	.2 x D	<b>80</b>	2445	8	1222	8	815	9	611	10	489	9	407	8
		1.5 x D	.07 x D	<b>125</b>	3820	20	1910	20	1273	24	955	25	764	24	637	22
	<b>Titanium Alloy</b> Ti-6Al4V Grades (5-38)	0.5	1 x D	<b>180</b>	5501	13	2750	13	1834	16	1375	17	1100	16	917	15
		1.25 x D	.3 x D	<b>225</b>	6876	20	3438	20	2292	24	1719	25	1375	24	1146	22
		1.5 x D	.1 x D	<b>360</b>	11002	54	5501	54	3667	65	2750	68	2200	65	1834	60

# SPEED & FEED GUIDE



Optimum Performance

## Series 2220, 2223

440V 440VBN 4 FLUTE

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	3362	10	2241	17	2241	17	1681	18	1345	18	1121	16
		1.25 x D	.3 x D	<b>264</b>	4034	15	2689	25	2689	25	2017	26	1614	25	1345	23
		1.5 X D	.1 x D	<b>343</b>	5244	31	3496	55	3496	55	2622	57	2098	55	1748	50
	<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>	2750	8	1834	14	1834	14	1375	14	1100	14	917	13
		1.25 x D	.3 x D	<b>225</b>	3438	12	2292	20	2292	20	1719	21	1375	21	1146	19
		1.5 X D	.1 x D	<b>270</b>	4126	24	2750	41	2750	41	2063	43	1650	41	1375	38
	<b>Tool Steel</b> A2 ,A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>	2750	6	1630	10	1834	10	1375	11	1100	10	917	9
		1.25 x D	.3 x D	<b>225</b>	3438	10	2037	18	2292	18	1719	19	1375	18	1146	17
		1.5 X D	.1 x D	<b>270</b>	4126	17	2445	29	2750	29	2063	30	1650	29	1375	26
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	<b>140</b>	2139	5	1426	9	1426	9	1070	10	856	9	713	8
		1.25 x D	.3 x D	<b>185</b>	2827	8	1885	14	1885	14	1413	15	1131	14	942	13
		1.5 x D	.1 x D	<b>230</b>	3519	17	2346	30	2346	30	1760	31	1408	30	1173	28
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-5	0.5	1 x D	<b>115</b>	1757	4	1171	7	1171	7	879	7	703	7	586	7
		1.25 x D	.3 x D	<b>180</b>	2750	8	1834	13	1834	13	1375	14	1100	13	917	12
		1.5 x D	.1 x D	<b>250</b>	3820	18	2547	31	2547	31	1910	32	1528	31	1273	28
<b>K</b>	<b>Cast Iron - Grey,</b> GG-10 to GG-40	1 x D	1 x D	<b>100</b>	1528	4	1019	7	1019	7	764	8	611	7	509	7
		1.25 x D	.3 x D	<b>125</b>	1910	6	1273	11	1273	11	955	11	764	11	637	10
		1.5 X D	.1 x D	<b>163</b>	2483	13	1655	23	1655	23	1242	24	993	23	828	22
	<b>Cast Iron- Ductile</b> GGG-40, to GGG-70	.75 x D	1 x D	<b>155</b>	2368	6	1579	11	1579	11	1184	11	947	11	789	10
		1.25 x D	.3 x D	<b>180</b>	2750	8	1834	15	1834	15	1375	15	1100	15	917	14
		1.5 x D	.1 x D	<b>216</b>	3300	17	2200	29	2200	29	1650	31	1320	30	1100	27
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, Waspalloy, A286, CoCr	.25 x D	.4 x D	<b>70</b>	1070	2	713	4	713	4	535	4	428	4	357	4
		1.25 x D	.2 x D	<b>80</b>	1222	3	815	6	815	6	611	6	489	6	407	5
		1.5 x D	.07 x D	<b>125</b>	1910	8	1273	15	1273	15	955	15	764	15	637	13
	<b>Titanium Alloy</b> Ti-6Al4V Grades (5-38)	0.5	1 x D	<b>180</b>	2750	6	1834	10	1834	10	1375	10	1100	10	917	9
		1.25 x D	.3 x D	<b>225</b>	3438	9	2292	15	2292	15	1719	16	1375	15	1146	14
		1.5 x D	.1 x D	<b>360</b>	5501	23	3667	40	3667	40	2750	42	2200	40	1834	37

# SPEED & FEED GUIDE



Optimum Performance

## Series 2225

540V 5-FLUTE

Material	Axial ↓	Radial →	SFM	1/4		1/8		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	<b>220</b>	3362	17	2689	20	2241	30	1681	32	1345	30	1121	28
		1.25 x D	.3 x D	<b>264</b>	4034	24	3227	29	2689	44	2017	46	1614	44	1345	40
		1.5 X D	.1 x D	<b>343</b>	5244	52	4195	63	3496	94	2622	99	2098	95	1748	87
	<b>Alloy Steel</b> 4140, 8620	1 x D	1 x D	<b>180</b>	2750	13	2200	16	1834	24	1375	25	1100	24	917	22
		1.25 x D	.3 x D	<b>225</b>	3438	20	2750	24	2292	35	1719	37	1375	36	1146	33
		1.5 X D	.1 x D	<b>270</b>	4126	39	3300	47	2750	71	2063	74	1650	71	1375	65
	<b>Tool Steel</b> A2 ,A3, D2, H11, H13	1 x D	.5 x D	<b>180</b>	2445	6	1956	7	1630	10	1222	11	978	10	815	9
		1.25 x D	.3 x D	<b>225</b>	3056	10	2445	13	2037	18	1528	19	1222	18	1019	17
		1.5 X D	.1 x D	<b>270</b>	3667	17	2934	20	2445	29	1834	30	1467	29	1222	26
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	<b>140</b>	2139	9	1711	10	1426	16	1070	16	856	16	713	14
		1.25 x D	.3 x D	<b>185</b>	2827	14	2261	17	1885	25	1413	26	1131	25	942	23
		1.5 x D	.1 x D	<b>230</b>	3519	29	2815	34	2346	52	1760	54	1408	52	1173	48
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-5	0.5	1 x D	<b>115</b>	1757	7	1406	8	1171	12	879	13	703	12	586	11
		1.25 x D	.3 x D	<b>180</b>	2750	13	2200	15	1834	23	1375	24	1100	23	917	21
		1.5 x D	.1 x D	<b>250</b>	3820	30	3056	35	2547	53	1910	56	1528	54	1273	49
<b>K</b>	<b>Cast Iron - Grey</b> GG-10 to GG-40	1 x D	1 x D	<b>100</b>	1528	7	1222	8	1019	12	764	13	611	13	509	11
		1.25 x D	.3 x D	<b>125</b>	1910	10	1528	12	1273	19	955	20	764	19	637	17
		1.5 X D	.1 x D	<b>163</b>	2483	22	1986	27	1655	40	1242	42	993	41	828	37
	<b>Cast Iron- Ductile</b> GGG-40, to GGG-70	.75 x D	1 x D	<b>155</b>	2368	10	1895	12	1579	18	1184	19	947	18	789	17
		1.25 x D	.3 x D	<b>180</b>	2750	14	2200	17	1834	25	1375	27	1100	26	917	24
		1.5 x D	.1 x D	<b>216</b>	3300	28	2640	34	2200	51	1650	53	1320	51	1100	47
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, Waspalloy, A286, CoCr	.25 x D	.4 x D	<b>70</b>	1070	4	856	5	713	7	535	7	428	7	357	7
		1.25 x D	.2 x D	<b>80</b>	1222	5	978	6	815	10	611	10	489	10	407	9
		1.5 x D	.07 x D	<b>125</b>	1910	14	1528	17	1273	25	955	27	764	25	637	23
	<b>Titanium Alloy</b> Ti-6Al4V Grades (5-38)	0.5	1 x D	<b>180</b>	2750	10	2200	12	1834	17	1375	18	1100	17	917	16
		1.25 x D	.3 x D	<b>225</b>	3438	14	2750	17	2292	26	1719	27	1375	26	1146	24
		1.5 x D	.1 x D	<b>360</b>	5501	38	4401	46	3667	69	2750	73	2200	70	1834	64

# SPEED & FEED GUIDE



Optimum Performance

## Series 2230

437

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 2XX, 13XX	1 x D	.3 x D	<b>220</b>	6723	13	3362	13	2241	16	1681	17	1345	16	1121	15
		1.25 x D	.2 x D	<b>264</b>	8068	19	4034	194	2689	23	2017	24	1614	23	1345	21
		1.5 x D	.08 x D	<b>317</b>	9681	39	4841	39	3227	45	2420	47	1936	46	1614	42
		1.5 x D	.05 x D	<b>380</b>	11618	60	5809	51	3873	59	2904	62	2324	59	1936	54
	<b>Alloy Steel</b> 4140, 8620	1 x D	.3 x D	<b>180</b>	5501	11	2750	15	1834	13	1375	14	1100	13	917	12
		1.25 x D	.2 x D	<b>225</b>	6876	17	3438	23	2292	20	1719	21	1375	20	1146	18
		1.5 x D	.08 x D	<b>270</b>	8251	33	4126	462	2750	39	2063	40	1650	39	1375	36
		1.5 x D	.05 x D	<b>297</b>	9076	47	4538	54	3025	46	2269	48	1815	46	1513	42
	<b>Tool Steel</b> A2 ,A3, D2, H11, H13	.5 x D	.3 x D	<b>160</b>	4890	10	2445	14	1630	12	1222	12	978	12	815	11
		1.0 x D	.2 x D	<b>200</b>	6112	15	3056	21	2037	18	1528	18	1222	18	1019	16
		1.5 x D	.08 x D	<b>240</b>	7334	29	3667	411	2445	34	1834	36	1467	35	1222	32
		1.5 x D	.05 x D	<b>264</b>	8068	42	4034	48	2689	41	2017	43	1614	41	1345	38
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	.3 x D	<b>140</b>	4278	9	2139	7	1426	10	1070	11	856	10	713	9
		1.25 x D	.2 x D	<b>185</b>	5654	14	2827	11	1885	16	1413	17	1131	16	942	15
		1.5 x D	.08 x D	<b>230</b>	7039	28	3519	23	2346	33	1760	34	1408	33	1173	30
		1.5 x D	.05 x D	<b>276</b>	8446	44	4223	34	2815	43	2112	45	1689	43	1408	40
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-6	.5 x D	.3 x D	<b>115</b>	3514	7	1757	6	1171	7	879	7	703	7	586	6
		1.25 x D	.2 x D	<b>180</b>	5501	13	2750	11	1834	12	1375	12	1100	12	917	11
		1.5 x D	.08 x D	<b>250</b>	7640	31	3820	24	2547	26	1910	28	1528	27	1273	24
		1.5 x D	.05 x D	<b>300</b>	9168	48	4584	37	3056	44	2292	46	1834	44	1528	41
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, A286, Waspalloy, CoCr	.25 x D	.3 x D	<b>70</b>	2139	4	1070	3	713	4	535	4	428	4	357	4
		1 x D	.2 x D	<b>80</b>	2445	6	1222	5	815	5	611	5	489	5	407	5
		1.25 x D	.08 x D	<b>125</b>	3820	15	1910	12	1273	13	955	14	764	13	637	12
		1.5 x D	.05 x D	<b>160</b>	4890	25	2445	20	1630	23	1222	25	978	24	815	22

