Greenleaf®

metalcutting tools and systems

INTRODUCTION

MILLING

TURNING AND BORING

HEAVY TURNING

GROOVING, PROFILING AND CUT-OFF

API RING-GROOVE MACHINING

INDEXABLE DRILLING

TUBE SCARFING

SPECIAL ENGINEERING

APPLICATION and TECHNICAL INFORMATION

2016

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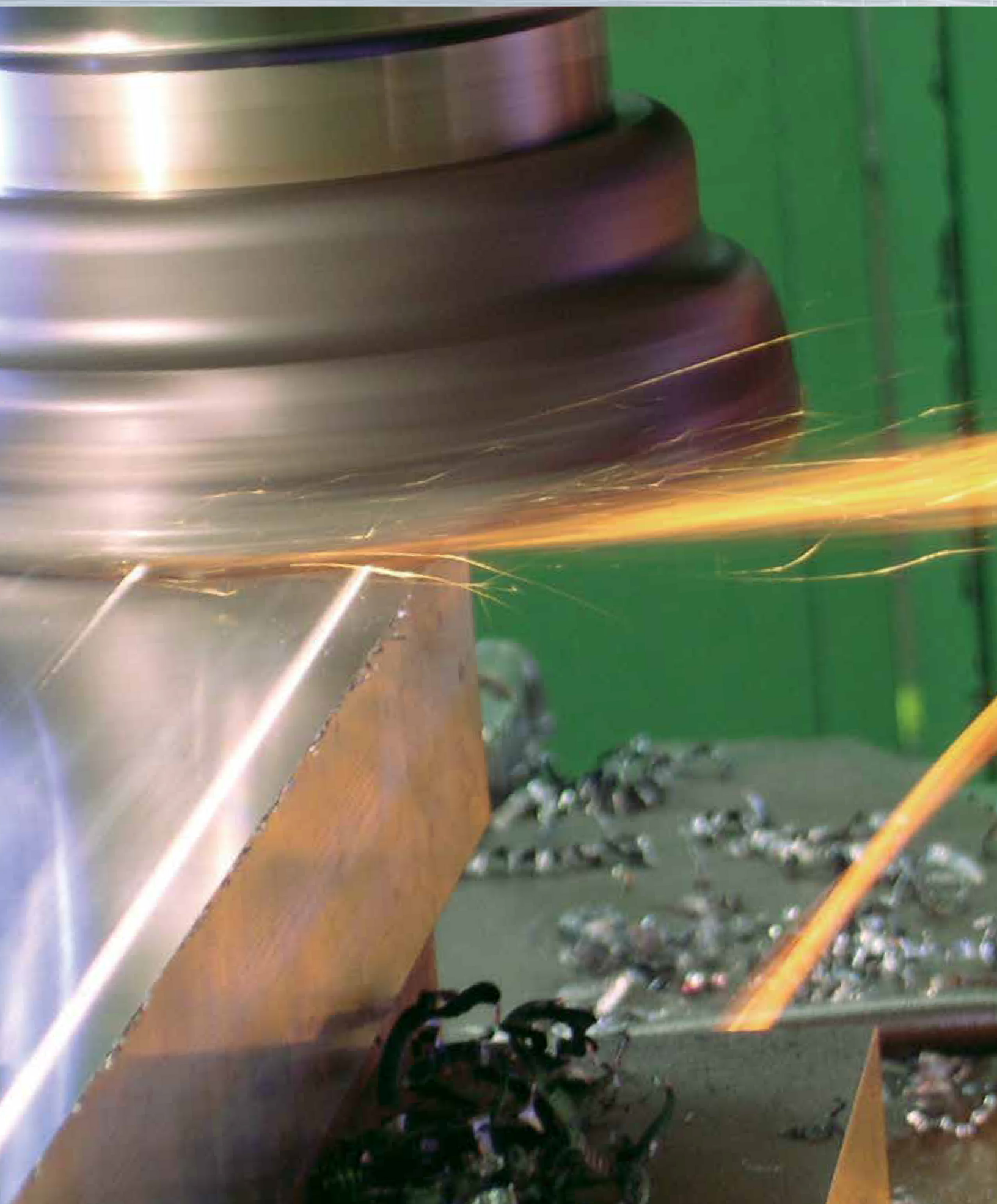

James M. Greenleaf
President, Greenleaf Corporation
jgreenleaf@greenleafcorporation.com

At Greenleaf, we use our expertise in advanced materials technology to develop products of superior quality and performance, and we work with our customers to help them use those products in the most efficient manner. It's our technology and our willingness to work closely with our customers that make us a world leader in cutting tools.

Our customers mean a lot to us, and we give them our personal attention. If you have the opportunity to visit us, we'll be glad to show you through our facilities. We're here to serve you, and we never lose sight of that fact.

Our goal is to help our customers become more successful by solving their productivity problems. We do this in several ways – by developing a better tool design, by producing superior tool materials, or just by offering some good shop-floor advice. Whatever it takes, we'll solve your toughest application problems. While other companies are selling commodities, we're offering technical ability, service, and excellent products.

Greenleaf Corporation is a leading developer of cutting tool technology, specializing in the manufacturing of high-performance tungsten carbide and ceramic inserts as well as innovative tool-holding systems. Greenleaf continues to build on 70 years of innovation, which centers on supplying customers with productive solutions to every metalcutting situation.

Greenleaf Corporation is positioned to serve the evolving needs of companies in all major segments of the metalcutting industry including aerospace, gas turbine, energy, oil and gas, steel, medical, roll turning, automotive, machine tool and rail. Greenleaf's products are engineered to provide optimal performance against a wide range of materials under the most rigorous metalcutting conditions. In addition to specially engineered tool-holding systems and a comprehensive line of carbide inserts, Greenleaf offers high-quality ceramic and ceramic composite materials, which can be custom designed for specific machining applications.

From its headquarters in Saegertown, Pennsylvania, a facility in North Carolina, and sales offices in Europe and China, Greenleaf maintains its commitment to pioneering breakthroughs in cutting tool technology and delivering productivity solutions to customers around the world.

MADE IN THE USA

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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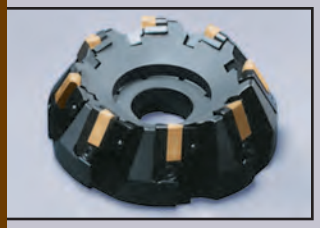
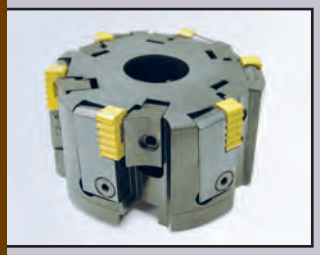
Greenleaf®

MILLING CUTTERS



Powermill® Cutters
Ideal for heavy-duty cutting in severe interruptions and uneven surfaces. Replaceable components maximize cutter life while providing deep depths of cut.

Also available as end mills, face mills and sinusoidal.

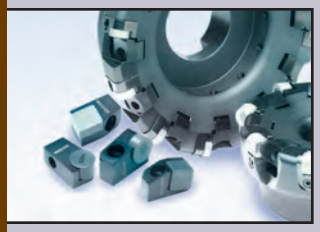


Powersine® Inserts
The Greenleaf Powersine® inserts are uniquely designed to have all four edge variations built into one insert, unlike other manufacturers who require sets of inserts. The sinusoidal or wave-type edge fits into the standard Powermill® cutter body and is especially helpful when dealing with long spindle extensions and limited horsepower machinery.

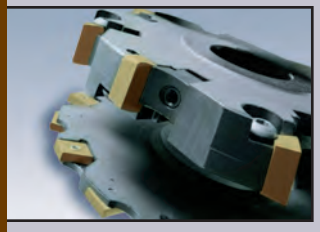
Hushcut® Series II Screw-on-Insert Cutters
Quiet and free-cutting mills with screw-on insert designs to make the most out of the available horsepower. The free cutting action results in longer tool life and improved surface finishes. Available in end mills and face mills in a wide range of small to large diameters.

Multi-Purpose End Mills
High-speed ceramic or standard-speed carbide milling with positive and negative designs for a broad range of materials.

Ball Nose End Mills



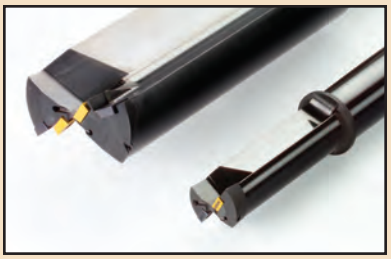
C-4 Series Face Mills
High-velocity cutters with ceramic inserts for use in high-temp alloys, hard metals, cast irons at high speeds and accelerated feed rates. Precision nests provide multiple insert configurations and body protection.



Slotting Cutters
Standard screw-on and mechanically held indexable slotting cutters.

Special application cutters designed to produce precise narrow width slots.

INDEXABLE DRILLING



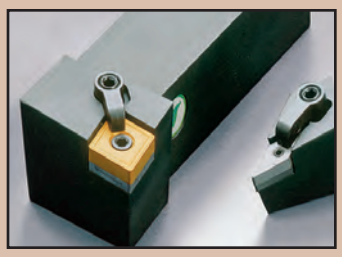
Holemill™ System
Indexable drill utilizing Greenleaf's advanced coated carbide grades for higher speeds, quieter cutting, longer tool life and reduced horsepower consumption. Inserts are positive squares (SPMT) for 4 indexes per insert. 1" to 3" diameter range.

SPECIALLY ENGINEERED PRODUCTS

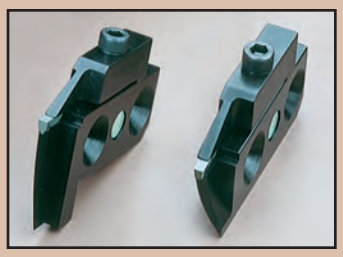
Greenleaf engineers have designed custom operation-specific metal-cutting tools for thousands of customers. Sometimes starting with a concept as simple as a paper sketch, they are able to implement their experience in materials and processes to devise a practical custom application.

From individual inserts making special cuts to ganged cutters providing special cutting paths, Greenleaf CAD engineering services can provide a prompt solution for your special metalcutting needs.

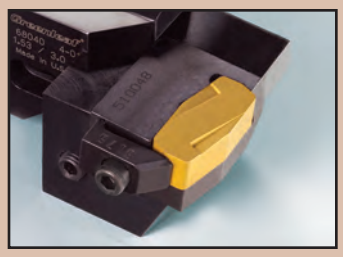
GROOVING, TURNING AND BORING SYSTEMS



ANSI Toolholders
Greenleaf manufactures a complete line of industry-standard toolholders in conformance with ANSI specifications in 4140 and 4150 alloy steel, hardened up to 42 Rc and oxide coated.



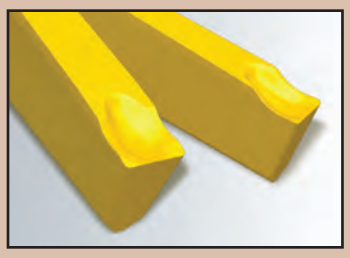
Face Grooving / Support Blades
A selection of 248 width and face grooving diameter combinations to fit our standard advanced ceramic tooling offering. Support blades accept GTS carbide groovers as well as Greenleaf standard ceramic grooving inserts.



Bar Turning Tools
Complete systems are available – heads, cartridges and inserts for Kieserling*, Medart/BlawKnox*, Daisho* and Hetran* bar turning machines.

* *These trademarks or registered trademarks are the property of the respective companies.*

Advanced Tooling
Greenleaf ceramic insert tool-holders feature a geometry and pocket depth that maximizes ceramic performance.

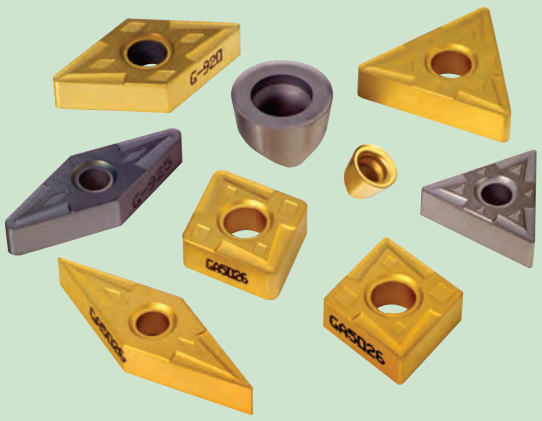


COS – Cut-Off System
Greenleaf's advanced Cut-Off System features inserts that are qualified to fit into the standard Greenleaf grooving tools while maintaining superior performance.

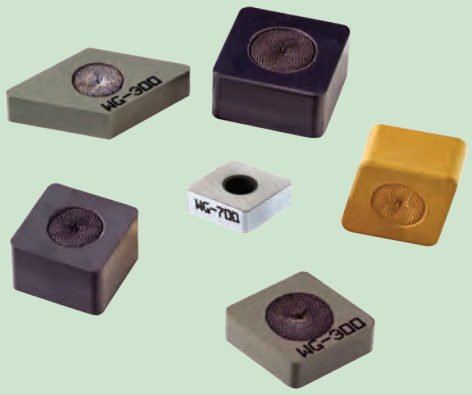
Trigon Inserts
Ceramic and carbide. Flexibility of a triangle with the corner strength of an 80° diamond.

GTS – Groove Turn System
GTS inserts offer high-speed performance in a chipform geometry specifically designed to allow the Greenleaf carbide grooving insert to double as a turning tool when the application dictates. GTS carbide inserts are qualified to fit into the same pocket as its standard ceramic groover counterpart.

GREENLEAF SURFACES/GEOMETRIES



TurboForm® Inserts
Precise finishing with excellent chip control in nickel-based alloys. Very effective for machining wall sections as thin as .050".



Rough Stuff® Surface Treatment
Greatly improved insert-gripping power for greater accuracy, speed and pocket retention. Available on WG-300®, WG-600®, WG-700™ and GSN100™ ceramics.
U.S. Patent No. 6,712,564 B1

CARBIDE

Greenleaf offers a comprehensive line of carbide inserts in grades ranging from sub-micron C-1 through C-8 classifications. An industry pioneer in coated carbide, Greenleaf offers a variety of uncoated, MT-CVD coated and PVD-coated grades. Carbide inserts are available in ANSI standard geometries with multi-purpose chipbreakers for heavy roughing through finishing.

COATED

GA5023 A high-speed performance grade for turning and milling cast iron. GA5023 features an advanced MT-CVD coating specifically developed for abrasive wear resistance. Application ranges from roughing to finishing on most cast iron materials including gray iron, ductile, nodular and other alloyed irons. The high wear and shock resistance of GA5023 allows machining at high speeds and a variety of feeds.

GA5025 A high-speed MT-CVD coated grade for turning, light roughing and finishing of carbon and alloy steels, as well as selected stainless steels.

GA5026 A high-speed grade developed for turning nickel- and cobalt-based super-alloys, stainless steels, and refractory metals. The advanced MT-CVD coating over a micro-grain substrate offers high wear resistance. GA5026 has exceptional resistance to the notching and deformation common to machining high strength materials. Apply at high speeds and light feeds in turning and selected milling applications.

GA5035 A high-performance MT-CVD coated grade for turning all types of steels, and selected stainless steels. GA5035 can be used in rough, semi-finish, and finish turning situations requiring resistance to heat deformation, thermal shock, and abrasion. GA5035 should be applied at high speeds and a range of feeds.

GA5036 A high-performance MT-CVD coated grade for milling steels at high speed. GA5036 should be used when milling forged and cast steels and selected ductile irons. GA5036 has a unique combination of toughness and heat resistance making it suitable for heavy and light duty milling at high cutting speeds.

GA5125 New high-performance MT-CVD coated carbide milling grade especially suited for manganese steel. GA5125 is also applicable on chrome-moly steel, tool steel and similar high alloy steels. GA5125 provides excellent resistance to abrasion, crater wear, thermal shock, deformation and edge build-up. GA5125 should be applied at high speeds with moderate feed rates.

G-910 PVD-coated grade for milling high-temp alloys, stainless steel, and low carbon steels. G-910 is a medium-speed grade and should be applied at moderate to high feed rates.

G-9120 PVD-coated grade for milling and turning steel castings and steel forgings. G-9120 is engineered to maximize productivity at moderate to heavy feed rates and depths of cut.

G-915 Multi-layer PVD-coated grade, excellent for cut off, milling and turning high-temp alloys, stainless steel, and low carbon steels. The multi-layer PVD coating adds heat and abrasion resistance to the tough, shock-resistant substrate. G-915 should be run at moderate speeds and moderate to high feeds in milling and interrupted turning applications.

G-920 PVD-coated grade for turning and milling high-strength materials such as high-temp alloys, titanium and stainless steel. G-920 is also an excellent grade for aluminum and refractory metals. This grade has the resistance to deformation and notching required for higher speeds than G-910.

G-9230 PVD-coated grade developed for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons. G-9230 has superior wear resistance and toughness and is excellent for cast and forged scale machining conditions.

G-925 Multi-layer PVD-coated grade specifically designed for machining abrasive and difficult-to-machine materials. Typical applications include high-temp alloys, titanium and other refractory metals, stainless steel, and many cast irons. G-925 exhibits excellent resistance to notching and deformation. Apply at moderate to high speeds and moderate feeds.

G-935 Multi-layer PVD-coated grade for steel milling and turning applications requiring additional resistance to mechanical and thermal shock. The multi-layered PVD coating increases the speed capability and wear resistance in tough milling and interrupted turning applications.

UNCOATED

G-01 Developed for milling high-temp alloys, stainless steel, and low-carbon steels at low speeds and moderate to high feeds. Also can be used for turning in the same application range on severe interruption or old machinery.

G-01M A tough, sub-micron grade used for milling and roughing austenitic stainless steels, and stainless steel castings – even when rolling or casting skin is present. The edge strength of G-01M allows the use of sharp edges, high positive rakes, and intermittent cuts.

G-10 For roughing all cast irons under severe conditions, including broaching. The edge strength of G-10 makes it a good choice for roughing high-temp alloys with positive rakes and machining non-ferrous materials when toughness is of prime importance. Apply at moderate speeds and feeds.

G-02 An excellent general-purpose cast iron grade. G-02 can be applied to milling and turning cast iron at moderately high speeds and medium feeds. G-02 is also a good choice for machining aluminum with positive rakes, and light roughing of some high-temp alloys and stainless steels.

G-20M A sub-micron C-2 carbide grade suited for use in turning and milling titanium and nickel-based super-alloys. G-20M has the strength and edge wear characteristics to resist notching when turning high-strength materials.

G-23 A finishing grade for all cast irons and other short-chipping non-ferrous materials, such as brass and bronze. Apply at moderately high speeds and moderate feed rates.

G-40 Finish turning of cast iron and other hard-wearing materials at high speeds and light feeds in good conditions.

G-50 Heavy roughing grade for steel and steel castings under difficult conditions, and ferritic stainless steels in most applications. G-50 is tough enough to enable the use of positive rakes for turning.

G-53 Excellent general-purpose milling grade for steel and steel alloys at moderate speeds and feeds. Good combination of toughness and wear resistance for milling, or as an all-around grade for mixed production applications. G-53 is not recommended for continuous turning.

G-60 Heavy, rough turning of steel, steel castings, and steel forgings. Apply G-60 at moderate speeds and heavy feed rates and depths of cut. More wear resistant than G-50, but lower in toughness.

G-74 Roughing or finishing grade for steel and steel castings. G-74 has higher shock resistance than G-70, and should be applied at high speeds and moderate to heavy feeds. Well suited for turning of steel rolls.

CERAMIC

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts in ANSI standard and special geometries. Some of the most prominent include:

WG-300® Whisker-reinforced ceramic with excellent wear and shock resistance at high surface speeds. WG-300 is very effective at machining nickel and cobalt based super-alloys, and other hard materials at metal removal rates up to 10 times higher than carbide.

WG-600® Coated whisker-reinforced ceramic offering longer tool life and better performance over uncoated ceramics due to outstanding thermal properties and shock-resistance at high cutting speeds. Application areas include rough and finish turning, as well as high-performance milling of high-strength alloys, hardened steels and select stainless steels. *U.S. Patent No. 6,447,896 B1*

WG-700™ New whisker-reinforced Al_2O_3 ceramic substrate featuring improved toughness and a unique high-speed coating. WG-700 is ideal for machining nickel- and cobalt-based super alloys and other difficult-to-machines materials. WG-700 exhibits high metal-removal rates with exceptional tool life.
U.S. Patent No. 6,447,896 B1

XSYTIN™-1 New phase-toughened ceramic capable of extreme feed rates. XSYTIN™-1 excels at machining a wide variety of materials including steels, cast and ductile irons, high-temperature alloys and other challenging metals. XSYTIN™-1 is ideal for use in interrupted cuts, scale, abrasive casting materials and milling.

GSN100™ New engineered blend of silicon nitride and proprietary toughening agents that redefines productivity in the machining of cast iron. GSN100 delivers outstanding tool life at high cutting speeds in turning, grooving and milling applications.

GEM-7™ Al_2O_3 + TiC composite ceramic with a high degree of predictability in roll turning and hard alloy (up to 65 R/c) machining.

GEM-19™ Cold pressed and sintered Al_2O_3 ceramic for economical roughing and finishing of cast iron grades.

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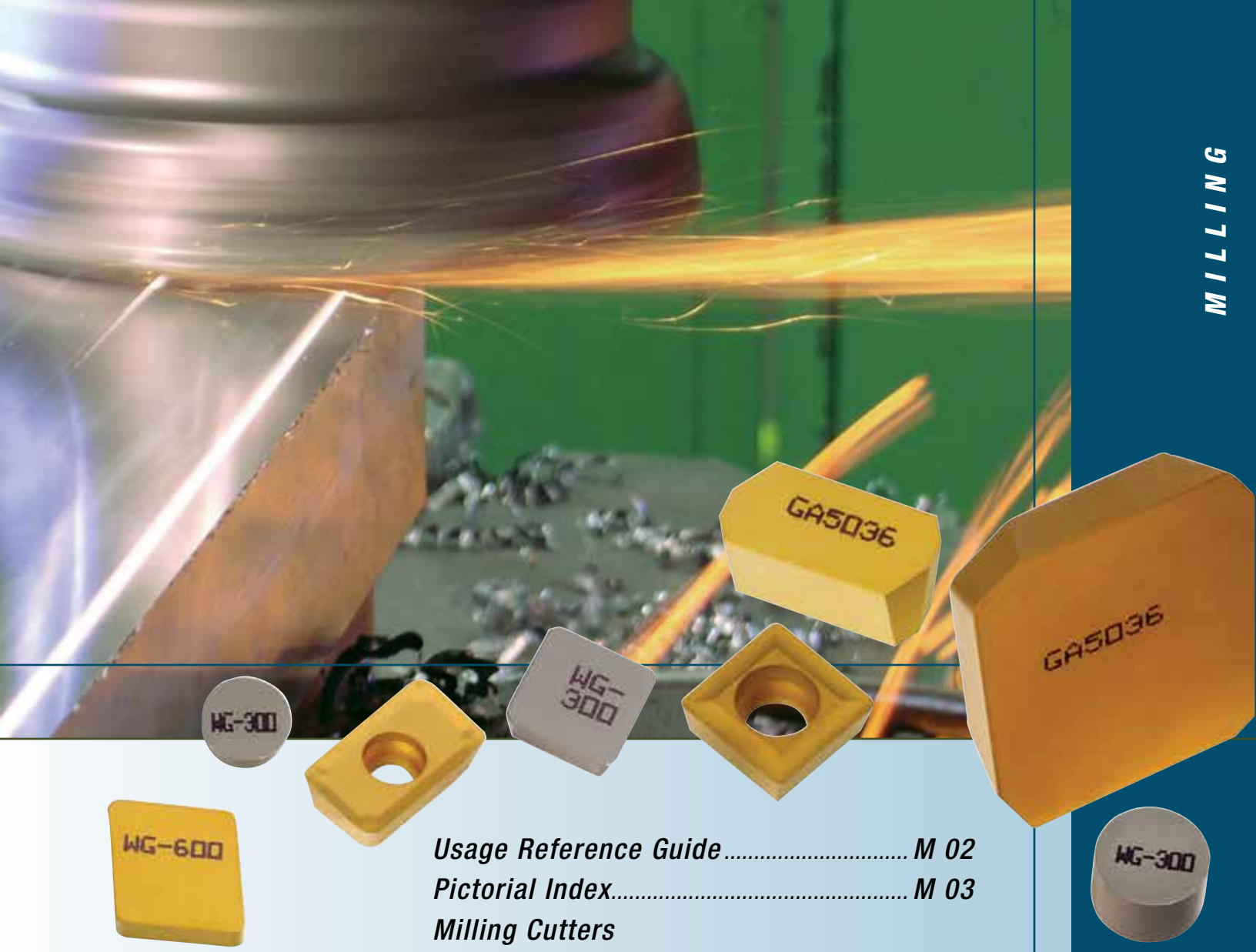

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Greenleaf®

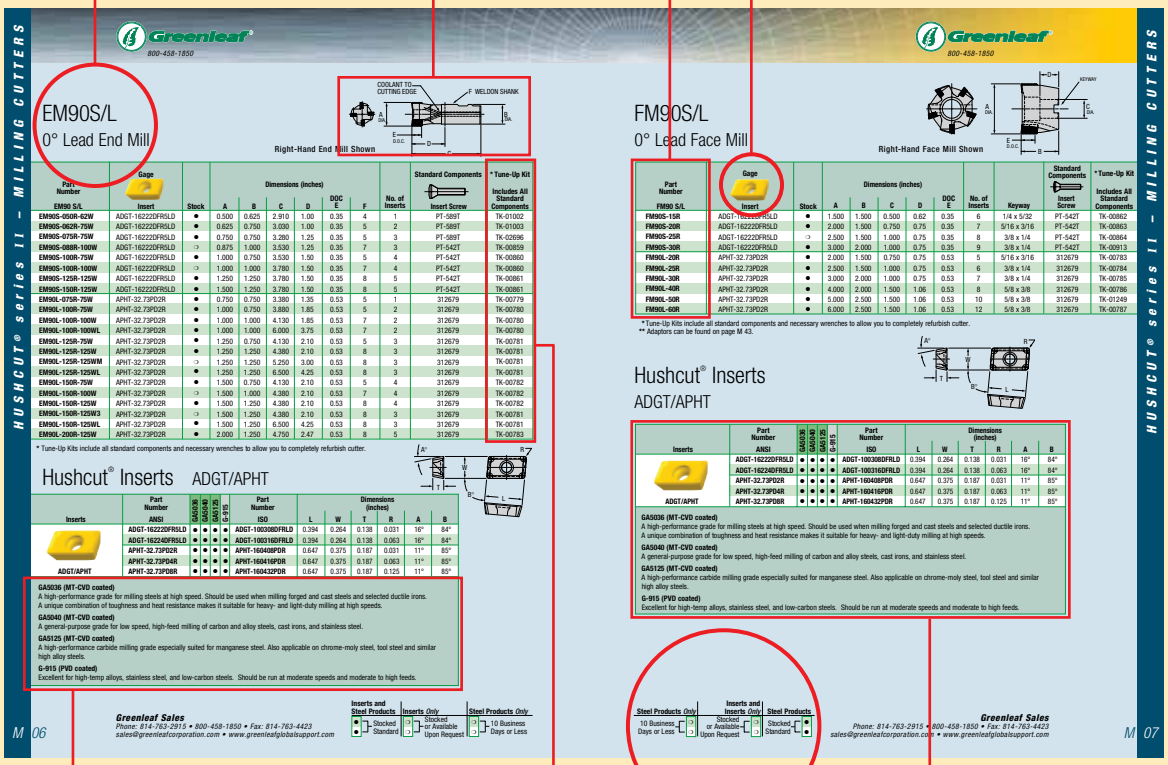
Greenleaf®

Geometry

Part Number

Milling Cutter

Insert Style



Appropriate Milling Grades

Tune-Up Kit *(includes all standard components to refurbish cutter)*

Stocking Status

Standard Insert

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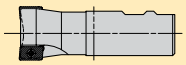
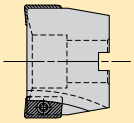
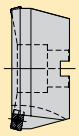
Hushcut® Series II Milling System



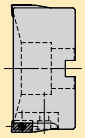
EM90
0° Lead End Mill
.375"-2.0" Diameter
page: M 06



FM90
0° Lead Face Mill
1.5"-6.0" Diameter
page: M 07

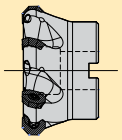


FM75
75° Lead
Face Mill
1.5"-6.0" Dia.
page: M 08



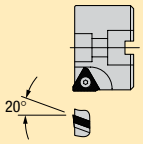
FMC90
Cartridge Style
0° Lead
Face Mill
3"-10.0" Dia.
page: M 09

Index-O-Cut™ Milling System

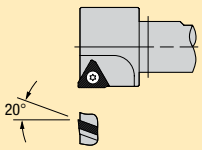


G-OFHP
High Positive Face Mill
Octagon Inserts
2.0"-8.0" Diameter
page: M 12-13

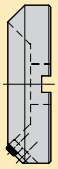
High-Shear Cutting Mills



FTHP
0° Lead Face Mill
20° Positive Axial Rake
2.50"-4.0" Diameter
page: M 16

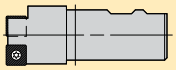


WSTHP
0° Lead End Mill
20° Positive Axial Rake
1.50"-2.5" Diameter
page: M 17



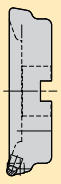
SHPC-345
45° Lead Face Mill
Negative Radial,
20° Positive Axial Rake
4"-12" Diameter
page: M 18

Screw-On Insert Style Cutters

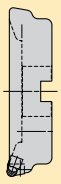


WSSCC
0° Lead End Mill
Center Cutting
.075"-1.5" Diameter
page: M 20

Excelerator® Milling Cutters
Ceramic and Carbide Inserts
Up to 4.0" Diameter Cutters

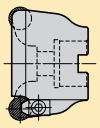


CP4 Series
Face Mill
Positive Rake Inserts
Cutters and Nests
page: M 22-23

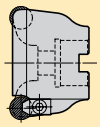


C4 Series
Face Mill
Negative Rake Inserts
Cutters and Nests
page: M 24-25

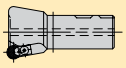
Excelerator® Milling Cutters
Ceramic and Carbide Inserts
Up to 4.0" Diameter Cutters



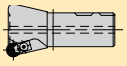
FMRP
Face Mill
Round Positive Inserts
2.0"-4.0" Dia.
page: M 26



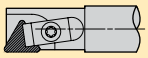
FMRN
Face Mill
Round Negative Inserts
2.0"-4.0" Dia.
page: M 26



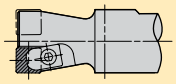
WSRP
End Mill
Round Positive Inserts
.625"-2.0" Dia.
page: M 27



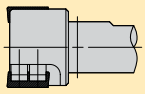
WSRN
End Mill
Round Negative Inserts
1.0"-2.5" Dia.
page: M 28



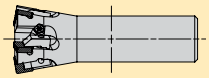
WSTP
End Mill
Positive Triangle Inserts
.5"-.625" Dia.
page: M 29



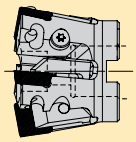
WSSP
End Mill
Positive Square Inserts
.375"-1.5" Dia.
page: M 30



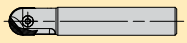
WSAN
End Mill
Parallelogram Inserts
.985"-2.465" Dia.
page: M 31



XFSP
High-Feed End Mill
Square Positive Inserts
1.0" – 1.5" Diameter
page: M 32

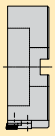


XFSP
High-Feed Face Mill
Square Positive Inserts
2" Diameter
page: M 32

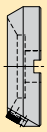


SSBN
Ball Nose End Mill
Ball Nose Inserts
.375" – 1" Diameter
page: M 34

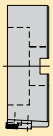
Powermill® Cutters



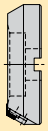
M400LNP-A
0° Lead Face Mill
Negative Radial
Positive Axial
4"-12" Diameter
page: M 38



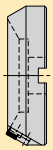
C430LNP-H
30° Lead Face Mill
Negative Radial
Positive Axial
8"-16" Diameter
page: M 42



M402LN-A
2° Lead Face Mill
Negative Radial
Negative Axial
4"-12" Diameter
page: M 39



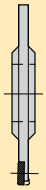
C430LNP-W
30° Lead Face Mill
Finishing Cutter
Negative Radial,
Positive Axial
8"-16" Diameter
page: M 43



M430LNP-A
30° Lead Face Mill
Negative Radial,
Positive Axial
4"-12" Diameter
page: M 41

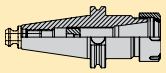
Slotting Cutters

Powerslot®
Wedge Design
Cutting Ranges:
.625"-1.093"
page: M 46
Special Design:
page: M 47



Narrow-Width Slotter
Screw-On Insert
Cutting Ranges:
.250", .312", .375"
page: M 48

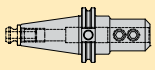
Toolholding



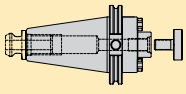
ER Collet Chucks
page: M 50-51

ER Collets
page: M 52-54

ER Collet Wrenches
page: M 55



Weldon-Style End Mill Holders
page: M 56-57



Shell Mill Holders
page: M 58-59

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Hushcut® Series II Milling Cutters

Quiet and free-cutting mills with screw-on insert designs to make the most out of the available horsepower. The free-cutting action results in longer tool life and improved surface finishes. Available in end mills and face mills in a wide range of small to large diameters.

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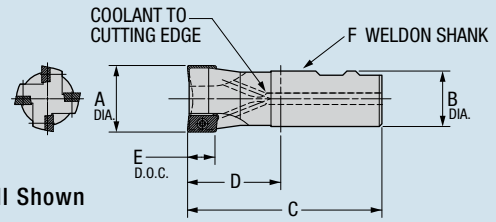
EM90S/L

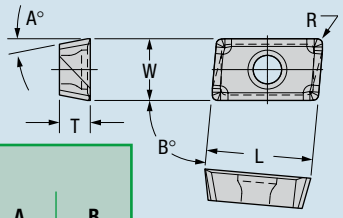
0° Lead End Mill



Right-Hand End Mill Shown

Part Number EM90 S/L	Gage Insert	Stock	Dimensions (inches) A	B	C	D	DOC E	F	No. of Inserts	Standard Components Insert Screw	*Tune-Up Kit Includes All Standard Components
EM90S-050R-62W	ADGT-16222DFR5LD	●	0.500	0.625	2.910	1.00	0.35	4	1	PT-589T	TK-01002
EM90S-062R-75W	ADGT-16222DFR5LD	●	0.625	0.750	3.030	1.00	0.35	5	2	PT-589T	TK-01003
EM90S-075R-75W	ADGT-16222DFR5LD	●	0.750	0.750	3.280	1.25	0.35	5	3	PT-589T	TK-02696
EM90S-088R-100W	ADGT-16222DFR5LD	❍	0.875	1.000	3.530	1.25	0.35	7	3	313631	TK-02379
EM90S-100R-75W	ADGT-16222DFR5LD	●	1.000	0.750	3.530	1.50	0.35	5	4	PT-542T	TK-00860
EM90S-100R-100W	ADGT-16222DFR5LD	●	1.000	1.000	3.780	1.50	0.35	7	4	PT-542T	TK-00860
EM90S-125R-125W	ADGT-16222DFR5LD	●	1.250	1.250	3.780	1.50	0.35	8	5	PT-542T	TK-00861
EM90S-150R-125W	ADGT-16222DFR5LD	●	1.500	1.250	3.780	1.50	0.35	8	5	PT-542T	TK-00861
EM90L-075R-75W	APHT-32.73PD2R**	●	0.750	0.750	3.380	1.35	0.53	5	1	PT-559T	TK-00758
EM90L-100R-75W	APHT-32.73PD2R**	●	1.000	0.750	3.880	1.85	0.53	5	2	312679	TK-00780
EM90L-100R-100W	APHT-32.73PD2R**	●	1.000	1.000	4.130	1.85	0.53	7	2	312679	TK-00780
EM90L-100R-100WL	APHT-32.73PD2R**	●	1.000	1.000	6.000	3.75	0.53	7	2	312679	TK-00780
EM90L-125R-75W	APHT-32.73PD2R**	●	1.250	0.750	4.130	2.10	0.53	5	3	312679	TK-00781
EM90L-125R-125W	APHT-32.73PD2R**	●	1.250	1.250	4.380	2.10	0.53	8	3	312679	TK-00781
EM90L-125R-125WM	APHT-32.73PD2R**	❍	1.250	1.250	5.250	3.00	0.53	8	3	312679	TK-00781
EM90L-125R-125WL	APHT-32.73PD2R**	●	1.250	1.250	6.500	4.25	0.53	8	3	312679	TK-00781
EM90L-150R-75W	APHT-32.73PD2R**	●	1.500	0.750	4.130	2.10	0.53	5	4	312679	TK-00782
EM90L-150R-100W	APHT-32.73PD2R**	❍	1.500	1.000	4.380	2.10	0.53	7	4	312679	TK-00782
EM90L-150R-125W	APHT-32.73PD2R**	●	1.500	1.250	4.380	2.10	0.53	8	4	312679	TK-00782
EM90L-150R-125W3	APHT-32.73PD2R**	❍	1.500	1.250	4.380	2.10	0.53	8	3	312679	TK-00781
EM90L-150R-125WL	APHT-32.73PD2R**	●	1.500	1.250	6.500	4.25	0.53	8	3	312679	TK-00781
EM90L-200R-125W	APHT-32.73PD2R**	●	2.000	1.250	4.380	2.10	0.53	8	5	312679	TK-00783

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** APET can be used in place of APHT.



Hushcut® Inserts ADGT/APHT/APET

Inserts	Part Number ANSI	GA5036	G-9120	G-915	Part Number ISO	Dimensions (inches) L	W	T	R	A	B
ADGT/APHT/APET	**ADGT-16222DFR5LD**	●	●	●	**ADGT-100308DFRLD**	0.394	0.264	0.138	0.031	16°	84°
	ADGT-16224DFR5LD	●	●	●	**ADGT-100316DFRLD**	0.394	0.264	0.138	0.063	16°	84°
	APHT-32.73PD2R	●	●	●	**APHT-160408PDR**	0.647	0.375	0.187	0.031	11°	85°
	APHT-32.73PD4R	●	●	●	**APHT-160416PDR**	0.647	0.375	0.187	0.063	11°	85°
	APHT-32.73PD8R	●	●	●	**APHT-160432PDR**	0.647	0.375	0.187	0.125	11°	85°
	APET-32.73XD2R	●	●	●	**APET-160408PDR**	0.660	0.375	0.188	0.031	11°	85°
	APET-32.73XD4R	●	❍	❍	**APET-160416PDR**	0.653	0.375	0.188	0.063	11°	85°
	APET-32.73XD6R	❍	❍	❍	**APET-160432PDR**	0.653	0.375	0.188	0.094	11°	85°

GA5036 (MT-CVD coated)
A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-9120 (PVD coated)
Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated)
Excellent for high-temp alloys, stainless steel, and low-carbon steels. Should be run at moderate speeds and moderate to high feeds.

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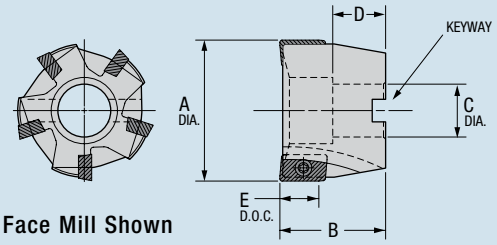
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● Stocked	❍ Stocked or Available Upon Request	❍ 10 Business Days or Less
● Standard	❍	❍

FM90S/L

0° Lead Face Mill



Right-Hand Face Mill Shown

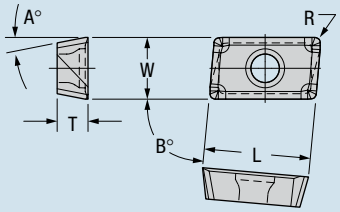
Part Number FM90 S/L	Gage Insert	Stock	Dimensions (inches) A	B	C	D	DOC E	No. of Inserts	Keyway	Standard Components Insert Screw	* Tune-Up Kit Includes All Standard Components
FM90S-15R	ADGT-16222DFR5LD	●	1.500	1.500	0.500	0.62	0.35	6	1/4 x 5/32	PT-542T	TK-00862
FM90S-20R	ADGT-16222DFR5LD	●	2.000	1.500	0.750	0.75	0.35	7	5/16 x 3/16	PT-542T	TK-00863
FM90S-25R	ADGT-16222DFR5LD	❍	2.500	1.500	1.000	0.75	0.35	8	3/8 x 1/4	PT-542T	TK-00864
FM90S-30R	ADGT-16222DFR5LD	●	3.000	2.000	1.000	0.75	0.35	9	3/8 x 1/4	PT-542T	TK-00913
FM90L-20R	APHT-32.73PD2R**	●	2.000	1.500	0.750	0.75	0.53	5	5/16 x 3/16	312679	TK-00783
FM90L-25R	APHT-32.73PD2R**	●	2.500	1.500	1.000	0.75	0.53	6	3/8 x 1/4	312679	TK-00784
FM90L-30R	APHT-32.73PD2R**	●	3.000	2.000	1.000	0.75	0.53	7	3/8 x 1/4	312679	TK-00785
FM90L-40R	APHT-32.73PD2R**	●	4.000	2.000	1.500	1.06	0.53	8	5/8 x 3/8	312679	TK-00786
FM90L-50R	APHT-32.73PD2R**	●	5.000	2.500	1.500	1.06	0.53	10	5/8 x 3/8	312679	TK-01249
FM90L-60R	APHT-32.73PD2R**	●	6.000	2.500	1.500	1.06	0.53	12	5/8 x 3/8	312679	TK-00787

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** APET can be used in place of APHT.