# SPEED & FEED GUIDE

Optimum Performance



## Series 2235

537

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
				<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	1 x D	.3 x D	<b>220</b>	6723	17	3362	17	2241	20	1681	21
1.25 x D	.2 x D	<b>264</b>	8068			24	4034	24	2689	29	2017	30	1614	29	1345	27
1.5 x D	.08 x D	<b>317</b>	9681			48	4841	48	3227	56	2420	59	1936	57	1614	52
1.5 x D	.05 x D	<b>380</b>	11618			76	5809	64	3873	74	2904	77	2324	74	1936	68
<b>Alloy Steel</b> 4140, 8620	1 x D	.3 x D	<b>180</b>		5501	14	2750	19	1834	17	1375	17	1100	17	917	15
	1.25 x D	.2 x D	<b>225</b>		6876	21	3438	29	2292	25	1719	26	1375	25	1146	23
	1.5 x D	.08 x D	<b>270</b>		8251	41	4126	57	2750	48	2063	51	1650	49	1375	44
	1.5 x D	.05 x D	<b>297</b>		9076	59	4538	68	3025	57	2269	60	1815	58	1513	53
<b>Tool Steel</b> A2, A3, D2, H11, H13	.5 x D	.3 x D	<b>160</b>		4890	12	2445	17	1630	15	1222	15	978	15	815	14
	1.0 x D	.2 x D	<b>200</b>		6112	18	3056	26	2037	22	1528	23	1222	22	1019	20
	1.5 x D	.08 x D	<b>240</b>		7334	37	3667	51	2445	43	1834	45	1467	43	1222	40
	1.5 x D	.05 x D	<b>264</b>		8068	52	4034	61	2689	51	2017	54	1614	52	1345	47
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	.3 x D	<b>140</b>	4278	11	2139	9	1426	13	1070	13	856	13	713	12
		1.25 x D	.2 x D	<b>185</b>	5654	17	2827	14	1885	20	1413	21	1131	21	942	19
		1.5 x D	.08 x D	<b>230</b>	7039	35	3519	28	2346	41	1760	43	1408	41	1173	38
		1.5 x D	.05 x D	<b>276</b>	8446	55	4223	42	2815	53	2112	56	1689	54	1408	49
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-6	.5 x D	.3 x D	<b>115</b>	3514	9	1757	7	1171	8	879	9	703	8	586	8
		1.25 x D	.2 x D	<b>180</b>	5501	17	2750	14	1834	15	1375	15	1100	15	917	14
		1.5 x D	.08 x D	<b>250</b>	7640	38	3820	31	2547	33	1910	35	1528	33	1273	31
		1.5 x D	.05 x D	<b>300</b>	9168	60	4584	46	3056	55	2292	58	1834	55	1528	51
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, A286, Waspalloy, CoCr	.25 x D	.3 x D	<b>70</b>	2139	5	1070	4	713	5	535	5	428	5	357	5
		1 x D	.2 x D	<b>80</b>	2445	7	1222	6	815	7	611	7	489	7	407	6
		1.25 x D	.08 x D	<b>125</b>	3820	19	1910	15	1273	17	955	17	764	17	637	15
		1.5 x D	.05 x D	<b>160</b>	4890	32	2445	24	1630	29	1222	31	978	30	815	27

# SPEED & FEED GUIDE



Optimum Performance

## Series 2240

TMF MULTI-FLUTE 815

	Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4	
					RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	.3 x D	220	6723	13	3362	13	2241	16	1681	17	1345	16	1121	15
		1.25 x D	.2 x D	264	8068	19	4034	194	2689	23	2017	24	1614	23	1345	21
		1.5 x D	.08 x D	317	9681	39	4841	39	3227	45	2420	47	1936	46	1614	42
		1.5 x D	.05 x D	380	11618	60	5809	51	3873	59	2904	62	2324	59	1936	54
	Alloy Steel 4140, 8620	1 x D	.3 x D	180	5501	11	2750	15	1834	13	1375	14	1100	13	917	12
		1.25 x D	.2 x D	225	6876	17	3438	23	2292	20	1719	21	1375	20	1146	18
		1.5 x D	.08 x D	270	8251	33	4126	462	2750	39	2063	40	1650	39	1375	36
		1.5 x D	.05 x D	297	9076	47	4538	54	3025	46	2269	48	1815	46	1513	42
	Tool Steel A2 ,A3, D2, H11, H13	.5 x D	.3 x D	160	4890	10	2445	14	1630	12	1222	12	978	12	815	11
		1.0 x D	.2 x D	200	6112	15	3056	21	2037	18	1528	18	1222	18	1019	16
		1.5 x D	.08 x D	240	7334	29	3667	411	2445	34	1834	36	1467	35	1222	32
		1.5 x D	.05 x D	264	8068	42	4034	48	2689	41	2017	43	1614	41	1345	38
M	SS 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	.3 x D	140	4278	9	2139	7	1426	10	1070	11	856	10	713	9
		1.25 x D	.2 x D	185	5654	14	2827	11	1885	16	1413	17	1131	16	942	15
		1.5 x D	.08 x D	230	7039	28	3519	23	2346	33	1760	34	1408	33	1173	30
		1.5 x D	.05 x D	276	8446	44	4223	34	2815	43	2112	45	1689	43	1408	40
	Precipitation SS 15-5, 16-6, 17-4, 17-6	.5 x D	.3 x D	115	3514	7	1757	6	1171	7	879	7	703	7	586	6
		1.25 x D	.2 x D	180	5501	13	2750	11	1834	12	1375	12	1100	12	917	11
		1.5 x D	.08 x D	250	7640	31	3820	24	2547	26	1910	28	1528	27	1273	24
		1.5 x D	.05 x D	300	9168	48	4584	37	3056	44	2292	46	1834	44	1528	41
S	High Temp Alloys Inconel 718, Hastalloy, A286, Waspalloy, CoCr	.25 x D	.3 x D	70	2139	4	1070	3	713	4	535	4	428	4	357	4
		1 x D	.2 x D	80	2445	6	1222	5	815	5	611	5	489	5	407	5
		1.25 x D	.08 x D	125	3820	15	1910	12	1273	13	955	14	764	13	637	12
		1.5 x D	.05 x D	160	4890	25	2445	20	1630	23	1222	25	978	24	815	22



# SPEED & FEED GUIDE



Optimum Performance

## Series 2245, 2250

TMF MULTI-FLUTE for Ti 840

Material	Axial ↓	Radial →	SFM	1/2			5/8			3/4		
				RPM	IPM	CPT	RPM	IPM	CPT	RPM	IPM	CPT
<b>P</b> Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	.5 x D	<b>220</b>	1681	32	0	1345	31	0	1121	35	0
	1.25 x D	.3 x D	<b>264</b>	2017	46	0	1614	45	0	1345	51	0
	1.5 x D	.1 x D	<b>343</b>	2622	100	0	2098	96	0	1748	110	0
	1.5 x D	.07 x D	<b>378</b>	2884	155	0	2307	148	0	1923	170	0
<b>M</b> SS 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	.5 x D	<b>140</b>	1070	18	0	856	17	0	713	19	0
	1.25 x D	.3 x D	<b>185</b>	1413	28	0	1131	27	0	942	31	0
	1.5 x D	.1 x D	<b>230</b>	1760	43	0	1408	41	0	1173	47	0
	1.5 x D	.07 x D	<b>276</b>	2112	68	0	1689	65	0	1408	75	0
<b>S</b> High Temp Alloys Ti-6Al4V Grades (5-38)	.75 x D	.5 x D	<b>180</b>	1375	28	0	1100	27	0	917	30	0
	1.25 x D	.3 x D	<b>225</b>	1719	42	0	1375	40	0	1146	46	0
	1.5 x D	.1 x D	<b>275</b>	2101	85	0	1681	81	0	1401	93	0
	1.5 x D	.07 x D	<b>303</b>	2311	130	0	1849	125	0	1541	144	0

# SPEED & FEED GUIDE



Optimum Performance

## Series 210, 215

335 335BN 3 FLUTE

Material	Axial ↓	Radial →	SFM	1/4		5/16		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	.5 x D	1 x D	<b>220</b>	3362	10	2689	12	2241	12	1681	13	1345	12	1121	12
		1.25 x D	.3 x D	<b>264</b>	4034	15	3227	17	2689	17	2017	18	1614	18	1345	18
		1.5 x D	.1 x D	<b>343</b>	5244	31	4195	38	3496	38	2622	40	2098	38	1748	38
	<b>Alloy Steel</b> 4140, 8620	.5 x D	1 x D	<b>180</b>	2750	8	2200	9	1834	9	1375	10	1100	9	917	9
		1.25 x D	.3 x D	<b>225</b>	3438	12	2750	14	2292	14	1719	15	1375	14	1146	13
		1.5 x D	.1 x D	<b>270</b>	4126	24	3300	28	2750	28	2063	30	1650	28	1375	26
	<b>Tool Steel</b> A2, A3, D2, H11, H13	.5 x D	1 x D	<b>160</b>	2445	6	1956	7	1630	8	1222	8	978	8	815	9
		1.0 x D	.3 x D	<b>200</b>	3056	10	2445	13	2037	14	1528	14	1222	14	1019	17
		1.5 x D	.1 x D	<b>240</b>	3667	17	2934	20	2445	21	1834	23	1467	22	1222	26
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 416	.5 x D	1 x D	<b>140</b>	2139	5	1711	6	1426	6	1070	7	856	6	713	6
		1.25 x D	.3 x D	<b>185</b>	2827	8	2261	10	1885	10	1413	10	1131	10	942	9
		1.5 x D	.1 x D	<b>230</b>	3519	17	2815	21	2346	21	1760	22	1408	21	1173	19
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-5	.5 x D	1 x D	<b>115</b>	1757	4	1406	5	1171	5	879	5	703	5	586	5
		1.25 x D	.3 x D	<b>180</b>	2750	8	2200	9	1834	9	1375	10	1100	9	917	8
		1.5 x D	.1 x D	<b>250</b>	3820	18	3056	21	2547	21	1910	22	1528	21	1273	20
<b>K</b>	<b>Cast Iron- Grey,</b> GG-10 to GG-40	1 x D	1 x D	<b>100</b>	1528	4	1222	5	1019	5	764	5	611	5	509	5
		1.25 x D	.3 x D	<b>125</b>	1910	6	1528	7	1273	7	955	8	764	8	637	7
		1.5 x D	.1 x D	<b>163</b>	2483	13	1986	16	1655	16	1242	17	993	16	828	15
	<b>Cast Iron- Ductile</b> GGG-40, to GGG-70	.75 x D	1 x D	<b>155</b>	2368	6	1895	7	1579	7	1184	8	947	7	789	7
		1.25 x D	.3 x D	<b>180</b>	2750	8	2200	10	1834	10	1375	11	1100	10	917	9
		1.5 x D	.1 x D	<b>216</b>	3300	17	2640	20	2200	20	1650	21	1320	21	1100	19
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, Waspalloy, A286, CoCr	.5 x D	1 x D	<b>70</b>	1070	2	856	3	713	3	535	3	428	3	357	3
		1.25 x D	.2 x D	<b>80</b>	1222	3	978	4	815	4	611	4	489	4	407	4
		1.5 x D	.07 x D	<b>125</b>	1910	8	1528	10	1273	10	955	11	764	10	637	9
	<b>Titanium Alloy</b> Ti-6Al4V Grades (5-38)	.5 x D	1 x D	<b>180</b>	2750	6	2200	7	1834	7	1375	7	1100	7	917	6
		1.25 x D	.3 x D	<b>225</b>	3438	9	2750	10	2292	10	1719	11	1375	10	1146	10
		1.5 x D	.1 x D	<b>360</b>	5501	23	4401	28	3667	28	2750	29	2200	28	1834	26