† Adaptors can be found on page M 45.

Hushcut® Inserts

ADGT/APHT/APET



Inserts	Part Number ANSI	GA5036	G-9120	G-915	Part Number ISO	Dimensions (inches) L	W	T	R	A	B
ADGT/APHT/APET	**ADGT-16222DFR5LD**	●	●	●	**ADGT-100308DFRLD**	0.394	0.264	0.138	0.031	16°	84°
	ADGT-16224DFR5LD	●	●	●	**ADGT-100316DFRLD**	0.394	0.264	0.138	0.063	16°	84°
	APHT-32.73PD2R	●	●	●	**APHT-160408PDR**	0.647	0.375	0.187	0.031	11°	85°
	APHT-32.73PD4R	●	●	●	**APHT-160416PDR**	0.647	0.375	0.187	0.063	11°	85°
	APHT-32.73PD8R	●	●	●	**APHT-160432PDR**	0.647	0.375	0.187	0.125	11°	85°
	APET-32.73XD2R	●	●	●	**APET-160408PDR**	0.660	0.375	0.188	0.031	11°	85°
	APET-32.73XD4R	●	❍	❍	**APET-160416PDR**	0.653	0.375	0.188	0.063	11°	85°
	APET-32.73XD6R	❍	❍	❍	**APET-160432PDR**	0.653	0.375	0.188	0.094	11°	85°

GA5036 (MT-CVD coated)
A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-9120 (PVD coated)
Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated)
Excellent for high-temp alloys, stainless steel, and low-carbon steels. Should be run at moderate speeds and moderate to high feeds.

Steel Products *Only*		Inserts and Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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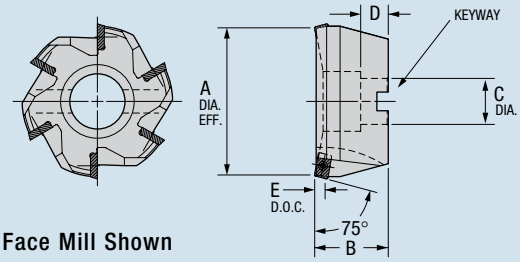
FM75L

75° Lead Face Mill



Right-Hand Face Mill Shown

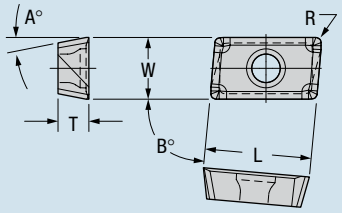
Part Number FM75 S/L	Gage Insert	Stock	Dimensions (inches) A	B	C	D	DOC E	No. of Inserts	Keyway	Standard Components Insert Screw	* Tune-Up Kit Includes All Standard Components
FM75L-20R	APHT-32.73PD2R**	●	2.000	1.500	0.750	0.75	0.31	3	5/16 x 3/16	312679	TK-00781
FM75L-25R	APHT-32.73PD2R**	●	2.500	1.500	1.000	0.75	0.31	4	3/8 x 1/4	312679	TK-00782
FM75L-30R	APHT-32.73PD2R**	●	3.000	2.000	1.000	0.75	0.31	5	3/8 x 1/4	312679	TK-00783
FM75L-40R	APHT-32.73PD2R**	●	4.000	2.000	1.500	1.06	0.31	6	5/8 x 3/8	312679	TK-00784
FM75L-50R	APHT-32.73PD2R**	●	5.000	2.500	1.500	1.06	0.31	7	5/8 x 3/8	312679	TK-00785
FM75L-60R	APHT-32.73PD2R**	●	6.000	2.500	1.500	1.06	0.31	8	5/8 x 3/8	312679	TK-00786

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** APET can be used in place of APHT.

† Adaptors can be found on page M 45.

Hushcut® Inserts

APHT/APET



Inserts	Part Number ANSI	GA5036	G-9120	G-915	Part Number ISO	Dimensions (inches) L	W	T	R	A	B
APHT/APET	**APHT-32.73PD2R**	●	●	●	**APHT-160408PDR**	0.647	0.375	0.187	0.031	11°	85°
	APHT-32.73PD4R	●	●	●	**APHT-160416PDR**	0.647	0.375	0.187	0.063	11°	85°
	APHT-32.73PD8R	●	●	●	**APHT-160432PDR**	0.647	0.375	0.187	0.125	11°	85°
	APET-32.73XD2R	●	●	●	**APET-160408PDR**	0.660	0.375	0.188	0.031	11°	85°
	APET-32.73XD4R	●	❍	❍	**APET-160416PDR**	0.653	0.375	0.188	0.063	11°	85°
	APET-32.73XD6R	❍	❍	❍	**APET-160432PDR**	0.653	0.375	0.188	0.094	11°	85°

GA5036 (MT-CVD coated)
A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-9120 (PVD coated)
Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated)
Excellent for high-temp alloys, stainless steel, and low-carbon steels. Should be run at moderate speeds and moderate to high feeds.

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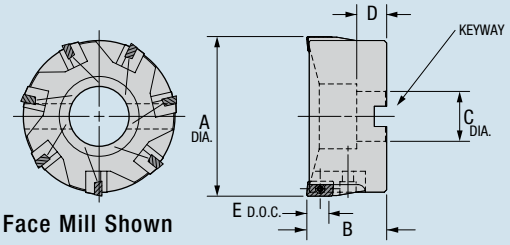
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

FMC90L

0° Lead Face Mill, Cartridge Style



Right-Hand Face Mill Shown

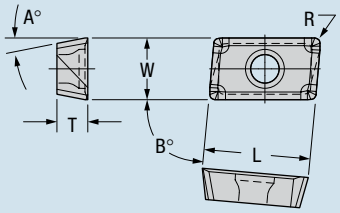
Part Number FMC90L	Gage Insert	Stock	Dimensions (inches) A	B	C	D	DOC E	No. of Inserts	Keyway	Standard Components Cartridge Screw	Cartridge	Insert Screw	*Tune-Up Kit Includes All Standard Components
FMC90L-30R	APHT-32.73PD2R**	●	3.000	2.000	1.000	0.750	0.53	6	3/8 x 1/4	1/4-20x3/4 SHCS	MC90L-R	312679	TK-00788
FMC90L-40R	APHT-32.73PD2R**	❍	4.000	2.500	1.500	1.060	0.53	7	5/8 x 3/8	1/4-20x3/4 SHCS	MC90L-R	312679	TK-00789
FMC90L-50R	APHT-32.73PD2R**	●	5.000	2.500	1.500	1.060	0.53	8	5/8 x 3/8	1/4-20x3/4 SHCS	MC90L-R	312679	TK-00790
FMC90L-60R	APHT-32.73PD2R**	●	6.000	2.500	1.500	1.060	0.53	10	5/8 x 3/8	1/4-20x3/4 SHCS	MC90L-R	312679	TK-00791
FMC90L-80R	APHT-32.73PD2R**	●	8.000	2.500	2.500	1.250	0.53	12	1 x 1/2	1/4-20x3/4 SHCS	MC90L-R	312679	TK-00792
FMC90L-100CR	APHT-32.73PD2R**	●	10.000	2.500	2.500	1.250	0.53	12	1 x 1/2	1/4-20x3/4 SHCS	MC90L-R	312679	TK-00792
FMC90L-100FR	APHT-32.73PD2R**	●	10.000	2.500	2.500	1.250	0.53	16	1 x 1/2	1/4-20x3/4 SHCS	MC90L-R	312679	TK-00793

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** APET can be used in place of APHT.

† Adaptors can be found on page M 45.

Hushcut® Inserts

APHT/APET



Inserts	Part Number ANSI	GA5036	G-9120	G-915	Part Number ISO	Dimensions (inches) L	W	T	R	A	B
APHT/APET	**APHT-32.73PD2R**	●	●	●	**APHT-160408PDR**	0.647	0.375	0.187	0.031	11°	85°
	APHT-32.73PD4R	●	●	●	**APHT-160416PDR**	0.647	0.375	0.187	0.063	11°	85°
	APHT-32.73PD8R	●	●	●	**APHT-160432PDR**	0.647	0.375	0.187	0.125	11°	85°
	APET-32.73XD2R	●	●	●	**APET-160408PDR**	0.660	0.375	0.188	0.031	11°	85°
	APET-32.73XD4R	●	❍	❍	**APET-160416PDR**	0.653	0.375	0.188	0.063	11°	85°
	APET-32.73XD6R	❍	❍	❍	**APET-160432PDR**	0.653	0.375	0.188	0.094	11°	85°

GA5036 (MT-CVD coated)
A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-9120 (PVD coated)
Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated)
Excellent for high-temp alloys, stainless steel, and low-carbon steels. Should be run at moderate speeds and moderate to high feeds.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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Index-O-Cut™ Milling Cutters

The Index-O-Cut™ is a high-performance milling system for all materials thanks to its high-shear cutting action and the 45° lead angle on the octagon-style insert. These mills are capable of running at higher speeds and feeds than the competitiion with low horsepower consumption.

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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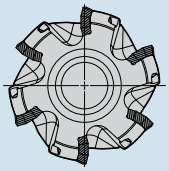
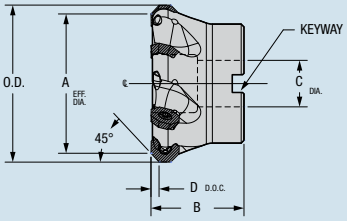
G-OFHP

Face Mill: High Positive



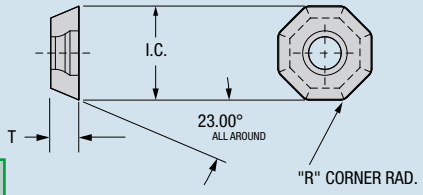


Part Number	Gage Insert	Stock	Dimensions (inches) A	O.D.	B	C	DOC** D	No. of Inserts	Keyway	Standard Components Insert Screw	*Tune-Up Kit Includes All Standard Components
G-OFHP-0545E200	OOEW-534	●	2.000	2.370	1.500	0.750	0.173	4	5/16	PT-546-T	TK-03249
G-OFHP-0545E250	OOEW-534	●	2.500	2.870	1.750	1.000	0.173	5	3/8	PT-546-T	TK-03165
G-OFHP-0545E300	OOEW-534	❍	3.000	3.370	2.000	1.000	0.173	6	3/8	PT-546-T	TK-03250
G-OFHP-0545E400	OOEW-534	●	4.000	4.370	2.000	1.500	0.173	7	5/8	PT-546-T	TK-03444
G-OFHP-0545E500	OOEW-534	●	5.000	5.370	2.000	1.500	0.173	8	5/8	PT-546-T	TK-03445
G-OFHP-0545E600	OOEW-534	●	6.000	6.370	2.000	1.500	0.173	9	5/8	PT-546-T	TK-03651
G-OFHP-0545E800	OOEW-534	●	8.000	8.370	2.000	2.000	0.173	10	5/8	PT-546-T	TK-03437

*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Maximum depth of cut is 0.312".

OOEW Insert

Octagon



Inserts	Part Number ANSI	G-9120	G-915	Part Number ISO	Dimensions (inches) A	T	R
	OOEW-534	●	●	**OOEW-060416**	0.625	0.1875	0.0625

G-9120 (PVD coated)
Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated)
Excellent for high-temp alloys, stainless steel, and low-carbon steels. Should be run at moderate speeds and moderate to high feeds.

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Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● Stocked	❍ Stocked or Available Upon Request	❍ 10 Business Days or Less
● Standard	❍	❍

Performance Calculations

Starting Speeds and Feeds for Index-O-Cut™ *(M12)*

Work Material	Insert Grades	Hardness (Hrc)	Cutting Speed (SFM)	Maximum Feed per Tooth (IPT)
Low-Carbon Steel/Free Machining	G-9120	<25	1200-1600	0.005-0.010
Alloy Steel (4140, 4130, 6150, 8620)	G-9120	15-30	900-1400	0.004-0.007
High-Carbon (Steel 1080,1541, Nitralloy, 52100)	G-9120	25-40	600-1000	0.003-0.006
Tool Steel (A6, D2, P-20, H-13)	G-9120	<30	800-1200	0.004-0.008
High-Temp (Inconel, Hastelloy, Waspaloy)	G-915	<35	400-800	0.003-0.007
Stainless Steel (304, 316, 17-4 PH)	G-915	<32	900-1500	0.004-0.009

Inserts and Steel Products *Only*	Inserts *Only*	Steel Products
❍ 10 Business Days or Less	❍ Stocked or Available Upon Request	● Stocked Standard
❍	❍	●

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High-Shear Milling Cutters

Greenleaf's high-shear face milling cutters are industry's first choice when surface finish and material removal rate are a priority in materials such as aluminum, high-temp alloy, stainless steel or low-carbon steel. The zero-degree lead face mills offer a protected screw-on insert pocket design with an anvil backup or cartridge design in a diameter range from 2.5"-12", which gives greater life to the cutter body.

The Greenleaf 45-degree face mill has a through-pocket wedge-behind design, which offers complete face adjustability to dial in the face runout and maximum chip gullets to allow even the most difficult-to-machine materials to exit the cut freely. This feature extends insert life and aids in achieving the desired surface finish.

- 2.5"-4" diameter, zero-degree lead are offered in a fixed pocket design.
- 4"-12" diameter, zero-degree and 45-degree lead are offered in adjustable pocket designs to pre-set face runout.

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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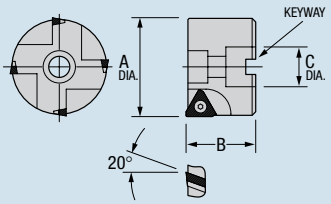
FTHP

Milling Cutters: High Shear



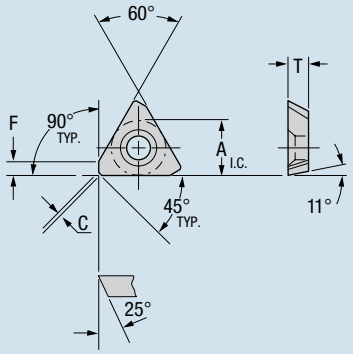
Right-Hand Face Mill Shown

Part Number		Gage	Stock		Dimensions (inches)				No. Of	Standard Components		* Tune-Up Kit
Right Hand	Left Hand**	Insert	R	L	A	B	C	Keyway	Inserts	Anvil	Insert Screw	Includes All Standard Components
FTHP-50002.5		TPCB-43P8F-R	❍	❍	2.50	1.750	1.000	3/8 X 7/32	4	308429	SE03-23	TK-00620
	FTHP-50002.5-LH	TPCB-43P8F-L	❍	❍	2.50	1.750	1.000	3/8 X 7/32	4	308429	SE03-23	TK-00620
FTHP-50003		TPCB-43P8F-R	❍	❍	3.00	2.000	1.250	1/2 X 9/32	4	308429	SE03-23	TK-00621
	FTHP-50003-LH	TPCB-43P8F-L	❍	❍	3.00	2.000	1.250	1/2 X 9/32	4	308429	SE03-23	TK-00621
FTHP-50004		TPCB-43P8F-R	●	❍	4.00	2.250	1.500	5/8 X 3/8	5	308429	SE03-23	TK-01812
	FTHP-50004-LH	TPCB-43P8F-L	❍	❍	4.00	2.250	1.500	5/8 X 3/8	5	308429	SE03-23	TK-01812

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.

TPCB Insert

Inserts	Part Number	GA5036	G-915	G-53	Part Number	Dimensions (inches) A	T	F	C
	TPCB-43P8F-R	❍	●	❍	TPCB-43P8F-R	0.500	0.187	0.125	0.044
	TPCB-43P8F-L	❍	●	❍	TPCB-43P8F-L	0.500	0.187	0.125	0.044



GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.

G-53 (uncoated) General purpose grade for steel and steel alloys. Good combination of toughness and wear resistance for milling, or as an all-around grade for mixed production applications.

"J" finish available upon request

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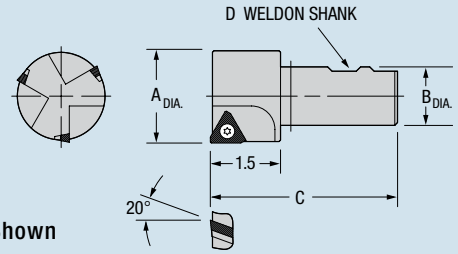
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● Stocked	❍ Stocked or Available	❍ 10 Business
● Standard	❍ Upon Request	❍ Days or Less

WSTHP

End Mill: Screw-On Inserts



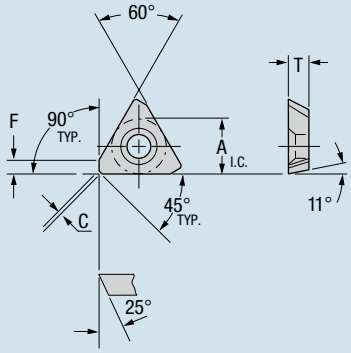
Right-Hand End Mill Shown

Part Number		Gage	Stock		Dimensions (inches)				No. Of	Standard Components		* Tune-Up Kit
Right Hand	Left Hand**	Insert	R	L	A	B	C	D	Inserts	Anvil	Insert Screw	Includes All Standard Components
WSTHP-50001.5(5)		TPCB-43P8F-R	❍	❍	1.500	0.750	3.750	5	2	308429	SE03-23	TK-00650
	WSTHP-50001.5(5)-LH	TPCB-43P8F-L	❍	❍	1.500	0.750	3.750	5	2	308429	SE03-23	TK-00650
WSTHP-50001.5		TPCB-43P8F-R	●	❍	1.500	1.250	4.000	8	2	308429	SE03-23	TK-00650
	WSTHP-50001.5-LH	TPCB-43P8F-L	❍	❍	1.500	1.250	4.000	8	2	308429	SE03-23	TK-00650
WSTHP-50002(5)		TPCB-43P8F-R	❍	❍	2.000	0.750	3.750	5	3	308429	SE03-23	TK-00651
	WSTHP-50002(5)-LH	TPCB-43P8F-L	❍	❍	2.000	0.750	3.750	5	3	308429	SE03-23	TK-00651
WSTHP-50002		TPCB-43P8F-R	●	❍	2.000	1.250	4.000	8	3	308429	SE03-23	TK-00651
	WSTHP-50002-LH	TPCB-43P8F-L	❍	❍	2.000	1.250	4.000	8	3	308429	SE03-23	TK-00651
WSTHP-50002.5		TPCB-43P8F-R	❍	❍	2.500	1.250	4.000	8	4	308429	SE03-23	TK-00652
	WSTHP-50002.5-LH	TPCB-43P8F-L	❍	❍	2.500	1.250	4.000	8	4	308429	SE03-23	TK-00652

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.

TPCB Insert

Inserts	Part Number	GA5036	G-915	G-53	Part Number	Dimensions (inches) A	T	F	C
	TPCB-43P8F-R	❍	●	❍	TPCB-43P8F-R	0.500	0.187	0.125	0.044
	TPCB-43P8F-L	❍	●	❍	TPCB-43P8F-L	0.500	0.187	0.125	0.044



GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.

G-53 (uncoated) General purpose grade for steel and steel alloys. Good combination of toughness and wear resistance for milling, or as an all-around grade for mixed production applications.

"J" finish available upon request

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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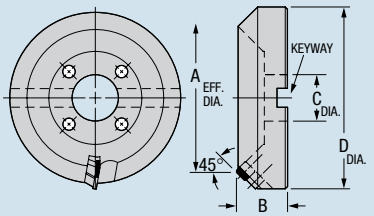
SHPC-345 45° Lead

45° Lead Face Mill, Negative Radial 20° Positive Axial

Right-Hand Cutter Shown

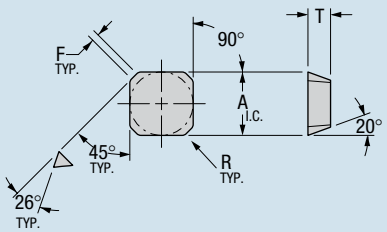


Part Number		Gage	Stock		Dimensions (inches)						No. of Inserts	Standard Components			* Tune-Up Kit
Right Hand	**Left Hand	† Insert	R	L	A	B	C	D	Keyway	Bolt Circle		Wedge	Wedge Screw	Back-Up Plate	Includes All Standard Components
SHPC4- 34504	–	SECN-42A6FR4	●	❍	4	2.250	1.500	5.180	5/8 X 3/8	–	6	411454	38309	307788	TK-00637
–	SHPC4-34504-LH	SECN-42A6FR4	❍	❍	4	2.250	1.500	5.180	5/8 X 3/8	–	6	411454	38309	307788	TK-00637
SHPC4-34505	–	SECN-42A6FR4	●	❍	5	2.250	1.500	6.180	5/8 X 3/8	–	8	411454	38309	307788	TK-00747
–	SHPC4-34505-LH	SECN-42A6FR4	❍	❍	5	2.250	1.500	6.180	5/8 X 3/8	–	8	411454	38309	307788	TK-00747
SHPC4-34506	–	SECN-42A6FR4	●	❍	6	2.250	2.000	7.180	3/4 X7/16	–	10	411454	38309	307788	TK-00707
–	SHPC4-34506-LH	SECN-42A6FR4	❍	❍	6	2.250	2.000	7.180	3/4 X7/16	–	10	411454	38309	307788	TK-00707
SHPC6-34504	–	SECN-63A8FR4	❍	❍	4	2.250	1.500	5.880	5/8 X 3/8	–	6	413466	33824	308467	TK-00638
–	SHPC6-34504-LH	SECN-63A8FR4	❍	❍	4	2.250	1.500	5.880	5/8 X 3/8	–	6	413466	33824	308467	TK-00638
SHPC6-34505	–	SECN-63A8FR4	❍	❍	5	2.250	1.500	6.880	5/8 X 3/8	–	6	413466	33824	308467	TK-00638
–	SHPC6-34505-LH	SECN-63A8FR4	❍	❍	5	2.250	1.500	6.880	5/8 X 3/8	–	6	413466	33824	308467	TK-00638
SHPC6-34506	–	SECN-63A8FR4	●	❍	6	2.250	2.000	7.880	3/4 X 7/16	–	8	413466	33824	308467	TK-00639
–	SHPC6-34506-LH	SECN-63A8FR4	❍	❍	6	2.250	2.000	7.880	3/4 X 7/16	–	8	413466	33824	308467	TK-00639
SHPC6-34508	–	SECN-63A8FR4	●	❍	8	2.750	2.500	9.880	1 X 9/16	4	10	413466	33824	308467	TK-00640
–	SHPC6-34508-LH	SECN-63A8FR4	❍	❍	8	2.750	2.500	9.880	1 X 9/16	4	10	413466	33824	308467	TK-00640
SHPC6-34510	–	SECN-63A8FR4	❍	❍	10	2.750	2.500	11.880	1 X 9/16	4, 4 3/4	14	413466	33824	308467	TK-00641
–	SHPC6-34510-LH	SECN-63A8FR4	❍	❍	10	2.750	2.500	11.880	1 X 9/16	4, 4 3/4	14	413466	33824	308467	TK-00641
SHPC6-34512	–	SECN-63A8FR4	❍	❍	12	2.750	2.500	13.880	1 X 9/16	4, 4 3/4,7	16	413466	33824	308467	TK-00844
–	SHPC6-34512-LH	SECN-63A8FR4	❍	❍	12	2.750	2.500	13.880	1 X 9/16	4, 4 3/4,7	16	413466	33824	308467	TK-00844

† SECN-42A6F AND SECN-63A8F CAN BE USED FOR FINISHING, BUT THERE IS NOT .06" CORNER RADIUS ON THE FLAT.
* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.

SECN Insert

Inserts	Part Number ANSI	GA5036	GA5125	G-9120	G-915	G-910	Part Number ANSI	Dimensions (inches) A	T	F	R
	SECN-42A6FR4	●	❍	●	●	●	SECN-42A6FR4	0.500	0.125	0.093	.060
	SECN-63A8FR4	●	❍	●	●	●	SECN-63A8FR4	0.750	0.187	0.125	.060



GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated)
Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.

G-910 (PVD coated) A grade for high-temp alloys, stainless steel, and low carbon steels. A medium speed grade and should be applied at moderate to high feed rates.

"J" polish available upon request.

Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

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Screw-On Insert Milling Cutters

The special-duty end mills utilize the screw-on insert concept for simplicity and maximum chip clearance without hardware interference. This provides longer tool life and better surface finishes.

Center Cutting

Greenleaf Corporation is continually upgrading its products. For the most current information, please visit our web site at:

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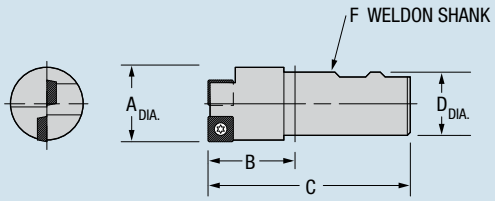
WSSCC

0° Lead End Mill, Center Cutting



Right-Hand End Mill Shown

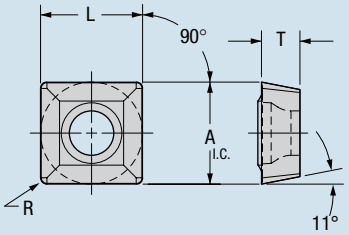
Part Number		Gage Insert	Stock	Dimensions (inches)					No. of Inserts	Standard Components	*Tune-Up Kit
Right Hand	Left Hand**			A	B	C	D	F		Insert Screw	Includes All Standard Components
WSSCC-70000.7		SPMT-2.522-X2	●	0.750	1.720	3.750	0.75	5	2	PT-543-T	TK-00737
	WSSCC-70000.7-LH	SPMT-2.522-X2	●	0.750	1.720	3.750	0.75	5	2	PT-543-T	TK-00737
WSSCC-70001		SPMT-32.52-X2	●	1.000	1.720	4.000	1.00	7	2	PT-559-T	TK-00738
	WSSCC-70001-LH	SPMT-32.52-X2	❍	1.000	1.720	4.000	1.00	7	2	PT-559-T	TK-00738
WSSCC-70001.2		SPMT-432-X2	●	1.250	1.720	4.000	1.25	8	2	PT-588-T	TK-00739
	WSSCC-70001.2-LH	SPMT-432-X2	❍	1.250	1.720	4.000	1.25	8	2	PT-588-T	TK-00739
WSSCC-70001.5		SPMT-432-X2	●	1.500	1.720	4.000	1.25	8	2	PT-588-T	TK-00739
	WSSCC-70001.5-LH	SPMT-432-X2	❍	1.500	1.720	4.000	1.25	8	2	PT-588-T	TK-00739

*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.

Screw-On Inserts

SPMT-X2

Inserts	Part Number ANSI	GA5036	G-935	Part Number ISO	Dimensions (inches) A	L	T	R
SPMT-X2	SPMT-2.522-X2	●	●	SPMT-070308-X2	0.312	0.312	0.125	0.031
	SPMT-32.52-X2	●	●	SPMT-09T308-X2	0.375	0.375	0.156	0.031
	SPMT-432-X2	●	●	SPMT-120408-X2	0.500	0.500	0.187	0.031



GA5036 (MT-CVD coated)
A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-935 (PVD coated)
For steel where additional resistance to mechanical and thermal shock is required. For moderate speeds and feeds.

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Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● Stocked	❍ Stocked or Available Upon Request	❍ 10 Business Days or Less
● Standard	❍	❍

Excelerator® Milling Cutters

High-velocity cutters with ceramic inserts for use in high-temp alloys, hard metals, cast irons at high speeds and accelerated feed rates. Precision nests provide multiple insert configurations and body protection.

Greenleaf Excelerator® Mills Set-Up and Operational Procedures

1. Thoroughly clean all insert pockets.
2. Install the inserts, making sure that they are properly seated in the pocket, and torque the insert clamp screws to the correct torque as indicated on the body of the Excelerator Milling Cutter.
3. Use Greenleaf Excelerator Mills only on machines that have adequate shield guards.
4. Run the Greenleaf Excelerator Mills using cutting parameters as recommended by Greenleaf Tech Team. Contact the Greenleaf Tech Team at: 814-763-2915 or by email: tech-team@greenleafcorporation.com
5. For safety purposes, do not exceed the maximum RPM's etched on the Excelerator Mill. Note: There are two max RPM numbers. One (the lower RPM number) is for using the mill with carbide inserts and the other is for usage with ceramic inserts.

Greenleaf Corporation is continually upgrading its products. For the most current information, please visit our web site at:

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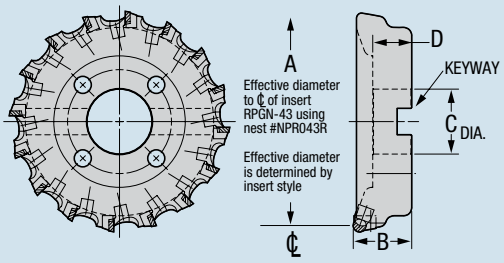
CP4 Series

Positive Rake Face Mill



Right-Hand
Face Mill Shown

Cutter Part Number			Dimensions (inches)							Standard Components			*Tune-Up Kit
Right Hand	Left Hand	Stock	A	B	C	D	Keyway	Bolt Circle	No. of Inserts	Wedge	Wedge Screw	Nest Screw	Includes All Standard Components
CP-403R	–	●	3.000	2.000	1.250	0.75	1/2 x 9/32	–	6	425605	430578	SE03-02	TK-01141
–	CP-403L	❍	3.000	2.000	1.250	0.75	1/2 x 9/32	–	6	425605	430578	SE03-02	TK-01141
CP-404R	–	●	4.000	2.250	1.500	1.00	5/8 x 3/8	–	8	425605	425606	SE03-02	TK-00841
–	CP-404L	❍	4.000	2.250	1.500	1.00	5/8 x 3/8	–	8	425605	425606	SE03-02	TK-00841
CP-405R	–	●	5.000	2.250	1.500	1.00	5/8 x 3/8	–	10	425605	425606	SE03-02	TK-00845
–	CP-405L	❍	5.000	2.250	1.500	1.00	5/8 x 3/8	–	10	425605	425606	SE03-02	TK-00845
CP-406R	–	●	6.000	2.250	2.000	1.00	3/4 x 7/16	–	12	425605	425606	SE03-02	TK-00842
–	CP-406L	❍	6.000	2.250	2.000	1.00	3/4 x 7/16	–	12	425605	425606	SE03-02	TK-00842
CP-408R	–	●	8.000	2.250	2.500	1.50	1 x 9/16	4	16	425605	425606	SE03-02	TK-00843
–	CP-408L	❍	8.000	2.250	2.500	1.50	1 x 9/16	4	16	425605	425606	SE03-02	TK-00843
CP-410R	–	❍	10.000	2.750	2.500	1.50	1 x 9/16	4, 4-3/4	20	425605	425606	SE03-02	TK-00846
–	CP-410L	❍	10.000	2.750	2.500	1.50	1 x 9/16	4, 4-3/4	20	425605	425606	SE03-02	TK-00846
CP-412R	–	❍	12.000	2.750	2.500	1.50	1 x 9/16	4, 4-3/4, 7	24	425605	425606	SE03-02	TK-00847
–	CP-412L	❍	12.000	2.750	2.500	1.50	1 x 9/16	4, 4-3/4, 7	24	425605	425606	SE03-02	TK-00847

*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.

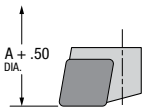
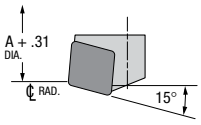
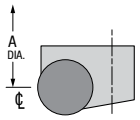
Cutters are supplied less insert and nest. Nest must be purchased separately. See below.

Insert shape, size and quantity must be determined after choosing cutter and nest.

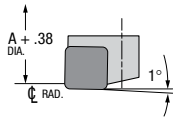
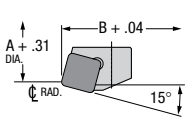
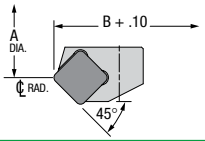
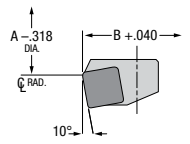
Left-hand cutters can be built to order.

CP4 Series

Nests

Inserts	Nest Part Number		Stock		Gage
	Right Hand	Left Hand	R	L	Insert
	NPC043R	—	●		CPGN-433
	—	NPC043L		❍	CPGN-433
	NPC1543R	—	●		CPGN-433
	—	NPC1543L		❍	CPGN-433
	NPR043R	—	●		RPGN-43
	—	NPR043L		❍	RPGN-43

The filler block nest, NPB, will act as a replacement for the inserts and insert nests. The filler block nest must be locked securely in place with the wedge to insure cutter integrity.

Inserts	Nest Part Number		Stock		Gage
	Right Hand	Left Hand	R	L	Insert
	NPS143R	—	●		SPGN-434
	—	NPS143L		❍	SPGN-434
	NPS1543R	—	●		SPGN-434
	—	NPS1543L		❍	SPGN-434
	NPS4543R	—	●		SPGN-434
	—	NPS4543L		❍	SPGN-434
	XFNPS8043R	—	●		SPGN-433
	—	XFNPS8043L		●	SPGN-433

Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● Stocked Standard	❍ Stocked or Available Upon Request	❍ 10 Business Days or Less
●	❍	❍

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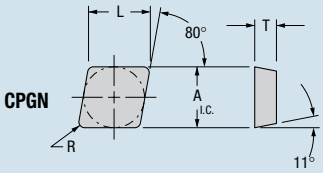
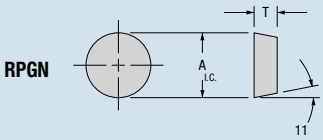
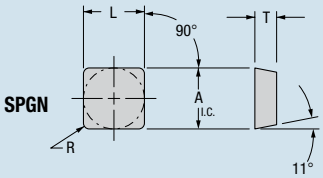
CP4 Series

Positive Inserts

Inserts	Part Number ANSI	WG-300	WG-600	XSYTIN-1	GSN100	G-9230	GA5036	GA5125	G-9120	G-915	Part Number ISO	Dimensions (inches) A	L	T	R
	CPGN-433	●	●	●	●	❍	●	❍	❍	●	CPGN-120412	0.500	0.507	0.187	0.047
	CPGN-434	●	●	❍	❍	❍	●	❍	❍	●	CPGN-120416	0.500	0.507	0.187	0.062
	RPGN-43	●	●	●	●	❍	●	●	●	●	RPGN-120400	0.500	N/A	0.187	N/A
	SPGN-433	●	●	●	❍	❍	●	●	●	●	SPGN-120412	0.500	0.500	0.187	0.047
	SPGN-434	●	●	❍	●	❍	●	❍	❍	●	SPGN-120416	0.500	0.500	0.187	0.062







WG-300® and WG-600® (Whiskered Ceramic)
Used for milling high-temp alloys and hardened material above 45 Rc.

XSYTIN™-1 (Phase-Toughened)
Ideal for use in interrupted cuts, scale and milling. Capable of extreme feed rates. Excels at machining steels, cast and ductile irons, high-temp alloys and other challenging materials.

GSN100™ (Silicon Nitride Ceramic)
For high-speed turning, grooving and milling of gray and ductile cast irons.

G-9230 (PVD coated)
Carbide grade for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons.

GA5036 (MT-CVD coated)
A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated)
A high-performance carbide milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated)
Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated)
Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.

Cutter Part Number	Screw Torque Setting
CP-403R/L	85 In/lbs.
CP-404R/L	85 In/lbs.
CP-405R/L	85 In/lbs.
CP-406R/L	85 In/lbs.
CP-408R/L	85 In/lbs.
CP-410R/L	85 In/lbs.
CP-412R/L	85 In/lbs.

For additional nose radii, call Greenleaf Technical Service.

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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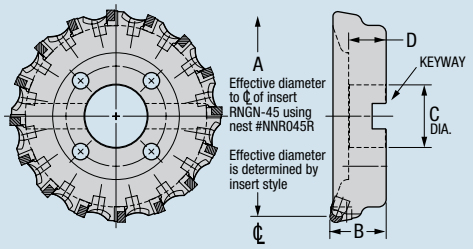
C4 Series

Negative Rake Face Mill

Right-Hand
Face Mill Shown

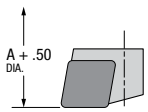
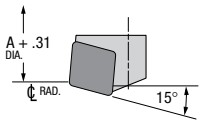
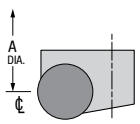


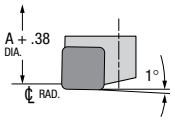
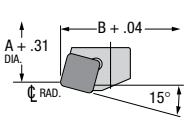
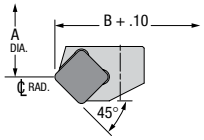
Cutter Part Number			Dimensions (inches)							Standard Components			* Tune-Up Kit
Right Hand	Left Hand	Stock	A	B	C	D	Keyway	Bolt Circle	No. of Inserts	Wedge	Wedge Screw	Nest Screw	Includes All Standard Components
C-403R	–	●	3.000	2.000	1.250	0.75	1/2 x 9/32	–	6	425605	425606	SE03-02	TK-00851
–	C-403L	❍	3.000	2.000	1.250	0.75	1/2 x 9/32	–	6	425605	425606	SE03-02	TK-00851
C-404R	–	●	4.000	2.250	1.500	1.00	5/8 x 3/8	–	8	425605	425606	SE03-02	TK-00841
–	C-404L	●	4.000	2.250	1.500	1.00	5/8 x 3/8	–	8	425605	425606	SE03-02	TK-00841
C-405R	–	●	5.000	2.250	1.500	1.00	5/8 x 3/8	–	10	425605	425606	SE03-02	TK-00845
–	C-405L	●	5.000	2.250	1.500	1.00	5/8 x 3/8	–	10	425605	425606	SE03-02	TK-00845
C-406R	–	●	6.000	2.250	2.000	1.00	3/4 x 7/16	–	12	425605	425606	SE03-02	TK-00842
–	C-406L	●	6.000	2.250	2.000	1.00	3/4 x 7/16	–	12	425605	425606	SE03-02	TK-00842
C-408R	–	●	8.000	2.250	2.500	1.50	1 x 9/16	4	16	425605	425606	SE03-02	TK-00843
–	C-408L	●	8.000	2.250	2.500	1.50	1 x 9/16	4	16	425605	425606	SE03-02	TK-00843
C-410R	–	❍	10.000	2.750	2.500	1.50	1 x 9/16	4, 4-3/4	20	425605	425606	SE03-02	TK-00846
–	C-410L	●	10.000	2.750	2.500	1.50	1 x 9/16	4, 4-3/4	20	425605	425606	SE03-02	TK-00846
C-412R	–	❍	12.000	2.750	2.500	1.50	1 x 9/16	4, 4-3/4, 7	24	425605	425606	SE03-02	TK-00847
–	C-412L	❍	12.000	2.750	2.500	1.50	1 x 9/16	4, 4-3/4, 7	24	425605	425606	SE03-02	TK-00847

*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
Cutters are supplied less insert and nest. Nest must be purchased separately. See below.
Insert shape, size and quantity must be determined after choosing cutter and nest.
Left-hand cutters can be built to order.

C4 Series

Nests

Inserts	Nest Part Number		Stock		Gage
	Right Hand	Left Hand	R	L	Insert
	NNC043R	—	●		CNGN-433
	—	NNC043L		●	CNGN-433
	NNC045R	—	●		CNGN-453
	—	NNC045L		●	CNGN-453
	NNC1543R	—	●		CNGN-433
	—	NNC1543L		●	CNGN-433
	NNC1545R	—	●		CNGN-453
	—	NNC1545L		●	CNGN-453
	NNR043R	—	●		RNGN-43
	—	NNR043L		●	RNGN-43
	NNR045R	—	●		RNGN-45
	—	NNR045L			RNGN-45
			●		

Inserts	Nest Part Number		Stock		Gage
	Right Hand	Left Hand	R	L	Insert
	NNS143R	—	●		SNGN-434
	—	NNS143L		●	SNGN-434
	NNS145R	—	●		SNGN-454
	—	NNS145L		●	SNGN-454
	NNS1543R	—	●		SNGN-434
	—	NNS1543L		❍	SNGN-434
	NNS1545R	—	❍		SNGN-454
	—	NNS1545L		❍	SNGN-454
	NNS4543R	—	●		SNGN-434
	—	NNS4543L		❍	SNGN-434
	NNS4545R	—	❍		SNGN-454
	—	NNS4545L		❍	SNGN-454

For applications which will not require the maximum number of inserts, the filler block nest, NNB, will act as a replacement for the inserts and insert nests.

The filler block nest must be locked securely in place with the wedge to insure cutter integrity.

Inserts and Steel Products		Inserts *Only*		Steel Products *Only*	
●	Stocked	❍	Stocked or Available Upon Request	❍	10 Business Days or Less
●	Standard	❍		❍	

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C4 Series

Negative Inserts

Inserts	Part Number ANSI	WG-300	WG-600	XSYTIN-1	GSN100	G-9230	GA5036	GA5125	G-9120	G-915	Part Number ISO	Dimensions (inches) A	L	T	R
	CNGN-433	●	●	●	●	❍	●	❍	❍	●	CNGN-120412	0.500	0.508	0.187	0.047
	CNGN-434	●	●	●	●	❍	●	❍	❍	●	CNGN-120416	0.500	0.508	0.187	0.062
	CNGN-453	●	●	●	●	❍	●	❍	❍	●	CNGN-120712	0.500	0.508	0.312	0.047
	CNGN-454	●	●	●	●	❍	●	❍	❍	●	CNGN-120716	0.500	0.508	0.312	0.062
	RNGN-43	●	●	●	●	❍	●	❍	❍	●	RNGN-120400	0.500	–	0.187	–
	RNGN-45	●	●	●	●	❍	●	❍	❍	●	RNGN-120700	0.500	–	0.312	–
	SNGN-433	●	●	●	●	❍	●	●	❍	●	SNGN-120412	0.500	0.500	0.187	0.047
	SNGN-434	●	●	●	●	❍	●	❍	❍	●	SNGN-120416	0.500	0.500	0.187	0.062
	SNGN-453	●	●	●	●	❍	●	❍	❍	●	SNGN-120712	0.500	0.500	0.312	0.046
	SNGN-454	●	●	●	●	❍	●	❍	❍	●	SNGN-120716	0.500	0.500	0.312	0.062

WG-300® and WG-600® (Whiskered Ceramic)
Used for milling high-temp alloys and hardened material above 45 Rc.

XSYTIN™-1 (Phase-Toughened)
Ideal for use in interrupted cuts, scale and milling. Capable of extreme feed rates. Excels at machining steels, cast and ductile irons, high-temp alloys and other challenging materials.

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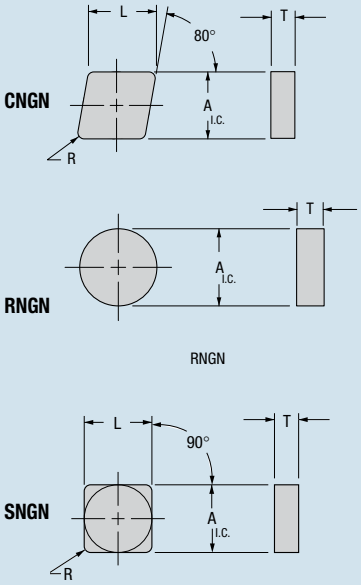

Cutter Part Number	Screw Torque Setting
C-403R/L	85 In/lbs.
C-404R/L	85 In/lbs.
C-405R/L	85 In/lbs.
C-406R/L	85 In/lbs.
C-408R/L	85 In/lbs.
C-410R/L	85 In/lbs.
C-412R/L	85 In/lbs.

For additional nose radii, call Greenleaf Technical Service.

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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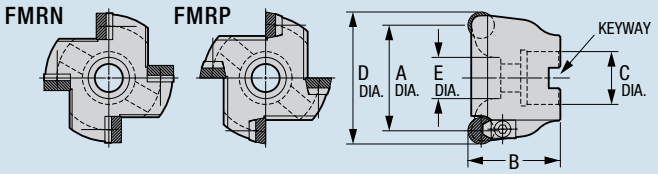
FMRP–FMRN

Round Insert Face Mill



Right-Hand Cutter Shown

Part Number		Gage	Stock		Dimensions (inches)					No. of Inserts	Keyway	Standard Components				*Tune-Up Kit Includes All Std. Components
Right Hand	Left Hand	Insert	R	L	A	B	C	D	E†			**Anvil	Anvil Screw	Clamp	Clamp Screw	
FMRP-200R		RPGN-43	●		2.000	1.750	0.750	2.500	3/8 SHCS	4	5/16x3/16	308341	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-00649
	FMRP-200L	RPGN-43		❍	2.000	1.750	0.750	2.500	3/8 SHCS	4	5/16x3/16	308341	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-00649
FMRP-250R		RPGN-43	●		2.500	1.750	1.000	3.000	1/2 SHCS	4	3/8x1/4	308341	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-00814
	FMRP-250L	RPGN-43		❍	2.500	1.750	1.000	3.000	1/2 SHCS	4	3/8x1/4	308341	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-00814
FMRP-300R		RPGN-43	●		3.000	2.000	1.250	3.500	5/8 SHCS	5	1/2x5/16	308341	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-00815
	FMRP-300L	RPGN-43		❍	3.000	2.000	1.250	3.500	5/8 SHCS	5	1/2x5/16	308341	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-00815
FMRP-400R		RPGN-43	●		4.000	2.250	1.500	4.500	2.000	6	5/8x3/8	308341	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-00816
	FMRP-400L	RPGN-43		❍	4.000	2.250	1.500	4.500	2.000	6	5/8x3/8	308341	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-00816

** For Insert RPGN-42, use anvil 312780. For insert RPGN-45, use no anvil.

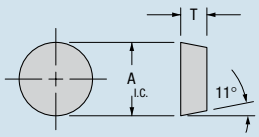
Part Number		Gage	Stock		Dimensions (inches)					No. of Inserts	Keyway	Standard Components				*Tune-Up Kit Includes All Std. Components
Right Hand	Left Hand	Insert	R	L	A	B	C	D	E†			**Anvil	Anvil Screw	Clamp	Clamp Screw	
FMRN-200R		RNGN-43	●		2.000	1.750	0.750	2.500	3/8 SHCS	4	5/16x3/16	313572	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-02695
	FMRN-200L	RNGN-43		❍	2.000	1.750	0.750	2.500	3/8 SHCS	4	5/16x3/16	313572	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-02695
FMRN-250R		RNGN-43	●		2.500	1.750	1.000	3.000	1/2 SHCS	4	3/8x1/4	313572	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-02695
	FMRN-250L	RNGN-43		❍	2.500	1.750	1.000	3.000	1/2 SHCS	4	3/8x1/4	313572	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-02695
FMRN-300R		RNGN-43	●		3.000	2.000	1.250	3.500	5/8 SHCS	5	1/2x5/16	313572	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-02697
	FMRN-300L	RNGN-43		❍	3.000	2.000	1.250	3.500	5/8 SHCS	5	1/2x5/16	313572	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-02697
FMRN-400R		RNGN-43	●		4.000	2.250	1.500	4.500	2.000	6	5/8x3/8	313572	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-02698
	FMRN-400L	RNGN-43		❍	4.000	2.250	1.500	4.500	2.000	6	5/8x3/8	313572	#4-40x1/4 FHCS	3025-1	#10-32x1/2 SHCS	TK-02698

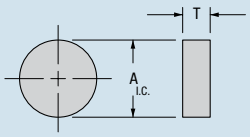
** For Insert RNGN-42, use anvil 313596. For insert RNGN-45, use no anvil.
*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.

Left-Hand cutters are made to order only.
† Hole to suit.

RPGN, RNGN Insert

Inserts	Part Number ANSI	WG-300	WG-600	XSYTIN-1	GSN100	GA5036	GA5125	G-9120	G-915	Part Number ISO	Dimensions (inches) A	T
	RPGN-42	❍	❍	❍	❍	●	❍	❍	●	RPGN-120300	0.500	0.125
	RPGN-43	●	●	●	●	●	●	●	●	RPGN-120400	0.500	0.187
	RNGN-42	❍	❍	●	❍	●	❍	❍	●	RNGN-120300	0.500	0.125
	RNGN-43	●	●	●	●	●	❍	❍	●	RNGN-120400	0.500	0.187
	RNGN-45	●	●	●	●	●	❍	❍	●	RNGN-120700	0.500	0.312





For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

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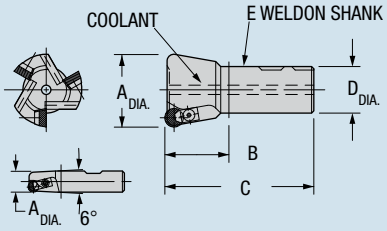
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● Stocked Standard	❍ Stocked or Available Upon Request	❍ 10 Business Days or Less

WSRP *Excelerator® Mill*

End Mill: Round Positive Inserts



Right-Hand Cutter Shown

Part Number		Gage	Stock		Dimensions (inches)					No. Of Inserts	Standard Components				* Tune-Up Kit
Right Hand	Left Hand**	Insert	R	L	A	B	C	D	E		Anvil	Anvil Screw	Clamp	Clamp Screw	Includes All Std. Components
† WSRP-60000.6-RH		RPGN-21.5	●		0.625	1.250	3.160	0.625	–	2	–	–	423978	#3-48 x 1/4 SHCS	TK-00879
	† WSRP-60000.6-LH	RPGN-21.5		❍	0.625	1.250	3.160	0.625	–	2	–	–	423978	#3-48 x 1/4 SHCS	TK-00879
† WSRP-60000.7-RH		RPGN-2.52	●		0.750	1.250	3.280	0.750	–	2	–	–	429323	SE02-01	TK-00880
	† WSRP-60000.7-LH	RPGN-2.52		❍	0.750	1.250	3.280	0.750	–	2	–	–	429323	SE02-01	TK-00880
WSRP-60001A-RH		RPGN-2.52	●		1.000	1.250	3.280	0.750	–	3	–	–	429323	SE02-01	TK-00917
	WSRP-60001A-LH	RPGN-2.52		❍	1.000	1.250	3.280	0.750	–	3	–	–	429323	SE02-01	TK-00917
WSRP-60001-RH		RPGN-32	●		1.000	1.250	3.280	0.750	–	3	–	–	425716	SE02-01	TK-00852
	WSRP-60001-LH	RPGN-32		❍	1.000	1.250	3.280	0.750	–	3	–	–	425716	SE02-01	TK-00852
WSRP-60001.2-RH		RPGN-32	●		1.250	1.250	3.530	1.000	7	3	–	–	425716	SE02-01	TK-00852
	WSRP-60001.2-LH	RPGN-32		❍	1.250	1.250	3.530	1.000	7	3	–	–	425716	SE02-01	TK-00852
WSRP-60001.5-RH		RPGN-43	●		1.500	1.720	4.000	1.250	8	3	–	–	3025-1	438919	TK-00645
	WSRP-60001.5-LH	RPGN-43		❍	1.500	1.720	4.000	1.250	8	3	–	–	3025-1	438919	TK-00645
WSRP-60002-RH		RPGN-43	●		2.000	1.720	4.000	1.250	8	3	308341	#4-40 x 1/4 FHCS	3025-1	438919	TK-00648
	WSRP-60002-LH	RPGN-43		❍	2.000	1.720	4.000	1.250	8	3	308341	#4-40 x 1/4 FHCS	3025-1	438919	TK-00648
WSRP-60002.5-RH		RPGN-43	●		2.500	1.750	4.000	1.250	8	4	308341	#4-40 x 1/4 FHCS	3025-1	#10-32 x 1/2 SHCS	TK-00649
	WSRP-60002.5-LH	RPGN-43		❍	2.500	1.750	4.000	1.250	8	4	308341	#4-40 x 1/4 FHCS	3025-1	#10-32 x 1/2 SHCS	TK-00649

† No thru-tool coolant is available on WSRP-60000.6 and WSRP-60000.7 cutters
* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.

RPGN Insert

Inserts	Part Number ANSI	WG-300	WG-600	XSYTIN-1	GSN100	GA5036	GA5125	G-9120	G-915	Part Number ISO	Dimensions (inches) A	T
	RPGN-21.5	●	●	●	❍	●	❍	●	●	RPGN-060200	0.250	0.094
	RPGN-2.52	●	●	●	●	●	❍	●	●	RPGN-070300	0.312	0.125
	RPGN-32	●	●	●	●	●	❍	●	●	RPGN-090300	0.375	0.125
	RPGN-43	●	●	●	●	●	●	●	●	RPGN-120400	0.500	0.187

WG-300® and WG-600® (Whiskered Ceramic) Used for milling high-temp alloys and hardened material above 45 Rc.

XSYTIN™-1 (Phase-Toughened) Ideal for use in interrupted cuts, scale and milling. Capable of extreme feed rates. Excels at machining steels, cast and ductile irons, high-temp alloys and other challenging materials.

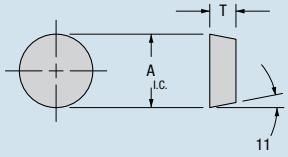
GSN100™ (Silicon Nitride Ceramic) For high-speed turning, grooving and milling of gray and ductile cast irons.

GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance carbide milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.



Cutter Part Number	Screw Torque Setting	Max RPM Carbide	Max RPM Ceramic
WSRP-60000.6-RH	15 In/lbs.	15,000	40,000
WSRP-60000.7-RH	30 In/lbs.	12,500	35,000
WSRP-60001A-RH	30 In/lbs.	9,500	26,000
WSRP-60001-RH	30 In/lbs.	9,500	26,000
WSRP-60001.2-RH	30 In/lbs.	7,500	21,000
WSRP-60001.5-RH	30 In/lbs.	6,200	19,500
WSRP-60002-RH	30 In/lbs.	4,600	13,000
WSRP-60002.5-RH	120 In/lbs.	3,800	10,000

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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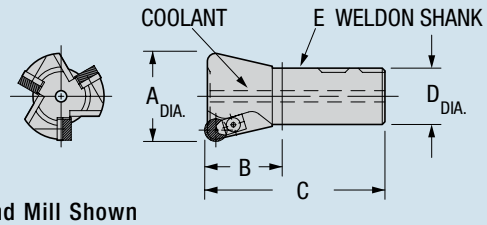
WSRN *Excelerator® Mill*

End Mill: Round Negative Inserts

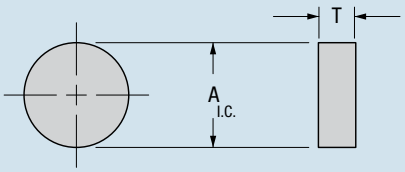


Right-Hand End Mill Shown

Part Number		Gage	Stock		Dimensions (inches)					No. Of	Standard Components				*Tune-Up Kit
Right Hand	Left Hand	Insert	R	L	A	B	C	D	E	Inserts	**Anvil	Anvil Screw	Clamp	Clamp Screw	Includes All Std. Components
WSRN-60001-RH		RNGN-32	●		1.000	1.250	3.280	0.75	–	2	–	–	425716	SE02-01	TK-00853
	WSRN-60001-LH	RNGN-32		❍	1.000	1.250	3.280	0.75	–	2	–	–	425716	SE02-01	TK-00853
WSRN-60001.2-RH		RNGN-32	●		1.250	1.250	3.530	1.00	7	3	–	–	425716	SE02-01	TK-00852
	WSRN-60001.2-LH	RNGN-32		❍	1.250	1.250	3.530	1.00	7	3	–	–	425716	SE02-01	TK-00852
WSRN-60001.5-RH		RNGN-43	●		1.500	1.720	4.000	1.25	8	3	–	–	3025-1	438919	TK-00645
	WSRN-60001.5-LH	RNGN-43		❍	1.500	1.720	4.000	1.25	8	3	–	–	3025-1	438919	TK-00645
WSRN-60002-RH		RNGN-43	●		2.000	1.720	4.000	1.25	8	3	313572	#4-40x1/4 FHCS	3025-1	#10-32 x 1/2 SHCS	TK-02703
	WSRN-60002-LH	RNGN-43		❍	2.000	1.720	4.000	1.25	8	3	313572	#4-40x1/4 FHCS	3025-1	#10-32 x 1/2 SHCS	TK-02703
WSRN-60002.5-RH		RNGN-43	●		2.500	1.750	4.000	1.25	8	4	313572	#4-40x1/4 FHCS	3025-1	#10-32 x 1/2 SHCS	TK-02695
	WSRN-60002.5-LH	RNGN-43		❍	2.500	1.750	4.000	1.25	8	4	313572	#4-40x1/4 FHCS	3025-1	#10-32 x 1/2 SHCS	TK-02695

** For Insert RNGN-42, use anvil 313596. For insert RNGN-45, use no anvil.
*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
† Left-Hand cutters are made to order only.

RNGN Insert



Inserts	Part Number ANSI	WG-300	WG-600	XSYTIN-1	GSN100	G-9120	G-915	Part Number ISO	Dimensions (inches) A	T
	RNGN-32	●	●	●	❍	❍	❍	RNGN-090300	0.375	0.125
	RNGN-42	●	❍	●	❍	❍	❍	RNGN-120300	0.500	0.125
	RNGN-43	●	●	●	●	❍	❍	RNGN-120400	0.500	0.187

Cutter Part Number	Screw Torque Setting	Max RPM Carbide	Max RPM Ceramic
WSRN-60001-RH	30 In/lbs.	9,500	26,000
WSRN-60001.2-RH	30 In/lbs.	7,500	21,000
WSRN-60001.5-RH	120 In/lbs.	6,200	16,500
WSRN-60002-RH	120 In/lbs.	4,600	13,000
WSRN-60002.5-RH	120 In/lbs.	3,800	10,000

WG-300® and WG-600® (Whiskered Ceramic) Used for milling high-temp alloys and hardened material above 45 Rc.

XSYTIN™-1 (Phase-Toughened) Ideal for use in interrupted cuts, scale and milling. Capable of extreme feed rates. Excels at machining steels, cast and ductile irons, high-temp alloys and other challenging materials.

GSN100™ (Silicon Nitride Ceramic) For high-speed turning, grooving and milling of gray and ductile cast irons.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

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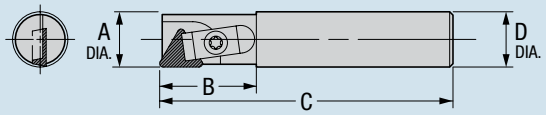
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● Stocked Standard	❍ Stocked or Available Upon Request	❍ 10 Business Days or Less

WSTP *Excelerator® Mill*

End Mill: Triangle Positive Inserts

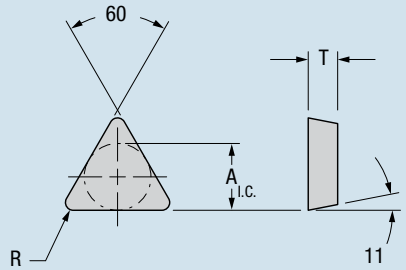


Right-Hand End Mill Shown

Part Number		Gage	Stock		Dimensions (inches)				No. Of	Standard Components		* Tune-Up Kit
Right Hand	Left Hand	Insert	R	L	A	B	C	D	Inserts	Clamp	Clamp Screw	Includes All Standard Components
WSTP-70.50-RH		TPGN-222	●		0.500	0.875	2.660	0.500	1	429871	PT-317T	TK-00897
	WSTP-70.50-LH	TPGN-222		❍	0.500	0.875	2.660	0.500	1	429871	PT-317T	TK-00897
WSTP-70.56-RH		TPGN-222	●		0.562	1.000	2.780	0.500	1	429871	PT-317T	TK-00897
	WSTP-70.56-LH	TPGN-222		❍	0.562	1.000	2.780	0.500	1	429871	PT-317T	TK-00897
WSTP-70.62-RH		TPGN-222	●		0.625	1.000	2.910	0.625	1	429871	PT-317T	TK-00897
	WSTP-70.62-LH	TPGN-222		❍	0.625	1.000	2.910	0.625	1	429871	PT-317T	TK-00897

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.

TPGN Insert



Inserts	Part Number ANSI	WG-300	GSN100	GA5036	G-9120	G-915	Part Number ISO	Dimensions (inches) A	T	R
	TPGN-222	●	❍	●	●	❍	TPGN-110308	0.250	0.125	0.031

Cutter Part Number	Screw Torque Setting	Max RPM Carbide	Max RPM Ceramic
WSTP-70.50-RH	20 In/lbs.	19,000	35,000
WSTP-70.56-RH	20 In/lbs.	17,000	35,000
WSTP-70.62-RH	20 In/lbs.	15,000	35,000

WG-300® (Whiskered Ceramic) Used for milling high-temp alloys and hardened material above 45 Rc.

GSN100™ (Silicone Nitride Ceramic) For high-speed turning, grooving and milling of gray and ducile cast irons.

GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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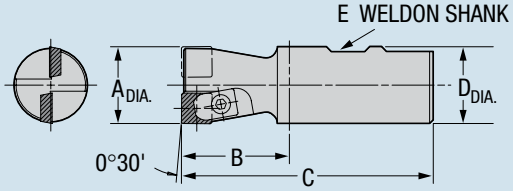
WSSP *Excelerator® Mill*

End Mill: Square Positive Inserts



Right-Hand End Mill Shown

Part Number		Gage	Stock		Dimensions (inches)					No. Of	Standard Components		* Tune-Up Kit
Right Hand	Left Hand**	Insert	R	L	A	B	C	D	E	Inserts	Clamp	Clamp Screw	Includes All Standard Components
WSSP-70000.3-RH		SPGN-21.52	●		0.375	0.750	2.310	0.375	–	1	429871	PT-317T	TK-00897
	WSSP-70000.3-LH	SPGN-21.52		❍	0.375	0.750	2.310	0.375	–	1	429871	PT-317T	TK-00897
WSSP-70000.5-RH		SPGN-21.52	●		0.500	0.875	2.660	0.500	–	1	429871	PT-317T	TK-00897
	WSSP-70000.5-LH	SPGN-21.52		❍	0.500	0.875	2.660	0.500	–	1	429871	PT-317T	TK-00897
WSSP-70000.6-RH		SPGN-222	●		0.625	1.000	2.910	0.625	–	2	423978	#3-48 x 3/16 SHCS	TK-00850
	WSSP-70000.6-LH	SPGN-222		❍	0.625	1.000	2.910	0.625	–	2	423978	#3-48 x 3/16 SHCS	TK-00850
WSSP-70000.7-RH		SPGN-222	●		0.750	1.000	3.030	0.750	–	2	423978	#3-48 x 1/4 SHCS	TK-00879
	WSSP-70000.7-LH	SPGN-222		❍	0.750	1.000	3.030	0.750	–	2	423978	#3-48 x 1/4 SHCS	TK-00879
WSSP-70001-RH		SPGN-322	●		1.000	1.250	3.280	0.750	–	2	429706	SE02-01	TK-00854
	WSSP-70001-LH	SPGN-322		❍	1.000	1.250	3.280	0.750	–	2	429706	SE02-01	TK-00854
WSSP-70001.2-RH		SPGN-322	●		1.250	1.750	4.030	1.000	7	3	429706	SE02-01	TK-00855
	WSSP-70001.2-LH	SPGN-322		❍	1.250	1.750	4.030	1.000	7	3	429706	SE02-01	TK-00855
WSSP-70001.5-RH		SPGN-432	●		1.500	1.750	4.030	1.250	8	3	3127-C	#10-32 x 1/2 SHCS	TK-00856
	WSSP-70001.5-LH	SPGN-432		❍	1.500	1.750	4.030	1.250	8	3	3127-C	#10-32 x 1/2 SHCS	TK-00856

*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.

SPGN Insert

Inserts	Part Number ANSI	WG-300	WG-600	XSYTIN-1	GSN100	G-9230	GA5036	GA5125	G-9120	G-915	Part Number ISO	Dimensions (inches) A	L	T	R
	SPGN-21.52	●	❍	●	❍	●	●	❍	❍	●	SPGN-060208	0.250	0.250	0.093	0.031
	SPGN-222	●	●	●	❍	❍	●	❍	●	●	SPGN-060308	0.250	0.250	0.125	0.031
	SPGN-322	●	●	●	●	❍	●	❍	●	●	SPGN-090308	0.375	0.375	0.125	0.031
	SPGN-432	●	●	●	❍	❍	●	❍	●	●	SPGN-120408	0.500	0.500	0.187	0.031
	SPGN-433	●	❍	●	❍	❍	●	●	●	❍	SPGN-120412	0.500	0.500	0.187	0.047

WG-300® and WG-600® (Whiskered Ceramic) Used for milling high-temp alloys and hardened material above 45 Rc.

XSYTIN™-1 (Phase-Toughened) Ideal for use in interrupted cuts, scale and milling. Capable of extreme feed rates. Excels at machining steels, cast and ductile irons, high-temp alloys and other challenging materials.

GSN100™ (Silicon Nitride Ceramic) For high-speed turning, grooving and milling of gray and ductile cast irons.

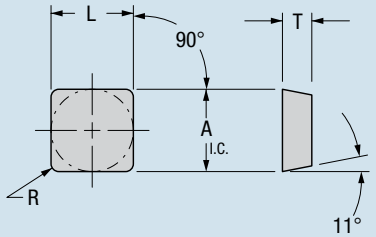
G-9230 (PVD coated) Carbide grade for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons.

GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance carbide milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.



Cutter Part Number	Screw Torque Setting	Max RPM Carbide	Max RPM Ceramic
WSSP-70000.3-RH	20 In/lbs.	25,000	40,000
WSSP-70000.5-RH	20 In/lbs.	19,000	40,000
WSSP-70000.6-RH	15 In/lbs.	15,000	40,000
WSSP-70000.7-RH	15 In/lbs.	12,500	35,000
WSSP-70001-RH	30 In/lbs.	9,500	26,000
WSSP-70001.2-RH	30 In/lbs.	7,500	21,000
WSSP-70001.5-RH	120 In/lbs.	6,200	16,500

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

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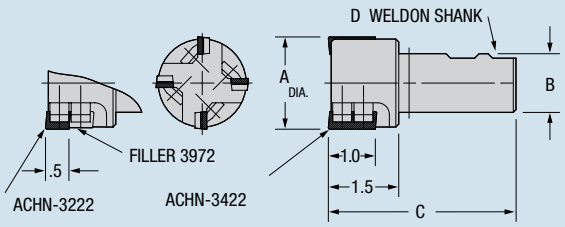
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

WSAN

End Mill: Parallelogram Inserts



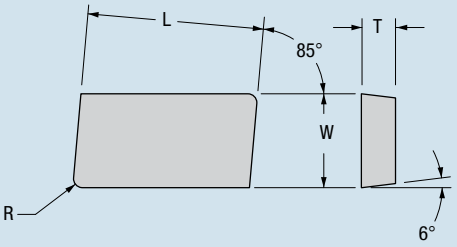
Right-Hand End Mill Shown

Part Number		Gage Insert	Stock		Dimensions (inches)				No. Of Inserts	Standard Components				* Tune-Up Kit	Optional Components	
Right Hand	Left Hand**	Max 1" DOC	R	L	A	B	C	D		Anvil	Anvil Screw	Clamp	Clamp Screw†	Includes All Standard Components	Max. 1/2" D.O.C. Insert	Filler
WSAN-1-RH		ACHN-3422	●		0.985	0.750	3.75	5	2	–	All Anvils use Anvil Screw #4-40x1/4 FHCS	410756	Clamp Screw #8-32x9/32 IPBHCS	TK-00642	ACHN-3222	3972
	WSAN-1-LH	ACHN-3422-LH		❍	0.985	0.750	3.75	5	2	–		410756		TK-00642	ACHN-3222-LH	3972
WSAN-1A-RH		ACHN-3422	●		0.985	1.000	4.00	7	2	–		410756		TK-00642	ACHN-3222	3972
	WSAN-1A-LH	ACHN-3422-LH		❍	0.985	1.000	4.00	7	2	–		410756		TK-00642	ACHN-3222-LH	3972
WSAN-1 1/4-RH		ACHN-3422	❍		1.215	1.000	4.00	7	2	–		410756		TK-00642	ACHN-3222	3972
	WSAN-1 1/4-LH	ACHN-3422-LH		❍	1.215	1.000	4.00	7	2	–		410756		TK-00642	ACHN-3222-LH	3972
WSAN-1 1/2-RH		ACHN-3422	●		1.465	1.000	4.00	7	3	AAP-3224		410756		TK-00643	ACHN-3222	3972
	WSAN-1 1/2-LH	ACHN-3422-LH		❍	1.465	1.000	4.00	7	3	AAP-3224-LH		410756		TK-00713	ACHN-3222-LH	3972
WSAN-2-RH		ACHN-3422	●		1.965	1.250	4.00	8	4	AAP-3224		410756	Clamp Screw #8-32x3/8 IPBHCS	TK-00644	ACHN-3222	3972
	WSAN-2-LH	ACHN-3422-LH		❍	1.965	1.250	4.00	8	4	AAP-3224-LH		410756		TK-00821	ACHN-3222-LH	3972
WSAN-2 1/2-RH		ACHN-3422	●		2.465	1.250	4.00	8	4	AAP-3224		410756		TK-00644	ACHN-3222	3972
	WSAN-2 1/2-LH	ACHN-3422-LH		❍	2.465	1.250	4.00	8	4	AAP-3224-LH		410756		TK-00821	ACHN-3222-LH	3972

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.
† Clamp Screw is Torx Plus Drive.

ACHN Insert

Inserts	Part Number ANSI	WG-300	XSYTIN-1	GSN100	G-9230	GA5036	G-9120	Part Number ANSI	Dimensions (inches) T	W	L	R
	ACHN-3422	●	●	●	●	❍	❍	ACHN-3422	0.125	0.375	1.000	0.031
	ACHN-3222	●	❍	●	❍	●	❍	ACHN-3222	0.125	0.375	0.500	0.031
	ACHN-3422LH	❍	❍	❍	❍	❍	❍	ACHN-3422LH	0.125	0.375	1.000	0.031
	ACHN-3222LH	❍	❍	❍	❍	❍	❍	ACHN-3222LH	0.125	0.375	0.500	0.031



WG-300® (Whiskered Ceramic) Used for milling high-temp alloys and hardened material above 45 Rc.

XSYTIN™-1 (Phase-Toughened) Ideal for use in interrupted cuts, scale and milling. Capable of extreme feed rates. Excels at machining steels, cast and ductile irons, high-temp alloys and other challenging materials.

GSN100™ (Silicon Nitride Ceramic) For high-speed turning, grooving and milling of gray and ductile cast irons.

G-9230 (PVD coated) Carbide grade for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons.

GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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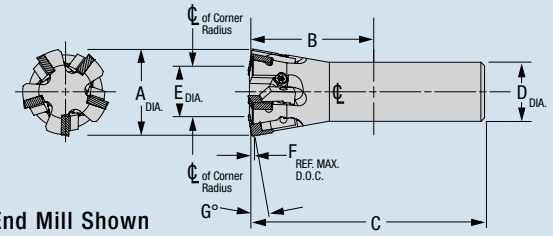
Excelerator® XF

Positive High-Feed Mills

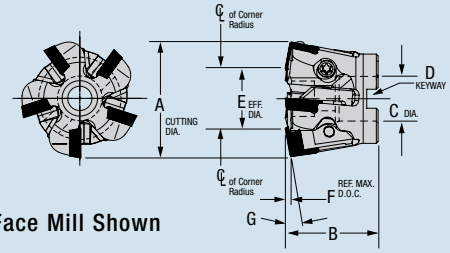


Right-Hand End Mill Shown

1" and 1-1/2" High-Feed End Mill: *Square Positive Inserts*

Cutter Order Number	Insert	Stock	Dimensions (inches) A	B	C	D	E	F	G	No. of Inserts	Standard Components Clamp	Clamp Screw	* Tune-Up Kit Includes All Standard Components	Screw Torque Setting	Max RPM Ceramic	Max RPM Carbide
XFSP-010-EM	SPGN-222	●	1.000	1.250	3.280	0.750	.580	.031	10°	4	431402	PT-542T	TK-01868	15 in/lbs	26,000	9,500
XFSP-015-EM	SPGN-322	●	1.500	1.720	4.000	1.000	.830	.052	10°	5	313256	SE02-01	TK-01905	35 in/lbs	16,500	6,200

*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
Add L to part number for left-hand cutter.



Right-Hand Face Mill Shown

2" High-Feed Face Mill: *Square Positive Inserts*

Cutter Order Number	Insert	Stock	Dimensions (inches) A	B	C	D Keyway	E	F	G	No. of Inserts	Standard Components Clamp	Clamp Screw	* Tune-Up Kit Includes All Standard Components	Screw Torque Setting	Max RPM Ceramic	Max RPM Carbide
XFSP-020-FM	SPGN-432	●	2.000	1.560	.750	.3125	1.076	.076	10°	5	431628	SE03-72	TK-02167	70 in/lbs	13,300	4,600

*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
Add L to part number for left-hand cut.

SPGN Insert

Inserts	Part Number ANSI	WG-300	WG-600	XSYTIN-1	GSN100	G-9230	GA5036	GA5125	G-9120	G-915	Part Number ISO	Dimensions (inches) A	L	T	R
	SPGN-222	●	●	●	○	○	●	○	●	●	SPGN-060308	0.250	0.250	0.125	0.031
	SPGN-322	●	●	●	●	○	●	○	●	●	SPGN-090308	0.375	0.375	0.125	0.031
	SPGN-432	●	●	●	○	○	●	○	●	●	SPGN-120408	0.500	0.500	0.187	0.031

WG-300® and WG-600® (Whiskered Ceramic) Used for milling high-temp alloys and hardened material above 45 Rc.

XSYTIN-1™ (Phase-Toughened) Ideal for use in interrupted cuts, scale and milling. Capable of extreme feed rates. Excels at machining steels, cast and ductile irons, high-temp alloys and other challenging materials.

GSN100™ (Silicon Nitride Ceramic) For high-speed turning, grooving and milling of gray and ductile cast irons.

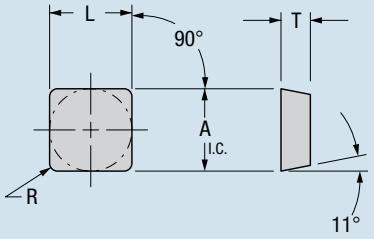
G-9230 (PVD coated) Carbide grade for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons.

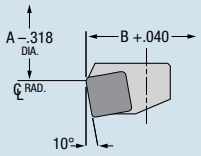
GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance carbide milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low carbon steels. Should be run at moderate speeds and moderate to high feeds.





XFNPS Nest

Nest Part Number Right Hand	Nest Part Number Left Hand	Gage Insert
XFNPS8043R	—	SPGN-433
—	XFNPS8043L	SPGN-433

Nest used with CP4 Series mills shown on M16

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	○ ○ Stocked or Available Upon Request	○ ○ 10 Business Days or Less

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Performance Calculations

Starting Speeds and Feeds for Excelerator® XF *(M32)*

Work Material	Insert Grades	Cutting Speed (SFM)	1" Diameter RPM	1" Diameter IPM	1" Diameter IPT	1.5" Diameter RPM	1.5" Diameter IPM	1.5" Diameter IPT	2" Diameter RPM	2" Diameter IPM	2" Diameter IPT	CP4 3" – 12" FPT
Hardened Steel (60-65rc)	WG-600	700	2674	100	0.0093	1783	80	0.0090	1337	65	0.0097	.002"
Hardened Steel (50-59rc)	WG-600	800	3056	160	0.0131	2036	150	0.0147	1527	120	0.0157	.003"
Hardened Steel (40-49rc)	WG-600	1400	5348	260	0.0122	3565	250	0.0140	2674	200	0.0150	.003"
Steel (30-39rc)	WG-600 GA5036	1400 800	5348 3056	280 150	0.0131 0.0123	3565 2037	280 140	0.0157 0.0137	2674 1528	230 100	0.0172 0.0131	.003" .005"
Steel	GA5036	800	3056	200	0.0164	2037	180	0.0177	1528	140	0.0183	.005"
High-Strength Alloys	G-915	100	382	23	0.0151	255	25	0.0196	191	20	0.0209	.004"
Cast Iron	GSN100 GA5023	2500 1200	9550 4585	664 300	0.0174 0.0164	6365 3057	595 275	0.0187 0.0180	4775 2290	460 220	0.0193 0.0192	.005" .005"
Maximum Stepover			.580"			.830"			1.050"			
Maximum Cutting Depth			0.31"			.052"			.076"			.071"
Maximum Width of Cut			1.0"			1.5"			2.0"			

AVERAGE CHIP THICKNESS

D.O.C. vs Effective Diameter for Excelerator® XF *(M32)*

D.O.C.	1"	1.5"	2"	3"	4"	5"	6"	8"	10"	12"
0.01	0.578	0.832	1.086	2.694	3.694	4.694	5.694	7.694	9.694	11.694
0.02	0.692	0.946	1.200	2.807	3.807	4.807	5.807	7.807	9.807	11.807
0.03	0.806	1.059	1.313	2.921	3.921	4.921	5.921	7.921	9.921	11.921
0.04		1.173	1.426	3.034	4.034	5.034	6.034	8.034	10.034	12.034
0.05		1.287	1.540	3.148	4.148	5.148	6.148	8.148	10.148	12.148
0.06		1.401	1.653	3.261	4.261	5.261	6.261	8.261	10.261	12.261
0.07			1.767	3.374	4.374	5.374	6.374	8.374	10.374	12.374
0.08			1.880	3.488	4.488	5.588	6.588	8.588	10.588	12.588

Hard-Milling Speeds and Feeds for Excelerator® End Mills *(M27-M31)*

Insert	Recommended Axial Depth	45-55 R/c 700-1200 SFM Starting Speed	45-55 R/c .003-.006 IPT Starting Feed	55-60 R/c 500-900 SFM Starting Speed	55-60 R/c .0025-.004 IPT Starting Feed	60-62 R/c 400-700 SFM Starting Speed	60-62 R/c .002-.0035 IPT Starting Feed
ACHN-3422	0.035	850	0.0040	700	0.0030	550	0.0025
RPGN-21.5	0.031	850	0.0040	700	0.0030	550	0.0025
RPGN-2.52	0.040	850	0.0045	700	0.0030	550	0.0025
RPGN-32	0.045	850	0.0050	700	0.0035	550	0.0030
RPGN-43	0.050	850	0.0045	700	0.0030	550	0.0025
RNGN-32	0.045	850	0.0050	700	0.0035	550	0.0030
RNGN-43	0.050	850	0.0032	700	0.0025	550	0.0022
SPGN-21.52	0.030	850	0.0035	700	0.0025	550	0.0025
SPGN-222	0.035	850	0.0035	700	0.0025	550	0.0025
SPGN-322	0.035	850	0.0035	700	0.0030	550	0.0025
SPGN-432	0.040	850	0.0032	700	0.0025	550	0.0022
TPGN-222	0.030	850	0.0035	700	0.0025	550	0.0025

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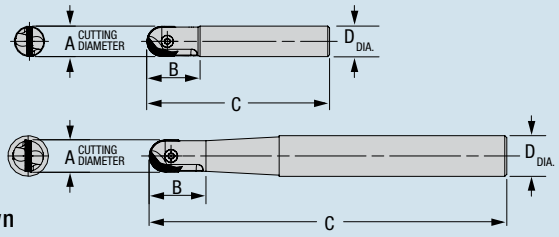
Excelerator® Ball Nose

End Mills

U.S. Patent No, 8,177,459 B2



Right-Hand End Mill Shown

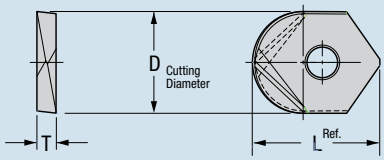
Part Number		Gage		Dimensions (inches)				Standard Component	* Tune-Up Kit Includes All Standard Components	Screw Torque Setting	Max RPM Ceramic	Max RPM Carbide
Short Series	Extended Series	Insert	Stock	A	B	C	D	Insert Screw				
SSBN-0375	—	GBN-0375	●	0.375	0.750	4.0	0.625	SM30-082	TK-02291	17.5 in/lbs	40,000	40,000
—	SSBN-0375E	GBN-0375	●	0.375	0.750	6.0	0.750	SM30-082	TK-02291	17.5 in/lbs	40,000	40,000
SSBN-0500	—	GBN-0500	●	0.500	1.250	4.0	0.625	SM40-106	TK-02292	26 in/lbs	40,000	40,000
—	SSBN-0500E	GBN-0500	●	0.500	1.250	7.5	0.750	SM40-106	TK-02292	26 in/lbs	40,000	40,000
SSBN-0625	—	GBN-0625	●	0.625	1.375	5.0	0.625	SM50-138	TK-02293	39 in/lbs	40,000	40,000
—	SSBN-0625E	GBN-0625	●	0.625	1.375	7.5	0.750	SM50-138	TK-02293	39 in/lbs	40,000	40,000
SSBN-0750	—	GBN-0750	●	0.750	1.750	4.5	0.750	SM60-165	TK-02294	52 in/lbs	40,000	40,000
—	SSBN-0750E	GBN-0750	●	0.750	1.750	10.0	1.000	SM60-165	TK-02294	52 in/lbs	40,000	40,000
SSBN-1000	—	GBN-1000	●	1.000	1.750	6.0	1.000	SM70-210	TK-02295	82 in/lbs	40,000	40,000
—	SSBN-1000E	GBN-1000	●	1.000	1.750	11.0	1.250	SM70-210	TK-02295	82 in/lbs	40,000	40,000

*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
Add L to part number for left-hand cutter.

GBN Inserts

U.S. Patent No, 8,177,459 B2

Inserts	Part Number ANSI	WG-600	G-925	Part Number ISO	Dimensions (inches) L	T	D
	GBN-0375	●	●	GBN-M010	0.500	0.125	0.375
	GBN-0500	●	●	GBN-M012	0.670	0.188	0.500
	GBN-0625	●	●	GBN-M016	0.800	0.188	0.625
	GBN-0750	●	●	GBN-M020	0.900	0.188	0.750
	GBN-1000	●		GBN-M025	1.230	0.188	1.000



WG-600® (Whiskered Ceramic) Used for milling high-temp alloys and hardened material above 45 Rc.

G-925 (Multi-layer CVD coated) Specifically designed for machining abrasive and difficult-to-machine materials. Should be used when milling high-temp alloys, titanium and other refractory metals, stainless steel and many cast irons. Excellent resistance to notching and deformation makes it suitable for moderate feeds at moderate to high speeds.

For available edge preps, please reference page ATI19 or contact Greenleaf Technical Service.