# SPEED & FEED GUIDE



Optimum Performance

## Series 220

545 5 FLUTE

Material	Axial ↓	Radial →	SFM	1/4		5/16		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	<b>Carbon Steel</b> 10XX, 11XX, 12XX, 13XX	.5 x D	1 x D	<b>220</b>	3362	17	2689	20	2241	20	1681	21	1345	20	1121	20
		1.25 x D	.3 x D	<b>264</b>	4034	24	3227	29	2689	29	2017	30	1614	29	1345	29
		1.5 X D	.1 x D	<b>343</b>	5244	52	4195	63	3496	52	2622	55	2098	53	1748	53
	<b>Alloy Steel</b> 4140, 8620	.5 x D	1 x D	<b>180</b>	2750	13	2200	16	1834	13	1375	14	1100	13	917	12
		1.25 x D	.3 x D	<b>225</b>	3438	20	2750	24	2292	20	1719	21	1375	20	1146	18
		1.5 X D	.1 x D	<b>270</b>	4126	39	3300	47	2750	39	2063	41	1650	40	1375	36
	<b>Tool Steel</b> A2 ,A3, D2, H11, H13	.5 x D	1 x D	<b>160</b>	2445	6	1956	7	1630	10	1222	11	978	10	815	9
		1.0 x D	.3 x D	<b>200</b>	3056	10	2445	13	2037	18	1528	19	1222	18	1019	17
		1.5 x D	.1 x D	<b>240</b>	3667	17	2934	20	2445	29	1834	30	1467	29	1222	26
<b>M</b>	<b>SS</b> 300 & 400 Series 303, 304, 316, 420, 416	.5 x D	1 x D	<b>140</b>	2139	9	1711	10	1426	9	1070	9	856	9	713	8
		1.25 x D	.3 x D	<b>185</b>	2827	14	2261	17	1885	14	1413	15	1131	14	942	13
		1.5 x D	.1 x D	<b>230</b>	3519	29	2815	34	2346	29	1760	30	1408	29	1173	26
	<b>Precipitation SS</b> 15-5, 16-6, 17-4, 17-5	.5 x D	1 x D	<b>115</b>	1757	7	1406	8	1171	7	879	7	703	7	586	6
		1.25 x D	.3 x D	<b>180</b>	2750	13	2200	15	1834	13	1375	13	1100	13	917	12
		1.5 x D	.1 x D	<b>250</b>	3820	30	3056	35	2547	30	1910	31	1528	30	1273	27
<b>K</b>	<b>Cast Iron - Grey,</b> GG-10 to GG-40	1 x D	1 x D	<b>100</b>	1528	7	1222	8	1019	7	764	7	611	7	509	6
		1.25 x D	.3 x D	<b>125</b>	1910	10	1528	12	1273	10	955	11	764	10	637	10
		1.5 X D	.1 x D	<b>163</b>	2483	22	1986	27	1655	22	1242	24	993	23	828	21
	<b>Cast Iron- Ductile</b> GGG-40, to GGG-70	3/4 x D	1 x D	<b>155</b>	2368	10	1895	12	1579	10	1184	11	947	10	789	9
		1.25 x D	.3 x D	<b>180</b>	2750	14	2200	17	1834	14	1375	15	1100	14	917	13
		1.5 x D	.1 x D	<b>216</b>	3300	28	2640	34	2200	28	1650	30	1320	29	1100	26
<b>S</b>	<b>High Temp Alloys</b> Inconel 718, Hastalloy, Waspalloy, A286, CoCr	3/8 x D	1 x D	<b>70</b>	1070	4	856	5	713	4	535	4	428	4	357	4
		1.25 x D	.2 x D	<b>80</b>	1222	5	978	6	815	5	611	6	489	5	407	5
		1.5 x D	.07 x D	<b>125</b>	1910	14	1528	17	1273	14	955	15	764	14	637	13
	<b>Titanium Alloy</b> Ti-6Al4V Grades (5-38)	.5 x D	1 x D	<b>180</b>	2750	10	2200	12	1834	10	1375	10	1100	10	917	9
		1.25 x D	.3 x D	<b>225</b>	3438	14	2750	17	2292	14	1719	15	1375	15	1146	13
		1.5 x D	.1 x D	<b>360</b>	5501	38	4401	46	3667	38	2750	40	2200	39	1834	35

# SPEED & FEED GUIDE



Optimum Performance

## Series 225, 227

General Purpose End Mills 2 FLUTES

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Low Carbon Steel 1018	.5 x D	1 x D	<b>180</b>	5501	5	2750	3	1834	6	1375	5	1100	6	917	5
		1.25 x D	.4 x D	<b>225</b>	6876	8	3438	4	2292	9	1719	7	1375	9	1146	8
		1.5 X D	.1 x D	<b>270</b>	8251	16	4126	8	2750	19	2063	14	1650	19	1375	16
	Med Alloy Steel <375 1045, 1050	.5 x D	1 x D	<b>100</b>	3056	3	1528	1	1019	3	764	2	611	3	509	3
		1.25 x D	.4 x D	<b>125</b>	3820	4	1910	2	1273	5	955	4	764	5	637	4
		1.5 X D	.1 x D	<b>163</b>	4966	9	2483	4	1655	11	1242	8	993	11	828	9
	Tool Steel <375 4140, P20	.5 x D	1 x D	<b>155</b>	4737	4	2368	2	1579	5	1184	4	947	5	789	4
		1.25 x D	.4 x D	<b>180</b>	5501	6	2750	3	1834	7	1375	5	1100	7	917	6
		1.5 X D	.1 x D	<b>216</b>	6601	11	3300	6	2200	14	1650	10	1320	14	1100	11
M	Stainless Steel 303, 304, 420	.5 x D	1 x D	<b>80</b>	2445	2	1222	1	815	2	611	2	489	2	407	2
		1.25 x D	.4 x D	<b>90</b>	2750	2	1375	1	917	3	688	2	550	3	458	2
		1.5 X D	.1 x D	<b>125</b>	3820	6	1910	3	1273	7	955	5	764	7	637	6
	Stainless Steel 316L, 404	.5 x D	1 x D	<b>180</b>	5501	4	2750	2	1834	5	1375	4	1100	5	917	4
		1.25 x D	.4 x D	<b>225</b>	6876	6	3438	3	2292	7	1719	5	1375	7	1146	6
		1.5 X D	.1 x D	<b>270</b>	8251	12	4126	6	2750	14	2063	10	1650	14	1375	12
K	Cast Iron- Gray <220 GG-10 G1800	.5 x D	1 x D	<b>140</b>	4278	3	2139	2	1426	4	1070	3	856	4	713	4
		1.25 x D	.4 x D	<b>185</b>	5654	6	2827	3	1885	7	1413	5	1131	7	942	6
		1.5 X D	.1 x D	<b>230</b>	7039	11	3519	6	2346	14	1760	10	1408	14	1173	12
	Ductile Cast GGG-40	.5 x D	1 x D	<b>115</b>	3514	3	1757	1	1171	3	879	2	703	3	586	3
		1.25 x D	.4 x D	<b>180</b>	5501	5	2750	3	1834	6	1375	5	1100	6	917	5
		1.5 X D	.1 x D	<b>250</b>	7640	12	3820	6	2547	14	1910	11	1528	14	1273	12
N	Cast Aluminum Casting	.5 x D	.5 x D	<b>350</b>	10696	22	5348	23	3565	26	2674	28	2139	27	1783	27
		1.25 x D	.3 x D	<b>420</b>	12835	33	6418	34	4278	38	3209	40	2567	39	2139	39
		1.5 X D	.1 x D	<b>500</b>	15280	73	7640	75	5093	77	3820	81	3056	78	2547	78
	Aluminum Alloy 6061, 7075	.5 x D	.5 x D	<b>300</b>	9168	18	4584	18	3056	22	2292	23	1834	22	1528	22
		1.25 x D	.3 x D	<b>360</b>	11002	26	5501	27	3667	32	2750	33	2200	32	1834	32
		1.5 X D	.1 x D	<b>500</b>	15280	59	7640	60	5093	66	3820	69	3056	67	2547	67