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●	○	○

Performance Calculations

Starting Speeds and Feeds for Excelerator® Ball Nose *(M34)*

Work Material	Insert Grades	Cutting Speed (SFM)	Maximum Feed per Tooth IPT Insert Diameter 0.375	0.500-0.625	0.750-1.0
H-13 (40Hrc)	G-925	700-1300	0.008	0.01	0.012
H-13 (41-55Hrc)	G-925 WG-600	700-1300 1000-2100	0.008	0.01	0.012
H-13 (56+Hrc)	G-925 WG-600	550-750 800-1500	0.006	0.011	0.011
A2 (<40Hrc)	G-925	700-1300	0.009	0.01	0.012
A2 (41-54Hrc)	G-925 WG-600	700-1000 1000-2100	0.008	0.01	0.012
A2 (55+Hrc)	G-925 WG-600	500-900 700-1400	0.007	0.009	0.011
P-20 (<40Hrc)	G-925	700-1350	0.008	0.012	0.014
P-20 (41-54Hrc)	G-925 WG-600	500-1000 1000-2400	0.008	0.01	0.01
D-2 (<40Hrc)	G-925	500-950	0.008	0.01	0.012
D-2 (41-54Hrc)	G-925 WG-600	400-850 900-1800	0.006	0.008	0.01
D-2 (55+Hrc)	G-925 WG-600	350-575 500-1000	0.006	0.008	0.001
4130-4150 (<45Hrc)	G-925	700-1400	0.008	0.01	0.012
400 Series SS (<40Hrc)	G-925	700-1300	0.01	0.012	0.014
400 Series SS (41-55Hrc)	G-925 WG-600	600-1100 1000-3000	0.008	0.01	0.012
300 Series SS (<41Hrc)	G-925	400-1000	0.008	0.012	0.014
Inconel (35-44Hrc)	WG-600	1500-4000	.002 – .003 actual chip thickness recommended		
High-Temp (<42Hrc)	G-925	100-700	0.008	0.01	0.012
High-Temp (35-45Hrc)	WG-600	1000-4000	.002 – .003 actual chip thickness recommended		
Cast Iron (<40Hrc)	G-925 WG-600	700-1500 1000-4000	0.010	0.012	0.014

For roughing operations, maximum recommended Width of Cut (WOC) and Depth of Cut (DOC) are 30 percent of ball diameter.

D.O.C. vs Effective Diameter for Excelerator® Ball Nose *(M34)*

Insert Diameter	Depth of Cut D.O.C. .005	.010	.015	.025	.035	.050	.100	.125	.150	.200	.250
.375	.086	.121	.147	.187	.218	.255	.332	.354	.367	.374	
.500	.099	.140	.171	.218	.255	.300	.400	.433	.458	.490	.500
.625	.111	.157	.191	.245	.287	.339	.458	.500	.534	.583	.612
.750	.122	.172	.210	.269	.316	.374	.510	.559	.600	.663	.707
1.000	.141	.199	.243	.312	.368	.436	.600	.661	.714	.800	.866

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Powermill® Milling Cutters

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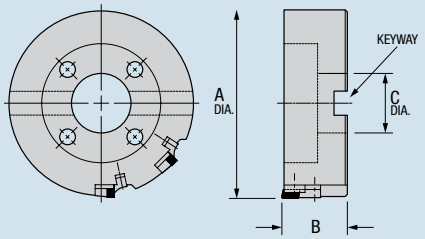
Powermill® M400LNP-A

0° Lead, Neg-Pos



Part Number		Gage	Stock		Dimensions (inches)					No. of Inserts	Standard Components					* Tune-Up Kit Includes All Std. Compo-nents
Right Hand	**Left Hand	Insert	R	L	A	B	C	Keyway	Bolt Circle		Wedge	Wedge Screw	Anvil	Anvil Screw	Back-Up Plate †	
M400LNP04A	–	LNP-335-90R	●	❍	4	2.250	1.500	5/8x3/8	–	6	412151	XNS-58	S-90R	#10-32 x 5/8 FHCS	–	TK-00623
–	M400LNP04A-LH	LNP-335-90L	❍	❍	4	2.250	1.500	5/8x3/8	–	6	412151	XNS-58	S-90L	#10-32 x 5/8 FHCS	–	TK-00624
M400LNP06A	–	LNP-335-90R	●	❍	6	2.250	2.000	3/4x7/16	–	8	412151	XNS-58	S-90R	#10-32 x 7/8 FHCS	303414	TK-00625
–	M400LNP06A-LH	LNP-335-90L	❍	❍	6	2.250	2.000	3/4x7/16	–	8	412151	XNS-58	S-90L	#10-32 x 7/8 FHCS	303414	TK-00626
M400LNP08A	–	LNP-335-90R	●	❍	8	2.750	2.500	1x17/32	4	10	412151	XNS-58	S-90R	#10-32 x 7/8 FHCS	303414	TK-00627
–	M400LNP08A-LH	LNP-335-90L	❍	❍	8	2.750	2.500	1x17/32	4	10	412151	XNS-58	S-90L	#10-32 x 7/8 FHCS	303414	TK-00628
M400LNP10A	–	LNP-335-90R	❍	❍	10	2.750	2.500	1x17/32	4,4-3/4	12	412151	XNS-58	S-90R	#10-32 x 7/8 FHCS	303414	TK-00629
–	M400LNP10A-LH	LNP-335-90L	❍	❍	10	2.750	2.500	1x17/32	4,4-3/4	12	412151	XNS-58	S-90L	#10-32 x 7/8 FHCS	303414	TK-00630
M400LNP12A	–	LNP-335-90R	❍	❍	12	2.750	2.500	1x17/32	4,4-3/4,7	16	412151	XNS-58	S-90R	#10-32 x 5/8 FHCS	303414	TK-00631
–	M400LNP12A-LH	LNP-335-90L	❍	❍	12	2.750	2.500	1x17/32	4,4-3/4,7	16	412151	XNS-58	S-90L	#10-32 x 5/8 FHCS	303414	TK-01243

Maximum depth of cut with standard components is .68".
When using optional inserts and anvil, depth of cut is 1.06".
* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.
† Back-Up Plate Screw is #5-40 x 3/8 FHCS

Part Number		Optional Components	
Right Hand	**Left Hand	Insert Size	Anvil
M400LNP04A	–	LNP-34.57-90R	S-91R
–	M400LNP04A-LH	LNP-34.57-90L	S-91L
M400LNP06A	–	LNP-34.57-90R	S-91R
–	M400LNP06A-LH	LNP-34.57-90L	S-91L
M400LNP08A	–	LNP-34.57-90R	S-91R
–	M400LNP08A-LH	LNP-34.57-90L	S-91L
M400LNP10A	–	LNP-34.57-90R	S-91R
–	M400LNP10A-LH	LNP-34.57-90L	S-91L
M400LNP12A	–	LNP-34.57-90R	S-91R
–	M400LNP12A-LH	LNP-34.57-90L	S-91L

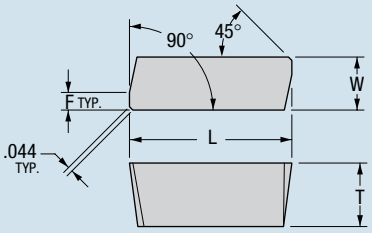
LNP Insert

Inserts	Part Number ANSI	GA5036	GA5125	G-9120	Part Number ANSI	Dimensions (inches) T	W	L	F
	LNP-335-90R	●	●	❍	LNP-335-90R	0.312	0.375	0.750	0.125
	LNP-335-90L	●	●	❍	LNP-335-90L	0.312	0.375	0.750	0.125
	LNP-34.57-90R	●	❍	❍	LNP-34.57-90R	0.437	0.375	1.125	0.125
	LNP-34.57-90L	●	❍	❍	LNP-34.57-90L	0.437	0.375	1.125	0.125

GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.



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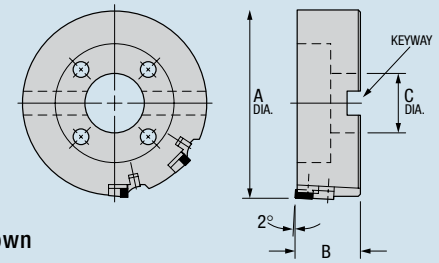
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

Powermill® M402LN-A

2° Lead, Neg-Neg



Right-Hand Cutter Shown

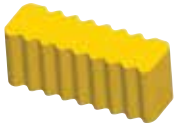
Part Number		Gage	Stock		Dimensions (inches)					No. of Inserts	Standard Components					* Tune-Up Kit Includes All Standard Components
Right Hand	**Left Hand	† Insert	R	L	A	B	C	Keyway	Bolt Circle		Wedge	Wedge Screw	Anvil	Anvil Screw	Back-Up Plate ††	
M402LN04A			●	❍	4	2.250	1.500	5/8x3/8	–	6	412151	XNS-58	S-21	#10-32 x 5/8 FHCS	–	TK-00632
	M402LN04A-LH	General	❍	❍	4	2.250	1.500	5/8x3/8	–	6	412151	XNS-58	S-21	#10-32 x 5/8 FHCS	–	TK-00632
M402LN06A		Purpose	●	❍	6	2.250	2.000	3/4x7/16	–	8	412151	XNS-58	S-21	#10-32 x 7/8 FHCS	303414	TK-00633
	M402LN06A-LH	LNE-335	❍	❍	6	2.250	2.000	3/4x7/16	–	8	412151	XNS-58	S-21	#10-32 x 7/8 FHCS	303414	TK-00633
M402LN08A			●	❍	8	2.750	2.500	1x17/32	4	12	412151	XNS-58	S-21	#10-32 x 7/8 FHCS	303414	TK-00634
	M402LN08A-LH	Finisher	❍	❍	8	2.750	2.500	1x17/32	4	12	412151	XNS-58	S-21	#10-32 x 7/8 FHCS	303414	TK-00634
M402LN10A		LNE-335F	❍	❍	10	2.750	2.500	1x17/32	4,4-3/4	12	412151	XNS-58	S-21	#10-32 x 7/8 FHCS	303414	TK-00634
	M402LN10A-LH		❍	❍	10	2.750	2.500	1x17/32	4,4-3/4	12	412151	XNS-58	S-21	#10-32 x 7/8 FHCS	303414	TK-00634
M402LN12A		Powersine	❍	❍	12	2.750	2.500	1x17/32	4,4-3/4,7	16	412151	XNS-58	S-21	#10-32 x 7/8 FHCS	303414	TK-00717
	M402LN12A-LH	LNES-335	❍	❍	12	2.750	2.500	1x17/32	4,4-3/4,7	16	412151	XNS-58	S-21	#10-32 x 7/8 FHCS	303414	TK-00717

Maximum depth of cut with standard components is .68". When using optional inserts and anvil, depth of cut is 1.06".
***** Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
****** Left-Hand cutters are made to order only.
† Specify; General Purpose – LNE, Powersine – LNES, or Finisher – LNEF.
†† Back-Up Plate Screw is #5-40 x 3/8 FHCS

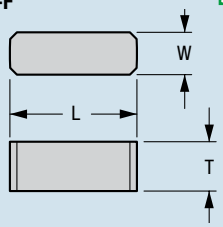
Optional Components

Insert Size	Anvil
General Purpose LNE-34.57	S-2 All Sizes
Finisher LNE-34.57F	
Powersine LNES-34.57	

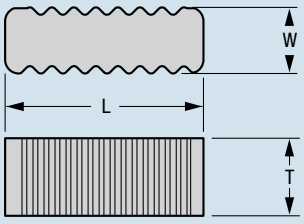
LNE, LNES Insert

Inserts	Part Number ANSI	GA5036	GA5125	G-9120	Part Number ANSI	Dimensions (inches) T	W	L
	LNE-335	●	❍	●	LNE-335	0.312	0.375	0.750
	LNE-34.57	●	●	●	LNE-34.57	0.437	0.375	1.125
	LNE-335F	●	❍	❍	LNE-335F	0.312	0.375	0.750
	LNE-34.57F	●	❍	❍	LNE-34.57F	0.437	0.375	1.125
	LNES-335	●	●	❍	LNES-335	0.312	0.375	0.750
	LNES-34.57	●	❍	❍	LNES-34.57	0.437	0.375	1.125

LNE/LNE-F



LNES



GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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Finishing Inserts (LNE-F)

Finishing inserts incorporating a 2° approach angle ground on the surface-generating edge of the insert are available to suit certain cutters in this range. When these inserts are an available option, they are listed at the bottom of the page with the standard insert. Finishing inserts should be used in complete sets for optimum results.

This is unlike "wiper" inserts which are designed to be higher on the cutter face and can be used in one or in a limited number of positions.

Finishing inserts will generally insure a better surface finish by their increased progressive wiping action on the surface being generated.

We do not recommend the use of finishing inserts under all conditions. Standard inserts will produce better life between indexes, and in the majority of cases the finish produced will be satisfactory for all but the most demanding situations.

Sinusoidal Inserts (LNES)

Sinusoidal inserts having a "wavy" or sine wave type edge have been designed to suit the Powermill® cutter line. This concept allows the chip to be produced as a series of small segments rather than as a continuous band of chip.

The effect is a lowering of cutting forces which is especially helpful when dealing with long spindle extensions to reduce deflective forces. This style of insert does not increase productivity under normal rigid conditions versus a standard insert.

Unique to the Greenleaf Powermill® sinusoidal insert design is the fact that all four edge variations are built into a single insert. There is, therefore, only one insert and not a set of inserts as is common with other manufacturers. The inserts are simply placed into the body with the clearly visible indicator dots in sequence: •, ••, •••, ••••.

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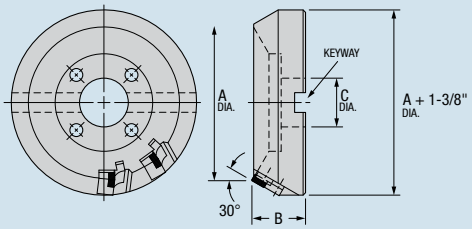
Inserts and Steel Products	**Inserts *Only***	**Steel Products *Only***
● Stocked	○ Stocked or Available	○ 10 Business
● Standard	○ Upon Request	○ Days or Less

Powermill® M430LNP-A

30° Lead, Neg-Pos



Right-Hand Cutter Shown

Part Number		Gage	No. of Inserts	Wiper	Stock	Dimensions (inches)					Standard Components				* Tune-Up Kit Includes All Std. Compo-nents	Optional Compo-nents
Right Hand	**Left Hand	Insert		†Insert		A	B	C	Keyway	Bolt Circle	Wedge	Wedge Screw	Anvil	Back-Up Plate		††Anvil
M430LNP04A		LNP-335R	6	LNP-335RW	●	4	2.250	1.500	5/8 x 3/8	–	412151	XNS-58	S-21	303414	TK-00729	S-2
	M430LNP04A-LH	LNP-335L	6	LNP-335LW	❍	4	2.250	1.500	5/8 x 3/8	–	412151	XNS-58	S-21	303414	TK-00729	S-2
M430LNP06A		LNP-335R	8	LNP-335RW	●	6	2.250	2.000	3/4 x 7/16	–	412151	XNS-58	S-21	303414	TK-00633	S-2
	M430LNP06A-LH	LNP-335L	8	LNP-335LW	❍	6	2.250	2.000	3/4 x 7/16	–	412151	XNS-58	S-21	303414	TK-00633	S-2
M430LNP08A		LNP-335R	10	LNP-335RW	●	8	2.750	2.500	1 x 17/32	4	412151	XNS-58	S-21	303414	TK-00730	S-2
	M430LNP08A-LH	LNP-335L	10	LNP-335LW	❍	8	2.750	2.500	1 x 17/32	4	412151	XNS-58	S-21	303414	TK-00730	S-2
M430LNP10A		LNP-335R	12	LNP-335RW	❍	10	2.750	2.500	1 x 17/32	4, 4-3/4	412151	XNS-58	S-21	303414	TK-00634	S-2
	M430LNP10A-LH	LNP-335L	12	LNP-335LW	❍	10	2.750	2.500	1 x 17/32	4, 4-3/4	412151	XNS-58	S-21	303414	TK-00634	S-2
M430LNP12A		LNP-335R	16	LNP-335RW	❍	12	2.750	2.500	1 x 17/32	4, 4-3/4, 7	412151	XNS-58	S-21	303414	TK-00717	S-2
	M430LNP12A-LH	LNP-335L	16	LNP-335LW	❍	12	2.750	2.500	1 x 17/32	4, 4-3/4, 7	412151	XNS-58	S-21	303414	TK-00717	S-2

Maximum Depth of Cut with standard parts is .50". When using optional insert and anvil, maximum depth of cut is .88".

†† Used with insert LNP34.57R/L.

* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.

** Left-Hand cutters are made to order only.

† See below for explanation of wiper insert.

The Standard and Optional Anvil both use the same Anvil Screw: #10-32 x 7/8 FHCS.

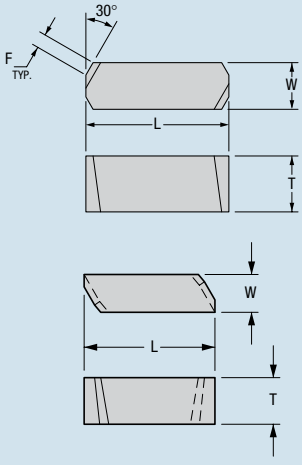
LNP Insert

Inserts	Part Number ANSI	GA5036	GA5125	G-9120	Part Number ANSI	Dimensions (inches) T	W	L	F
	LNP-335R	●	❍	●	LNP-335R	0.312	0.375	0.750	0.100
	LNP-335L	●	❍	●	LNP-335L	0.312	0.375	0.750	0.100
	LNP-335RW	●	❍	●	LNP-335RW	0.312	0.355	0.850	N/A
	LNP-335LW	●	❍	●	LNP-335LW	0.312	0.355	0.850	N/A
	LNP-34.57R	●	❍	●	LNP-34.57R	0.437	0.375	1.125	0.100
	LNP-34.57L	●	●	●	LNP-34.57L	0.437	0.375	1.125	0.100
	LNP-34.57RW	●	❍	❍	LNP-34.57RW	0.437	0.355	1.228	N/A
	LNP-34.57LW	●	❍	❍	LNP-34.57LW	0.437	0.355	1.228	N/A

GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance carbide milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.



Wiper Insert

Wiper Inserts (LNP-RW/LW)

A wiper insert is designed to be higher above the face of the cutter compared to standard inserts and has a broader wiping flat or radius to effectively wipe out any tool marks produced by the tolerance differences in the standard inserts.

Wiper inserts can be used effectively in a single pocket in smaller diameter cutters and in multiples of two or three in larger cutters to produce a superior finish.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

The grades selected for wiper inserts will generally be harder (higher 'C' classification) to combat the trend toward more rapid wear caused by the increased surface contact.

Wiper inserts should only be a used when the required RMS value is very low.

Always bear in mind that the majority of finish problems in milling come from lack of rigidity of the set-up, deflection of the part piece or machine spindle, excessive overhangs, and poor cleanliness and assembly practices in the cutter body. Wiper inserts cannot be expected to resolve these problems.

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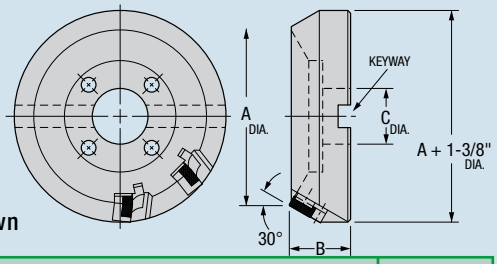
Powermill® C430LNP-H

30° Lead, Neg-Pos, Heavy Duty



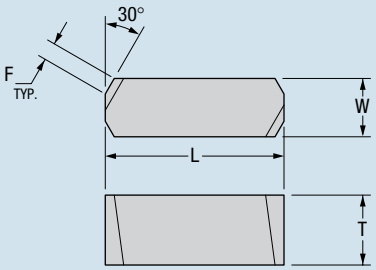
Right-Hand Cutter Shown

Part Number		Gage	Stock	Dimensions (inches)					No. of Inserts	Standard Components				* Tune-Up Kit
Right Hand	**Left Hand	Insert		A	B	C	Keyway	Bolt Circle		Wedge	Wedge Screw	Anvil	Back-Up Plate	Includes All Standard Components
C430LNP08H	–	LNP-44.57R	❍	8	2.750	2.500	1 x 17/32	4	8	412151	XNS-58	S-24	303414	TK-00840
–	C430LNP08H-LH	LNP-44.57L	❍	8	2.750	2.500	1 x 17/32	4	8	412151	XNS-58	S-24	303414	TK-00840
C430LNP10H	–	LNP-44.57R	❍	10	2.750	2.500	1 x 17/32	4,4-3/4	10	412151	XNS-58	S-24	303414	TK-00731
–	C430LNP10H-LH	LNP-44.57L	❍	10	2.750	2.500	1 x 17/32	4,4-3/4	10	412151	XNS-58	S-24	303414	TK-00731
C430LNP12H	–	LNP-44.57R	●	12	2.750	2.500	1 x 17/32	4,4-3/4,7	12	412151	XNS-58	S-24	303414	TK-00732
–	C430LNP12H-LH	LNP-44.57L	❍	12	2.750	2.500	1 x 17/32	4,4-3/4,7	12	412151	XNS-58	S-24	303414	TK-00732

Maximum depth is .88".
* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.
The Standard and Optional Anvil both use the same Anvil Screw: #10-32 x 1 FHCS.

LNP Insert

Inserts	Part Number ANSI	GA5036	GA5125	G-9120	Part Number ANSI	Dimensions (inches) T	W	L	F
	LNP-44.57R	●	❍	●	LNP-44.57R	0.437	0.500	1.125	0.100
	LNP-44.57L	●	❍	●	LNP-44.57L	0.437	0.500	1.125	0.100



GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance carbide milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

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Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
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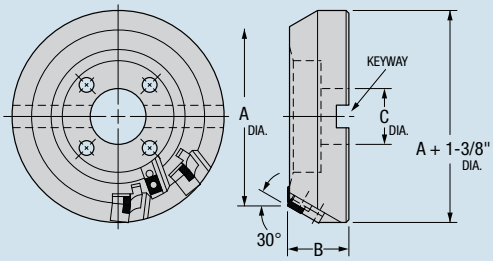
Powermill® C430LNP-W

30° Lead, Neg-Pos, Finishing



Right-Hand Cutter Shown

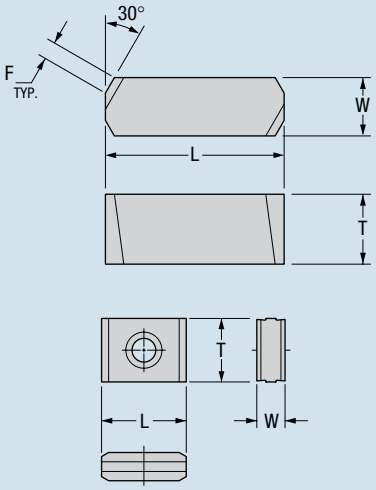
Part Number		Gage	No. of Inserts	† Wiper	No. of Inserts	Stock	Dimensions (inches)					Standard Components					*Tune-Up Kit Includes All Std. Compo-nents	Optional Components
Right Hand	**Left Hand	Insert		Insert			A	B	C	Keyway	Bolt Circle	Wedge	Wedge Screw	Anvil	Back-Up Plate	Wiper Insert Screw		†† Anvil
C430LNP08W		LNP-335R	8	YCE-434-01	2	❍	8	2.750	2.500	1 x 17/32	4	412151	XNS-58	S-21	303414	SE03-10	TK-00837	S-2
	C430LNP08W-LH	LNP-335L	8	YCE-434-01	2	❍	8	2.750	2.500	1 x 17/32	4	412151	XNS-58	S-21	303414	SE03-10	TK-00837	S-2
C430LNP10W		LNP-335R	10	YCE-434-01	2	❍	10	2.750	2.500	1 x 17/32	4,4-3/4	412151	XNS-58	S-21	303414	SE03-10	TK-00828	S-2
	C430LNP10W-LH	LNP-335L	10	YCE-434-01	2	❍	10	2.750	2.500	1 x 17/32	4,4-3/4	412151	XNS-58	S-21	303414	SE03-10	TK-00828	S-2
C430LNP12W		LNP-335R	12	YCE-434-01	4	❍	12	2.750	2.500	1 x 17/32	4,4-3/4,7	412151	XNS-58	S-21	303414	SE03-10	TK-00750	S-2
	C430LNP12W-LH	LNP-335L	12	YCE-434-01	4	❍	12	2.750	2.500	1 x 17/32	4,4-3/4,7	412151	XNS-58	S-21	303414	SE03-10	TK-00750	S-2

The effective finish diameter is 1.00" less than the "A" diameter.
Maximum depth is .88".
* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.
** Left-Hand cutters are made to order only.
† See below for explanation of wiper insert.
The Standard and Optional Anvil both use the same Anvil Screw: #10-32 x 7/8 FHCS.

†† Used with insert LNP34.57R/L.

LNP, YCE Insert

Inserts	Part Number ANSI	GA5036	GA5125	G-9120	G-60	Part Number ANSI	Dimensions (inches) T	W	L	F
	LNP-335R	●	●	●		LNP-335R	0.312	0.375	0.750	0.100
	LNP-335L	●	❍	●		LNP-335L	0.312	0.375	0.750	0.100
	LNP-34.57R	●	●	●		LNP-34.57R	0.437	0.375	1.125	0.100
	LNP-34.57L	●	●	●		LNP-34.57L	0.437	0.375	1.125	0.100
	YCE-434-01				●	YCE-434-01	0.562	0.250	0.750	–



Wiper Insert

GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance carbide milling grade especially suited for manganese steel. Also applicable on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

G-60 (uncoated) Finishing of steel and steel castings under favorable conditions in the wiper configuration.

Wiper Inserts (YCE)

A wiper insert is designed to be higher above the face of the cutter compared to standard inserts and has a broader wiping flat or radius to effectively wipe out any tool marks produced by the tolerance differences in the standard inserts.

The grades selected for wiper inserts will generally be harder (higher 'C' classification) to combat the trend toward more rapid wear caused by the increased surface contact.

Wiper inserts should only be a used when the required RMS value is very low.

Always bear in mind that the majority of finish problems in milling come from lack of rigidity of the set-up, deflection of the part piece or machine spindle, excessive overhangs, and poor cleanliness and assembly practices in the cutter body. Wiper inserts cannot be expected to resolve these problems.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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Standard screw-on and mechanically held indexable slotting cutters.

Special application cutters designed to produce precise narrow-width slots.

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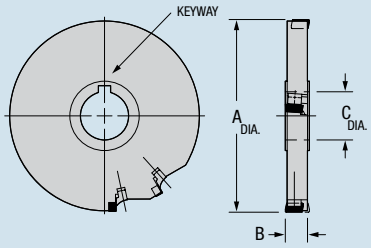
Powerslot® II Slotting Cutter

Adjustable Cutting Width

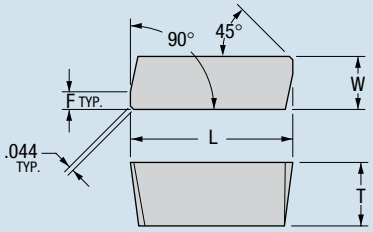


Part Number	Gage Insert Right Hand	Gage Insert Left Hand	Stock	Dimensions (inches) A	Cutting Range B	C	Keyway	No. Of Inserts R	L	Standard Components Wedge	Wedge Screw	Adj. Screw	*Tune-Up Kit Includes All Std. Components
PS2A-05625	LNP-325-90R	LNP-325-90L	❍	5	.625 - .687	1.500	3/8 x 3/16	5	5	413811	XNS-46	PAS1	TK-00865
PS2A-05750	LNP-325-90R	LNP-325-90L	❍	5	.750 - .812	1.500	3/8 x 3/16	5	5	413811	XNS-46	PAS1	TK-00865
PS2A-06625	LNP-325-90R	LNP-325-90L	❍	6	.625 - .687	1.500	3/8 x 3/16	6	6	413811	XNS-46	PAS1	TK-00866
PS2A-06750	LNP-325-90R	LNP-325-90L	❍	6	.750 - .812	1.500	3/8 x 3/16	6	6	413811	XNS-46	PAS1	TK-00866
PS2A-08750	LNP-325-90R	LNP-325-90L	❍	8	.750 - .812	2.000	1/2 x 1/4	8	8	413811	XNS-46	PAS1	TK-00867
PS2A-08100	LNP-335-90R	LNP-335-90L	❍	8	1.000 - 1.093	2.000	1/2 x 1/4	8	8	413809	XNS-58	PAS1	TK-00868
PS2A-10750	LNP-325-90R	LNP-325-90L	❍	10	.750 - .812	2.000	1/2 x 1/4	10	10	413811	XNS-46	PAS1	TK-00869
PS2A-10100	LNP-335-90R	LNP-335-90L	❍	10	1.000 - 1.093	2.000	1/2 x 1/4	10	10	413809	XNS-58	PAS1	TK-00870
PS2A-12750	LNP-325-90R	LNP-325-90L	❍	12	.750 - .812	2.500	5/8 x 5/16	12	12	413811	XNS-46	PAS1	TK-00871
PS2A-12100	LNP-335-90R	LNP-335-90L	❍	12	1.000 - 1.093	2.500	5/8 x 5/16	12	12	413809	XNS-58	PAS1	TK-00872

Powerslot milling cutters are built to order, call Greenleaf technical service for details.
*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.

LNP Insert

Inserts	Part Number ANSI	GA5036	GA5125	G-9120	Part Number ANSI	Dimensions (inches) T	W	L	F
	LNP-325-90R	●	❍	❍	**LNP-325-90R**	0.312	0.375	0.500	0.125
	LNP-325-90L	●	❍	❍	**LNP-325-90L**	0.312	0.375	0.500	0.125
	LNP-335-90R	●	●	❍	**LNP-335-90R**	0.312	0.375	0.750	0.125
	LNP-335-90L	●	●	❍	**LNP-335-90L**	0.312	0.375	0.750	0.125



GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

GA5125 (MT-CVD coated) A high-performance carbide milling grade especially suited for manganese steel. Also applicabe on chrome-moly steel, tool steel and similar high alloy steels.

G-9120 (PVD coated) Carbide grade engineered for milling steel castings and steel forgings. Should be run at moderate to heavy feed rates and depths of cut.

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Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
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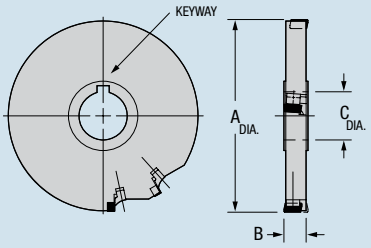
Powerslot® II Slotting Cutter: Custom Order Form



Cutters are available in two different designs, the fixed nest and the adjustable design. The fixed nest design has a fixed cutting width whereas the width of the adjustable design can be changed within a given range. The maxium range for the .5" long insert is .062", for the .75" long, .093", and the 1.125" long is .125" (Refer to L dimension below for insert length)

For special orders: Fill in the following form and fax back to Greenleaf Engineering: 1-814-763-4040.

Order Form To Special Powerslot® II Cutters

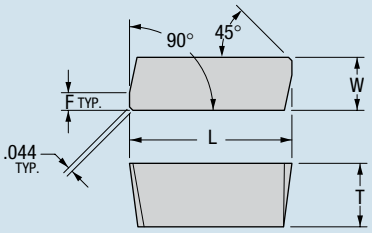
Cutter Style	Minimum Cutting Width Required	Cutter Diameter
☐ Fixed Width		
☐ Adjustable Width		

Insert		Number Of Teeth		Dimensions (inches)				Standard Components		
Right Hand	Left Hand	Right Hand	Left Hand	A	B	C	Keyway	Wedge	Wedge Screw	*Adj. Screw
LNP-325-90R	LNP-325-90L	5	5	5	.62" thru .89"	1.5	3/8 x 3/16	413811	XNS-46	PAS-1
		6	6	6		1.5	3/8 x 3/16			
		8	8	8		2	1/2 x 1/4			
		10	10	10		2	1/2 x 1/4			
		12	12	12		2.5	5/8 x 5/16			
LNP-335-90R	LNP-335-90L	4	4	6	.89" thru 1.34"	1.5	3/8 x 3/16	413809	XNS-58	PAS-1
		6	6	8		2	1/2 x 1/4			
		8	8	10		2	1/2 x 1/4			
		9	9	12		2.5	5/8 x 5/16			
LNP-34.57-90R	LNP-34.57-90L	4	4	6	1.34" thru 2.09"	1.5	3/8 x 3/16	412151	XNS-58	PAS-1
		6	6	8		2	1/2 x 1/4			
		8	8	10		2	1/2 x 1/4			
		9	9	12		2.5	5/8 x 5/16			

*Adjusting Screw is only used in Adjustable Design Powerslot II Slotting Cutter.
Note: When ordering, specify cutter style (fixed or adjustable width), minimum cutting width, and cutter diameter.

LNP Insert

Inserts	Part Number ANSI	GA5036	GA5125	G-9120	Part Number ANSI	Dimensions (inches) T	W	L	F
	LNP-325-90R	●	○	○	LNP-325-90R	0.312	0.375	0.500	0.125
	LNP-325-90L	●	○	○	LNP-325-90L	0.312	0.375	0.500	0.125
	LNP-335-90R	●	●	○	LNP-335-90R	0.312	0.375	0.750	0.125
	LNP-335-90L	●	●	○	LNP-335-90L	0.312	0.375	0.750	0.125
	LNP-34.57-90R	●	○	○	LNP-34.57-90R	0.437	0.375	1.125	0.125
	LNP-34.57-90L	●	○	○	LNP-34.57-90L	0.437	0.375	1.125	0.125



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Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	○ ○	Stocked or Available Upon Request	○ ○	Stocked Standard	● ●

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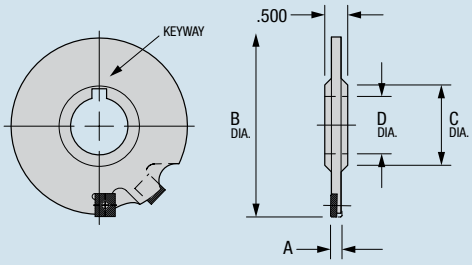
Narrow-Width Slotter

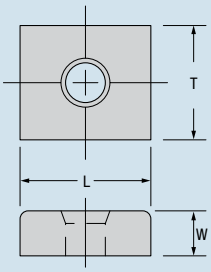


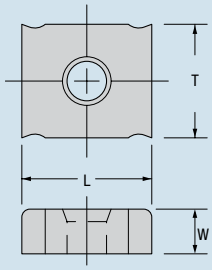
Part Number	Gage *Insert	Stock	Dimensions (inches) A	B	C	D	Keyway	No. Of Inserts	Standard Components Insert Screw	*Tune-Up Kit Includes All Standard Components	Opt. Components Positive Insert
SC-4250	LNEW-4T250R2	❍	0.250	4.000	1.750	1.250	5/16 x 5/32	10	311739	TK-00710	LNPEW-4T250R2
SC-4312	LNEW-4T312R2	●	0.312	4.000	1.750	1.250	5/16 x 5/32	10	312912	TK-00635	LNPEW-4T312R2
SC-6250	LNEW-4T250R2	●	0.250	6.000	2.130	1.500	3/8 x 3/16	16	311739	TK-01807	LNPEW-4T250R2
SC-6312	LNEW-4T312R2	●	0.312	6.000	2.130	1.500	3/8 x 3/16	16	312912	TK-00636	LNPEW-4T312R2
SC-6375	LNEW-4T375R2	●	0.375	6.000	2.130	1.500	3/8 x 3/16	16	SE02-59	TK-00724	LNPEW-4T375R2
SC-8312	LNEW-4T312R2	●	0.312	8.000	2.750	2.000	1/2 x 1/4	20	312912	TK-00767	LNPEW-4T312R2
SC-8375	LNEW-4T375R2	●	0.375	8.000	2.750	2.000	1/2 x 1/4	20	SE02-59	TK-00744	LNPEW-4T375R2

Powerslot milling cutters are built to order, call Greenleaf technical service for details.
* Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.

LNEW/LNPEW Inserts

Inserts	Part Number ANSI	GA5036	Part Number ANSI	Dimensions (inches) T	W	L
	LNEW-4T250R2	❍	**LNEW-4T250R2**	0.437	0.135	0.500
	LNEW-4T312R2	❍	**LNEW-4T312R2**	0.437	0.172	0.500
	LNEW-4T375R2	❍	**LNEW-4T375R2**	0.437	0.203	0.500
	LNPEW-4T250R2	❍	**LNPEW-4T250R2**	0.437	0.135	0.500
	LNPEW-4T312R2	❍	**LNPEW-4T312R2**	0.437	0.172	0.500
	LNPEW-4T375R2	❍	**LNPEW-4T375R2**	0.437	0.203	0.500





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Rotating Toolholders

Greenleaf rotating toolholders and collet chucks are manufactured to the highest standards to take advantage of the performance characteristics of Greenleaf milling products. These holders are constructed of alloy steel with a hardness range of 56-60 Rc and a pilot runout less than .0002". The result is higher metal-removal rates, improved surface finish, and longer tool life.

Shell Mill Holders
pilot range .750" – 2.500" diameter

End Mill Holders
range .500" – 2.000" diameter
single and double ended

Collet Chucks
range .0625" – 1.1812" diameter

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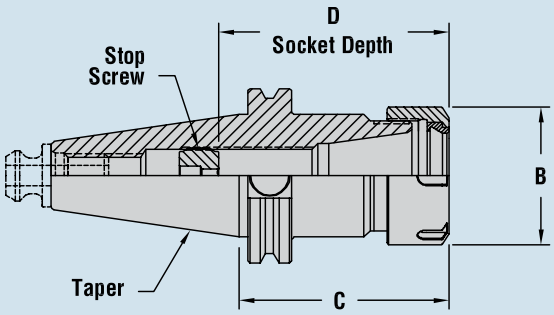
ER Collet Chucks

- Constructed of alloy steel for long, durable service life.
- Hardened to RC 52-56 to avoid damaging collet chuck threads.
- Collet seat taper T.I.R.≤ .0002".
- Accepts DIN 6499-B collets.
- Through-spindle coolant capability.



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ER16 Collet Series

Collet Chucks:

Standard Through Coolant

Taper	Part Number	Stock	Dimensions (inches) C	D
BT 40	**G-B40-16ER412**	❍	4.12	3.62
CAT 40	**G-C40-16ER412**	❍	4.12	2.12
CAT 50	**G-C50-16ER412**	❍	4.12	2.62

Order Collet Nut Wrench G-ECN20W separately, recommended torque 52 ft. lbs

Collet Nut Included

Range .020"-.393"(.5-10)/ B= 1.11"

ER32 Collet Series

Collet Chucks:

Standard Through Coolant

Taper	Part Number	Stock	Dimensions (inches) C	D
BT 30	**G-B30-32ER248**	●	2.48	2.20
BT 40	**G-B40-32ER412**	●	4.12	4.00
CAT 40	**G-C40-32ER412**	●	4.12	4.00
CAT 50	**G-C50-32ER412**	●	4.12	4.00

Order Collet Nut Wrench G-32ERNW separately, recommended torque 125 ft. lbs

Collet Nut Included

Range .078"-.787" (2-20)/ B= 1.97"

ER40 Collet Series

Collet Chucks:

Standard Through Coolant

Taper	Part Number	Stock	Dimensions (inches) C	D
BT 40	**G-B40-40ER412**	●	4.12	4.00
CAT 40	**G-C40-40ER412**	●	4.12	4.00
CAT 50	**G-C50-40ER412**	●	4.12	4.00

Order Collet Nut Wrench G-40ERNW separately, recommended torque 162 ft. lbs

Collet Nut Included

Range .118"-1.181" (3-30)/ B= 2.36"

10 Business Days or Less ❍ ❍

Stocked Standard ● ●

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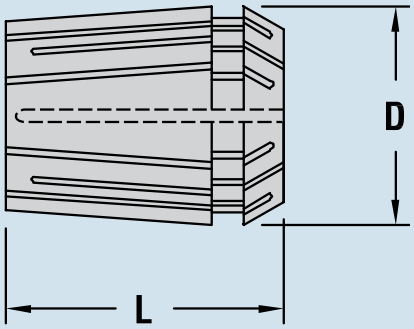
ER Collets

ER Collet

ER COLLET STYLES:
ER – Standard Service Collet

- For use in ER collet chucks for drilling, reaming, boring, tapping, and milling.
- Meets DIN 6499-B industry standard.
- Collapse range .0393"(1 mm) maximum.



ER16 Collet Sets

Part Number	Quantity	Range	Stock	Type	L	D
G-ER16-S012	12	1/16-13/32 x 1/32"	❍	ER16	1.082	.669

ER32 Collet Sets

Part Number	Quantity	Range	Stock	Type	L	D
G-ER32-S021	21	1/8 - 3/4 x 1/8"	●	ER32	1.574	1.300

ER40 Collet Sets

Part Number	Quantity	Range	Stock	Type	L	D
G-ER40-S023	23	4mm - 26mm	●	ER40	1.811	1.614

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● ● Stocked Standard

❍ ❍ 10 Business Days or Less

ER Collets

Standard Style

ER16 Part Number	Stock	ER32 Part Number	Stock	ER40 Part Number	Stock	Inch Range	Metric Range
G-ER16-0137	❍	–		–		.098 - .1378	2.5 - 3.5
G-ER16-0156	❍	G-ER32-0156	❍	–		.117 - .156	–
G-ER16-0157	❍	G-ER32-0157	❍	G-ER40-0157	❍	.1181 - .1575	3 - 4
G-ER16-0177	❍	–		–		.1575 - .1772	4 - 4.5
G-ER16-0187	❍	G-ER32-0187	❍	–		.148 - .187	–
G-ER16-0196	❍	G-ER32-0196	❍	G-ER40-0196	❍	.1575 - .1969	4 - 5
G-ER16-0216	❍	–		–		.177 - .2165	5 - 5.5
G-ER16-0218	❍	G-ER32-0218	❍	–		.179 - .218	–
G-ER16-0236	❍	G-ER32-0236	❍	G-ER40-0236	❍	.1969 - .2362	5 - 6
G-ER16-0250	❍	G-ER32-0250	❍	–		.211 - .250	–
G-ER16-0255	❍	–		–		.217 - .2559	5.5 - 6.5
G-ER16-0275	❍	G-ER32-0275	❍	G-ER40-0275	❍	.2362 - .2756	6 - 7
G-ER16-0281	❍	G-ER32-0281	❍	–		.242 - .281	–
G-ER16-0295	❍	–		–		.256 - .295	7 - 7.5
G-ER16-0312	❍	G-ER32-0312	❍	–		.273 - .312	–
G-ER16-0315	❍	G-ER32-0315	❍	G-ER40-0315	❍	.2756 - .3150	7 - 8
G-ER16-0334	❍	–		–		.296 - .334	8 - 8.5
G-ER16-0343	❍	G-ER32-0343	❍	–		.304 - .343	–
G-ER16-0354	❍	G-ER32-0354	❍	G-ER40-0354	❍	.3150 - .3543	8 - 9
G-ER16-0375	❍	G-ER32-0375	❍	G-ER40-0375	❍	.336 - .0375	–
G-ER16-0393	❍	G-ER32-0393	●	G-ER40-0393	●	.3543 - .3937	9 - 10
G-ER16-0406	❍	G-ER32-0406	❍	–		.3666 - .406	–
–		G-ER32-0433	❍	G-ER40-0433	❍	.3937 - .4331	10 - 11
–		G-ER32-0437	❍	–		.398 - .437	–
–		G-ER32-0468	❍	–		.429 - .468	–
–		G-ER32-0472	❍	G-ER40-0472	❍	.4331 - .4724	11 - 12
–		G-ER32-0500	❍	G-ER40-0500	❍	.461 - .500	–
–		G-ER32-0511	●	G-ER40-0511	●	.4724 - .5118	12 - 13
–		G-ER32-0531	❍	–		.492 - .531	–
–		G-ER32-0551	❍	G-ER40-0551	❍	.5118 - .5512	13 - 14
–		G-ER32-0562	❍	–		.523 - .562	–
–		G-ER32-0590	❍	G-ER40-0590	❍	.5512 - .5906	14 - 15
–		G-ER32-0625	❍	G-ER40-0625	❍	.586 - .625	–
–		G-ER32-0630	●	G-ER40-0630	●	.5906 - .6299	15 - 16
–		G-ER32-0656	❍	–		.617 - .656	–
–		G-ER32-0669	❍	G-ER40-0669	❍	.6299 - .6693	16 - 17
–		G-ER32-0687	❍	–		.648 - .687	–
–		G-ER32-0708	❍	G-ER40-0708	❍	.6693 - .7087	17 - 18
–		G-ER32-0748	❍	G-ER40-0748	❍	.7087 - .7480	18 - 19
–		G-ER32-0750	❍	G-ER40-0750	❍	.711 - .750	–
–		G-ER32-0787	●	G-ER40-0787	●	.7480 - .7874	19 - 20
–		–		G-ER40-0826	❍	.7874 - .8268	20 - 21
–		–		G-ER40-0866	❍	.8268 - .8661	21 - 22
–		–		G-ER40-0875	❍	.836 - .875	–

Range: Always select collet that the high end of range is closest to, larger than, or equal to cutting tool shank.
Collets perform best when "on size".

Continued on next page.

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ER Collets

Standard Style *(continued)*

ER16 Part Number	ER32 Part Number	ER40 Part Number	Stock	Inch Range	Metric Range
–	–	G-ER40-0905	❍	.8661 - .9055	22 - 23
–	–	G-ER40-0944	❍	.9055 - .9449	23 - 24
–	–	G-ER40-0984	❍	.9449 - .9843	24 - 25
–	–	G-ER40-1000	❍	.9610 - 1.000	–
–	–	G-ER40-1023	●	.9843 - 1.0236	25 - 26
–	–	G-ER40-1063	❍	1.0236 - 1.0630	26 - 27
–	–	G-ER40-1102	❍	1.0630 - 1.1024	27 - 28
–	–	G-ER40-1141	❍	1.1024 - 1.1418	28 - 29
–	–	G-ER40-1181	●	1.1418 - 1.1812	29 - 30

Range: Always select collet that the high end of range is closest to, larger than, or equal to cutting tool shank.
Collets perform best when "on size".

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● ● Stocked Standard

❍ ❍ 10 Business Days or Less

ER Collet Wrenches

Standard Wrench	Stock	ER Size	Size and Style
G-ECN20W	●	ER16	1" Hex
G-32ERNW	●	ER32	Spanner
G-40ERNW	●	ER40	Spanner

Fixed Spanner
Wrench G-32ERNW

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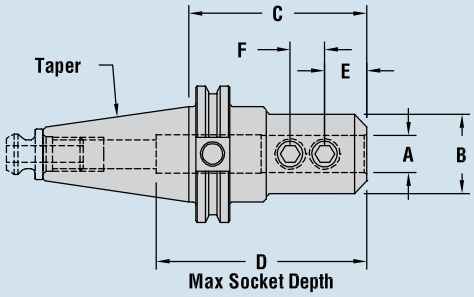
Weldon-Style End Mill Holders

End Mill Holder

- Constructed of alloy steel for long, durable life service.
- Hardened to RC 56-60 for long service life.
- Shiny taper with black oxide finish for the best combination of accuracy and durability.
- End mill socket T.I.R.≤ .0002".
- Through-spindle coolant capability.
- Parsymmetry™ design for high-speed operation.



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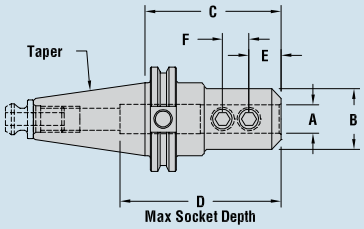
Weldon-Style
End Mill Holders



	Taper	Part Number	End Styles	Stock	Dimensions (inches) A (dia.)	B (dia.)	C	D	E	F
1/2" DIAMETER	BT 30	G-B30-50EM238	Single-ended	●	.500	1.38	2.38	2.00	.88	–
	BT 40	G-B40-50EM2	Double-ended	●	.500	1.25	2.25	3.00	.88	–
	CAT 40	G-C40-50EM2	Double-ended	●	.500	1.25	2.62	3.80	.88	–
	CAT 50	G-C50-50EM2	Single-ended	●	.500	1.25	2.62	3.00	.88	–
5/8" DIAMETER	BT 30	G-B30-62EM250	Single-ended	●	.625	1.44	2.50	2.25	.94	–
	BT 40	G-B40-62EM2	Single-ended	●	.625	1.50	2.25	3.50	.94	–
	CAT 40	G-C40-62EM2	Double-ended	●	.625	1.50	2.75	3.62	.94	–
	CAT 50	G-C50-62EM3	Double-ended	●	.625	1.50	3.75	3.50	.94	–
3/4" DIAMETER	BT 30	G-B30-75EM250	Single-ended	●	0.75	2.00	2.50	2.25	1.00	–
	BT 40	G-B40-75EM3	Double-ended	●	0.75	1.75	3.38	2.38	1.00	–
	CAT 40	G-C40-75EM3	Double-ended	●	0.75	1.75	3.50	3.94	1.00	–
	CAT 50	G-C50-75EM3	Single-ended	●	0.75	1.75	3.75	4.00	1.00	–
1" DIAMETER	BT 30	G-B30-10EM275	Single-ended	●	1.000	2.38	2.75	2.50	1.12	–
	BT 40	G-B40-10EM4	Double-ended	●	1.000	2.00	4.00	4.44	1.12	1.00
	CAT 40	G-C40-10EM4	Double-ended	●	1.000	2.00	4.00	4.50	1.12	1.00
	CAT 50	G-C50-10EM4	Double-ended	●	1.000	2.00	4.00	4.44	1.12	1.00
1-1/4" DIAMETER	BT 40	G-B40-12EM4	Single-ended	●	1.250	2.50	4.00	3.38	1.12	1.00
	CAT 40	G-C40-12EM4	Single-ended	●	1.250	2.50	4.00	3.75	1.12	1.00
	CAT 50	G-C50-12EM4	Double-ended	●	1.250	2.50	4.00	3.35	1.12	1.00
2" DIAMETER	CAT 50	G-C50-20EM5	Single-ended	●	2.000	3.75	5.62	3.50	1.41	1.50

Set screws included.
All adapters shipped less retention knobs.

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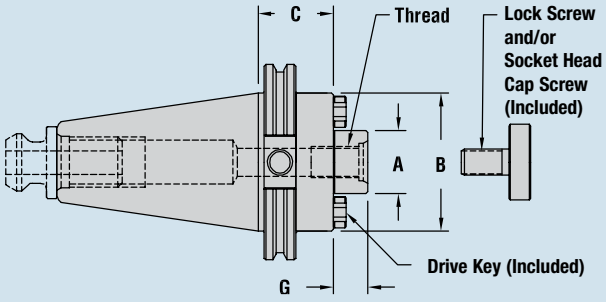
Shell Mill Holders

Shell Mill Holder

- Constructed of alloy steel for long, durable service life.
- Hardened to RC 56-60 for long service life.
- Shiny taper with black oxide finish for the best combination of accuracy and durability.
- Shell mill pilot T.I.R. ≤.0002".



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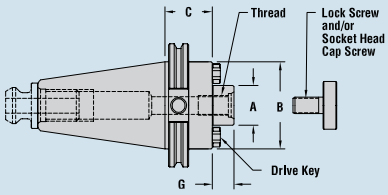
Shell Mill Holders



	Taper	Part Number	Stock	Dimensions (inches) A (Dia.)	B (Dia.)	C	G	Drive Key	Thread
1/2" DIAMETER	BT 30	**G-B30-50SM118**	●	.500	1.50	1.18	.56	.25	1/4" - 28
3/4" DIAMETER	BT 30	**G-B30-75SM118**	●	.750	1.75	1.18	.68	.31	3/8" - 24
	BT 40	**G-B40-75SM2**	●	.750	1.75	2.00	.68	.31	3/8" - 24
	CAT 40	**G-C40-75SM2**	●	.750	1.75	1.50	.68	.31	3/8" - 24
	CAT 50	**G-C50-75SM1**	●	.750	1.75	1.50	.68	.31	3/8" - 24
1" DIAMETER	BT 30	**G-B30-10SM177**	●	1.000	2.38	1.77	.68	.38	1/2" - 20
	BT 40	**G-B40-10SM2**	●	1.000	2.25	2.00	.68	.38	1/2" - 20
	CAT 40	**G-C40-10SM2**	●	1.000	2.25	2.00	.68	.38	1/2" - 20
	CAT 50	**G-C50-10SM2**	●	1.000	2.25	2.00	.68	.38	1/2" - 20
1-1/4" DIAMETER	BT 40	**G-B40-12SM2**	●	1.250	2.75	2.25	.68	.50	5/8" - 18
	CAT 40	**G-C40-12SM2**	●	1.250	2.75	2.25	.68	.50	5/8" - 18
	CAT 50	**G-C50-12SM1**	●	1.250	2.75	1.50	.68	.50	5/8" - 18
1-1/2" DIAMETER	BT 40	**G-B40-15SM2**	●	1.500	3.75	2.25	.94	.62	3/4" - 16
	CAT 40	**G-C40-15SM2**	●	1.500	3.75	2.40	.94	.62	3/4" - 16
	CAT 50	**G-C50-15SM2**	●	1.500	3.75	2.40	.94	.62	3/4" - 16
2" DIAMETER	CAT 50	*** G-C50-20SM2**	●	2.000	4.88	2.40	.94	.75	1" - 14
2-1/2" DIAMETER	CAT 50	*** G-C50-25SM2**	●	2.500	4.88	2.40	1.12	1.00	1" - 14

Lock screw and/or socket head cap screw is included.
* Includes four 5/8"-11 tapped holes on a 4" bolt circle.
All adapters shipped less retention knobs.

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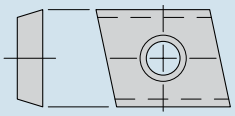
Additional Greenleaf Milling Inserts



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CDE 313R41 *(419155)*
CDE 313L41 *(419156)*
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CDE 313R51 *(419648)*
CDE 313R52 *(424817)*
CDE 313L52 *(424818)*
CDE 322L02 *(308859)*
CDE 313R30 *(418647)*
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CDE 322R02 *(306908)*
CDE 322R04 *(428334)*
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CDE 323R30 *(311842)*
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CDE 323L31 *(310841)*
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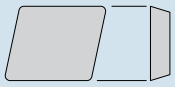
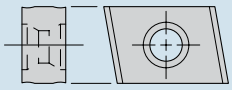
GDE 323R04 *(426277)*



FPE-21.521 *(418104)*



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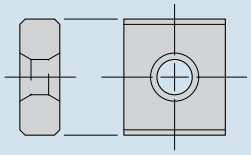
DXE 324-007 *(427719)*



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LNE 324-01 *(418796)*
LNE 324-05 *(302414)*
LNE 414-08 *(309917)*
LNE 424-20 *(306518)*
LNE 434-02 *(36768)*
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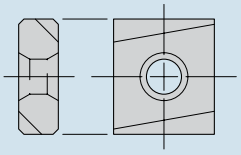
LNE 434-20 *(306242)*
LNE 443-01 *(307357)*
LNE 443-20 *(418641)*
LNE 446-01 *(38548)*



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LSE 446L01 *(418959)*
LSE 446R01 *(418958)*

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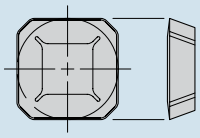

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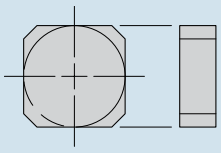

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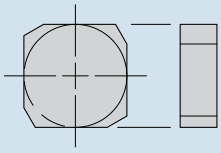

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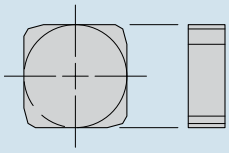

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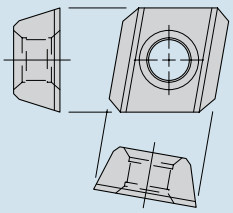

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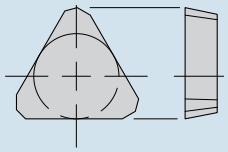

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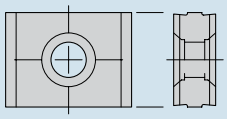

YCE 434-01
(417787)
YCE 446-01
(423783)

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CARBIDE

Greenleaf offers a comprehensive line of carbide inserts in grades ranging from sub-micron C-1 through C-8 classifications. An industry pioneer in coated carbide, Greenleaf offers a variety of uncoated, MT-CVD coated and PVD-coated grades. Carbide inserts are available in ANSI standard geometries with multi-purpose chip-breakers for heavy roughing through finishing.

COATED

GA5036 A high-performance MT-CVD coated grade for milling steels at high speed. GA5036 should be used when milling forged and cast steels and selected ductile irons. GA5036 has a unique combination of toughness and heat resistance making it suitable for heavy- and light-duty milling at high cutting speeds.

GA5125 New high-performance MT-CVD coated carbide milling grade especially suited for manganese steel. GA5125 is also applicable on chrome-moly steel, tool steel and similar high alloy steels. GA5125 provides excellent resistance to abrasion, crater wear, thermal shock, deformation and edge build-up. GA5125 should be applied at high speeds with moderate feed rates.

G-910 PVD-coated grade for milling high-temp alloys, stainless steel, and low carbon steels. G-910 is a medium-speed grade and should be applied at moderate to high feed rates.

G-9120 PVD-coated grade for milling and turning steel castings and steel forgings. G-9120 is engineered to maximize productivity at moderate to heavy feed rates and depths of cut.

G-915 Multi-layer PVD-coated grade, excellent for milling and turning high-temp alloys, stainless steel, and low-carbon steels. The multi-layer PVD coating adds heat and abrasion resistance to the tough, shock-resistant substrate. G-915 should be run at moderate speeds and moderate to high feeds in milling and interrupted turning applications.

G-9230 PVD-coated grade developed for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons. G-9230 has superior wear resistance and toughness and is excellent for cast and forged scale machining conditions.

G-935 Multi-layer PVD-coated grade for steel milling and turning applications requiring additional resistance to mechanical and thermal shock. The multi-layered PVD coating increases the speed capability and wear resistance in tough milling and interrupted turning applications.

UNCOATED

G-53 Excellent general-purpose milling grade for steel and steel alloys at moderate speeds and feeds. Good combination of toughness and wear resistance for milling, or as an all-around grade for mixed production applications. G-53 is not recommended for continuous turning.

G-60 Heavy, rough turning of steel, steel castings, and steel forgings. Apply G-60 at moderate speeds and heavy feed rates and depths of cut. More wear resistant than G-50, but lower in toughness.

CERAMIC

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts in ANSI standard and special geometries. Some of the most prominent include:

WG-300®
Whisker-reinforced ceramic with excellent wear and shock resistance at high surface speeds. WG-300 is very effective at machining nickel- and cobalt-based super alloys, and other hard materials at metal removal rates up to 10 times higher than carbide.

WG-600®
Coated whisker-reinforced ceramic offering longer tool life and better performance over uncoated ceramics due to outstanding thermal properties and shock-resistance at high cutting speeds. Application areas include rough and finish turning, as well as high-performance milling of high-strength alloys, hardened steels and select stainless steels. *U.S. Patent No. 6,447,896 B1.*

XSYTIN™-1 New phase-toughened ceramic capable of extreme feed rates. XSYTIN™-1 excels at machining a wide variety of materials including steels, cast and ductile irons, high-temperature alloys and other challenging metals. XSYTIN™-1 is ideal for use in interrupted cuts, scale, abrasive casting materials and milling.

GSN100™
New engineered blend of silicon nitride and proprietary toughening agents that redefines productivity in the machining of cast iron. GSN100 delivers outstanding tool life at high cutting speeds in turning, grooving and milling applications.

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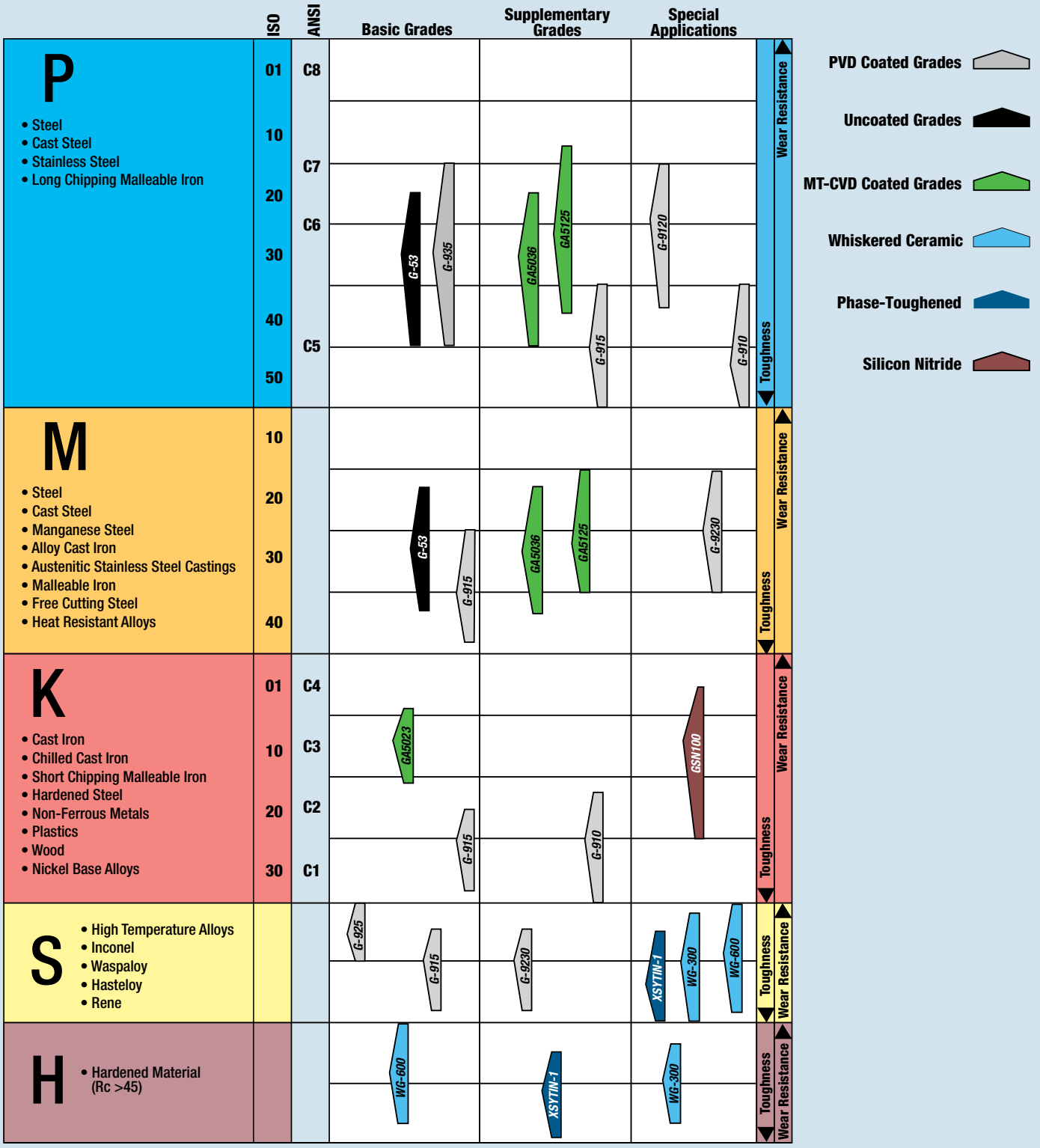
Insert Grade Reference for Milling



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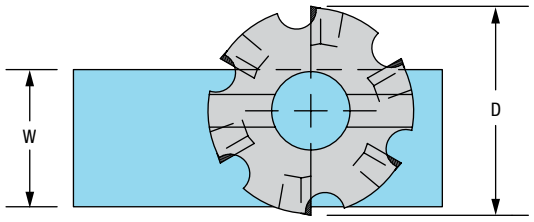
Selection of Correct Cutter Diameter

Select a cutter diameter greater than the workpiece width by a ratio of approximately 1.5 to 1. This will ensure that each insert enters the cut without the frictional, no-chip phase which occurs when attempting to cut the full cutter diameter. Also, the insert leaves the part without reducing the chip down to zero. These benefits can greatly extend the insert life.

With smaller, low horsepower machines it will be better to select a smaller cutter and take two passes rather than a large diameter cutter forced to operate at low tooth loads (feed rates) to avoid stalling of the spindle.

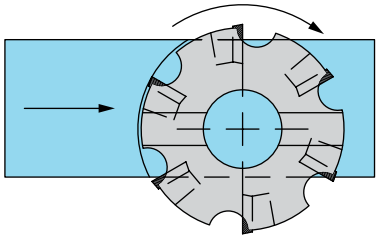


W = Width of work
D = Cutter diameter

Choose a cutter diameter approximately 1.5 times the workpiece width.

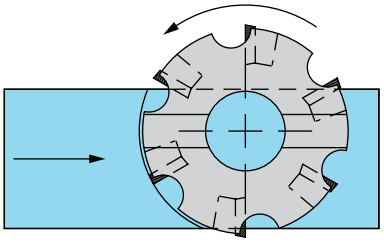
Hand of Cutters

A *right-hand cutter* is one which, when viewed from above, rotates clockwise relative to the workpiece.



Right-Hand Cutter

A *left-hand cutter* is one which, when viewed from above, rotates counterclockwise relative to the workpiece.



Left-Hand Cutter

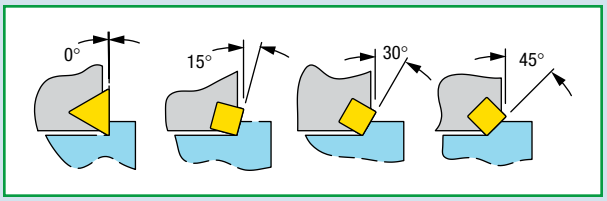
Lead Angle

The lead angle of a milling cutter is not intended for producing a specific angle on the work. In fact, because of compound angles, a given lead angle will not produce that angle exactly.

The purpose of lead angle is to thin the chip while absorbing a given depth of cut over a greater portion of the insert edge. This results in improved tool life and, for a given horsepower, a greater depth potential.

For example, 30° lead angle is a good choice for face milling in general purpose applications.

The exception to the previous statement is the 0° lead cutter, sometimes called a 90° cutter, which is designed for milling to square shoulders and producing a 90° corner.

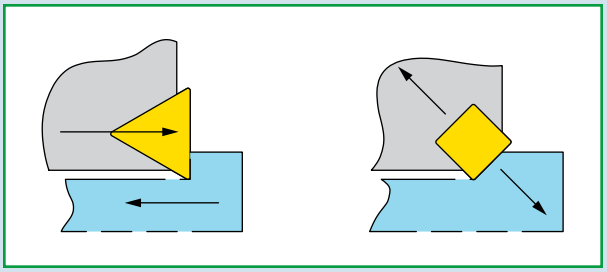


Lead Angles and Cutting Forces

The lead angle of a milling cutter has a direct effect upon the cutting forces being presented to the workpiece, cutting tool, and machine.

The resultant force is always directly perpendicular to the cutting edge. A lead angle may, therefore, be a major consideration in how we want to direct the forces.

For example, in a thin section workpiece, a high lead angle may cause deflection since there is more tendency to “push” the part away from the cutter. On the other hand, a 0° lead cutter has more deflective force on the machine spindle.



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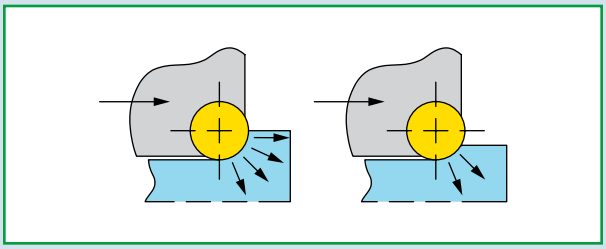
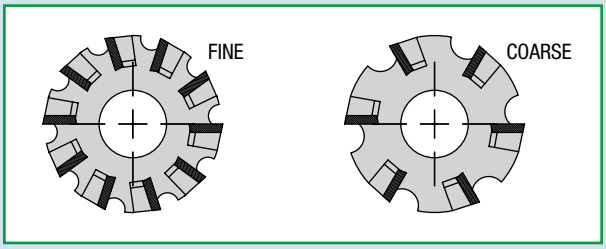
The Round Insert Cutter

The exception to the rule in lead angle cutting forces is the round insert. With a round insert, the lead angle is entirely dependent upon the depth of cut. As the depth increases, the lead angle decreases. If cutting half the diameter deep, there is effectively 0° lead angle.



In the milling of work hardening materials such as Inconel, and using a round insert cutter, there will be a direct relationship between depth of cut and speed of development of notch wear. The shallower the cut, the slower the notch wear.



Pitch

The pitch of a milling cutter refers to the numbers of inserts placed into a given diameter.

Cutters for cast iron are often closer pitch to allow the maximum number of teeth to be engaged at one time for smoother cutting, and because cast iron does not need large gullet for the discontinuous chips produced.

For general use, choose a fairly coarse pitch. A guide would be diameter plus 2, i.e., a 6" cutter with 8 inserts, etc.

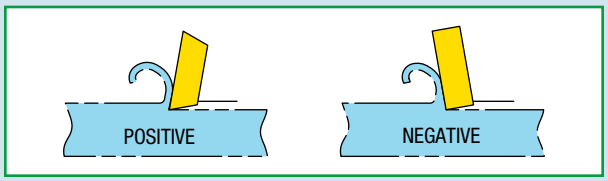
Negative Versus Positive Geometry

In an indexable cutter, the negative insert is the only one which permits the insert to be turned over and used on both sides. It is the most economical style. Also, it is the strongest insert because all edges are 90° to the faces.

On the minus side, the negative rake tool produces higher cutting forces when compared to the positive rake.

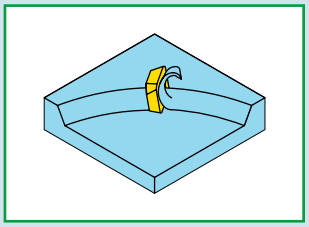
In general, use negative rakes for cast iron, interrupted cuts, and on rigid high horsepower machining for steels.

Use positive rakes for aluminum, titanium, copper, most stainless steels, thin or easily deflected parts, steels, and nickel alloys.



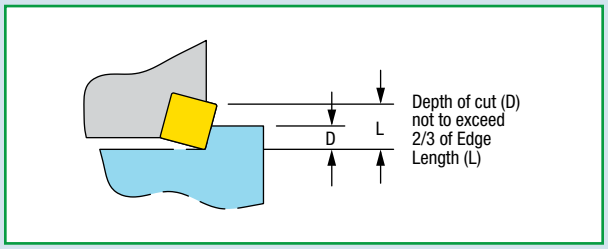
There are many milling cutters with a combination of positive and negative rakes often called shear-angle design. These cutters offer some of both worlds, although inserts are essentially like positive inserts and cannot be turned over. Shear angle cutters do provide continuous chip ejection since the axial rake behaves much like a helix in a flute and takes the chip up and away from the finished surface.

These cutters work well in heavy duty operations with wide widths of cut—especially if combined with a 30° lead angle.



Depth of Cut

It is a good general rule not to allow depth of cut to exceed 2/3 of the cutting edge length. Remember that in lead angle cutters the cutting edge length in use is not the same as the depth of cut.



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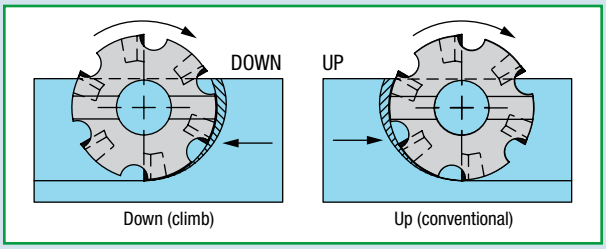
Up Milling and Down Milling

This refers to direction of rotation relative to the feed.

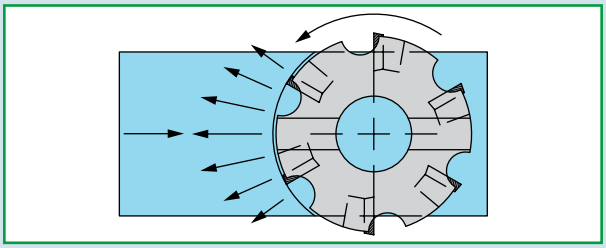


With a modern machine in good condition, down milling will give the best results. This is because the thickest section of the chip is against the insert to avoid welding, and pressure is progressively relieved towards the finished surface.

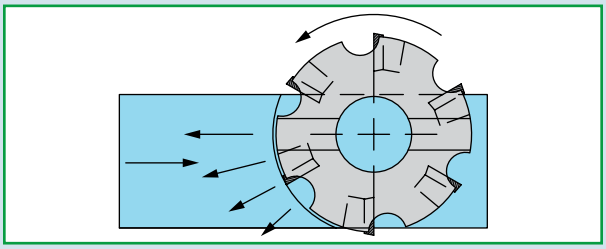
In up milling, friction and pressure build up before the chip starts to form, causing premature edge wear. It should be in rare cases that up milling is needed. This could be, for example, on an older machine with backlash in the table feed.

Cutter Positioning

Central positioning of the cutter can give rise to vibration if any spindle play is present. This is because of an alternating radial force pushing against the spindle.



Placing the cutter off center will always be a better situation to avoid chatter and vibration and also to improve tool life.

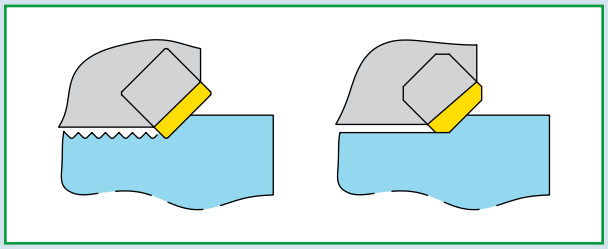


When moving off center, the path of cut is longer since each insert now sweeps a longer arc with each revolution. This may have a measureable impact on tool life, and cutting temperature will tend to increase.

Seek a happy medium by moving off center in small increments until vibration is controlled.

Surface Finish

In a milling cutter the finish is produced by the highest insert. Since variations exist in the body and the inserts, it is inevitable that some inserts will be higher than others. If the inserts have small corner radii, for example, the highest insert will cut the track and this will determine the finish.

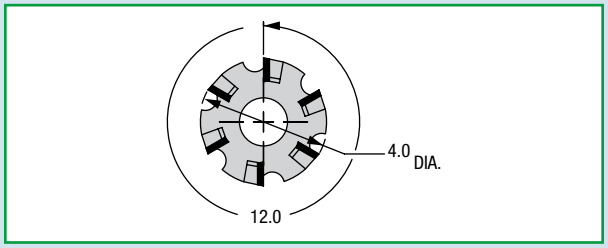


For this reason, most inserts designed especially for milling, use flats on the insert rather than a radius. In this way, the highest insert produces a wiping effect removing the variances of the other inserts and leaving a much improved finish. “Wiper” inserts installed in a few stations can be used for this purpose as well as “finishing” inserts which are available for certain cutters in the Greenleaf line.

The 4" Reference for Speed Calculations

Recommended cutting speeds are usually given in surface feet per minute (SFM). Sometimes a problem exists in converting SFM to the correct RPM (revolutions per minute) for a given cutter diameter.

A very easy way to make a quick approximate calculation is to use a 4" cutter as a base of reference. Since a 4" cutter has a circumference of approximately 12" or 1 foot $\frac{(\pi \times D")}{12}$ = Cft the correct RPM for a 4" cutter is the same as required speed in SFM, i.e,100 RPM = 100 SFM.



This makes it easy to make a mental calculation for most popular cutter diameters

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For Example:

An 8" cutter has 2x the circumference. Therefore, 100 RPM=200 SFM. A 2" cutter has half the circumference. Therefore, 100 RPM=50 SFM and so forth.

If you want to make an accurate calculation, the formula is: $SFM = \frac{\pi \times d \times RPM}{12}$

Speed rate recommendations are based upon the material to be machined and the cutting tool material which will be used, i.e., carbide, coated carbide, ceramic, silicon nitride, etc.

Feed Rate Calculation

One problem encountered in milling cutter feed rate considerations is that while most milling cutter manufacturers make recommendations in load per tooth or feed per tooth, the machine is calibrated in *inches per minute*. It is, therefore, necessary to do a little simple math to get the answers required.

In turning, these problems do not exist since only one insert is involved, and the machine is calibrated in feed per revolution. Feed per revolution is the same as feed per tooth when there is only one insert, so we simply plug in the recommended feed.

With a milling cutter, the feed per tooth is controlled by three factors. These are:

1. The feed rate or table advance in inches per minute.
2. The spindle speed in revolutions per minute.
3. The number of inserts in the milling cutter.

We must make a calculation in order to find out the really critical information needed, i.e., what is the feed per tooth or how much work are we asking each insert to perform? Too little work is more often a problem than too much.

If the feed per tooth is very small, let us say less than .003", then abrasive wear is accelerated. No real chip is produced to take away the heat.

On the other hand, if high feed rates are used and the cutter has many teeth, then horsepower available may be insufficient. This is an important consideration in selecting a cutter, especially larger diameter cutters with fine pitch. Here are the equations you will need to make your calculations:

T = Number of teeth
FPT = Feed per tooth
IPM = Inches per minute
RPM = Revolutions per minute
π = 3.1416

$$\text{Feed per tooth} = \frac{IPM}{T \times RPM}$$

$$\text{Feed per revolution} = \frac{IPM}{RPM}$$

$$\text{Inches per minute} = FPT \times T \times RPM$$

$$\text{Revolutions per minute} = \frac{12 \times SFM}{\pi \times d}$$

These calculations can also be readily made using the Greenleaf milling calculator available free of charge upon request from your local representative or directly from Greenleaf Corporation (800-458-1850). This calculator also displays horsepower needed at the spindle for a given cut. This takes into account width and depth as well as speed and feed for a given cutter together with the machinability of the material to be machined, often referred to as the "K" factor.

It is a good starting point to know that a mild steel (150BHN) requires about 1 HP per cubic inch of material to be removed per minute.

The formula for cubic inches removed is:

Cu. ins. = D x W x IPM

Depth = .060

Width = 6 inches

IPM = 22 inches per minute

.060 x 6 x 22 = 7.92 cubic inches per minute
(or)
Approximately 8HP needed for steel 150 BHN

For any other material we can divide our answer by the "K" factor which is a machinability rating relative to 150BHN steel.

"K" Factors

Material	*"K" Factor*
Aluminum	4.00
Brass–soft	3.00
Brass–hard	2.00
Bronze–hard	1.40
Cast iron to 200 BHN	1.75
Cast iron to over 200 BHN	1.20
Malleable iron	1.50
Steel–100 BHN	1.40
Steel–150 BHN	1.00
Steel–200 BHN	0.85
Steel–250 BHN	0.83
Steel–300 BHN	0.80
Steel–400 BHN	0.65

HPc = Horsepower needed at spindle

D = Depth of cut

W = Width of cut

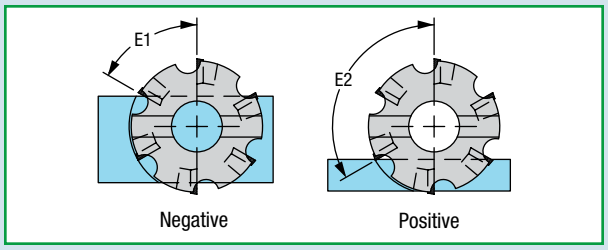
IPM = Inches per minute feed rate

K = K Factor

$$HPc = \frac{D \times W \times IPM}{K}$$

Angle of Entry

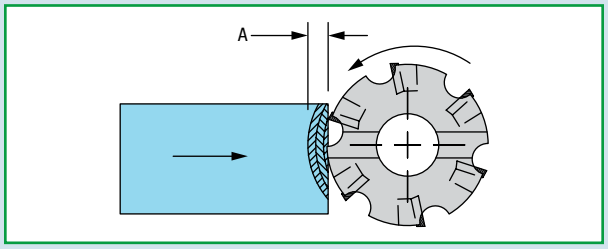
In face milling operations, the angle of entry can have a significant impact upon insert performance. A positive angle of entry can cause breakage or chipping, especially when using positive inserts. Positive angle of entry will occur when the path of cut is narrow relative to cutter diameter.



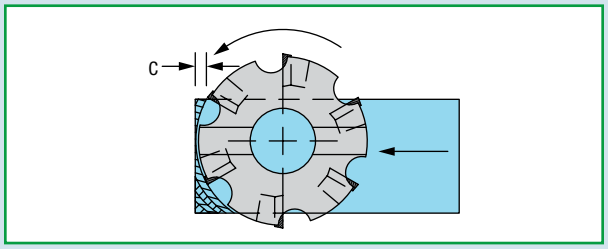
1. When the angle of entry (E1) is less than 90°, the initial impact occurs at a position behind the point of the tool. The insert has a greater section and is stronger here and better able to withstand the impacts.

2. When the angle of entry (E2) is greater than 90°, the initial impact between the insert and the part piece occurs at the point of the tool, which, especially in a positive rake milling cutter, is the weakest section of the insert. This can lead to insert failure.

Entering and Exiting the Cut



The angle of entry is always adverse as the cut commences. In the illustration, we can see that as the cutter travels through zone A, the angle of entry is changing. It starts out positive as the inserts first start to cut. As the cut progresses, it becomes less and less positive and eventually negative.



With a CNC machine, it is a worthwhile exercise to slow down the feed rate in zone A, especially with positive rake tools and hard to cut materials. As the cutter starts to break through at the end of the cut, another problem area is created in zone C. At this point, the cutter breaks through in the center, leaving two islands of material. Changes of entry angle occur which can result in insert problems. As in entry into the part, a reduction of feed rate can help alleviate chipping or breakage problems if they arise.

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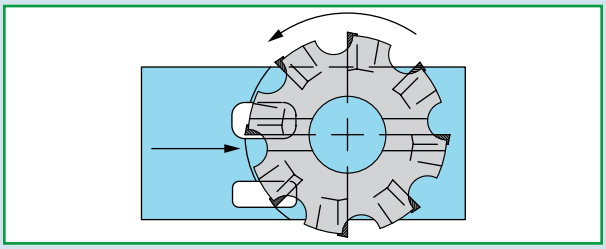
Interruptions

Milling is by definition an interrupted operation. In addition, as the cutter crosses voids in the part, changes of entry angle occur. This situation is usually too complex to define in absolute terms relative to a targeted solution. Recognizing this in interrupted parts, try to include some of the following features in the set-up to reduce impact:

1. Negative or negative/positive geometry
2. Use a lead-angle cutter (30° or 45°) if possible
3. Use an impact-resistant carbide grade
4. Use a cutter with medium or fine pitch
5. Keep the load per tooth on the low end



A Milling Cutter is a Series of Single-Point Tools

It is easy to lose sight of the fact that a milling cutter is nothing more than a series of single-point tools clamped into a rotating holder. If you always keep this in mind, you will be constantly reminded that what is most important to know is what is happening to each tool or insert.