# SPEED & FEED GUIDE



Optimum Performance

## Series 230, 237

General Purpose End Mills 4 FLUTES

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
<b>P</b>	Low Carbon Steel 1018	.5 x D	1 x D	<b>180</b>	5501	10	2750	5	1834	7	1375	9	1100	11	917	12
		1.25 x D	.4 x D	<b>225</b>	6876	16	3438	8	2292	10	1719	14	1375	16	1146	17
		1.5 X D	.1 x D	<b>270</b>	8251	31	4126	16	2750	21	2063	28	1650	32	1375	35
	Med Alloy Steel <375, 1045, 1050	.5 x D	1 x D	<b>100</b>	3056	6	1528	3	1019	4	764	5	611	6	509	6
		1.25 x D	.4 x D	<b>125</b>	3820	8	1910	4	1273	6	955	7	764	8	637	9
		1.5 X D	.1 x D	<b>163</b>	4966	18	2483	9	1655	12	1242	16	993	18	828	20
	Tool Steel <375, 4140, P20	.5 x D	1 x D	<b>155</b>	4737	8	2368	4	1579	5	1184	7	947	8	789	9
		1.25 x D	.4 x D	<b>180</b>	5501	11	2750	6	1834	8	1375	10	1100	11	917	13
		1.5 X D	.1 x D	<b>216</b>	6601	23	3300	11	2200	15	1650	20	1320	23	1100	25
<b>M</b>	Stainless Steel 303, 304, 420	.5 x D	1 x D	<b>70</b>	2139	3	1070	2	713	2	535	3	428	3	357	3
		1.25 x D	.4 x D	<b>80</b>	2445	4	1222	2	815	3	611	4	489	4	407	5
		1.5 X D	.1 x D	<b>125</b>	3820	11	1910	6	1273	7	955	10	764	11	637	12
	Stainless Steel 316L, 404	.5 x D	1 x D	<b>180</b>	5501	88	2750	44	1834	59	1375	79	1100	89	917	98
		1.25 x D	.4 x D	<b>225</b>	6876	12	3438	6	2292	8	1719	10	1375	12	1146	13
		1.5 X D	.1 x D	<b>270</b>	8251	23	4126	12	2750	15	2063	21	1650	23	1375	26
<b>K</b>	Cast Iron- Gray <220 GG-10, G1800	.5 x D	1 x D	<b>140</b>	4278	7	2139	3	1426	5	1070	6	856	7	713	8
		1.25 x D	.4 x D	<b>185</b>	5654	11	2827	6	1885	7	1413	10	1131	11	942	12
		1.5 X D	.1 x D	<b>230</b>	7039	23	3519	11	2346	15	1760	21	1408	23	1173	25
	Ductile Cast GGG-40	.5 x D	1 x D	<b>115</b>	3514	5	1757	3	1171	4	879	5	703	5	586	6
		1.25 x D	.4 x D	<b>180</b>	5501	10	2750	5	1834	7	1375	9	1100	10	917	11
		1.5 X D	.1 x D	<b>250</b>	7640	24	3820	12	2547	16	1910	21	1528	24	1273	26
<b>N</b>	Cast Aluminum Casting	.5 x D	.5 x D	<b>350</b>	10696	28	5348	28	3565	33	2674	35	2139	33	1783	33
		1.25 x D	.3 x D	<b>420</b>	12835	41	6418	42	4278	48	3209	50	2567	48	2139	48
		1.5 X D	.1 x D	<b>500</b>	15280	92	7640	94	5093	96	3820	101	3056	97	2547	97
	Aluminum Alloy 6061, 7075	.5 x D	.5 x D	<b>300</b>	9168	23	4584	23	3056	28	2292	29	1834	28	1528	28
		1.25 x D	.3 x D	<b>360</b>	11002	33	5501	34	3667	40	2750	42	2200	40	1834	40
		1.5 X D	.1 x D	<b>500</b>	15280	73	7640	75	5093	83	3820	87	3056	83	2547	83

# SPEED & FEED GUIDE



Optimum Performance

## Series 240, 243

2FLUTES CHAMFER MILLS

Material	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
		RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Low Carbon Steel 1018	180	5501	5	2750	3	1834	6	1375	5	1100	6	917	5
		225	6876	8	3438	4	2292	9	1719	7	1375	9	1146	8
		270	8251	16	4126	8	2750	19	2063	14	1650	19	1375	16
	Med Alloy Steel <375, 1045, 1050	100	3056	3	1528	1	1019	3	764	2	611	3	509	3
		125	3820	4	1910	2	1273	5	955	4	764	5	637	4
		162	4966	9	2483	4	1655	11	1242	8	993	11	828	9
	Tool Steel <375, 4140, P20	155	4737	4	2368	2	1579	5	1184	4	947	5	789	4
		180	5501	6	2750	3	1834	7	1375	5	1100	7	917	6
		216	6601	11	3300	6	2200	14	1650	10	1320	14	1100	11
M	Stainless Steel 303, 304, 420	80	2445	2	1222	1	815	2	611	2	489	2	407	2
		90	2750	2	1375	1	917	3	688	2	550	3	458	2
		125	3820	6	1910	3	1273	7	955	5	764	7	637	6
	Stainless Steel 316L, 404	180	5501	4	2750	2	1834	5	1375	4	1100	5	917	4
		225	6876	6	3438	3	2292	7	1719	5	1375	7	1146	6
		270	8251	12	4126	6	2750	14	2063	10	1650	14	1375	12
K	Cast Iron- Gray <220, GG-10, G1800	140	4278	3	2139	2	1426	4	1070	3	856	4	713	4
		185	5654	6	2827	3	1885	7	1413	5	1131	7	942	6
		230	7039	11	3519	6	2346	14	1760	10	1408	14	1173	12
	Ductile Cast GGG-40	115	3514	3	1757	1	1171	3	879	2	703	3	586	3
		180	5501	5	2750	3	1834	6	1375	5	1100	6	917	5
		250	7640	12	3820	6	2547	14	1910	11	1528	14	1273	12
N	Cast Aluminum Casting	350	10696	22	5348	23	3565	26	2674	28	2139	27	1783	27
		420	12835	33	6418	34	4278	38	3209	40	2567	39	2139	39
		500	15280	73	7640	75	5093	77	3820	81	3056	78	2547	78
	Aluminum Alloy 6061, 7075	300	9168	18	4584	18	3056	22	2292	23	1834	22	1528	22
		360	11002	26	5501	27	3667	32	2750	33	2200	32	1834	32
		500	15280	59	7640	60	5093	66	3820	69	3056	67	2547	67

# SPEED & FEED GUIDE



Optimum Performance

## Series 241, 244 4 FLUTES CHAMFER MILLS

Material	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
		RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Low Carbon Steel 1018	180	5501	10	2750	5	1834	7	1375	9	1100	11	917	12
		225	6876	16	3438	8	2292	10	1719	14	1375	16	1146	17
		270	8251	31	4126	16	2750	21	2063	28	1650	32	1375	35
	Med Alloy Steel <375, 1045, 1050	100	3056	6	1528	3	1019	4	764	5	611	6	509	6
		125	3820	8	1910	4	1273	6	955	7	764	8	637	9
		162	4966	18	2483	9	1655	12	1242	16	993	18	828	20
	Tool Steel <375, 4140, P20	155	4737	8	2368	4	1579	5	1184	7	947	8	789	9
		180	5501	11	2750	6	1834	8	1375	10	1100	11	917	13
		216	6601	23	3300	11	2200	15	1650	20	1320	23	1100	25
M	Stainless Steel 303, 304, 420	70	2139	3	1070	2	713	2	535	3	428	3	357	3
		80	2445	4	1222	2	815	3	611	4	489	4	407	5
		125	3820	11	1910	6	1273	7	955	10	764	11	637	12
	Stainless Steel 316L, 404	180	5501	88	2750	44	1834	59	1375	79	1100	89	917	98
		225	6876	12	3438	6	2292	8	1719	10	1375	12	1146	13
		270	8251	23	4126	12	2750	15	2063	21	1650	23	1375	26
K	Cast Iron- Gray <220, GG-10, G1800	140	4278	7	2139	3	1426	5	1070	6	856	7	713	8
		185	5654	11	2827	6	1885	7	1413	10	1131	11	942	12
		230	7039	23	3519	11	2346	15	1760	21	1408	23	1173	25
	Ductile Cast GGG-40	115	3514	5	1757	3	1171	4	879	5	703	5	586	6
		180	5501	10	2750	5	1834	7	1375	9	1100	10	917	11
		250	7640	24	3820	12	2547	16	1910	21	1528	24	1273	26
N	Cast Aluminum Casting	350	10696	28	5348	28	3565	33	2674	35	2139	33	1783	33
		420	12835	41	6418	42	4278	48	3209	50	2567	48	2139	48
		500	15280	92	7640	94	5093	96	3820	101	3056	97	2547	97
	Aluminum Alloy 6061, 7075	300	9168	23	4584	23	3056	28	2292	29	1834	28	1528	28
		360	11002	33	5501	34	3667	40	2750	42	2200	40	1834	40
		500	15280	73	7640	75	5093	83	3820	87	3056	83	2547	83

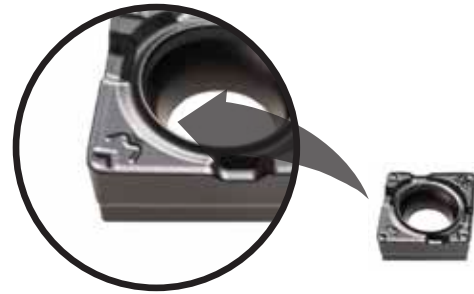


# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Chipbreaker A

Positive Masterfinish Geometry  
High surface quality



#### General cutting parameters depending on the application

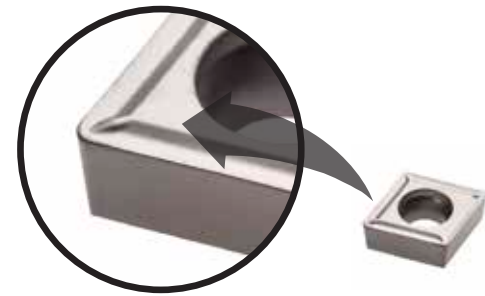
Work piece material			Coated carbide			Application	Depth of cut and feed rate										
			CG92	CG93	CG94		Chip breaker	a <sub>p</sub> [inch]	f [inch]								
	Type of treatment/ally	Hardness HB	V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]												
<b>P</b>	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	722 – 1312	558 – 787	558 – 623	A	0.039 to 0.138	0.012 to 0.006								
		Low alloyed steel	250 – 300	656 – 1050	328 – 623	295 – 492	Ex: CCMT 32.52-A for CK60 Different in each application	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td>●</td> <td>○</td> <td>✕</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	●	○	✕
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut													
●	○	✕															
High alloyed steel	200	591 – 1050	427 – 689	394 – 656													
Corrosion resistant steel	200	656 – 1050	427 – 689	459 – 591													
<b>M</b>	Stainless steel	Ferritic	200	722 – 1050	459 – 689	459 – 656	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td>●</td> <td>○</td> <td>✕</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	●	○	✕	
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut													
●	○	✕															
Austenitic	180	-	328 – 689	361 – 623													
Duplex	230 – 260	-	-	262 – 492													
<b>K</b>	Cast iron	Martensitic	330	-	230 – 328	180 – 246	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td>●</td> <td>○</td> <td>✕</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	●	○	✕	
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut													
●	○	✕															
Grey cast iron	180	459 – 1214	427 – 689	-													
Spheroidal	160	623 – 1411	394 – 787	-													
Malleable/Tempered iron	130	591 – 1706	492 – 820	-													

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Chipbreaker B

Increase life time  
Reduce temperature and stresses



#### General cutting parameters depending on the application

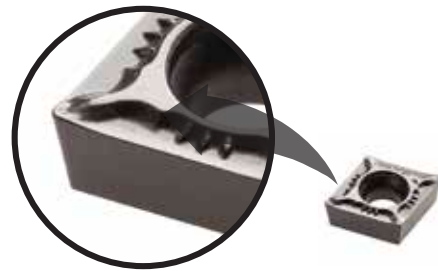
Work piece material			Cermet	Application	Depth of cut and feed rate		
	Type of treatment/alloy	Hardness HB	CG91		Chip breaker	$a_p$ [inch]	$f$ [inch]
<b>P</b>	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	755 – 886	B	0.004 to 0.065	0.008 to 0.002
		Low alloyed steel	250 – 300	591 – 755	Ex: CCMT 32.51-B Different in each application		
		High alloyed steel	200	525 – 656			
		Corrosion resistant steel	200	755 – 886			
<b>M</b>	Stainless steel	Ferritic	200	558 – 787			
		Austenitic	180	656 – 787	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Duplex	230 – 260	–			
		Martensitic	330	427 – 525			
<b>K</b>	Cast iron	Grey cast iron	180	–		<b>X</b>	<b>X</b>
		Spheroidal	160	722 – 984			
		Malleable/Tempered iron	130	820 – 1148			