The feed rate in inches per minute of machine table travel does not tell you anything important unless or until you calculate the feed per tooth. You cannot calculate the feed per tooth until you know the speed in revolutions per minute and how many teeth are in the cutter. Therefore, it should become second nature to ask, know, and consider the three “golden” variables:

1. How many inserts?
2. How many RPM?
3. What feed in inches per minute?

Use this formula to find feed per tooth:

$$\text{FPT} = \frac{\text{IPM}}{\text{No. of Teeth x RPM}}$$

Once you know the feed per tooth, as a very broad general guide, try to keep the feed above .003" per tooth and remember that horsepower limitations usually come into play long before most cutters reach the upper limit. Efficient metal removal will usually dictate working in the .005" to .010" per tooth range.

Some heavy-duty cutters can be used as high as .030" or more per tooth, but this will need a machine in the 50+ horsepower class – and a larger cutter could well use over 100 horsepower!

Greenleaf Excelerator® Mills Setup and Operational Procedures

1. Thoroughly clean all insert pockets.
2. Install the inserts, making sure that they are properly seated in the pocket, and torque the insert clamp screws to the correct torque as indicated on the body of the Excelerator Milling Cutter.
3. Use Greenleaf Excelerator Mills only on machines that have adequate shield guards.
4. Run the Greenleaf Excelerator Mills using cutting parameters as recommended by Greenleaf Tech Team. Contact the Greenleaf Tech Team at: 814-763-2915 or by email: techteam@greenleafcorporation.com
5. For safety purposes, do not exceed the maximum RPM’s etched on the Excelerator Mill. Note: There are two max RPM numbers. One (the lower RPM number) is for using the mill with carbide inserts and the other is for usage with ceramic inserts.

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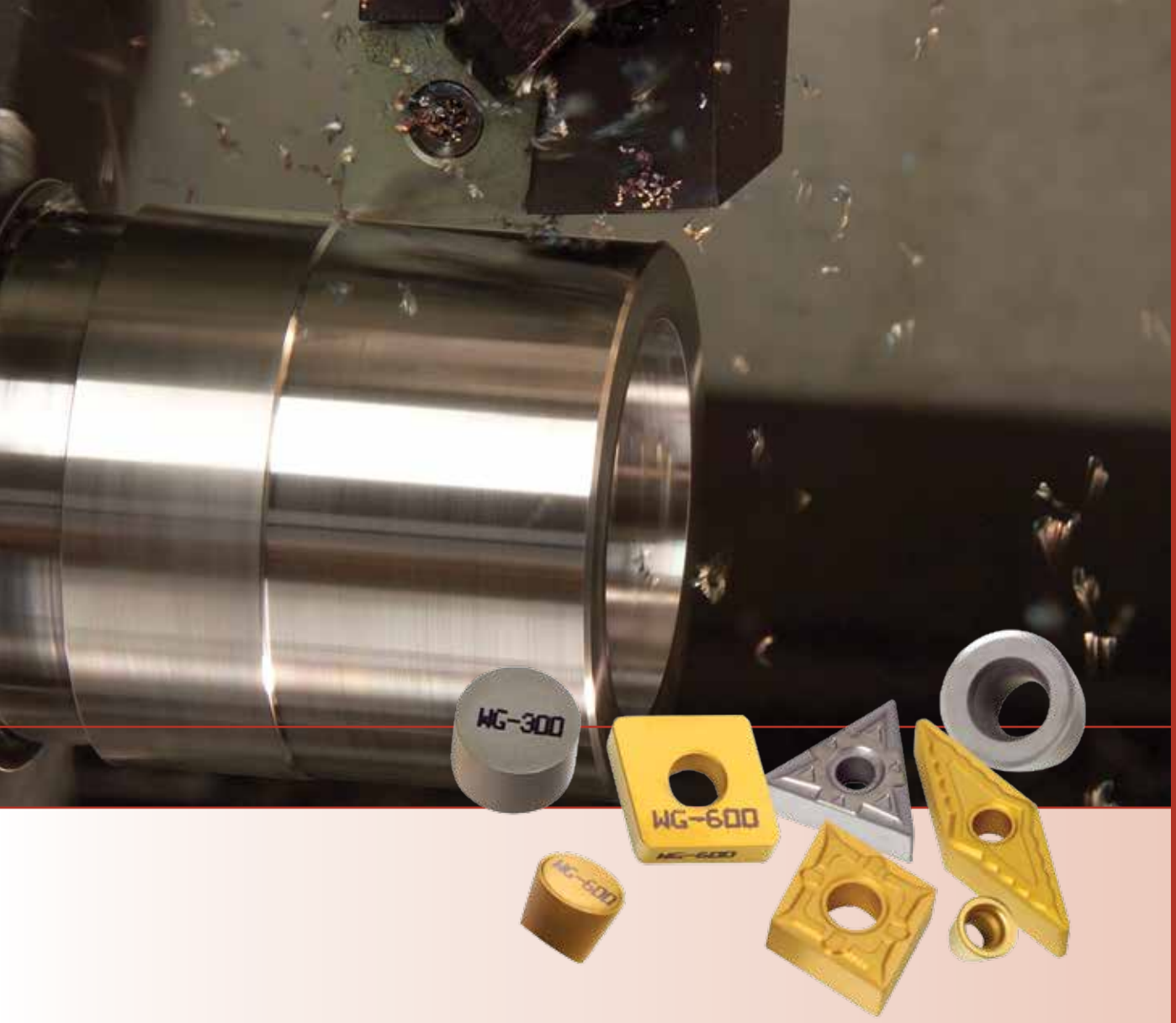

Carbide Inserts ..... *T 02-40*
Ceramic Inserts ..... *T 41-70*
Industry-Standard Toolholders ..... *T 71-97*
Ceramic Toolholders ..... *T 99-121*
Industry-Standard Boring Bars for Carbide Inserts ..... *T 123-137*
Ceramic-Insert Boring Bars ..... *T 139-151*
Additional Greenleaf Turning Inserts ..... *T 152*

Greenleaf®

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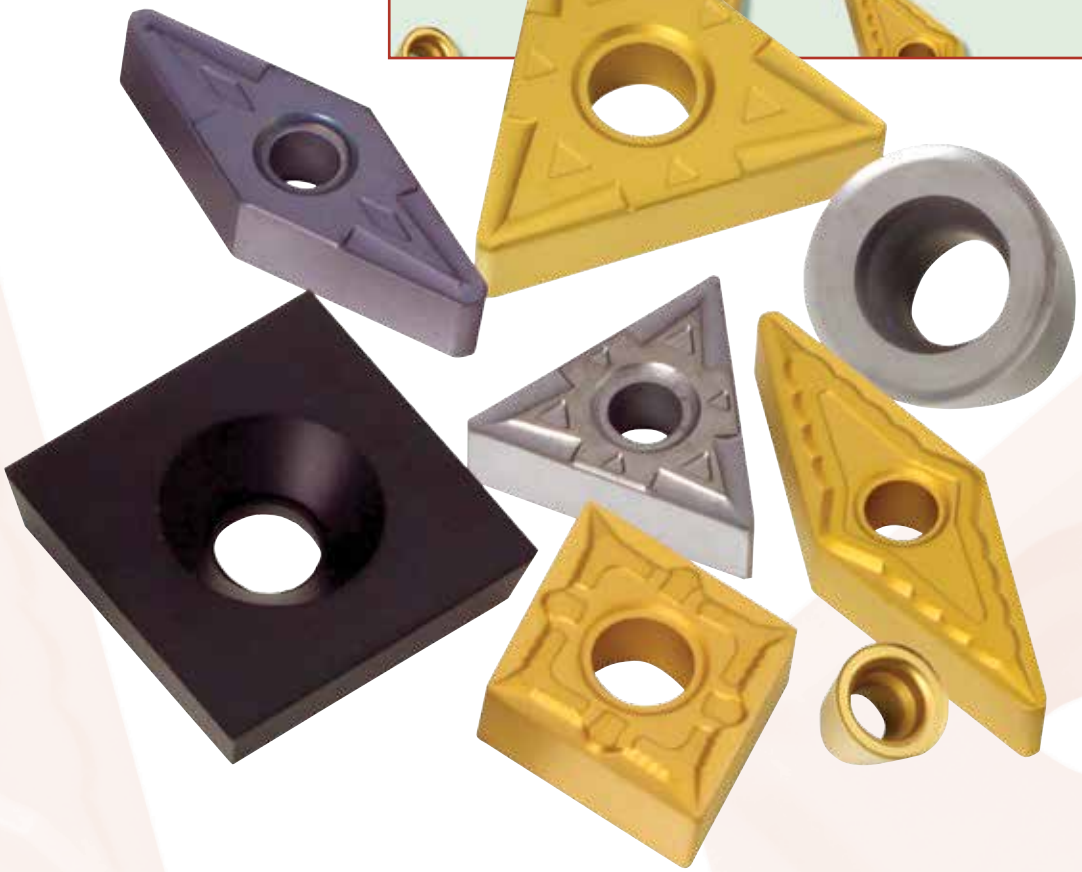
Advanced Carbide Inserts

Greenleaf offers a comprehensive line of carbide inserts in grades ranging from sub-micron C-1 through C-8 classifications. An industry pioneer in coated carbide, Greenleaf offers a variety of uncoated, MT-CVD coated and PVD-coated grades. Carbide inserts are available in ANSI standard geometries with multi-purpose chipbreakers for heavy roughing through finishing.



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Carbide Insert Grade Description

CARBIDE

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COATED – MT-CVD

GA5023 A high-speed performance grade for turning and milling cast iron. GA5023 features an advanced MT-CVD coating specifically developed for abrasive wear resistance. Application ranges from roughing to finishing on most cast iron materials including gray iron, ductile, nodular and other alloyed irons. The high wear and shock resistance of GA5023 allows machining at high speeds and a variety of feeds.

GA5025 A high-speed MT-CVD coated grade for turning, light roughing and finishing of carbon and alloy steels, as well as selected stainless steels.

GA5026 A high-speed grade developed for turning nickel- and cobalt-based super-alloys, stainless steels, and refractory metals. The advanced MT-CVD coating over a micro-grain substrate offers high wear resistance. GA5026 has exceptional resistance to the notching and deformation common to machining high strength materials. Apply at high speeds and light feeds in turning and selected milling applications.

GA5035 A high-performance MT-CVD coated grade for turning all types of steels, and selected stainless steels. GA5035 can be used in rough, semi-finish, and finish turning situations requiring resistance to heat deformation, thermal shock, and abrasion. GA5035 should be applied at high speeds and a range of feeds.

GA5036 A high-performance MT-CVD coated grade for milling steels at high speed. GA5036 should be used when milling forged and cast steels and selected ductile irons. GA5036 has a unique combination of toughness and heat resistance making it suitable for heavy- and light-duty milling at high cutting speeds.

GA5125 New high-performance MT-CVD coated carbide milling grade especially suited for manganese steel. GA5125 is also applicable on chrome-moly steel, tool steel and similar high alloy steels. GA5125 provides excellent resistance to abrasion, crater wear, thermal shock, deformation and edge build-up. GA5125 should be applied at high speeds with moderate feed rates.

COATED – PVD

G-915 Multi-layer PVD-coated grade, excellent for cut off, milling and turning high-temp alloys, stainless steel, and low carbon steels. The multi-layer PVD coating adds heat and abrasion resistance to the tough, shock-resistant substrate. G-915 should be run at moderate speeds and moderate to high feeds in milling and interrupted turning applications.

G-920 PVD-coated grade for turning and milling high-strength materials such as high-temp alloys, titanium and stainless steel. G-920 is also an excellent grade for aluminum and refractory metals. This grade has the resistance to deformation and notching required for higher speeds than G-910.

G-9230 PVD-coated grade developed for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons. G-9230 has superior wear resistance and toughness and is excellent for cast and forged scale machining conditions.

G-925 Multi-layer PVD-coated grade specifically designed for machining abrasive and difficult-to-machine materials. Typical applications include high-temp alloys, titanium and other refractory metals, stainless steel, and many cast irons. G-925 exhibits excellent resistance to notching and deformation. Apply at moderate to high speeds and moderate feeds.

UNCOATED

G-02 An excellent general-purpose grade for all types of machining of cast irons. G-02 should be used at moderate speeds and feeds. Also good for light roughing and finishing of high-temperature alloys, stainless steels, and aluminums.

G-60 Used for heavy, rough turning of steel, steel castings, and steel forgings. G-60 should be used at moderate speeds and feeds.

G-20M A sub-micron C-2 carbide grade suited for use in turning and milling titanium and nickel-based super-alloys. G-20M has the strength and edge wear characteristics to resist notching when turning high-strength materials.

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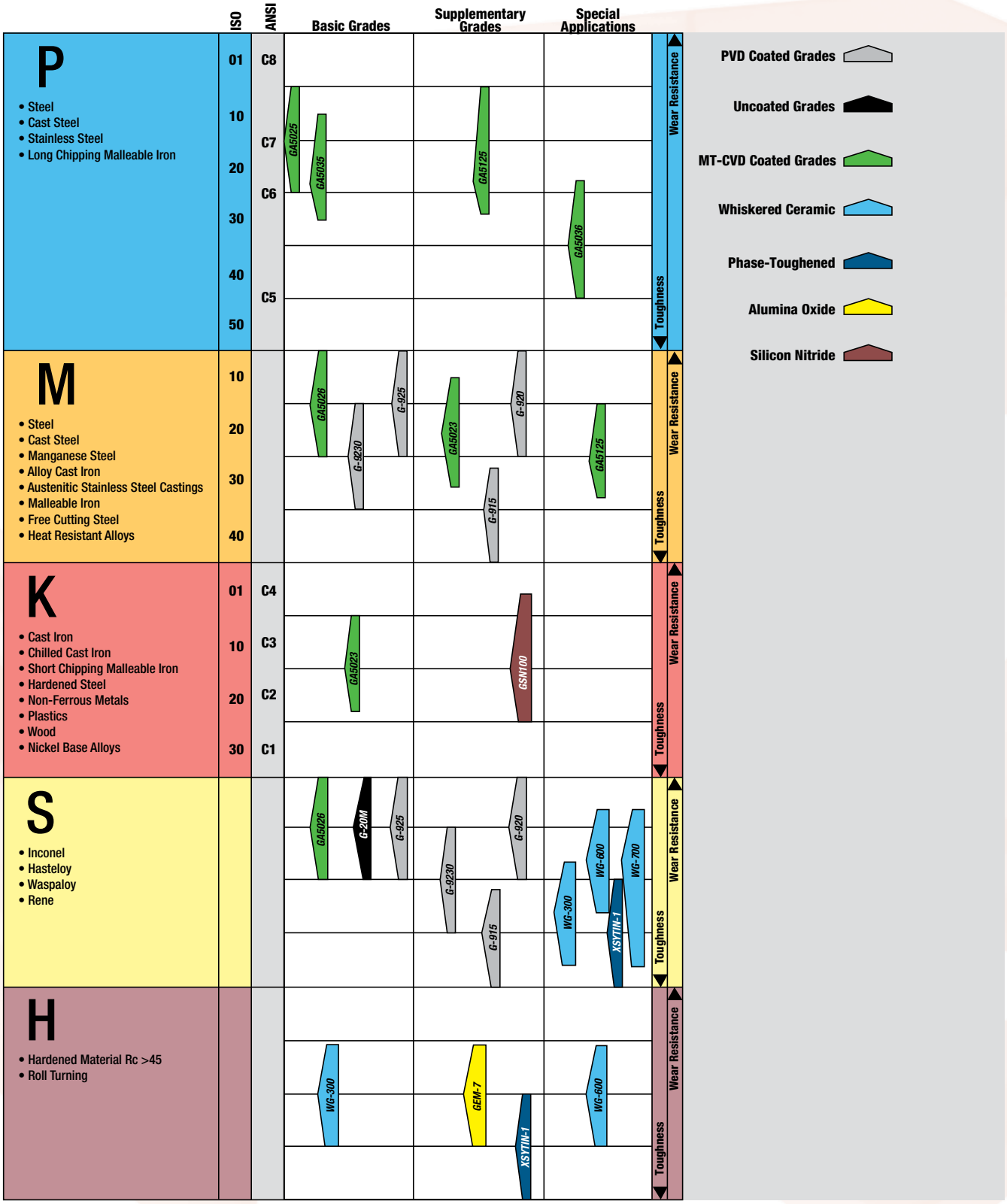
Insert Grade Reference for Turning



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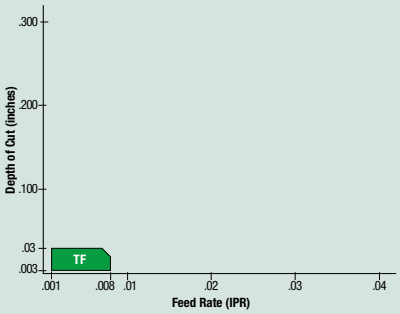
Chipform Application Range

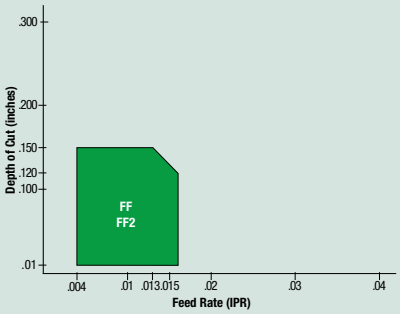
PRECISION FINISHING



TF

Precision ground chipbreaker for nickel alloys. Good for feeds up to 0.009"/rev and depths to 0.03".

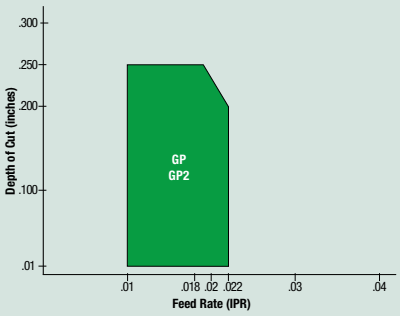
FINISHING



FF and FF2

For finishing all types of material. Designed for feeds up to 0.0185"/rev and 0.15" depth of cut.

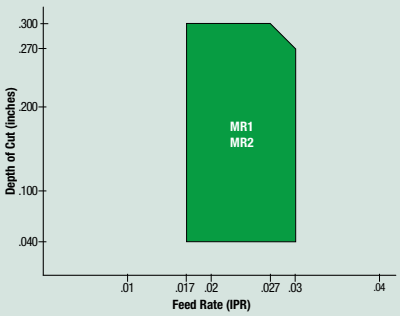
GENERAL PURPOSE



GP and GP2

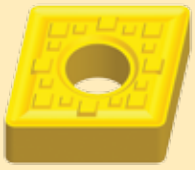
General purpose chipbreaker. Feed rates up to 0.02"/rev and 0.25" depth of cut.

MEDIUM ROUGHING



MR and MR2

Used for medium roughing of all material. Feeds up to 0.028"/rev and depths up to 0.30".



HEAVY ROUGHING

HR

Heavy roughing for all materials. Feeds above 0.023"/rev. One-sided chipbreaker for heaviest feeds (MM).

Example: CNMM 644 HR

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Greenleaf®

A.N.S.I. Identification for Turning and Boring Inserts

Tolerance Class [1]

	Roll Dim. B	I.C. A	Thickness T
A	0.0002 [2]	0.001	0.001
B	0.0002	0.001	0.005
C	0.0005	0.001	0.001
D	0.0005	0.001	0.005
E	0.001	0.001	0.001
F	0.0002 [2]	0.0005	0.001
G	0.001	0.001	0.005
H	0.0005	0.0005	0.001
J	0.0002 [2]	0.002-0.005	0.001
K	0.0005	0.002-0.005	0.001
L	0.001	0.002-0.005	0.001
M	0.002-0.010 [3]	0.002-0.004 [3]	0.005
U	0.005-0.012 [3]	0.005-0.010 [3]	0.005
N	0.002-0.010 [3]	0.002-0.004 [3]	0.001

Size (I.C.)

Regular polygons and diamonds
Number of 1/8ths of an inch in the inscribed circle as per table below:

Example:

5/32" I.C.	1.2
3/16" I.C.	1.5
7/32" I.C.	1.8
1/4" I.C.	2
5/16" I.C.	2.5
3/8" I.C.	3
1/2" I.C.	4
5/8" I.C.	5
3/4" I.C.	6
7/8" I.C.	7
1" I.C.	8
1-1/4" I.C.	10

Rectangles and parallelograms
Use two digits to size
1st digit: Number of 1/8ths of an inch in width
2nd digit: Number of 1/4ths of an inch in length

S P G A 6

Shape

- **V** 35° diamond
- **D** 55° diamond
- **K** 55° parallelogram
- **T** 60° triangle
- **E** 75° diamond
- **C** 80° diamond
- **W** 80° Trigon
- **B** 82° parallelogram
- **A** 85° parallelogram
- **M** 86° diamond
- **S** 90° square
- **L** 90° rectangle
- **P** 108° pentagon
- **H** 120° hexagon
- **O** 135° octagon
- **R** round

Clearances

- **N** 0°
- **A** 3°
- **B** 5°
- **C** 7°
- **P** 11°
- **D** 15°
- **E** 20°
- **F** 25°
- **G** 30°
- **H** 0°-11° [4]
- **J** 0°-14° [4]
- **K** 0°-17° [4]
- **L** 0°-20° [4]
- **M** 11°-14° [4]
- **R** 11°-17° [4]
- **S** 11°-20° [4]

Type

- **N** Without hole
- **R** Without hole with chip groove on one rake face
- **F** Without hole with chip grooves on two rake faces
- **A** With hole
- **B** With hole and one countersink (80°-90°)
- **C** With hole and two countersinks (80°-90°)
- **W** With hole and one countersink (40°-60°)
- **Q** With hole and two countersinks (40°-60°)
- **M** With hole and chip groove on one rake face
- **G** With hole and chip grooves on two rake faces
- **H** With hole, one countersink (80°-90°) and chip groove on one rake face
- **J** With hole, two countersinks (80°-90°) and chip grooves on two rake faces
- **T** With hole, one countersink (40°-60°) and chip groove on one rake face
- **U** With hole, two countersinks (40°-60°) and chip grooves on two rake faces

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Thickness

Regular polygons, diamonds, rectangles and parallelograms: *Number of 1/16ths of an inch in thickness as per table below:*

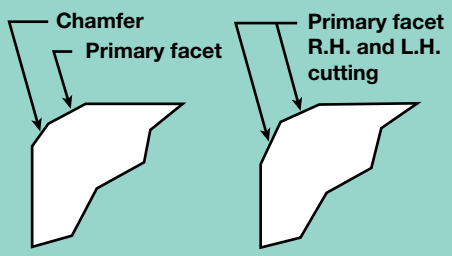
Example:

3/32"	1.5
1/8"	2
5/32"	2.5
3/16"	3
7/32"	3.5
1/4"	4
5/16"	5
3/8"	6
7/16"	7
1/2"	8

Special Cutting Point Definition (5)

Only used following a letter in the seventh position.

Number of 1/64ths of an inch in the primary facet length.



Hand (5)

R *Right*
L *Left*

3 **3** [ ] [ ] **A**

Cutting Point Configuration

0 *Sharp Corner*
1 *1/64" radius*
2 *1/32" radius*
3 *3/64" radius*
4 *1/16" radius*
5 *5/64" radius*
6 *3/32" radius*
7 *7/64" radius*
8 *1/8" radius*

A *Square insert with 45° chamfer*
D *Square insert with 30° chamfer*
E *Square insert with 15° chamfer*
F *Square insert with 3° chamfer*
K *Square insert with 30° double chamfer*
L *Square insert with 15° double chamfer*
M *Square insert with 3° double chamfer*
N *Truncated triangular insert*
P *Flatted corner triangle – 90°*

Other Conditions (5)

A *Honed (0.0005 to 0.001")*
B *Honed (0.001 to 0.002")*
C *Honed (0.005 to less than 0.007")*
D *Honed (0.007" and over)*
J *Polished to 4 microinch AA (rake face only)*
T *Chamfered – manufacturer's standard (negative land – rake face only)*

(1) Tolerances given are plus and minus from nominal.

(2) These tolerances normally apply to indexable inserts with facets (secondary cutting edges).

(3) The tolerance depends on the size and shape of the insert and should be shown in the standards for the corresponding shapes and sizes (see ANSI B94.25).

(4) Secondary facet angle may vary by +1°.

(5) Shall only be used when required.

(6) Dimensions are established prior to supplemental edge or coating modification.

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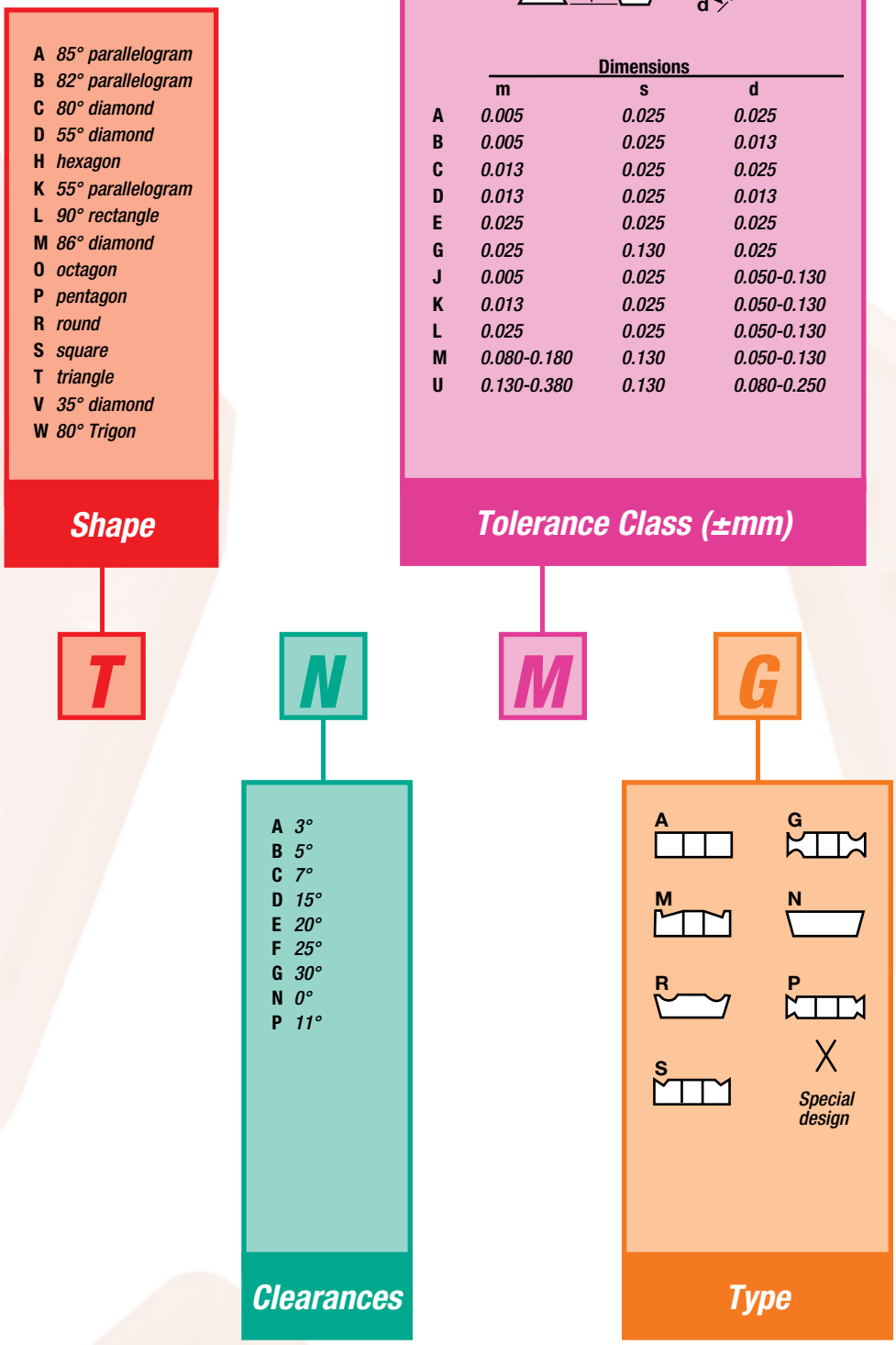
I.S.O. Identification for Turning and Boring Inserts



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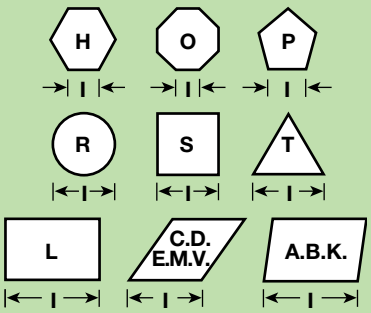
Comparison cutting edge length in mm – IC in inches

△	06	09	11	16	22	27	33	44
□ ○				09	12	15	19	25
55°					15	19		
80°					12	16	19	25
35°				16	22			
IC = d 1"	5/32"	7/32"	1/4"	3/8"	1/2"	5/8"	3/4"	



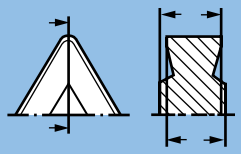
Integers to be preceded by a 0.
Example: 9,52 mm indicated by 09.

Cutting Edge Length

Unhoned	F
Honed	E
Chamfered	T
Chamfered and Honed	S

Cutting Edge

22 **04** **08** **E**



01	s= 1,59
T1	s= 1,98
02	s= 2,38
03	s= 3,18
T3	s= 3,97
04	s= 4,76
05	s= 5,56
06	s= 6,35
07	s= 7,94
09	s= 9,52
10	s= 10,00
12	s= 12,00

Thickness

Radius in terms of 0.1 mm	
00	Round insert sharp point
02	0.2
04	0.4
05	0.5
08	0.8
10	1.0
12	1.2
15	1.5
16	1.6
24	2.4
32	3.2
40	4.0

Cutting Point Configuration

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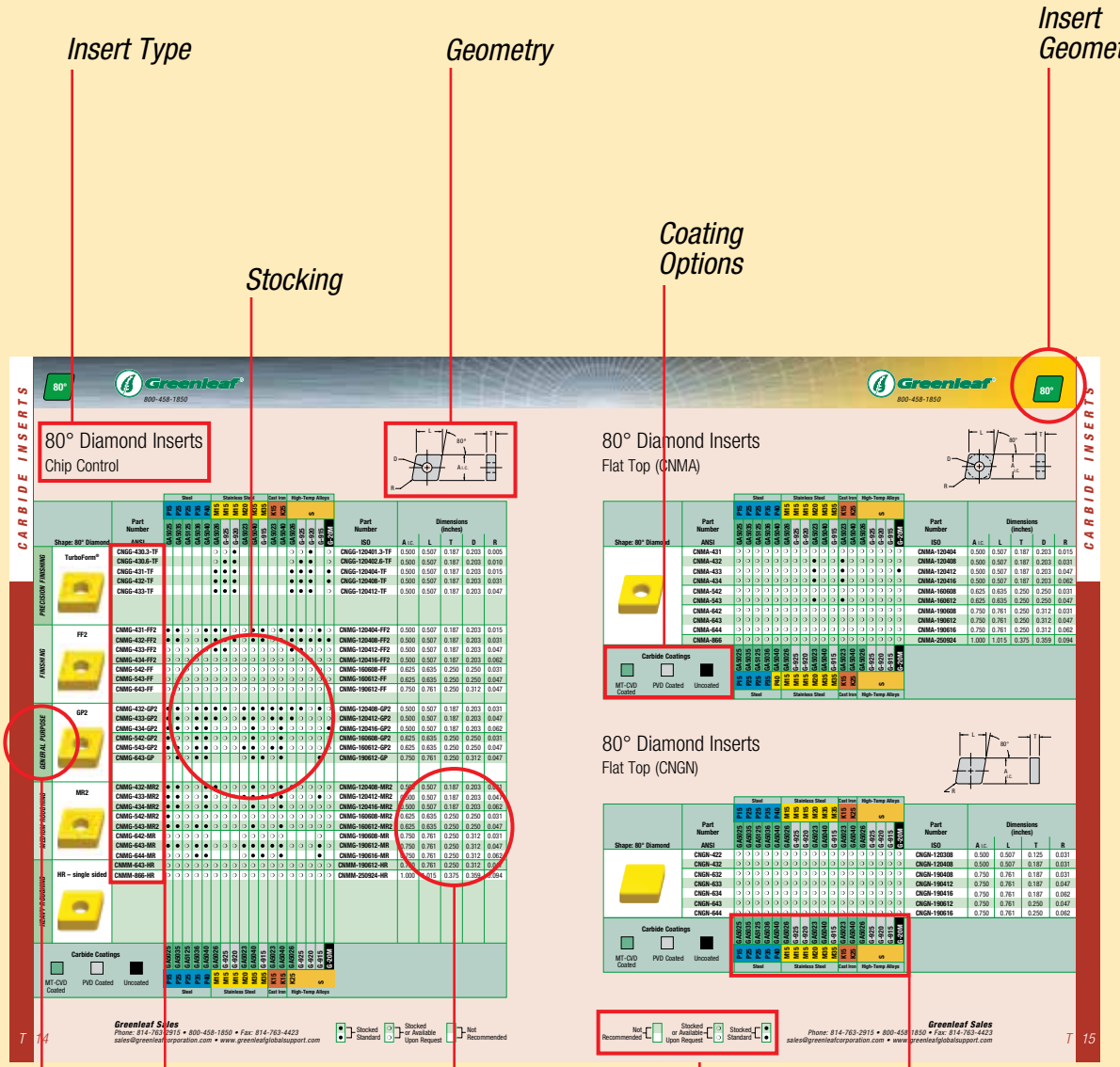
Carbide Insert Usage Reference Guide



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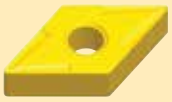
Negative Inserts

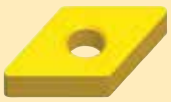
80° Diamond
Chip Control
page: T 14

80° Diamond
Flat Top
page: T 15

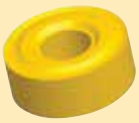
80° Diamond
Flat Top
page: T 15



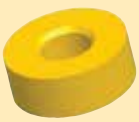
55° Diamond
Chip Control
page: T 16



55° Diamond
Flat Top
page: T 17



Round
Chip Control
page: T 18



Round
Flat Top
page: T 19

Round
Flat Top
page: T 19

Negative Inserts *continued*

Square
Chip Control
page: T 20

Square
Flat Top
page: T 21

Square
Flat Top
page: T 22-23

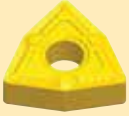
Triangle
Chip Control
page: T 24-25

Triangle
Flat Top
page: T 26

Triangle
Flat Top
page: T 27-28

35° Diamond
Chip Control
page: T 29

35° Diamond
Flat Top
page: T 30



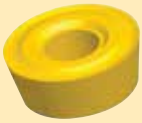
80° Trigon
Chip Control
page: T 31

80° Trigon
Flat Top
page: T 32

Positive Inserts

80° Diamond
Positive Flat Top
page: T 33

Round
Positive Flat Top
page: T 33



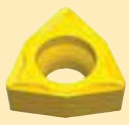
Round
Positive Chip Control
page: T 34

Round
Positive Chip Control
page: T 34

Square
Positive Flat Top
page: T 35

Triangle
Positive Flat Top
page: T 36-37

Triangle
Positive Flat Top
page: T 38



80° Trigon
Chip Control: Screw On
page: T 39

Radius Forming Insert

SNMA-IR
Insert and Toolholder
page: T 40

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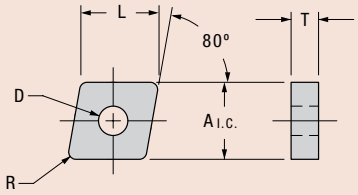
80° Diamond Inserts

Chip Control



	Shape: 80° Diamond	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)				
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	D	R
PRECISION FINISHING	TurboForm®	CNGG-430.3-TF					❍	❍	●	❍					❍	❍	❍		❍	CNGG-120401.3-TF	0.500	0.507	0.187	0.203	0.005
		CNGG-430.6-TF					❍	●	●	❍					❍	●	❍		❍	CNGG-120402.6-TF	0.500	0.507	0.187	0.203	0.010
		CNGG-431-TF					●	●	●	●					●	●	●		●	CNGG-120404-TF	0.500	0.507	0.187	0.203	0.015
		CNGG-432-TF					●	●	●	●					●	●	●		●	CNGG-120408-TF	0.500	0.507	0.187	0.203	0.031
		CNGG-433-TF					●	●	●	●					●	●	●		❍	CNGG-120412-TF	0.500	0.507	0.187	0.203	0.047
FINISHING	FF2	CNMG-431-FF2	●	●	❍	❍	●	●	❍	●	❍	●	❍	●	●	❍	●	●	❍	CNMG-120404-FF2	0.500	0.507	0.187	0.203	0.015
		CNMG-432-FF2	●	●	❍	❍	●	●	❍	●	❍	●	❍	●	●	❍	●	●	●	CNMG-120408-FF2	0.500	0.507	0.187	0.203	0.031
		CNMG-433-FF2					●	●	❍	●					●	❍	●		❍	CNMG-120412-FF2	0.500	0.507	0.187	0.203	0.047
		CNMG-434-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMG-120416-FF2	0.500	0.507	0.187	0.203	0.062
		CNMG-542-FF	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMG-160608-FF	0.625	0.635	0.250	0.250	0.031
		CNMG-543-FF	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMG-160612-FF	0.625	0.635	0.250	0.250	0.047
		CNMG-643-FF	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMG-190612-FF	0.750	0.761	0.250	0.312	0.047
GENERAL PURPOSE	GP2	CNMG-432-GP2	●	●	❍	●	●	●	❍	●	●	●	●	●	●	❍	●	●	❍	CNMG-120408-GP2	0.500	0.507	0.187	0.203	0.031
		CNMG-433-GP2	●	●	❍	●	●	❍	❍	●	●	❍	●	●	●	❍	●	❍	❍	CNMG-120412-GP2	0.500	0.507	0.187	0.203	0.047
		CNMG-434-GP2	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	●	CNMG-120416-GP2	0.500	0.507	0.187	0.203	0.062
		CNMG-542-GP2	●	❍	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMG-160608-GP2	0.625	0.635	0.250	0.250	0.031
		CNMG-543-GP2	●	●	❍	●	❍	❍	❍	❍	●	❍	●	❍	❍	❍	❍	❍	❍	CNMG-160612-GP2	0.625	0.635	0.250	0.250	0.047
		CNMG-643-GP	❍	●	❍	❍				❍	❍	●	❍				❍	●		CNMG-190612-GP	0.750	0.761	0.250	0.312	0.047
MEDIUM ROUGHING	MR2	CNMG-432-MR2	●	●	❍	❍	●	❍	❍	●	❍	❍	❍	●	❍	❍	●	❍	❍	CNMG-120408-MR2	0.500	0.507	0.187	0.203	0.031
		CNMG-433-MR2	●	●	❍	❍	❍	❍	❍	❍	❍	●	●	❍	❍	❍	❍	●	❍	CNMG-120412-MR2	0.500	0.507	0.187	0.203	0.047
		CNMG-434-MR2	●	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMG-120416-MR2	0.500	0.507	0.187	0.203	0.062
		CNMG-542-MR2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMG-160608-MR2	0.625	0.635	0.250	0.250	0.031
		CNMG-543-MR2	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMG-160612-MR2	0.625	0.635	0.250	0.250	0.047
		CNMG-642-MR	❍	❍	❍	❍				❍	❍	❍	❍				❍	●		CNMG-190608-MR	0.750	0.761	0.250	0.312	0.031
		CNMG-643-MR	●	●	❍	●	❍	❍	❍	❍	●	●	●	❍	❍	❍	❍	❍	❍	CNMG-190612-MR	0.750	0.761	0.250	0.312	0.047
		CNMG-644-MR	❍	❍	❍	●				❍	❍	●	❍				❍	●		CNMG-190616-MR	0.750	0.761	0.250	0.312	0.062
HEAVY ROUGHING	HR – single sided	CNMM-643-HR	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMM-190612-HR	0.750	0.761	0.250	0.312	0.047
		CNMM-866-HR	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	CNMM-250924-HR	1.000	1.015	0.375	0.359	0.094

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S					
			Steel				Stainless Steel						Cast Iron	High-Temp Alloys					

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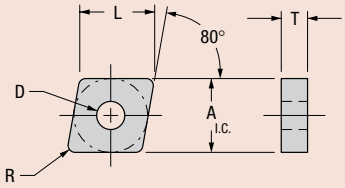
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

80° Diamond Inserts

Flat Top (CNMA)



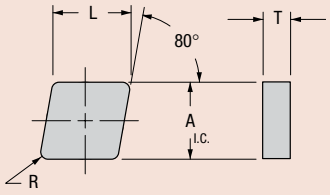
Shape: 80° Diamond	Part Number ANSI	Steel P15	Steel P25	Steel P25	Steel P35	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M20	Stainless Steel M35	Cast Iron K15	High-Temp Alloys S						Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M						
	CNMA-431	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNMA-120404	0.500	0.507	0.187	0.203	0.015
	CNMA-432	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○	CNMA-120408	0.500	0.507	0.187	0.203	0.031
	CNMA-433	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	●	CNMA-120412	0.500	0.507	0.187	0.203	0.047
	CNMA-434	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○	CNMA-120416	0.500	0.507	0.187	0.203	0.062
	CNMA-542	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNMA-160608	0.625	0.635	0.250	0.250	0.031
	CNMA-543	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○	CNMA-160612	0.625	0.635	0.250	0.250	0.047
	CNMA-642	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNMA-190608	0.750	0.761	0.250	0.312	0.031
	CNMA-643	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNMA-190612	0.750	0.761	0.250	0.312	0.047
	CNMA-644	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNMA-190616	0.750	0.761	0.250	0.312	0.062
	CNMA-866	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNMA-250924	1.000	1.015	0.375	0.359	0.094