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Chipbreaker C

To optimize the control of the chip



General cutting parameters depending on the application

Work piece material	Type of treatment/alloy	Hardness HB	Coated carbide			Application	Depth of cut and feed rate		
			CG92	CG93	CG94		Chip breaker	a <sub>p</sub> [inch]	f [inch]
			V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	722 – 1312	558 – 787	558 – 623	C	0.02 to 0.089	0.006 to 0.003
		Low alloyed steel	250 – 300	656 – 1050	328 – 623	295 – 492	Ex: CCMT 32.51-C for CK60 Different in each application		
		High alloyed steel	200	591 – 1050	427 – 689	394 – 656			
		Corrosion resistant steel	200	656 – 1050	427 – 689	459 – 591			
M	Stainless steel	Ferritic	200	722 – 1050	459 – 689	459 – 656			
		Austenitic	180	–	328 – 689	361 – 623	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Duplex	230 – 260	–	–	262 – 492			
		Martensitic	330	–	230 – 328	180 – 246			
K	Cast iron	Grey cast iron	180	459 – 1214	427 – 689	–			
		Spheroidal	160	623 – 1411	394 – 787	–			
		Malleable/Tempered iron	130	591 – 1706	492 – 820	–			

General cutting parameters depending on the application

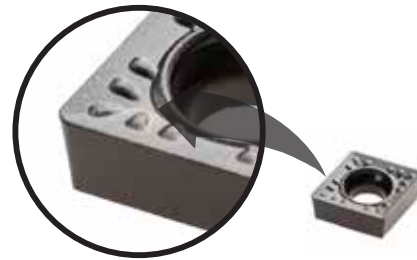
Work piece material	Type of treatment/alloy	Hardness HB	Coated carbide			Application	Depth of cut and feed rate		
			CG92	CG93	CG94		Chip breaker	a <sub>p</sub> [inch]	f [inch]
			V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	722 – 1312	558 – 787	558 – 623	C	0.02 to 0.089	0.006 to 0.003
		Low alloyed steel	250 – 300	656 – 1050	328 – 623	295 – 492	Ex: CCMT 32.51-C for CK60 Different in each application		
		High alloyed steel	200	591 – 1050	427 – 689	394 – 656			
		Corrosion resistant steel	200	656 – 1050	427 – 689	459 – 591			
M	Stainless steel	Ferritic	200	722 – 1050	459 – 689	459 – 656			
		Austenitic	180	–	328 – 689	361 – 623	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Duplex	230 – 260	–	–	262 – 492			
		Martensitic	330	–	230 – 328	180 – 246			
K	Cast iron	Grey cast iron	180	459 – 1214	427 – 689	–			
		Spheroidal	160	623 – 1411	394 – 787	–			
		Malleable/Tempered iron	130	591 – 1706	492 – 820	–			

# ULTIMATE PERFORMANCE



## Turning Speed & Feed Guide

### Optimized by FEM:

Increase life time  
Reduce temperature and stresses  
Universal application



### General cutting parameters depending on the application

Work piece material			Coated carbide			Application	Depth of cut and feed rate			
			CG92	CG93	CG94		Chip breaker	$a_p$ [inch]	f [inch]	
	Type of treatment/alloy	Hardness HB	$V_c$ [sfm]	$V_c$ [sfm]	$V_c$ [sfm]					
P	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	722 – 1312	558 – 787	558 – 623	D	0.02 to 0.118	0.008 to 0.005	
		Low alloyed steel	250 – 300	656 – 1050	328 – 623	295 – 492				
		High alloyed steel	200	591 – 1050	427 – 689	394 – 656				
		Corrosion resistant steel	200	656 – 1050	427 – 689	459 – 591				
M	Stainless steel	Ferritic	200	722 – 1050	459 – 689	459 – 656	Ex: CCMT 32.51-D for CK60 Different in each application 	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Austenitic	180	–	328 – 689	361 – 623				
		Duplex	230 – 260	–	–	262 – 492				
K	Cast iron	Martensitic	330	–	230 – 328	180 – 246		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Grey cast iron	180	459 – 1214	427 – 689	–				
		Spheroidal	160	623 – 1411	394 – 787	–				
		Malleable/Tempered iron	130	591 – 1706	492 – 820	–				

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Optimized by FEM:

Positive Masterfinish Geometry  
High surface quality



### General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide		Application	Depth of cut and feed rate										
			CG93	CG97		Chip breaker	$a_p$ [inch]	f [inch]								
P Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	558 – 787	558 – 623	A Ex: CCMT 32.52-A for 304 Different in each application	0.039 to 0.138	0.012 to 0.006									
	Low alloyed steel	250 – 300	328 – 623	295 – 492												
	High alloyed steel	200	427 – 689	394 – 656												
	Corrosion resistant steel	200	427 – 689	459 – 591												
M Stainless steel	Ferritic	200	459 – 689	459 – 656	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut					
	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut													
Austenitic	180	328 – 689	361 – 623													
Duplex	230 – 260	–	262 – 492													
Martensitic	330	230 – 328	180 – 246													
K Cast iron	Grey cast iron	180	427 – 689	–												
	Spheroidal	160	394 – 787	–												
	Malleable/Tempered iron	130	492 – 820	–												

### General cutting parameters depending on the application

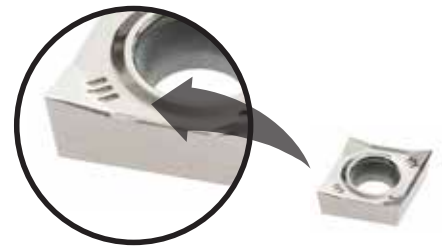
Work piece material	Type of treatment/ally	Hardness HB	Coated carbide		Application	Depth of cut and feed rate									
			CG96	$V_c$ [sfm]		Chip breaker	$a_p$ [inch]	f [inch]							
M Stainless steel	Ferritic	200	492 – 656	E Ex: CCGT-32.50-E for 304 Different in each application	0.002 to 0.053	0.001 to 0.004									
	Austenitic	180	394 – 656												
	Duplex	230 – 260	295 – 525												
	Martensitic	330	197 – 262												
K Cast iron	Grey cast iron	180	394 – 525	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut					
	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut												
Spheroidal	160	394 – 525													
Malleable / Tempered iron	130	459 – 722													
N Non Ferrous		100	328 – 1312												
		130	328 – 1312												
		90	328 – 1969												
		100	328 – 1312												
S Exotic	Fe base	200	66 – 164												
	Nickel or Kobalt base	280	66 – 164												
	Nickel or Kobalt base	250	49 – 131												
	Nickel or Kobalt base		66 – 115												
	Titanium	Rm 440*	262 – 459												

# ULTIMATE PERFORMANCE







## Turning Speed & Feed Guide

### Optimized by FEM:

Increased life expectancy  
Small feedrate in bar turning



General cutting parameters depending on the application

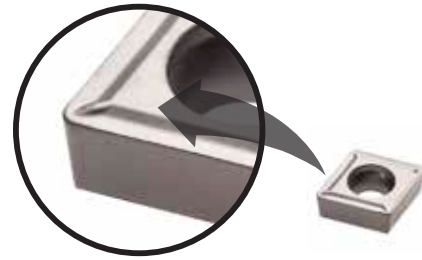
Work piece material			Coated carbide	Application	Depth of cut and feed rate		
			CG98		Chip breaker	$a_p$ [inch]	f [inch]
	Type of treatment/alloy	Hardness HB	$V_c$ [sfm]				
<b>K</b>	Cast iron	Grey cast iron	180	–	AA	0.002 to 0.053	0.001 to 0.004
		Spheroidal	160	–	Ex: CCGT 432FN-AA for 304 Different in each application		
		Malleable/Tempered iron	130	–			
<b>N</b>	Alu Cuivre		100	328 – 6562			
			130	328 – 2625	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
			90	328 – 1969			
			100	328 – 984			
<b>S</b>	Exotic	Fe base	200	98 – 148			
		Nickel or Kobalt base	280	66 – 115	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Nickel or Kobalt base	250	66 – 115			
		Nickel or Kobalt base		59 – 98			
		Titanium	Rm 440*	197 – 394			

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Optimized by FEM:

Increase life time  
Reduce temperature and stresses



### General cutting parameters depending on the application

Work piece material	Type of treatment/alloy	Hardness HB	Cermet		Application	Depth of cut and feed rate							
			CG91	$V_c$ [sfm]		Chip breaker	$a_p$ [inch]	$f$ [inch]					
P	Steel	Non alloyed steel 0-0.45% C	150 – 250	755 – 886	B	0.004 to 0.065	0.008 to 0.002						
		Low alloyed steel	250 – 300	591 – 755	Ex: CCMT 32.51-B Different in each application								
		High alloyed steel	200	525 – 656	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> </table>						Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut											
Corrosion resistant steel	200	755 – 886											
M	Stainless steel	Ferritic	200	558 – 787									
		Austenitic	180	656 – 787									
		Duplex	230 – 260	–									
K	Cast iron	Martensitic	330	427 – 525									
		Grey cast iron	180	–									
		Spheroidal	160	722 – 984									
		Malleable/Tempered iron	130	820 – 1148									

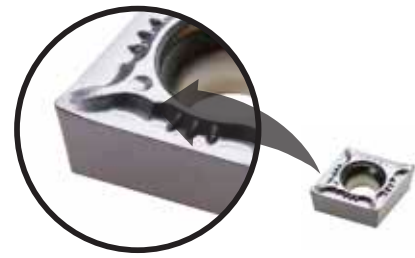


# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Chipbreaker C

To optimize the control of the chip



#### General cutting parameters depending on the application

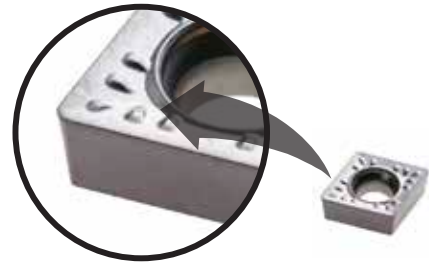
Work piece material			Coated carbide		Application	Depth of cut and feed rate		
			CG95	CG97		Chip breaker	$a_p$ [inch]	f [inch]
	Type of treatment/ally	Hardness HB	$V_c$ [sfm]	$V_c$ [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	427 – 820	558 – 623	C	0.02 to 0.089	0.006 to 0.003
		Low alloyed steel	250 – 300	197 – 591	295 – 492	Ex: CCMT 32.51-C Different in each application		
		High alloyed steel	200	262 – 656	394 – 656			
		Corrosion resistant steel	200	328 – 656	459 – 591	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
M	Stainless steel	Ferritic	200	394 – 820	459 – 656			
		Austenitic	180	328 – 722	361 – 623	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Duplex	230 – 260	197 – 525	262 – 492			
		Martensitic	330	131 – 328	180 – 246			