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

80° Diamond Inserts

Flat Top (CNGN)



Shape: 80° Diamond	Part Number ANSI	Steel P15	Steel P25	Steel P25	Steel P35	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M20	Stainless Steel M35	Cast Iron K15	High-Temp Alloys S						Part Number ISO	Dimensions (inches) A I.C.	L	T	R
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M					
	CNGN-422	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNGN-120308	0.500	0.507	0.125	0.031
	CNGN-432	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNGN-120408	0.500	0.507	0.187	0.031
	CNGN-632	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNGN-190408	0.750	0.761	0.187	0.031
	CNGN-633	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNGN-190412	0.750	0.761	0.187	0.047
	CNGN-634	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNGN-190416	0.750	0.761	0.187	0.062
	CNGN-643	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNGN-190612	0.750	0.761	0.250	0.047
	CNGN-644	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CNGN-190616	0.750	0.761	0.250	0.062

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Not Recommended | Stocked or Available Upon Request | Stocked Standard

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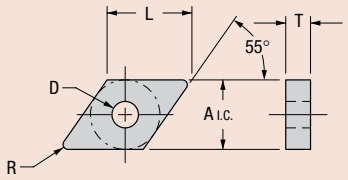
55° Diamond Inserts

Chip Control



	Shape: 55° Diamond	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)				
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	D	R
PRECISION FINISHING	TurboForm®	DNGG-430.3-TF					❍	❍	❍	❍				❍	❍	❍	❍		●	DNGG-150401.3-TF	0.500	0.610	0.187	0.203	0.005
		DNGG-430.6-TF					❍	❍	❍	❍				❍	❍	❍	❍		●	DNGG-150402.6-TF	0.500	0.610	0.187	0.203	0.010
		DNGG-431-TF					●	●	●	❍				●	●	●	❍		❍	DNGG-150404-TF	0.500	0.610	0.187	0.203	0.015
		DNGG-432-TF					●	●	●	❍				●	●	●	❍		❍	DNGG-150408-TF	0.500	0.610	0.187	0.203	0.031
		DNGG-433-TF					●	●	●	❍				●	●	●	❍		❍	DNGG-150412-TF	0.500	0.610	0.187	0.203	0.047
		DNGG-542-TF					❍	❍	❍	❍				❍	❍	❍	❍		❍	DNGG-190608-TF	0.625	0.763	0.250	0.250	0.031
		DNGG-543-TF					❍	❍	❍	❍				❍	❍	❍	❍		❍	DNGG-190612-TF	0.625	0.763	0.250	0.250	0.047
FINISHING	FF2	DNMG-431-FF2	●	●	❍	❍	●	●	❍	●	●	❍	●	●	●	❍	●	❍	❍	DNMG-150404-FF2	0.500	0.610	0.187	0.203	0.015
		DNMG-432-FF2	●	●	❍	❍	●	●	❍	●	❍	●	❍	●	●	❍	●	●	❍	DNMG-150408-FF2	0.500	0.610	0.187	0.203	0.031
		DNMG-433-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-150412-FF2	0.500	0.610	0.187	0.203	0.047
		DNMG-441-FF2	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	DNMG-150604-FF2	0.500	0.610	0.250	0.203	0.015
		DNMG-442-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-150608-FF2	0.500	0.610	0.250	0.203	0.031
		DNMG-443-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-150612-FF2	0.500	0.610	0.250	0.203	0.047
		DNMG-542-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-190608-FF2	0.625	0.763	0.250	0.250	0.031
		DNMG-543-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-190612-FF2	0.625	0.763	0.250	0.250	0.047
GENERAL PURPOSE	GP2	DNMG-432-GP2	●	●	❍	❍	●	●	❍	❍	●	❍	●	●	●	❍	❍	❍	❍	DNMG-150408-GP2	0.500	0.610	0.187	0.203	0.031
		DNMG-433-GP2	❍	❍	❍	❍	●	❍	❍	❍	●	❍	●	●	❍	❍	❍	❍	❍	DNMG-150412-GP2	0.500	0.610	0.187	0.203	0.047
		DNMG-442-GP2	❍	❍	❍	❍	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	●	❍	DNMG-150608-GP2	0.500	0.610	0.250	0.203	0.031
		DNMG-443-GP2	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	DNMG-150612-GP2	0.500	0.610	0.250	0.203	0.047
		DNMG-542-GP2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-190608-GP2	0.625	0.763	0.250	0.250	0.031
		DNMG-543-GP2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-190612-GP2	0.625	0.763	0.250	0.250	0.047
MEDIUM ROUGHING	MR2	DNMG-432-MR	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-150408-MR	0.500	0.610	0.187	0.203	0.031
		DNMG-442-MR	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-150608-MR	0.500	0.610	0.250	0.203	0.031
		DNMG-542-MR	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-190608-MR2	0.625	0.763	0.250	0.250	0.031
		DNMG-543-MR2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	DNMG-190612-MR2	0.625	0.763	0.250	0.250	0.047

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

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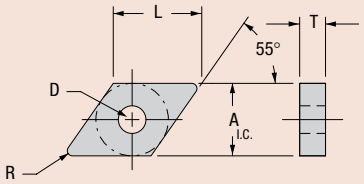
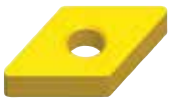
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

55° Diamond Inserts

Flat Top



Shape: 55° Diamond	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)				
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	D	R
	DNMA-431	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	DNMA-150404	0.500	0.610	0.187	0.203	0.015
	DNMA-432	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○	DNMA-150408	0.500	0.610	0.187	0.203	0.031
	DNMA-433	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○	DNMA-150412	0.500	0.610	0.187	0.203	0.047
	DNMA-434	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	DNMA-150416	0.500	0.610	0.187	0.203	0.062
	DNMA-533	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	DNMA-190412	0.625	0.763	0.187	0.250	0.047
	DNMA-542	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	DNMA-190608	0.625	0.763	0.250	0.250	0.031
	DNMA-543	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	DNMA-190612	0.625	0.763	0.250	0.250	0.047
	DNMA-544	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	DNMA-190616	0.625	0.763	0.250	0.250	0.062

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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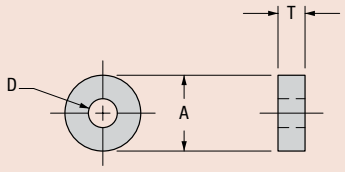
Round Inserts

Chip Control



	Shape: Round	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches) A I.C.	T	D
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S									
			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M				
PRECISION FINISHING	TurboForm®	RNGG-43-TF			❍		●	❍	❍	❍				●	❍	❍	❍		●	RNGG-120400-TF	0.500	0.187	0.203
GENERAL PURPOSE	GP	RNMG-32-GP	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	RNMG-090300-GP	0.375	0.125	0.150
		RNMG-33-GP	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	RNMG-090400-GP	0.375	0.187	0.150
		RNMG-43-GP	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	RNMG-120400-GP	0.500	0.187	0.203
MEDIUM ROUGHING	MR	RNMG-64-MR	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	RNMG-190600-MR	0.750	0.250	0.312
		RNMG-86-MR	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	RNMM-250600-MR	1.000	0.375	0.359
HEAVY ROUGHING	MR – single sided	RNMM-84 MR	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	RNMM-250600-MR	1.000	0.250	0.359
			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M				
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S									
			Steel				Stainless Steel						Cast Iron	High-Temp Alloys									

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

● Stocked Standard
❍ Stocked or Available Upon Request
Not Recommended

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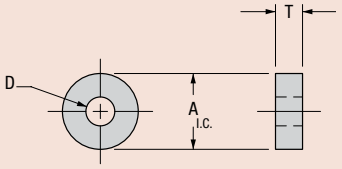
Round Inserts
Flat Top (RNMA)

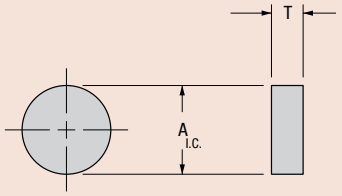


Shape: Round	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	T	D
	RNMA-32	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNMA-090300	0.375	0.125	0.150
	RNMA-33	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNMA-090400	0.375	0.187	0.150
	RNMA-43	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNMA-120400	0.500	0.187	0.203
	RNMA-54	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNMA-150600	0.625	0.250	0.250
	RNMA-64	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNMA-190600	0.750	0.250	0.312
	RNMA-86	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNMA-250900	1.000	0.375	0.359
	RNMA-106	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNMA-310900	1.250	0.375	0.500

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Round Inserts
Flat Top (RNGN)



Shape: Round	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	T
	RNGN-32	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	●	○	RNGN-090300	0.375	0.125
	RNGN-42	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	●	○	RNGN-120300	0.500	0.125
	RNGN-43	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	●	○	RNGN-120400	0.500	0.187
	RNGN-45	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	●	●	RNGN-120700	0.500	0.312
	RNGN-53	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNGN-150400	0.625	0.187
	RNGN-63	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNGN-190400	0.750	0.187
	RNGN-84	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RNGN-250600	1.000	0.250

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Not Recommended | Stocked or Available Upon Request | Stocked Standard

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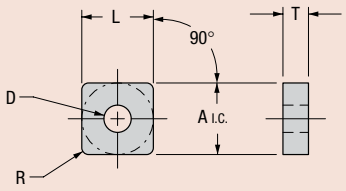
Square Inserts

Chip Control



	Shape: Square	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
FINISHING	FF2	SNMG-322-FF2	●	❍	❍	❍				❍	❍	❍	❍				❍	❍		SNMG-090308-FF2	0.375	0.375	0.125	0.150	0.031
		SNMG-432-FF2	●	❍	❍	❍	●	❍	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	SNMG-120408-FF2	0.500	0.500	0.187	0.203	0.031
		SNMG-433-FF	❍	❍	❍	❍				❍	❍	❍	❍				❍	❍		SNMG-120412-FF	0.500	0.500	0.187	0.203	0.047
		SNMG-543-FF	❍	❍	❍	❍				❍	❍	❍	❍				❍	❍		SNMG-150612-FF	0.625	0.625	0.250	0.250	0.047
GENERAL PURPOSE	GP2	SNMG-322-GP	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-090308-GP	0.375	0.375	0.125	0.150	0.031
		SNMG-432-GP2	●	❍	❍	❍	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	●	❍	SNMG-120408-GP2	0.500	0.500	0.187	0.203	0.031
		SNMG-433-GP2	●	●	❍	❍	●	●	❍	❍	❍	●	❍	●	●	❍	❍	●	❍	SNMG-120412-GP2	0.500	0.500	0.187	0.203	0.047
		SNMG-434-GP	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-120416-GP	0.500	0.500	0.187	0.203	0.062
		SNMG-543-GP2	●	●	❍	●	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-150612-GP2	0.625	0.625	0.250	0.250	0.047
		SNMG-643-GP2	❍	●	❍	●	●	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	●	❍	SNMG-190612-GP2	0.750	0.750	0.250	0.312	0.047
		SNMG-644-GP2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-190616-GP2	0.750	0.750	0.250	0.312	0.062
MEDIUM ROUGHING	MR2	SNMG-432-MR2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-120408-MR2	0.500	0.500	0.187	0.203	0.031
		SNMG-442-MR	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-120608-MR	0.500	0.500	0.250	0.203	0.031
		SNMG-543-MR2	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-150612-MR2	0.625	0.625	0.250	0.250	0.047
		SNMG-643-MR	❍	●	❍	●	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	●	❍	SNMG-190612-MR	0.750	0.750	0.250	0.312	0.047
		SNMG-644-MR	❍	❍	❍	●	❍	❍	❍	●	❍	❍	❍	❍	❍	❍	●	❍	●	SNMG-190616-MR	0.750	0.750	0.250	0.312	0.062
		SNMG-866-MR	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-250924-MR	1.000	1.000	0.375	0.359	0.094
HEAVY ROUGHING	HR – single sided	SNMM-643-HR	❍	❍	❍	❍				❍	❍	❍	❍				❍	❍		SNMM-190612-HR	0.750	0.750	0.250	0.312	0.047
		SNMM-644-HR	❍	❍	❍	❍				❍	❍	❍	❍				❍	❍		SNMM-190616-HR	0.750	0.750	0.250	0.312	0.062
			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M						
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
			Steel				Stainless Steel						Cast Iron	High-Temp Alloys											

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

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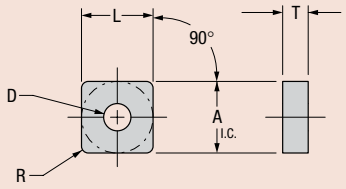
● ● Stocked Standard — ❍ ❍ Stocked or Available Upon Request — Not Recommended

Square Inserts

Flat Top (SNMA)



Shape: Square	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
	SNMA-321	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-090304	0.375	0.375	0.125	0.150	0.015
	SNMA-322	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-090308	0.375	0.375	0.125	0.150	0.031
	SNMA-323	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-090312	0.375	0.375	0.125	0.150	0.047
	SNMA-431	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-120404	0.500	0.500	0.187	0.203	0.015
	SNMA-432	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-120408	0.500	0.500	0.187	0.203	0.031
	SNMA-433	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-120412	0.500	0.500	0.187	0.203	0.047
	SNMA-434	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	○	SNMA-120416	0.500	0.500	0.187	0.203	0.062
	SNMA-542	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-150608	0.625	0.625	0.250	0.250	0.031
	SNMA-543	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-150612	0.625	0.625	0.250	0.250	0.047
	SNMA-544	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-150616	0.625	0.625	0.250	0.250	0.062
	SNMA-643	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-190612	0.750	0.750	0.250	0.312	0.047
	SNMA-644	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-190616	0.750	0.750	0.250	0.312	0.062
	SNMA-864	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-250916	1.000	1.000	0.375	0.359	0.062
	SNMA-866	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNMA-250924	1.000	1.000	0.375	0.359	0.094

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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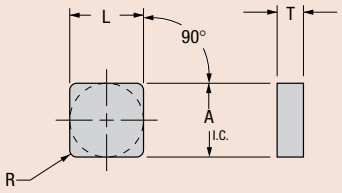
Square Inserts

Flat Top (SNGN)



Shape: Square	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches) A I.C.	L	T	R
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S										
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M					
	SNGN-321	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-090304	0.375	0.375	0.125	0.015
	SNGN-322	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-090308	0.375	0.375	0.125	0.031
	SNGN-422	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-120308	0.500	0.500	0.125	0.031
	SNGN-423	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-120312	0.500	0.500	0.125	0.047
	SNGN-430	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-120400	0.500	0.500	0.187	0.005
	SNGN-431	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-120404	0.500	0.500	0.187	0.015
	SNGN-432	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-120408	0.500	0.500	0.187	0.031
	SNGN-433	○	○	●	●	○	○	○	○	○	●	○	○	○	○	○	●	○	SNGN-120412	0.500	0.500	0.187	0.047
	SNGN-434	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	●	○	SNGN-120416	0.500	0.500	0.187	0.062
	SNGN-533	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-150412	0.625	0.625	0.187	0.047
	SNGN-534	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-150416	0.625	0.625	0.187	0.062
	SNGN-543	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-150612	0.625	0.625	0.250	0.047
	SNGN-631	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-190404	0.750	0.750	0.187	0.015
	SNGN-632	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-190408	0.750	0.750	0.187	0.031
	SNGN-633	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-190412	0.750	0.750	0.187	0.047
	SNGN-634	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-190416	0.750	0.750	0.187	0.062
	SNGN-638	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-190432	0.750	0.750	0.187	0.125
	SNGN-643	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-190612	0.750	0.750	0.250	0.047
	SNGN-644	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-190616	0.750	0.750	0.250	0.062
	SNGN-646	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-190624	0.750	0.750	0.250	0.094
	SNGN-844	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-250616	1.000	1.000	0.250	0.062
	SNGN-854	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-250716	1.000	1.000	0.312	0.062
	SNGN-10412	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-310648	1.250	1.250	0.250	0.187
	SNGN-1066	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-310924	1.250	1.250	0.375	0.094
	SNGN-1068	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-310932	1.250	1.250	0.375	0.125
	SNGN-1288	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNGN-381232	1.500	1.500	0.500	0.125

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

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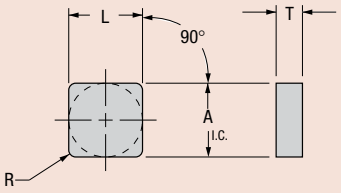
sales@greenleafcorporation.com • www.greenleafglobalsupport.com

● ● Stocked Standard | ○ ○ Stocked or Available Upon Request | Not Recommended

Square Inserts

Flat Top (SNUN)



Shape: Square	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)			
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S										
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	R
	SNUN-322	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-090308	0.375	0.375	0.125	0.031
	SNUN-323	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-090312	0.375	0.375	0.125	0.047
	SNUN-422	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-120308	0.500	0.500	0.125	0.031
	SNUN-423	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-120312	0.500	0.500	0.125	0.047
	SNUN-424	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-120316	0.500	0.500	0.125	0.062
	SNUN-432	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-120408	0.500	0.500	0.187	0.031
	SNUN-433	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-120412	0.500	0.500	0.187	0.047
	SNUN-434	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-120416	0.500	0.500	0.187	0.062
	SNUN-533	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-150412	0.625	0.625	0.187	0.047
	SNUN-632	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-190408	0.750	0.750	0.187	0.031
	SNUN-633	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-190412	0.750	0.750	0.187	0.047
	SNUN-634	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-190416	0.750	0.750	0.187	0.062
	SNUN-844	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-250616	1.000	1.000	0.250	0.062
	SNUN-848	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-250632	1.000	1.000	0.250	0.125
	SNUN-854	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-250716	1.000	1.000	0.312	0.062
	SNUN-1066	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-310924	1.250	1.250	0.375	0.094
	SNUN-1068	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-310932	1.250	1.250	0.375	0.125
	SNUN-1288	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SNUN-381232	1.500	1.500	0.500	0.125
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M					
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S										
		Steel				Stainless Steel						Cast Iron	High-Temp Alloys										

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

Not Recommended — Stocked or Available Upon Request (○) — Stocked Standard (●)

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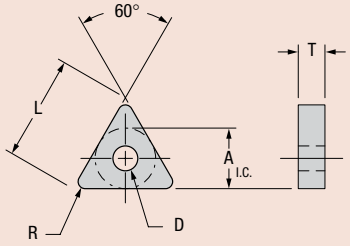
60°

Greenleaf®

Triangle Inserts

Chip Control



	Shape: Triangle	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)				
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	D	R
PRECISION FINISHING	TurboForm®	TNGG-330.3-TF					❍	❍	❍	❍				❍	❍	❍	❍		❍	TNGG-160401.3-TF	0.375	0.650	0.187	0.150	0.005
		TNGG-330.6-TF					❍	❍	❍	❍				❍	❍	❍	❍		❍	TNGG-160402.6-TF	0.375	0.650	0.187	0.150	0.010
		TNGG-331-TF					❍	❍	❍	❍				❍	❍	❍	❍		❍	TNGG-160404-TF	0.375	0.650	0.187	0.150	0.015
		TNGG-332-TF					●	❍	❍	❍				●	❍	❍	❍		❍	TNGG-160408-TF	0.375	0.650	0.187	0.150	0.031
		TNGG-430.3-TF					❍	❍	❍	❍				❍	❍	❍	❍		❍	TNGG-220401.3-TF	0.500	0.866	0.187	0.203	0.005
		TNGG-430.6-TF					❍	❍	❍	❍				❍	❍	❍	❍		❍	TNGG-220402.6-TF	0.500	0.866	0.187	0.203	0.010
		TNGG-431-TF					❍	❍	❍	❍				❍	❍	❍	❍		❍	TNGG-220404-TF	0.500	0.866	0.187	0.203	0.015
		TNGG-432-TF					●	●	❍	❍				●	●	❍	❍		❍	TNGG-220408-TF	0.500	0.866	0.187	0.203	0.031
FINISHING	FF2	TNMG-321-FF2					❍	❍	❍	❍				❍	❍	❍	❍		❍	TNMG-160304-FF2	0.375	0.650	0.125	0.150	0.015
		TNMG-322-FF2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160308-FF2	0.375	0.650	0.125	0.150	0.031
		TNMG-323-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160312-FF2	0.375	0.650	0.125	0.150	0.047
		TNMG-324-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160316-FF2	0.375	0.650	0.125	0.150	0.062
		TNMG-331-FF2					❍	❍	❍	❍				❍	❍	❍	❍		❍	TNMG-160404-FF2	0.375	0.650	0.187	0.150	0.015
		TNMG-332-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160408-FF2	0.375	0.650	0.187	0.150	0.031
		TNMG-334-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160416-FF2	0.375	0.650	0.187	0.150	0.062
		TNMG-431-FF2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG- 220404-FF2	0.500	0.866	0.187	0.203	0.015
		TNMG-432-FF2	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-220408-FF2	0.500	0.866	0.187	0.203	0.031
		TNMG-433-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-220412-FF2	0.500	0.866	0.187	0.203	0.047
		TNMG-434-FF2	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	TNMG-220416-FF2	0.500	0.866	0.187	0.203	0.062
		TNMG-542-FF2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-270608-FF2	0.625	1.083	0.250	0.250	0.031
		TNMG-543-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-270612-FF2	0.625	1.083	0.250	0.250	0.047
GENERAL PURPOSE	GP2	TNMG-321-GP2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160304-GP2	0.375	0.650	0.125	0.150	0.015
		TNMG-322-GP2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160308-GP2	0.375	0.650	0.125	0.150	0.031
		TNMG-323-GP2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160312-GP2	0.375	0.650	0.125	0.150	0.047
		TNMG-324-GP2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160316-GP2	0.375	0.650	0.125	0.150	0.062
		TNMG-333-GP2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-160412-GP2	0.375	0.650	0.187	0.150	0.047
		TNMG-432-GP2	●	●	❍	●	❍	❍	❍	❍	●	●	●	❍	❍	❍	❍	●	❍	TNMG-220408-GP2	0.500	0.866	0.187	0.203	0.031
		TNMG-433-GP2	●	❍	❍	❍	●	●	❍	❍	❍	●	❍	●	●	❍	❍	●	❍	TNMG-220412-GP2	0.500	0.866	0.187	0.203	0.047
		TNMG-434-GP2	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	TNMG-220416-GP2	0.500	0.866	0.187	0.203	0.062
		TNMG-542-GP2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMG-270608-GP2	0.625	1.083	0.250	0.250	0.031

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 | GA5026 G-925 G-920 G-9230 GA5023 G-915 | GA5023 | GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 | M15 M15 M15 M15 M20 M35 | K15 | S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

Continued on next page.

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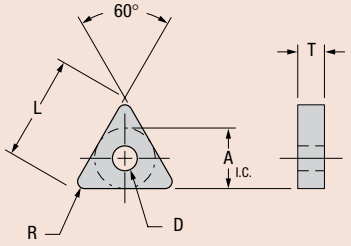
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

Triangle Inserts

Chip Control *Continued*



Shape: Triangle		Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
MEDIUM ROUGHING	MR2	TNMG-222-MR2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMG-110308-MR2	0.250	0.433	0.125	0.093	0.031
		TNMG-433-MR2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMG-220412-MR2	0.500	0.866	0.187	0.203	0.047
		TNMG-434-MR2	○	○	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	TNMG-220416-MR2	0.500	0.866	0.187	0.203	0.062
		TNMG-438-MR2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMG-220432-MR2	0.500	0.866	0.187	0.203	0.125
		TNMG-542-MR2	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMG-270608-MR2	0.625	1.083	0.250	0.250	0.031
		TNMG-543-MR2	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMG-270612-MR2	0.625	1.083	0.250	0.250	0.047
		TNMG-544-MR2	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMG-270616-MR2	0.625	1.083	0.250	0.250	0.062
		TNMG-546-MR2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMG-270624-MR2	0.625	1.083	0.250	0.250	0.094
		TNMG-666-MR	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMG-330924-MR	0.750	1.299	0.375	0.312	0.094
HEAVY ROUGHING	HR – single sided	TNMM-433-HR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMM-220412-HR	0.500	0.866	0.187	0.203	0.047
		TNMM-544-HR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNMM-270616-HR	0.625	1.083	0.250	0.250	0.062

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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60°

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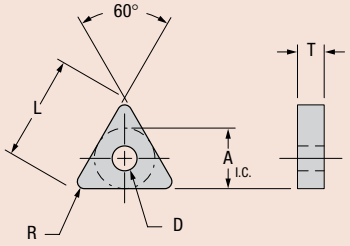
Triangle Inserts

Flat Top (TNMA)



Shape: Triangle	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)				
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	D	R
	TNMA-222	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-110308	0.250	0.433	0.125	0.093	0.031
	TNMA-321	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-160304	0.375	0.650	0.125	0.150	0.015
	TNMA-322	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-160308	0.375	0.650	0.125	0.150	0.031
	TNMA-323	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-160312	0.375	0.650	0.125	0.150	0.047
	TNMA-324	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-160316	0.375	0.650	0.125	0.150	0.062
	TNMA-332	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-160408	0.375	0.650	0.187	0.150	0.031
	TNMA-333	❍	❍	❍	❍	❍	❍	❍	❍	●	❍	●	❍	❍	❍	❍	❍	❍	TNMA-160412	0.375	0.650	0.187	0.150	0.047
	TNMA-431	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-220404	0.500	0.866	0.187	0.203	0.015
	TNMA-432	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-220408	0.500	0.866	0.187	0.203	0.031
	TNMA-433	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-220412	0.500	0.866	0.187	0.203	0.047
	TNMA-434	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-220416	0.500	0.866	0.187	0.203	0.062
	TNMA-542	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-270608	0.625	1.083	0.250	0.250	0.031
	TNMA-543	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-270612	0.625	1.083	0.250	0.250	0.047
	TNMA-544	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-270616	0.625	1.083	0.250	0.250	0.062
	TNMA-548	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-270632	0.625	1.083	0.250	0.250	0.125
	TNMA-556	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-270724	0.625	1.083	0.312	0.250	0.094
	TNMA-566	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-270924	0.625	1.083	0.375	0.250	0.094
	TNMA-642	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-330608	0.750	1.299	0.250	0.312	0.031
	TNMA-643	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-330612	0.750	1.299	0.250	0.312	0.047
	TNMA-644	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-330616	0.750	1.299	0.250	0.312	0.062
	TNMA-664	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-330916	0.750	1.299	0.375	0.312	0.062
	TNMA-666	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-330924	0.750	1.299	0.375	0.312	0.094
	TNMA-668	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNMA-330932	0.750	1.299	0.375	0.312	0.125

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

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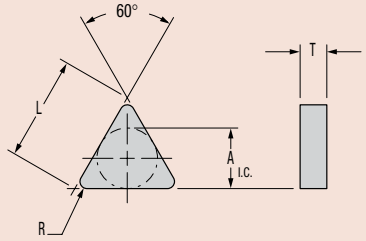
● Stocked Standard — ❍ Stocked or Available Upon Request — Not Recommended

Triangle Inserts

Flat Top (TNGN)



Shape: Triangle	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	TNGN-222	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-110308	0.250	0.433	0.125	0.031
	TNGN-223	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-110312	0.250	0.433	0.125	0.047
	TNGN-320	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160300	0.375	0.650	0.125	0.005
	TNGN-321	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160304	0.375	0.650	0.125	0.015
	TNGN-322	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160308	0.375	0.650	0.125	0.031
	TNGN-323	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160312	0.375	0.650	0.125	0.047
	TNGN-324	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160316	0.375	0.650	0.125	0.062
	TNGN-331	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160404	0.375	0.650	0.187	0.015
	TNGN-332	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160408	0.375	0.650	0.187	0.031
	TNGN-333	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160412	0.375	0.650	0.187	0.047
	TNGN-334	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-160416	0.375	0.650	0.187	0.062
	TNGN-431	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-220404	0.500	0.866	0.187	0.015
	TNGN-432	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-220408	0.500	0.866	0.187	0.031
	TNGN-433	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-220412	0.500	0.866	0.187	0.047
	TNGN-434	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-220416	0.500	0.866	0.187	0.062
	TNGN-438	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-220432	0.500	0.866	0.187	0.125
	TNGN-442	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-220608	0.500	0.866	0.250	0.031
	TNGN-443	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-220612	0.500	0.866	0.250	0.047
	TNGN-444	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-220616	0.500	0.866	0.250	0.062
	TNGN-532	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-270408	0.625	1.083	0.187	0.031
	TNGN-538	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-270432	0.625	1.083	0.187	0.125
	TNGN-541	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-270604	0.625	1.083	0.250	0.015
	TNGN-542	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-270608	0.625	1.083	0.250	0.031
	TNGN-543	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-270612	0.625	1.083	0.250	0.047
	TNGN-544	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-270616	0.625	1.083	0.250	0.062
	TNGN-554	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-270716	0.625	1.083	0.312	0.062
	TNGN-556	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-270724	0.625	1.083	0.312	0.094
	TNGN-654	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-330716	0.750	1.299	0.312	0.062
	TNGN-656	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-330724	0.750	1.299	0.312	0.094
	TNGN-664	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-330916	0.750	1.299	0.375	0.062
	TNGN-666	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-330924	0.750	1.299	0.375	0.094
	TNGN-668	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-330932	0.750	1.299	0.375	0.125
	TNGN-776	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-381124	0.875	1.516	0.437	0.094
	TNGN-778	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-381132	0.875	1.516	0.437	0.125
	TNGN-7710	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-381140	0.875	1.516	0.437	0.156
	TNGN-878	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TNGN-441132	1.000	1.732	0.437	0.125
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M					
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S										
		Steel				Stainless Steel						Cast Iron	High-Temp Alloys										

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

Not Recommended — Stocked or Available Upon Request (○) — Stocked Standard (●)

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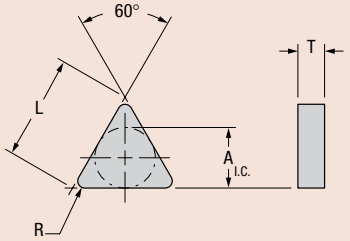
60°

Greenleaf®

Triangle Inserts

Flat Top (TNUN)



		Steel				Stainless Steel						Cast Iron	High-Temp Alloys									
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S									
Shape: Triangle	Part Number ANSI	GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	TNUN-321	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-160304	0.375	0.650	0.125	0.015
	TNUN-322	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-160308	0.375	0.650	0.125	0.031
	TNUN-323	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-160312	0.375	0.650	0.125	0.047
	TNUN-332	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-160408	0.375	0.650	0.187	0.031
	TNUN-333	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-160412	0.375	0.650	0.187	0.047
	TNUN-334	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-160416	0.375	0.650	0.187	0.062
	TNUN-432	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220408	0.500	0.866	0.187	0.031
	TNUN-433	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220412	0.500	0.866	0.187	0.047
	TNUN-434	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220416	0.500	0.866	0.187	0.062
	TNUN-438	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220432	0.500	0.866	0.187	0.125
	TNUN-441	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220604	0.500	0.866	0.250	0.015
	TNUN-442	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220608	0.500	0.866	0.250	0.031
	TNUN-443	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220612	0.500	0.866	0.250	0.047
	TNUN-444	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220616	0.500	0.866	0.250	0.062
	TNUN-448	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-220632	0.500	0.866	0.250	0.125
	TNUN-542	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-270608	0.625	1.083	0.250	0.031
	TNUN-543	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-270612	0.625	1.083	0.250	0.047
	TNUN-544	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-270616	0.625	1.083	0.250	0.062
	TNUN-546	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-270624	0.625	1.083	0.250	0.094
	TNUN-552	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-270708	0.625	1.083	0.312	0.031
	TNUN-553	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-270712	0.625	1.083	0.312	0.047
	TNUN-554	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-270716	0.625	1.083	0.312	0.062
	TNUN-556	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-270724	0.625	1.083	0.312	0.094
	TNUN-654	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330716	0.750	1.299	0.312	0.062
	TNUN-656	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330724	0.750	1.299	0.312	0.094
	TNUN-664	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330916	0.750	1.299	0.375	0.062
	TNUN-666	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330924	0.750	1.299	0.375	0.094
	TNUN-668	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330932	0.750	1.299	0.375	0.125
	TNUN-776	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-381124	0.875	1.516	0.437	0.094
	TNUN-778	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-381132	0.875	1.516	0.437	0.125
	TNUN-7710	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-381140	0.875	1.516	0.437	0.156

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S					
		Steel				Stainless Steel						Cast Iron	High-Temp Alloys					

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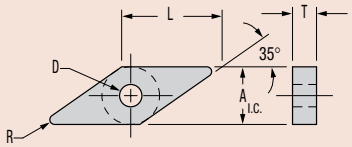
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

35° Diamond Inserts

Chip Control



	Shape: 35° Diamond	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
PRECISION FINISHING	TurboForm®	VNGG-330.3-TF			❍		❍	●	●	❍				❍	●	●	❍		❍	VNGG-160401.3-TF	0.375	0.654	0.187	0.150	0.005
		VNGG-330.6-TF			❍		❍	❍	●	❍				❍	❍	●	❍		❍	VNGG-160402.6-TF	0.375	0.654	0.187	0.150	0.010
		VNGG-331-TF			❍		●	●	●	●				●	●	●	●		●	VNGG-160404-TF	0.375	0.654	0.187	0.150	0.015
		VNGG-332-TF			❍		●	●	●	❍				●	●	●	❍		●	VNGG-160408-TF	0.375	0.654	0.187	0.150	0.031
		VNGG-333-TF			❍		●	●	❍	❍				●	●	❍	❍		❍	VNGG-160412-TF	0.375	0.654	0.187	0.150	0.047
FINISHING	FF2	VNMG-331-FF2	●	●	❍	❍	❍	●	❍	●	❍	●	❍	❍	●	❍	●	●	●	VNMG-160404-FF2	0.375	0.654	0.187	0.150	0.015
		VNMG-332-FF2	●	●	❍	❍	●	❍	❍	❍	❍	●	❍	●	❍	❍	❍	●	●	VNMG-160408-FF2	0.375	0.654	0.187	0.150	0.031
		VNMG-333-FF2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	VNMG-160412-FF2	0.375	0.654	0.187	0.150	0.047
		VNMG-432-FF2	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	VNMG-220408-FF2	0.500	0.872	0.187	0.203	0.031
GENERAL PURPOSE	GP2	VNMG-332-GP2	●	❍	❍	❍	●	❍	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	VNMG-160408-GP2	0.375	0.654	0.187	0.150	0.031
		VNMG-333-GP2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	VNMG-160412-GP2	0.375	0.654	0.187	0.150	0.047
		VNMG-432-GP2	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	VNMG-220408-GP2	0.500	0.872	0.187	0.203	0.031
	Carbide Coatings: MT-CVD Coated; PVD Coated; Uncoated		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M						
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
			Steel				Stainless Steel						Cast Iron	High-Temp Alloys											

Not Recommended ( ) Stocked or Available Upon Request (❍ ❍) Stocked Standard (● ●)

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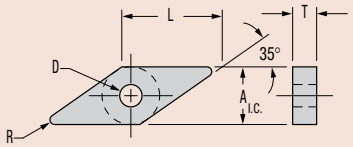
35° Diamond Inserts

Flat Top



		Steel				Stainless Steel						Cast Iron	High-Temp Alloys						
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S						
Shape: 35° Diamond	Part Number ANSI	GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M	Part Number ISO
	VNMA-331	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	VNMA-160404
	VNMA-332	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	VNMA-160408
	VNMA-431	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	VNMA-220404
	VNMA-432	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	VNMA-220408

Dimensions (inches)				
A I.C.	L	T	D	R
0.375	0.654	0.187	0.150	0.015
0.375	0.654	0.187	0.150	0.031
0.500	0.872	0.187	0.203	0.015
0.500	0.872	0.187	0.203	0.031

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

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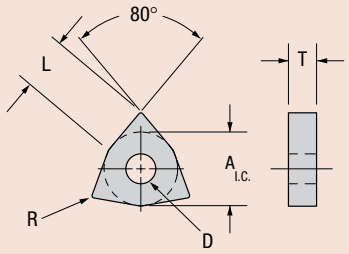
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

80° Trigon Inserts

Chip Control



	Shape: 80° Trigon	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)				
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	D	R
FINISHING	FF2	WNMG-331-FF2	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	WNMG-060404-FF2	0.375	0.257	0.187	0.150	0.015
		WNMG-332-FF2	●	●	○	○	●	○	○	○	○	○	○	●	○	○	○	○	○	WNMG-060408-FF2	0.375	0.257	0.187	0.150	0.031
		WNMG-431-FF2	●	○	○	○	●	○	○	○	○	○	○	●	○	○	○	○	○	WNMG-080404-FF2	0.500	0.342	0.187	0.203	0.015
		WNMG-432-FF2	●	●	○	○	●	○	○	○	○	○	○	●	○	○	○	○	○	WNMG-080408-FF2	0.500	0.342	0.187	0.203	0.031
GENERAL PURPOSE	GP2	WNMG-331-GP2	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	WNMG-060404-GP2	0.375	0.257	0.187	0.150	0.015
		WNMG-332-GP2	●	○	○	○	○	○	○	○	●	○	●	○	○	○	○	●	○	WNMG-060408-GP2	0.375	0.257	0.187	0.150	0.031
		WNMG-431-GP2	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	WNMG-080404-GP2	0.500	0.342	0.187	0.203	0.015
		WNMG-432-GP2	●	●	○	●	●	●	○	○	●	○	●	●	●	○	○	●	○	WNMG-080408-GP2	0.500	0.342	0.187	0.203	0.031
		WNMG-433-GP2	●	●	○	●	●	●	○	○	●	○	●	●	●	○	○	○	○	WNMG-080412-GP2	0.500	0.342	0.187	0.203	0.047
		WNMG-434-GP2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	WNMG-080416-GP2	0.500	0.342	0.187	0.203	0.062
MEDIUM ROUGHING	MR2	WNMG-432-MR2	●	○	○	○	○	○	○	●	○	○	○	○	○	○	●	○	○	WNMG-080408-MR2	0.500	0.342	0.187	0.203	0.031
		WNMG-433-MR2	●	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	WNMG-080412-MR2	0.500	0.342	0.187	0.203	0.047

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

			GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M
			P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S					
			Steel				Stainless Steel						Cast Iron	High-Temp Alloys					

Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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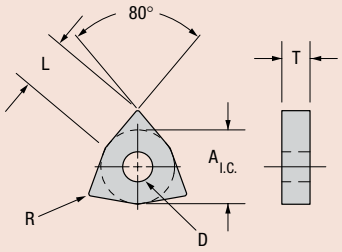
80° Trigon Inserts

Flat Top



Shape: 80° Trigon	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)				
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	D	R
	WNMA-331	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	WNMA-060404	0.375	0.257	0.187	0.150	0.015
	WNMA-332	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	WNMA-060408	0.375	0.257	0.187	0.150	0.031
	WNMA-333	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	WNMA-060412	0.375	0.257	0.187	0.150	0.047
	WNMA-431	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	WNMA-080404	0.500	0.342	0.187	0.203	0.015
	WNMA-432	❍	❍	❍	❍	❍	❍	❍	❍	●	❍	●	❍	❍	❍	❍	❍	❍	WNMA-080408	0.500	0.342	0.187	0.203	0.031
	WNMA-433	❍	❍	❍	❍	❍	❍	❍	❍	●	❍	●	❍	❍	❍	❍	❍	❍	WNMA-080412	0.500	0.342	0.187	0.203	0.047
	WNMA-434	❍	❍	❍	❍	❍	❍	❍	❍	●	❍	●	❍	❍	❍	❍	❍	❍	WNMA-080416	0.500	0.342	0.187	0.203	0.062
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M						
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
		Steel				Stainless Steel						Cast Iron	High-Temp Alloys											

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

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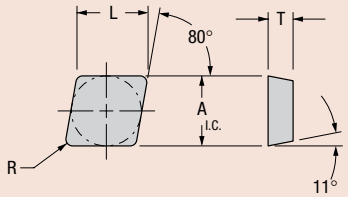
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

80° Diamond Inserts

Positive Flat Top



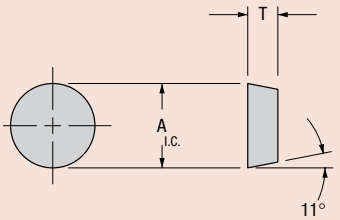
Shape: 80° Diamond	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	CPGN-422	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CPGN-120308	0.500	0.507	0.125	0.031
	CPGN-424	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CPGN-120316	0.500	0.507	0.125	0.062
	CPGN-426	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CPGN-120324	0.500	0.507	0.125	0.094
	CPGN-433	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	●	○	CPGN-120412	0.500	0.507	0.187	0.047
	CPGN-434	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	●	○	CPGN-120416	0.500	0.507	0.187	0.062
	CPGN-632	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CPGN-190408	0.750	0.761	0.187	0.031
	CPGN-633	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	CPGN-190412	0.750	0.761	0.187	0.047

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Round Inserts

Positive Flat Top



Shape: Round	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	T
	RPGN-43	○	○	●	●	○	●	○	○	○	●	○	○	●	○	○	●	●	RPGN-120400	0.500	0.187

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Not Recommended | Stocked or Available Upon Request | Stocked Standard