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Optimized by FEM:

- Increase life time
- Reduce temperature and stresses
- Universal application



### General cutting parameters depending on the application

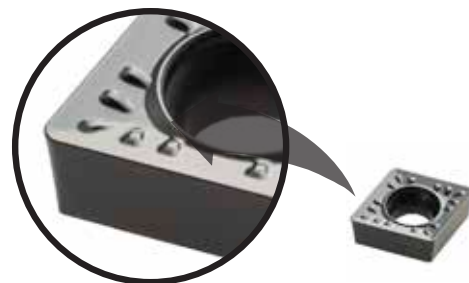
Work piece material	Type of treatment/ally	Hardness HB	Coated carbide		Application	Depth of cut and feed rate		
			CG95	CG97		Chip breaker	a <sub>p</sub> [inch]	f [inch]
			V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	427 – 820	558 – 623	D	0.02 to 0.118	0.008 to 0.005
		Low alloyed steel	250 – 300	197 – 591	295 – 492	Ex: CCMT 32.51-D for 304 Different in each application		
		High alloyed steel	200	262 – 656	394 – 656			
		Corrosion resistant steel	200	328 – 656	459 – 591			
M	Stainless steel	Ferritic	200	394 – 820	459 – 656	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Austenitic	180	328 – 722	361 – 623	●	●	○
		Duplex	230 – 260	197 – 525	262 – 492			
		Martensitic	330	131 – 328	180 – 246			

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Optimized by FEM:

- Increase life time
- Reduce temperature and stresses
- Universal application



### General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide	Application	Depth of cut and feed rate	
			CG99		Chip breaker	$a_p$ [inch]
			$V_c$ [sfm]			
P Steel	Non alloyed steel 0 - 0.45% C	150 – 250	656 – 1116	D	0.039 to 0.118	0.016 to 0.009
	Low alloyed steel	250 – 300	492 – 951	Ex: CCMT 32.52-D for GG25 Different in each application		
	High alloyed steel	200	492 – 951			
	Corrosion resistant steel	200	525 – 951	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
K Cast iron	Grey cast iron	180	492 – 1312			<b>X</b>
	Spheroidal	160	656 – 1476			
	Malleable/Tempered iron	130	656 – 1805			

### General cutting parameters depending on the application

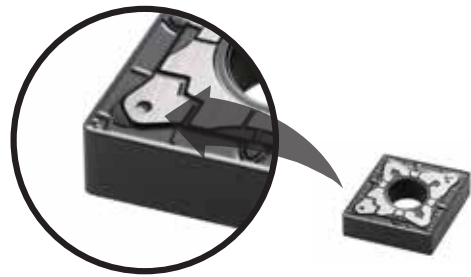
Work piece material	Type of treatment/ally	Hardness HB	Uncoated carbide	Application	Depth of cut and feed rate	
			CG910		Chip breaker	$a_p$ [inch]
			$V_c$ [sfm]			
K Cast iron	Grey cast iron	180	394 – 525	AA	0.059 to 0.256	0.02 to 0.008
	Spheroidal	160	427 – 558	Ex: C CGT 432FN-AA for AIMg1 Different in each application		
	Malleable/Tempered iron	130	459 – 656			
N Alu Cuivre	Aluminium wrought alloys	100	328 – 6562			
	Aluminium cast alloys	130	328 – 2625			
	Copper and copper alloys	90	328 – 1969			
	Non-metallic materials	100	328 – 984	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
S Exotic	Fe base	200	98 – 148			
	Nickel or Kobalt base	280	66 – 115			
	Nickel or Kobalt base	250	66 – 115			
	Nickel or Kobalt base	–	59 – 98			
	Titanium	Rm 440*	197 – 394			

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Optimized by FEM:

Masterfinish Geometry  
High surface quality



### General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide			Application	Depth of cut and feed rate													
			CG92	CG93	CG94		Chip breaker	$a_p$ [inch]	f [inch]											
			V <sub>c</sub> : [sfm]	V <sub>c</sub> : [sfm]	V <sub>c</sub> : [sfm]															
P	Steel	Non alloyed steel 0-0.45 % C	150 – 250	722 – 1312	558 – 787	558 – 623	F	0.02 to 0.118	0.014 to 0.006											
		Low alloyed steel	250 – 300	656 – 1050	328 – 623	295 – 492	Ex: Ex: CNMX 432-F Different in each application	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																		
High alloyed steel	200	591 – 1050	427 – 689	394 – 656																
Corrosion resistant steel	200	656 – 1050	427 – 689	459 – 591																
M	Stainless steel	Ferritic	200	722 – 1050	459 – 689	459 – 656	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																		
Austenitic	180	–	328 – 689	361 – 623																
Duplex	230 – 260	–	–	262 – 492																
Martensitic	330	–	230 – 328	180 – 246																
K	Cast iron	Grey cast iron	180	459 – 1214	427 – 689	–	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																		
Spheroidal	160	623 – 1411	394 – 787	–																
Malleable/Tempered iron	130	591 – 1706	492 – 820	–																

### General cutting parameters depending on the application

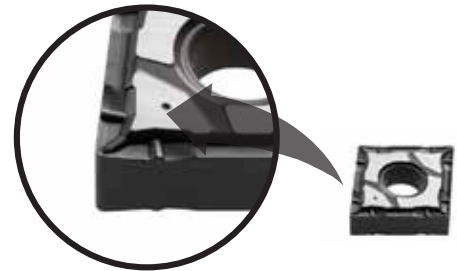
Work piece material	Type of treatment/ally	Hardness HB	Cermet	Application	Depth of cut and feed rate													
			CG91		Chip breaker	$a_p$ [inch]	f [inch]											
			V <sub>c</sub> [sfm]															
P	Steel	Non alloyed steel 0-0.45 % C	150 – 250	755 – 886	B	0.004 to 0.079	0.008 to 0.002											
		Low alloyed steel	250 – 300	591 – 755	Ex: CNMG 431EN-B for CK60 Different in each application	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut														
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																
High alloyed steel	200	525 – 656																
Corrosion resistant steel	200	755 – 886																
M	Stainless steel	Ferritic	200	558 – 787	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut														
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																
Austenitic	180	656 – 787																
Duplex	230 – 260	–																
Martensitic	330	427 – 525																
K	Cast iron	Grey cast iron	180	–	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	
		Consistent cutting depth	Inconsistent cutting depth	Interrupted cut														
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut																
Spheroidal	160	722 – 984																
Malleable/Tempered iron	130	820 – 1148																

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Optimized by FEM:

Increase life time  
Reduce temperature and stresses










### General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide			Application	Depth of cut and feed rate										
			CG92	CG93	CG94		Chip breaker	a <sub>p</sub> [inch]	f [inch]								
			V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]												
<b>P</b>	Steel					H	0.02 to 0.079	0.008 to 0.004									
	Non alloyed steel 0 - 0.45 % C	150 – 250	722 – 1312	558 – 787	558 – 623	Ex: CNMG 432-H for CK60 Different in each application	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td>●</td> <td>○</td> <td>⊗</td> </tr> </table>				Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	●	○	⊗	
	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut														
●	○	⊗															
Low alloyed steel	250 – 300	656 – 1050	328 – 623	295 – 492													
High alloyed steel	200	591 – 1050	427 – 689	394 – 656													
Corrosion resistant steel	200	656 – 1050	427 – 689	459 – 591													
<b>M</b>	Stainless steel																
	Ferritic	200	722 – 1050	459 – 689	459 – 656												
	Austenitic	180	–	328 – 689	361 – 623												
	Duplex	230 – 260	–	–	262 – 492												
<b>K</b>	Cast iron																
	Grey cast iron	180	–	–	–												
	Spheroidal	160	–	–	–												
	Malleable/Tempered iron	130	–	–	–												











# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide			Application	Depth of cut and feed rate	
			CG92	CG93	CG94		Chip breaker	$a_p$ [inch]
			V <sub>c</sub> : [sfm]	V <sub>c</sub> : [sfm]	V <sub>c</sub> : [sfm]			
P	Steel							
	Non alloyed steel 0 - 0.45 % C	150 – 250	722 – 1312	558 – 787	558 – 623	I	0.059 to 0.197	0.02 to 0.012
	Low alloyed steel	250 – 300	656 – 1050	328 – 623	295 – 492	Ex: CNMG 432-I for CK60 Different in each application		
	High alloyed steel	200	591 – 1050	427 – 689	394 – 656			
M	Stainless steel							
	Ferritic	200	722 – 1050	459 – 689	459 – 656			
	Austenitic	180	–	328 – 689	361 – 623	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut
	Duplex	230 – 260	–	–	262 – 492			
Martensitic	330	–	230 – 328	180 – 246				
K	Cast iron							
	Grey cast iron	180	459 – 1214	427 – 689	–			
	Spheroidal	160	623 – 1411	394 – 787	–			
Malleable/Tempered iron	130	591 – 1706	492 – 820	–				

General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide	Application	Depth of cut and feed rate		
			CG96		Chip breaker	$a_p$ [inch]	f [inch]
			V <sub>c</sub> [sfm]				
M	Stainless steel						
	Ferritic	200	492 – 656	J	0.02 to 0.098	0.01 to 0.004	
	Austenitic	180	394 – 656	Ex: CNGP 432-J for 304 Different in each application			
	Duplex	230 – 260	295 – 525				
K	Cast iron						
	Martensitic	330	197 – 262				
	Grey cast iron	180	394 – 525	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	
Spheroidal	160	394 – 525					
N	Non Ferrous						
	Malleable / Tempered iron	130	459 – 722				
		100	328 – 1312	Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	
		130	328 – 1312				
S	Exotic						
		90	328 – 1969				
		100	328 – 1312				
		200	66 – 164				
		280	66 – 164				
	250	49 – 131					
	Nickel or Kobalt base						
	Nickel or Kobalt base						
	Nickel or Kobalt base						
	Titanium	Rm 440*	262 – 459				

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

### Sharp positive cutting edges:

Reduced formation of burrs  
 Good surface finish  
 Low cutting forces



Medium machining

### General cutting parameters depending on the application

Work piece material			Coated carbide		Application	Depth of cut and feed rate											
			CG95	CG97		Chip breaker	a <sub>p</sub> [inch]	f [inch]									
	Type of treatment/ally	Hardness HB	V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]													
<b>P</b>	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	427 – 820	558 – 623	K	0.039 to 0.165	0.016 to 0.009									
		Low alloyed steel	250 – 300	197 – 591	295 – 492	Ex: CNMG 432-K for 304 Different in each application											
		High alloyed steel	200	262 – 656	394 – 656	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td>●</td> <td>○</td> <td>✘</td> </tr> </table>						Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	●	○	✘
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut															
●	○	✘															
Corrosion resistant steel	200	328 – 656	459 – 591														
<b>M</b>	Stainless steel	Ferritic	200	394 – 820	459 – 656												
		Austenitic	180	328 – 722	361 – 623												
		Duplex	230 – 260	197 – 525	262 – 492												
		Martensitic	330	131 – 328	180 – 246												



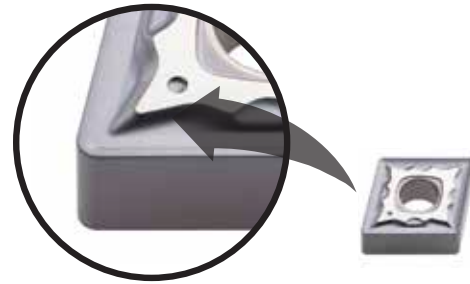
# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

-L

### Sharp positive cutting edges:

- Reduced formation of burrs
- Good surface finish
- Low cutting forces



### General cutting parameters depending on the application

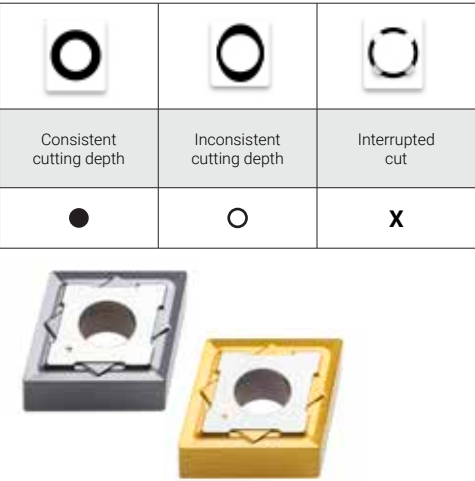
### Medium machining and light roughing

Work piece material	Type of treatment/alloy	Hardness HB	Coated carbide		Application	Depth of cut and feed rate						
			CG95	CG97		Chip breaker	$a_p$ [inch]	$f$ [inch]				
P Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	427 – 820	558 – 623	L	0.059 to 0.236	0.02 to 0.01					
	Low alloyed steel	250 – 300	197 – 591	295 – 492	Ex: CNMG 432-L for 304 Different in each application							
	High alloyed steel	200	262 – 656	394 – 656								
	Corrosion resistant steel	200	328 – 656	459 – 591	<table border="1"> <tr> <td>Consistent cutting depth</td> <td>Inconsistent cutting depth</td> <td>Interrupted cut</td> </tr> <tr> <td>●</td> <td>●</td> <td>○</td> </tr> </table>			Consistent cutting depth	Inconsistent cutting depth	Interrupted cut	●	●
Consistent cutting depth	Inconsistent cutting depth	Interrupted cut										
●	●	○										
M Stainless steel	Ferritic	200	394 – 820	459 – 656								
	Austenitic	180	328 – 722	361 – 623								
	Duplex	230 – 260	197 – 525	262 – 492								
	Martensitic	330	131 – 328	180 – 246								

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

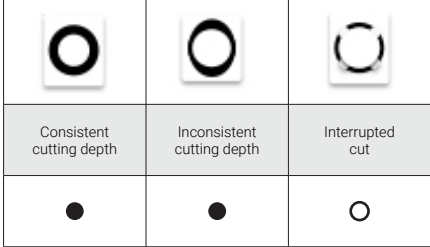


### General cutting parameters depending on the application

Work piece material			Coated carbide		Application	Depth of cut and feed rate		
			CG911	CG912		Chip breaker	a <sub>p</sub> [inch]	f [inch]
	Type of treatment/alloy	Hardness HB	V <sub>c</sub> [sfm]	V <sub>c</sub> [sfm]				
<b>M</b>	Stainless steel	Ferritic	200	492 – 755	427 – 722	N	0.031 to 0.118	0.012 to 0.004
		Austenitic	180	459 – 623	394 – 591	Ex: CNMG 432-N for Super Alloys Different in each application		
		Duplex	230 – 260	197 – 328	164 – 295			
		Martensitic	330	–	–			
<b>S</b>	Exotic	Febase	200	262 – 394	262 – 394			
		Nickel or Kobalt base	280	197 – 328	197 – 328			
		Nickel or Kobalt base	250	115 – 295	115 – 295			
		Nickel or Kobalt base		98 – 164	98 – 164			
		Titanium	Rm 440*	230 – 394	230 – 394			
								

# ULTIMATE PERFORMANCE

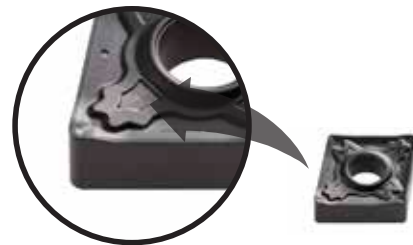
## Turning Speed & Feed Guide

General cutting parameters depending on the application

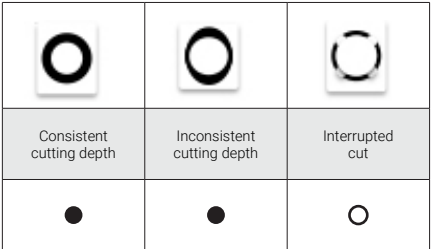
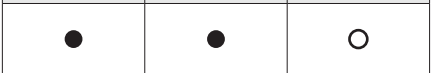
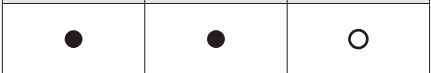
Work piece material	Type of treatment/ally	Hardness HB	Coated carbide			Application	Depth of cut and feed rate		
			CG92	CG93	CG94		Chip breaker	a <sub>p</sub> [inch]	f [inch]
			Vc: [sfm]	Vc: [sfm]	Vc: [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 - 250	722 - 1312	558 - 787	558 - 623	O	0.098 to 0.394	0.024 to 0.012
		Low alloyed steel	250 - 300	656 - 1050	328 - 623	295 - 492	Different in each application		
		High alloyed steel	200	591 - 1050	427 - 689	394 - 656		Consistent cutting depth Inconsistent cutting depth Interrupted cut	
		Corrosion resistant steel	200	656 - 1050	427 - 689	459 - 591			
M	Stainless steel	Ferritic	200	722 - 1050	459 - 689	459 - 656			
		Austenitic	180	-	328 - 689	361 - 623			
		Duplex	230 - 260	-	-	262 - 492			
K	Cast iron	Martensitic	330	-	230 - 328	180 - 246		Consistent cutting depth Inconsistent cutting depth Interrupted cut	
		Grey cast iron	180	459 - 1214	427 - 689	-			
		Spheroidal	160	623 - 1411	394 - 787	-			
K	Cast iron	Malleable/Tempered iron	130	591 - 1706	492 - 820	-			

### Sharp positive cutting edges:

- Single Sided roughing geometry
- Good chip control
- For steels with high strength (800N/mm<sup>2</sup>)



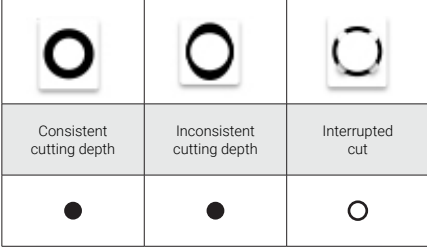

General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide			Application	Depth of cut and feed rate		
			CG92	CG93	CG94		Chip breaker	a <sub>p</sub> [inch]	f [inch]
			Vc: [sfm]	Vc: [sfm]	Vc: [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 - 250	722 - 1312	558 - 787	558 - 623	P	0.059 to 0.472	0.02 to 0.035
		Low alloyed steel	250 - 300	656 - 1050	328 - 623	295 - 492	Ex: CNMM 432-P for CK60		
		High alloyed steel	200	591 - 1050	427 - 689	394 - 656	Different in each application		
		Corrosion resistant steel	200	656 - 1050	427 - 689	459 - 591		Consistent cutting depth Inconsistent cutting depth Interrupted cut	
M	Stainless steel	Ferritic	200	722 - 1050	459 - 689	459 - 656			
		Austenitic	180	-	328 - 689	361 - 623			
		Duplex	230 - 260	-	-	262 - 492			
K	Cast iron	Martensitic	330	-	230 - 328	180 - 246		Consistent cutting depth Inconsistent cutting depth Interrupted cut	
		Grey cast iron	180	459 - 1214	427 - 689	-			
		Spheroidal	160	623 - 1411	394 - 787	-			
K	Cast iron	Malleable/Tempered iron	130	591 - 1706	492 - 820	-		Consistent cutting depth Inconsistent cutting depth Interrupted cut	

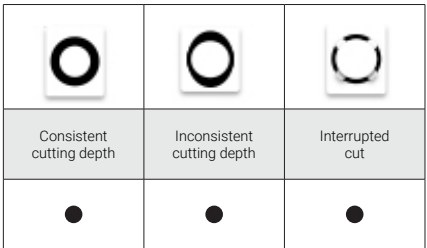

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide			Application	Depth of cut and feed rate		
			CG92	CG93	CG94		Chip breaker	$a_p$ [inch]	f [inch]
			Vc: [sfm]	Vc: [sfm]	Vc: [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 - 250	722 - 1312	558 - 787	558 - 623	Q	0.079 to 0.472	0.031 to 0.012
		Low alloyed steel	250 - 300	656 - 1050	328 - 623	295 - 492	Ex: CNMM 644EN-Q for CK60 Different in each application		
		High alloyed steel	200	591 - 1050	427 - 689	394 - 656			
		Corrosion resistant steel	200	656 - 1050	427 - 689	459 - 591			
M	Stainless steel	Ferritic	200	722 - 1050	459 - 689	459 - 656			
		Austenitic	180	-	328 - 689	361 - 623			
		Duplex	230 - 260	-	-	262 - 492			
		Martensitic	330	-	230 - 328	180 - 246			
K	Cast iron	Grey cast iron	180	459 - 1214	427 - 689	-			
		Spheroidal	160	623 - 1411	394 - 787	-			
		Malleable/Tempered iron	130	591 - 1706	492 - 820	-			

General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide			Application	Depth of cut and feed rate		
			CG92	CG93	CG94		Chip breaker	$a_p$ [inch]	f [inch]
			Vc: [sfm]	Vc: [sfm]	Vc: [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 - 250	722 - 1312	558 - 787	558 - 623	R	0.098 to 0.472	0.047 to 0.014
		Low alloyed steel	250 - 300	656 - 1050	328 - 623	295 - 492	Ex: CNMM 644-R for CK60 Different in each application		
		High alloyed steel	200	591 - 1050	427 - 689	394 - 656			
		Corrosion resistant steel	200	656 - 1050	427 - 689	459 - 591			
M	Stainless steel	Ferritic	200	722 - 1050	459 - 689	459 - 656			
		Austenitic	180	-	328 - 689	361 - 623			
		Duplex	230 - 260	-	-	262 - 492			
		Martensitic	330	-	230 - 328	180 - 246			
K	Cast iron	Grey cast iron	180	459 - 1214	427 - 689	-			
		Spheroidal	160	623 - 1411	394 - 787	-			
		Malleable/Tempered iron	130	591 - 1706	492 - 820	-			

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide			Application	Depth of cut and feed rate		
			CG92	CG93	CG94		Chip breaker	a <sub>p</sub> [inch]	f [inch]
			V <sub>c</sub> : [sfm]	V <sub>c</sub> : [sfm]	V <sub>c</sub> : [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	722 – 1312	558 – 787	558 – 623	M	0.126 to 0.299	0.039 to 0.024
		Low alloyed steel	250 – 300	656 – 1050	328 – 623	295 – 492	Ex: CNMG 644-M for CK60 Different in each application		
		High alloyed steel	200	591 – 1050	427 – 689	394 – 656			
		Corrosion resistant steel	200	656 – 1050	427 – 689	459 – 591			
M	Stainless steel	Ferritic	200	722 – 1050	459 – 689	459 – 656			
		Austenitic	180	–	328 – 689	361 – 623			
		Duplex	230 – 260	–	–	262 – 492			
		Martensitic	330	–	230 – 328	180 – 246			
K	Cast iron	Grey cast iron	180	459 – 1214	427 – 689	–			
		Spheroidal	160	623 – 1411	394 – 787	–			
		Malleable/Tempered iron	130	591 – 1706	492 – 820	–			

General cutting parameters depending on the application

Work piece material	Type of treatment/ally	Hardness HB	Coated carbide	Application	Depth of cut and feed rate		
			CG99		Chip breaker	a <sub>p</sub> [inch]	f [inch]
			V <sub>c</sub> [sfm]				
P	Steel	Non alloyed steel 0 - 0.45 % C	150 – 250	656 – 1116	M	0.126 to 0.22	0.024 to 0.015
		Low alloyed steel	250 – 300	492 – 951	Ex: CNMG 543-M for GC25 Different in each application		
		High alloyed steel	200	492 – 951			
		Corrosion resistant steel	200	525 – 951			
K	Cast iron	Grey cast iron	180	492 – 1312			
		Spheroidal	160	656 – 1476			
		Malleable/Tempered iron	130	656 – 1805			

# ULTIMATE PERFORMANCE

## Turning Speed & Feed Guide

Grade designation	Standard designation		Type of cutting material	Application range											P	M	K	N	S	H
	ISO	ANSI		01	05	10	15	20	25	30	35	40	45	50	Steel	Stainless	Cast iron	Non-ferrous metals	Heat-resistant	Hard materials
CG91	HC-P15	C7	T																	
	HC-M10	-	T																	
	HC-K10	C3	T																	
CG92	HC-P15	C7	C																	
	HC-K25	C2	C																	
	HC-M10	-	C																	
CG93	HC-P25	C6	C																	
	HC-K30	C1	C																	
	HC-M20	-	C																	
CG94	HC-M35	C5	C																	
	HC-M25	-	C																	
	HC-S25	-	C																	
CG95	HC-M25	-	P																	
	HC-M35	C5	P																	
	HC-S25	-	P																	
CG96	HC-M20	C3	P																	
	HC-K20	C2	P																	
CG97	HC-M35	C5	P																	
	HC-P35	-	P																	
CG98	HC-M15	-	P																	
	HC-S15	-	P																	
CG99	HC-K20	C2	C																	
	HC-P10	C8	C																	
CG910	HW-N15	C3	W																	
	HW-K15	C3	W																	
CG911	HC-S15	-	P																	
	HC-M15	-	P																	
CG912	HC-S15	-	P																	
	HC-M15	-	P																	
				01	05	10	15	20	25	30	35	40	45	50	● Main application ○ Extended application					

# FORMULAS

Standard Technical Formulas

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## **(SFM) SURFACE FEET PER MINUTE**

$.262 * \text{DIAMETER} * \text{RPM}$

## **(RPM) REVOLUTIONS PER MINUTE**

$3.82 + \text{SFM} / \text{DIAMETER}$

## **(IPM) INCHES PER MINUTE**

$\text{FPT} * \text{NUMBER OF TEETH} * \text{RPM}$

## **(FPT) FEED PER TOOTH**

$\text{IPM} / (\text{NUMBER OF TEETH} * \text{RPM})$

## **(IPR) INCHES PER REVOLUTION**

$\text{IPM} / \text{RPM}$

## **METAL REMOVAL RATE IN CUBIC INCHES**

$\text{DEPTH OF CUT} * \text{WIDTH OF CUT} * \text{IPM}$

## **(CPT) CHIPLOAD PER TOOTH**

$\text{IPM} / \text{RPM} / \text{NO. OF FLUES}$

## **INCH TO METRIC**

$\text{NCH} * 25.4$

## **METRIC TO INCH**

$\text{METRIC} / 25.4$



Chip thinning is applied when Radial Depth of Cut (RDOC) = < 50% x Tool Diameter

The result of the formula is an increased Inch per Tooth (IPT), which subsequently improves productivity while maintaining tool life through via proper control of chip thickness.

### Chip Thinning Formula Key:

- IPT = Inch per Tooth
- CT = Chip Thickness  
(for CT, use recommended IPT for 50% or greater step over)
- D = Diameter
- RDOC = Radial Depth of Cut  
(aka. Step Over)

Deeper cut,  
up to 1/2 cutter  
diameter

$$IPT = \frac{CT \times D}{2 \times \sqrt{(D \times RDOC) - RDOC^2}}$$

Shallow cut,  
chip is much thinner

# INDEX

## Reference Table for Prior Part Numbering System



1015			1040S75016030C15			1215			250			25010040			25018705NS0		
EDP	Page		EDP	Page		EDP	Page		EDP	Page		EDP	Page		EDP	Page	
101575026030C15	317158	119	1040S75016060C15	317249	121	121510032030C15	317182	120	2501.2520C5	313555	91	25010040C5	313531	91	25018705NS0C5	313788	93
101575026060C15	317162	119	1040S75016090C15	317253	121	121510032060C15	317186	120	2501.2532C5	313557	91	25010040C5	313533	91	25018705NS0C5	312966	88
101575026090C15	317164	119	1040S75016120C15	317257	121	121510032090C15	317190	120	2501.2580C5	313560	91	25010048	313535	91	25018705NS22	313792	93
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EDP	Page		EDP	Page		EDP	Page		EDP	Page		EDP	Page		EDP	Page	
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## Reference Table for Prior Part Numbering System



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25025012C5	313039	88	25034316	313157	89	25050010	313270	90	25050032BN	313671	92
25025012NS34015C5	313847	93	25034316C5	313159	89	25050010015C5	313276	90	25050032BNC5	313674	92
25025012NS34030C5	313851	93	25037508	313162	89	25050010020C5	313278	90	25050032C5	313337	90
25025012NS34060C5	313855	93	25037508020C5	313166	89	25050010030C5	313281	90	25050036	313339	90
25025012NS34090C5	313858	93	25037508030C5	313169	89	25050010060C5	313284	90	25050036C5	313341	90
25025016	313056	88	25037508045C5	313172	89	25050010090C5	313288	90	25050040	313344	90
25025016C5	313060	88	25037508BN	313621	92	25050010BN	313659	92	25050040C5	313346	90
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43862512060C15	310364	61	43875016120NS32C15	311010	67	CB43831207020C15	311262	71	440V37516030C15	316196	108
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43862512060NS38C15	310957	67	43875016120NS66C15	311077	68	CB43831216020C15	311268	71	440V37516C15	316191	108
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43862512090NS38C15	310961	67	43875016190S54C15	311056	68	CB43837524020C15	311282	71	440V50010030C15	316209	108
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43862512C15	310356	61	43875016NS32C15	310997	67	CB43862520030C15	311302	71	440V50032030C15	316230	108
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43862512NS54C15	310968	67	43875016NS66C15	311063	68	CB43862540030C15	311310	71	440V50032C15	316227	108
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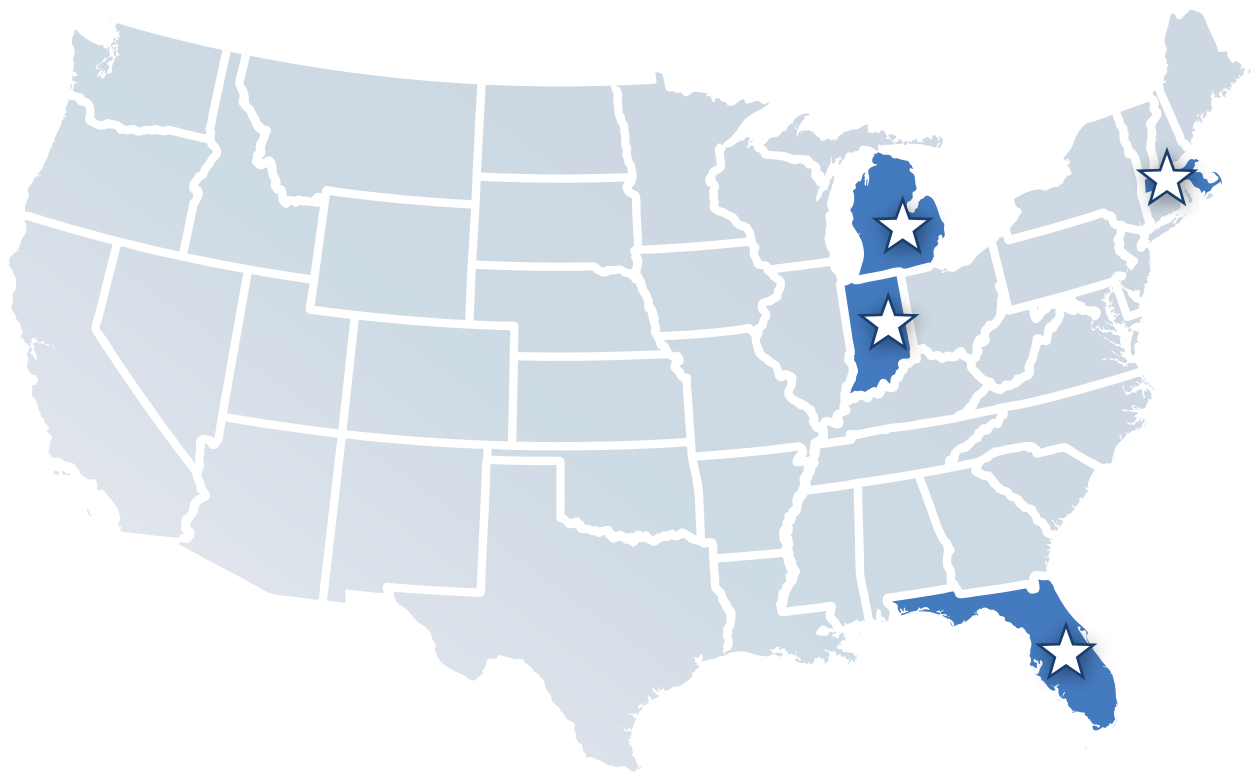
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