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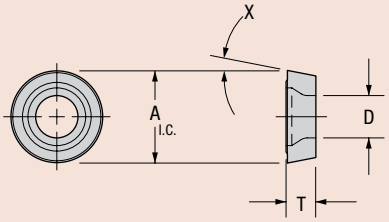
Round Inserts

Positive Chip Control (RCGT/RPGT)



Shape: Round	Part Number ANSI	Steel P15	Steel P25	Steel P25	Steel P35	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M20	Stainless Steel M35	Cast Iron K15	High-Temp Alloys S					
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M
TurboForm®	RCGT-22-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RCGT-32.5-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RCGT-43-TF			❍		❍	●	❍	❍				❍	●	❍	❍		❍
	RPGT-22-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RPGT-32.5-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RPGT-43-TF			❍		●	●	❍	❍				●	●	❍	❍		❍

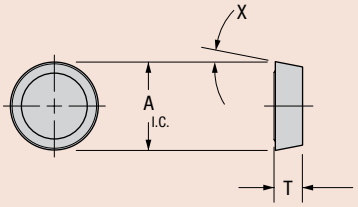
Part Number ISO	Dimensions (inches) A I.C.	T	D	X
RCGT-060300-TF	0.250	0.125	.134	7°
RCGT-09T300-TF	0.375	0.156	.173	7°
RCGT-120400-TF	0.500	0.187	.217	7°
RPGT-060300-TF	0.250	0.125	.134	11°
RPGT-09T300-TF	0.375	0.156	.173	11°
RPGT-120400-TF	0.500	0.187	.217	11°

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Round Inserts

Positive Chip Control (RCGR/RPGR)



Shape: Round	Part Number ANSI	Steel P15	Steel P25	Steel P25	Steel P35	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M20	Stainless Steel M35	Cast Iron K15	High-Temp Alloys S					
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M
TurboForm®	RCGR-22-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RCGR-32.5-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RCGR-43-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RPGR-22-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RPGR-32.5-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍
	RPGR-43-TF			❍		❍	❍	❍	❍				❍	❍	❍	❍		❍

Part Number ISO	Dimensions (inches) A I.C.	T	X
RCGR-060300-TF	0.250	0.125	7°
RCGR-09T300-TF	0.375	0.156	7°
RCGR-120400-TF	0.500	0.187	7°
RPGR-060300-TF	0.250	0.125	11°
RPGR-09T300-TF	0.375	0.156	11°
RPGR-120400-TF	0.500	0.187	11°

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

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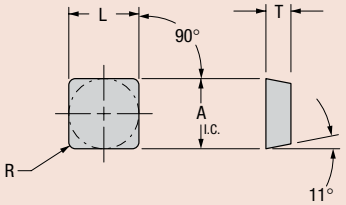
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

Square Inserts

Positive Flat Top



Shape: Square	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)			
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S							A I.C.	L	T	R
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M					
	SPGN-322	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	●	○	SPGN-090308	0.375	0.375	0.125	0.031
	SPGN-323	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-090312	0.375	0.375	0.125	0.047
	SPGN-422	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-120308	0.500	0.500	0.125	0.031
	SPGN-423	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-120312	0.500	0.500	0.125	0.047
	SPGN-424	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-120316	0.500	0.500	0.125	0.062
	SPGN-432	○	○	○	●	○	○	○	○	○	●	○	○	○	○	○	●	○	SPGN-120408	0.500	0.500	0.187	0.031
	SPGN-433	○	○	●	●	○	○	○	○	○	●	○	○	○	○	○	●	○	SPGN-120412	0.500	0.500	0.187	0.047
	SPGN-434	○	○	○	●	○	○	○	○	●	●	●	○	○	○	○	●	○	SPGN-120416	0.500	0.500	0.187	0.062
	SPGN-532	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-150408	0.625	0.625	0.187	0.031
	SPGN-534	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-150416	0.625	0.625	0.187	0.062
	SPGN-631	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-190404	0.750	0.750	0.187	0.015
	SPGN-632	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-190408	0.750	0.750	0.187	0.031
	SPGN-633	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-190412	0.750	0.750	0.187	0.047
	SPGN-634	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-190416	0.750	0.750	0.187	0.062
	SPGN-636	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-190424	0.750	0.750	0.187	0.094
	SPGN-638	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPGN-190432	0.750	0.750	0.187	0.125
	SPUN-422	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	SPUN-120308	0.500	0.500	0.125	0.031
	SPUN-423	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-120312	0.500	0.500	0.125	0.047
	SPUN-424	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-120316	0.500	0.500	0.125	0.062
	SPUN-432	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-120408	0.500	0.500	0.187	0.031
	SPUN-433	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-120412	0.500	0.500	0.187	0.047
	SPUN-633	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-190412	0.750	0.750	0.187	0.047
	SPUN-634	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-190416	0.750	0.750	0.187	0.062
	SPUN-643	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-190612	0.750	0.750	0.250	0.047
	SPUN-644	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-190616	0.750	0.750	0.250	0.062
	SPUN-864	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-250916	1.000	1.000	0.375	0.062
	SPUN-866	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-250924	1.000	1.000	0.375	0.094
	SPUN-868	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-250932	1.000	1.000	0.375	0.125
	SPUN-1068	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-310932	1.250	1.250	0.375	0.125
	SPUN-1288	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	SPUN-381232	1.500	1.500	0.500	0.125

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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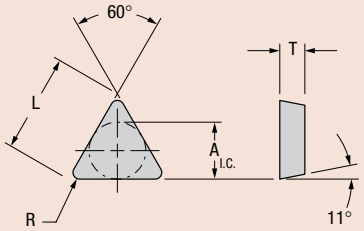
60°

Greenleaf®

Triangle Inserts

Positive Flat Top (TPGN)



		Steel				Stainless Steel						Cast Iron	High-Temp Alloys									
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S									
Shape: Triangle	Part Number ANSI	GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	TPGN-221	○	○	○	○	○	○	○	●	○	○	○	○	○	○	●	○	○	TPGN-110304	0.250	0.433	0.125	0.015
	TPGN-222	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-110308	0.250	0.433	0.125	0.031
	TPGN-223	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-110312	0.250	0.433	0.125	0.047
	TPGN-224	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-110316	0.250	0.433	0.125	0.062
	TPGN-320	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-160300	0.375	0.650	0.125	0.005
	TPGN-321	○	○	○	○	○	○	●	○	○	○	○	○	○	●	○	○	●	TPGN-160304	0.375	0.650	0.125	0.015
	TPGN-322	○	○	○	○	●	○	○	○	○	○	○	●	○	○	○	○	●	TPGN-160308	0.375	0.650	0.125	0.031
	TPGN-323	○	○	○	○	●	○	○	○	○	○	○	●	○	○	○	○	●	TPGN-160312	0.375	0.650	0.125	0.047
	TPGN-324	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	TPGN-160316	0.375	0.650	0.125	0.062
	TPGN-334	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-160416	0.375	0.650	0.187	0.062
	TPGN-336	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-160424	0.375	0.650	0.187	0.094
	TPGN-431	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	TPGN-220404	0.500	0.866	0.187	0.015
	TPGN-432	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	TPGN-220408	0.500	0.866	0.187	0.031
	TPGN-433	○	○	○	○	●	●	○	○	○	○	○	●	●	○	○	○	○	TPGN-220412	0.500	0.866	0.187	0.047
	TPGN-434	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-220416	0.500	0.866	0.187	0.062
	TPGN-436	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-220424	0.500	0.866	0.187	0.094
	TPGN-532	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270408	0.625	1.083	0.187	0.031
	TPGN-533	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270412	0.625	1.083	0.187	0.047
	TPGN-534	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270416	0.625	1.083	0.187	0.062
	TPGN-541	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270604	0.625	1.083	0.250	0.015
	TPGN-542	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270608	0.625	1.083	0.250	0.031
	TPGN-543	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270612	0.625	1.083	0.250	0.047
	TPGN-544	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270616	0.625	1.083	0.250	0.062
	TPGN-548	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270632	0.625	1.083	0.250	0.125
	TPGN-554	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270716	0.625	1.083	0.312	0.062
	TPGN-556	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-270724	0.625	1.083	0.312	0.094
	TPGN-666	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	TPGN-330924	0.750	1.299	0.375	0.094

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

		Steel				Stainless Steel						Cast Iron	High-Temp Alloys									
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M				
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S									

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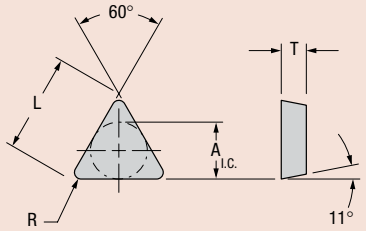
● ● Stocked Standard | ○ ○ Stocked or Available Upon Request | Not Recommended

Triangle Inserts

Positive Flat Top (TPUN)



		Steel				Stainless Steel						Cast Iron	High-Temp Alloys								
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S								
Shape: Triangle	Part Number ANSI	GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	TPUN-321	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-160304	0.375	0.650	0.125	0.015
	TPUN-322	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-160308	0.375	0.650	0.125	0.031
	TPUN-323	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-160312	0.375	0.650	0.125	0.047
	TPUN-431	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-220404	0.500	0.866	0.187	0.015
	TPUN-432	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-220408	0.500	0.866	0.187	0.031
	TPUN-433	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	●	TPUN-220412	0.500	0.866	0.187	0.047
	TPUN-434	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-220416	0.500	0.866	0.187	0.062
	TPUN-542	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-270608	0.625	1.083	0.250	0.031
	TPUN-543	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-270612	0.625	1.083	0.250	0.047
	TPUN-544	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-270616	0.625	1.083	0.250	0.062
	TPUN-552	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-270708	0.625	1.083	0.312	0.031
	TPUN-553	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-270712	0.625	1.083	0.312	0.047
	TPUN-554	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-270716	0.625	1.083	0.312	0.062
	TPUN-556	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-270724	0.625	1.083	0.312	0.094
	TPUN-664	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-330916	0.750	1.299	0.375	0.062
	TPUN-666	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-330924	0.750	1.299	0.375	0.094

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

Not Recommended | Stocked or Available Upon Request ❍ ❍ | Stocked Standard ● ●

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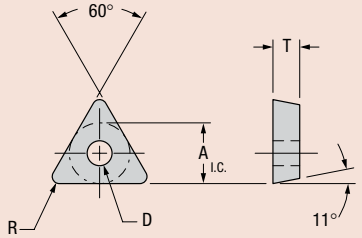
60°

Greenleaf®

Triangle Inserts

Positive Flat Top (TP/TPGA)



Shape: Triangle	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M15 G-9230	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-9230	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A I.C.	T	D	R
	TP-41	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TP-41	0.250	0.093	0.137	0.015
	TP-42	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TP-42	0.250	0.093	0.137	0.031
	TP-62	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TP-62	0.375	0.125	0.163	0.031
	TP-64	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TP-64	0.375	0.125	0.163	0.062
	TP-82	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TP-82	0.500	0.187	0.203	0.031
	TPGA-321	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPGA-160304	0.375	0.125	0.150	0.015
	TPGA-322	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPGA-160308	0.375	0.125	0.150	0.031
	TPGA-323	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	TPGA-160312	0.375	0.125	0.150	0.047

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel Stainless Steel Cast Iron High-Temp Alloys

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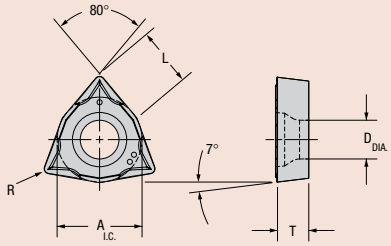
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

80° Trigon Inserts

Chip Control: Screw On



Shape: 80° Trigon	Part Number ANSI	Steel				Stainless Steel						Cast Iron	High-Temp Alloys						Part Number ISO	Dimensions (inches)				
		P15	P25	P25	P35	M15	M15	M15	M15	M20	M35	K15	S											
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	G-9230	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-9230	G-915	G-20M		A I.C.	L	T	D	R
	WCMT-21.5.5-X3	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	WCMT-060202-X3	0.250	0.171	0.093	0.110	0.008
	WCMT-21.51-X3	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	WCMT-060204-X3	0.250	0.171	0.093	0.110	0.015
	WCMT-32.51-X3	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	WCMT-09T304-X3	0.375	0.256	0.156	0.173	0.015
	WCMT-32.52-X3	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	WCMT-09T308-X3	0.375	0.256	0.156	0.173	0.031

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5025 GA5035 GA5125 GA5036 GA5026 G-925 G-920 G-9230 GA5023 G-915 GA5023 GA5026 G-925 G-920 G-9230 G-915 G-20M
P15 P25 P25 P35 M15 M15 M15 M15 M20 M35 K15 S
Steel | Stainless Steel | Cast Iron | High-Temp Alloys

Not Recommended | Stocked or Available Upon Request ❍ ❍ | Stocked Standard ● ●

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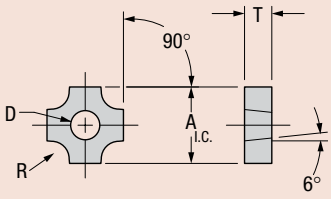
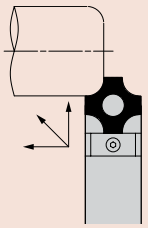
Radius Forming Inserts

Shape: Square	Part Number ANSI	G-02	G-60	GA5035	GA5036	Part Number ISO	Dimensions (inches) A I.C.	T	D	R
	SNMA-64IR4	❍	●	❍	❍	SNMA-64IR4	0.750	0.250	0.312	0.062
	SNMA-64IR6	●	●	❍	❍	SNMA-64IR6	0.750	0.250	0.312	0.093
	SNMA-64IR8	❍	●	●	●	SNMA-64IR8	0.750	0.250	0.312	0.125
	SNMA-64IR10	❍	●	❍	❍	SNMA-64IR10	0.750	0.250	0.312	0.156
	SNMA-84IR12	❍	●	●	❍	SNMA-84IR12	1.000	0.250	0.359	0.187
	SNMA-84IR14	❍	●	❍	❍	SNMA-84IR14	1.000	0.250	0.359	0.218
	SNMA-84IR16	●	●	❍	❍	SNMA-84IR16	1.000	0.250	0.359	0.250
	SNMA-106IR20	❍	❍	❍	❍	SNMA-106IR20	1.250	0.375	0.500	0.312
	SNMA-106IR24	●	❍	❍	❍	SNMA-106IR24	1.250	0.375	0.500	0.375
	SNMA-126IR28	❍	●	❍	❍	SNMA-126IR28	1.500	0.375	0.500	0.437
	SNMA-126IR32	●	❍	❍	❍	SNMA-126IR32	1.500	0.375	0.500	0.500
Carbide Coatings		G-02	G-60	GA5035	GA5036					

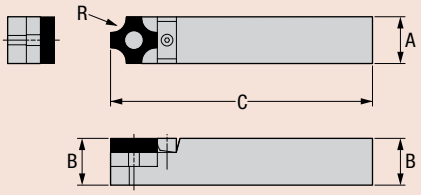
MT-CVD Coated PVD Coated Uncoated



Style GSRN



Neutral
Toolholder Shown



Part Number Neutral	Stock N	Dimensions (inches) A	B	C	Standard Components Shim	Center Pin	Clamp	Clamp Screw	Tune-Up Kit Includes All Standard Components	Insert Options Insert	R
GSRN-646	●	0.750	1.000	6.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR4	0.062
GSRN-656	❍	0.750	1.250	6.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR6	0.093
GSRN-666	●	0.750	1.500	7.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR8	0.125
										SNMA-64IR10	0.156
GSRN-168	●	1.000	1.000	6.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR12	0.187
GSRN-858	❍	1.000	1.250	7.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR14	0.218
GSRN-868	●	1.000	1.500	8.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR16	0.250
GSRN-2010	●	1.250	1.250	7.000	SR10	30454	30319-2	30320	TK-00573	SNMA-106IR20	0.312
GSRN-2410	●	1.500	1.500	8.000	SR10	30454	30319-2	30320	TK-00573	SNMA-106IR24	0.375
GSRN-2412	●	1.500	1.500	8.000	SR12	30454	30319-2	30320	TK-00574	SNMA-126IR28	0.437
										SNMA-126IR32	0.500

These toolholders are Greenleaf standard and do not conform to the ANSI identification system.

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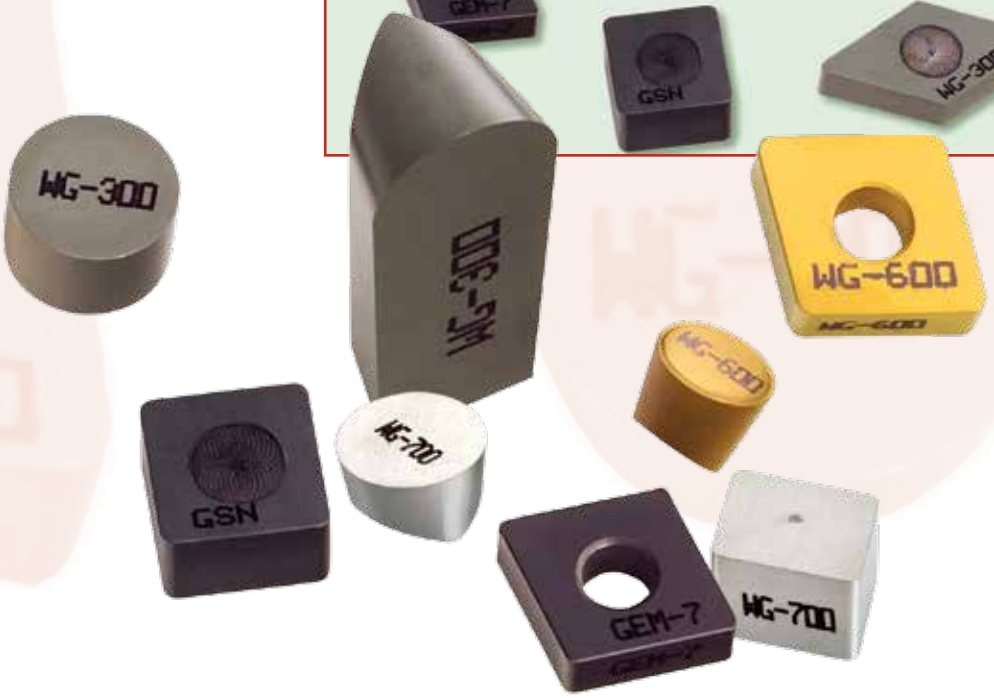
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

Ceramic Inserts

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts in ANSI standard and special geometries.



Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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Ceramic Insert Grade Description

CERAMIC

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts in ANSI standard and special geometries. Some of the most prominent include:

WG-300® Whisker-reinforced ceramic with excellent wear and shock resistance at high surface speeds. WG-300 is very effective at machining nickel and cobalt based super-alloys, and other hard materials at metal removal rates up to 10 times higher than carbide.

WG-600® Coated whisker-reinforced ceramic offering longer tool life and better performance over uncoated ceramics due to outstanding thermal properties and shock-resistance at high cutting speeds. Application areas include rough and finish turning, as well as high-performance milling of high-strength alloys, hardened steels and select stainless steels. *U.S. Patent No. 6,447,896 B1*.

WG-700™ New whisker-reinforced Al_2O_3 ceramic substrate featuring improved toughness and a unique high-speed coating. WG-700 is ideal for machining nickel- and cobalt-based super alloys and other difficult-to-machines materials. WG-700 exhibits high metal-removal rates with exceptional tool life. *U.S. Patent No. 6,447,896 B1*.

XSYTIN™-1 New phase-toughened ceramic capable of extreme feed rates. XSYTIN™-1 excels at machining a wide variety of materials including steels, cast and ductile irons, high-temperature alloys and other challenging metals. XSYTIN™-1 is ideal for use in interrupted cuts, scale, abrasive casting materials and milling.

GSN100™ New engineered blend of silicon nitride and proprietary toughening agents that redefines productivity in the machining of cast iron. GSN100 delivers outstanding tool life at high cutting speeds in turning, grooving and milling applications.

GEM-7™ Al_2O_3 + TiC composite ceramic with a high degree of predictability in roll turning and hard alloy (up to 65 R/c) machining.

GEM-19™ Cold pressed and sintered Al_2O_3 ceramic for economical roughing and finishing of cast iron grades application range on severe interruption or old machinery.

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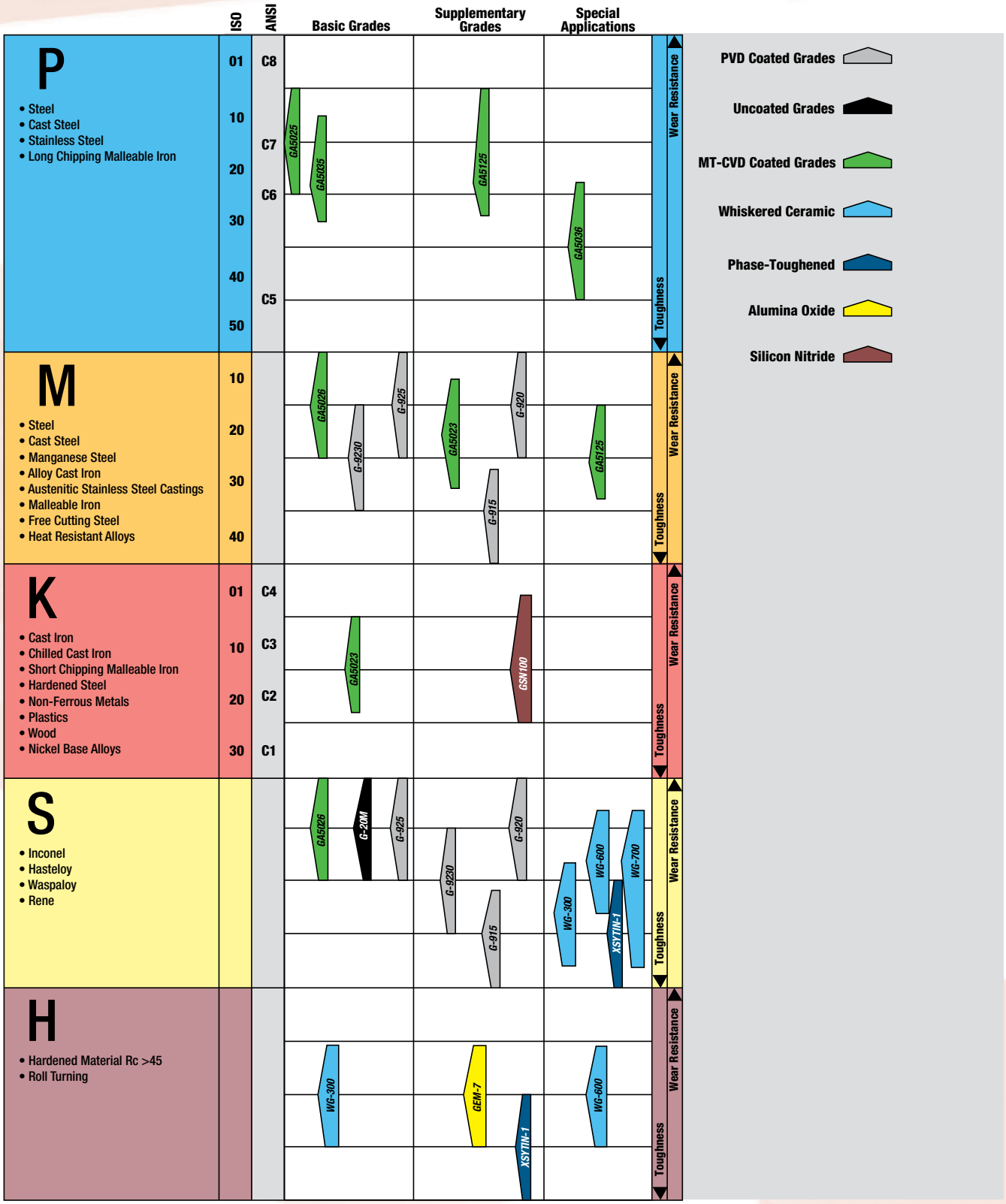
Insert Grade Reference for Turning



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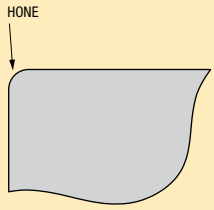
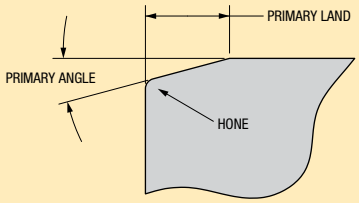
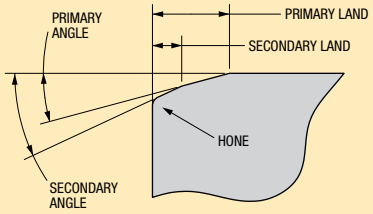
Edge Preparation and Application Guide



HONE



PRIMARY ANGLE



SECONDARY ANGLE

Edge Prep	Hone	Primary Land	Primary Angle	Application
A	.0005 - .001" R.	–	–	For light finishing and grooving, also added to designated negative lands (i.e. T1, T2, T9).
T1	–	.002 - .004"	20°	General purpose for turning and light milling in clean high-temp. alloys and materials <50R/C.
T1A	.0005 - .001" R.	.002 - .004"	20°	Used where more protection is needed than T1 such as in scale and light interruptions, hard turning.
T2	–	.006 - .008"	20°	General purpose chamfer for light to medium feed rates, cast-iron machining.
T2A	.0005 - .001" R.	.006 - .008"	20°	Scale applications, light interruptions, weld overlays, finish turning and milling of hardened materials.

See page ATI 19 for other Greenleaf edge preps or call Greenleaf Technical Service for application concerns.

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A.N.S.I. Identification for Turning and Boring Inserts

Tolerance Class [1]

	Roll Dim. B	I.C. A	Thickness T
A	0.0002 [2]	0.001	0.001
B	0.0002	0.001	0.005
C	0.0005	0.001	0.001
D	0.0005	0.001	0.005
E	0.001	0.001	0.001
F	0.0002 [2]	0.0005	0.001
G	0.001	0.001	0.005
H	0.0005	0.0005	0.001
J	0.0002 [2]	0.002-0.005	0.001
K	0.0005	0.002-0.005	0.001
L	0.001	0.002-0.005	0.001
M	0.002-0.010 [3]	0.002-0.004 [3]	0.005
U	0.005-0.012 [3]	0.005-0.010 [3]	0.005
N	0.002-0.010 [3]	0.002-0.004 [3]	0.001

Size (I.C.)

Regular polygons and diamonds
Number of 1/8ths of an inch in the inscribed circle as per table below:

Example:

5/32" I.C.	1.2
3/16" I.C.	1.5
7/32" I.C.	1.8
1/4" I.C.	2
5/16" I.C.	2.5
3/8" I.C.	3
1/2" I.C.	4
5/8" I.C.	5
3/4" I.C.	6
7/8" I.C.	7
1" I.C.	8
1-1/4" I.C.	10

Rectangles and parallelograms
Use two digits to size
1st digit: Number of 1/8ths of an inch in width
2nd digit: Number of 1/4ths of an inch in length

S P G A 6

Shape

- **V** 35° diamond
- **D** 55° diamond
- **K** 55° parallelogram
- **T** 60° triangle
- **E** 75° diamond
- **C** 80° diamond
- **W** 80° Trigon
- **B** 82° parallelogram
- **A** 85° parallelogram
- **M** 86° diamond
- **S** 90° square
- **L** 90° rectangle
- **P** 108° pentagon
- **H** 120° hexagon
- **O** 135° octagon
- **R** round

Clearances

- **N** 0°
- **A** 3°
- **B** 5°
- **C** 7°
- **P** 11°
- **D** 15°
- **E** 20°
- **F** 25°
- **G** 30°
- **H** 0°-11° [4]
- **J** 0°-14° [4]
- **K** 0°-17° [4]
- **L** 0°-20° [4]
- **M** 11°-14° [4]
- **R** 11°-17° [4]
- **S** 11°-20° [4]

Type

- **N** Without hole
- **R** Without hole with chip groove on one rake face
- **F** Without hole with chip grooves on two rake faces
- **A** With hole
- **B** With hole and one countersink (80°-90°)
- **C** With hole and two countersinks (80°-90°)
- **W** With hole and one countersink (40°-60°)
- **Q** With hole and two countersinks (40°-60°)
- **M** With hole and chip groove on one rake face
- **G** With hole and chip grooves on two rake faces
- **H** With hole, one countersink (80°-90°) and chip groove on one rake face
- **J** With hole, two countersinks (80°-90°) and chip grooves on two rake faces
- **T** With hole, one countersink (40°-60°) and chip groove on one rake face
- **U** With hole, two countersinks (40°-60°) and chip grooves on two rake faces

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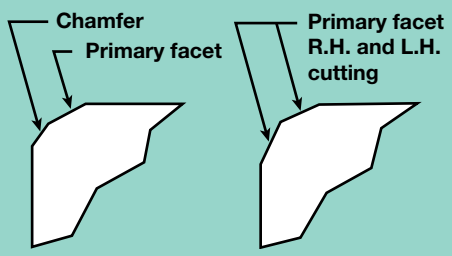
Regular polygons, diamonds, rectangles and parallelograms:
Number of 1/16ths of an inch in thickness as per table below:

Example:

3/32"	1.5
1/8"	2
5/32"	2.5
3/16"	3
7/32"	3.5
1/4"	4
5/16"	5
3/8"	6
7/16"	7
1/2"	8

Thickness

Only used following a letter in the seventh position.
Number of 1/64ths of an inch in the primary facet length.



Special Cutting (5) Point Definition

R	Right
L	Left

Hand (5)

3 3 [ ] [ ] A

0 Sharp Corner
1 1/64" radius
2 1/32" radius
3 3/64" radius
4 1/16" radius
5 5/64" radius
6 3/32" radius
7 7/64" radius
8 1/8" radius

A Square insert with 45° chamfer
D Square insert with 30° chamfer
E Square insert with 15° chamfer
F Square insert with 3° chamfer
K Square insert with 30° double chamfer
L Square insert with 15° double chamfer
M Square insert with 3° double chamfer
N Truncated triangular insert
P Flatted corner triangle – 90°

Cutting Point Configuration

A	Honed (0.0005 to less than 0.001")
B	Honed (0.001 to less than 0.002")
C	Honed (0.005 to less than 0.007")
D	Honed (0.007" and over)
J	Polished to 4 microinch AA (rake face only)
T	Chamfered – manufacturer's standard (negative land – rake face only)

Other Conditions (5)

(1) Tolerances given are plus and minus from nominal.

(2) These tolerances normally apply to indexable inserts with facets (secondary cutting edges).

(3) The tolerance depends on the size and shape of the insert and should be shown in the standards for the corresponding shapes and sizes (see ANSI B94.25).

(4) Secondary facet angle may vary by +1°.

(5) Shall only be used when required.

(6) Dimensions are established prior to supplemental edge or coating modification.

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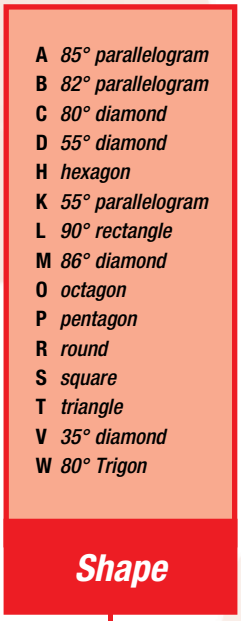
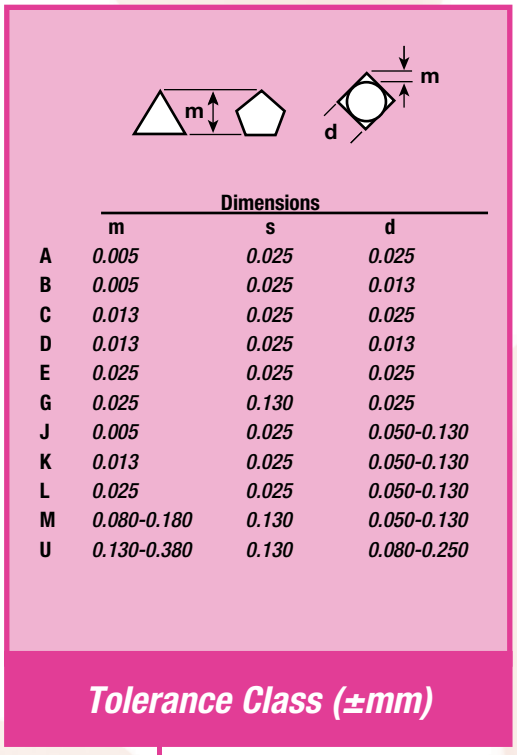
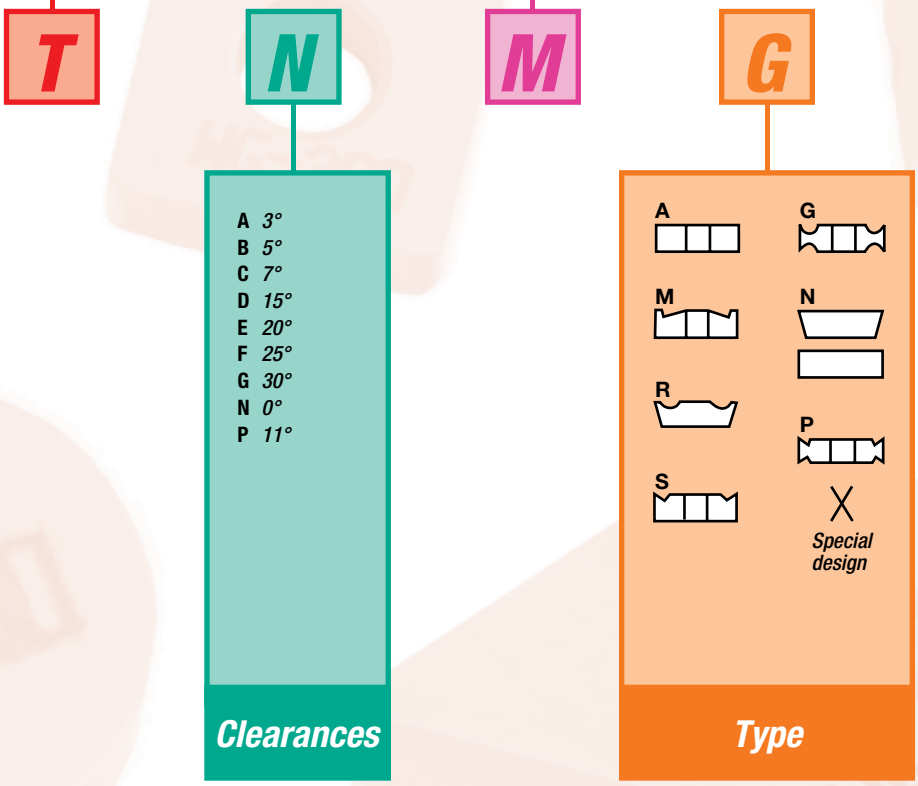
I.S.O. Identification for Turning and Boring Inserts







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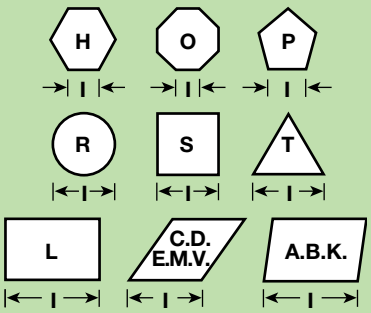
Comparison cutting edge length in mm – IC in inches

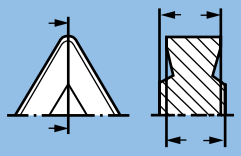
△	06	09	11	16	22	27	33	44
□ ○				09	12	15	19	25
55°					15	19		
80°					12	16	19	25
35°				16	22			
IC = d	5/32"	7/32"	1/4"	3/8"	1/2"	5/8"	3/4"	1"



Integers to be preceded by a 0.
Example: 9,52 mm indicated by 09.

Cutting Edge Length

22



01	s= 1,59
T1	s= 1,98
02	s= 2,38
03	s= 3,18
T3	s= 3,97
04	s= 4,76
05	s= 5,56
06	s= 6,35
07	s= 7,94
09	s= 9,52
10	s= 10,00
12	s= 12,00

Thickness

Unhoned	F
Honed	E
Chamfered	T
Chamfered and Honed	S

Cutting Edge

E

Radius in terms of 0.1 mm

00	Round insert sharp point
00	0.2
02	0.4
04	0.5
05	0.8
08	1.0
10	1.2
12	1.5
15	1.6
16	2.4
24	3.2
32	4.0
40	

08

Cutting Point Configuration

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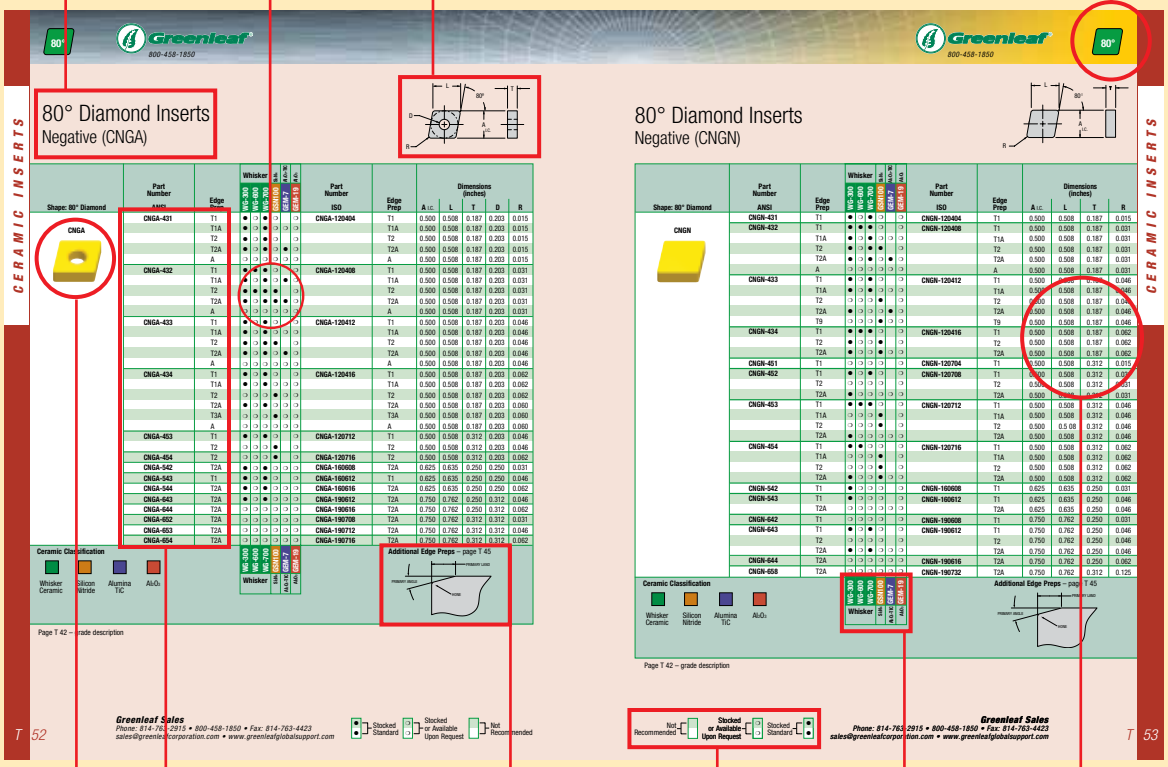
Ceramic Insert Usage Reference Guide



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Negative Inserts

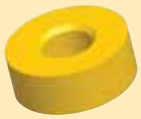
80° Diamond
page: T 52

80° Diamond
page: T 53

80° Diamond
Rough Stuff®
page: T 54

55° Diamond
page: T 55

55° Diamond
page: T 56



Round
page: T 57

Round
page: T 58

Negative Inserts *continued*

Square
page: T 59

Square
page: T 60

Square
Rough Stuff®
page: T 61

Triangle
page: T 62

Triangle
page: T 63

35° Diamond
page: T 64

Trigon
page: T 65

Positive Inserts

80° Diamond
Positive Flat Top
page: T 66

Round
Positive Flat Top
page: T 66

Round
V-Bottom
page: T 67

Square
Positive Flat Top
page: T 68

Triangle
Positive Flat Top
page: T 69

Triangle
page: T 70

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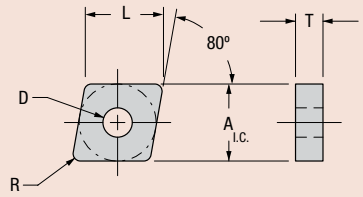
80° Diamond Inserts
Negative (CNGA)



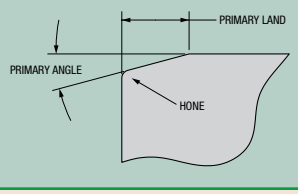
Shape: 80° Diamond	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	D	R
CNGA	CNGA-431	T1	●	○	●	○	○		○	CNGA-120404	T1	0.500	0.508	0.187	0.203	0.015
		T1A	●	○	●	○	○	○	○		T1A	0.500	0.508	0.187	0.203	0.015
		T2	●	○	●	○	○		○		T2	0.500	0.508	0.187	0.203	0.015
		T2A	●	○	●	○	○	●	○		T2A	0.500	0.508	0.187	0.203	0.015
		A	○	○	○	○	○	○	○		A	0.500	0.508	0.187	0.203	0.015
	CNGA-432	T1	●	●	●	●	○		○	CNGA-120408	T1	0.500	0.508	0.187	0.203	0.031
		T1A	●	●	●	○	○	●	○		T1A	0.500	0.508	0.187	0.203	0.031
		T2	●	●	●	○	●		○		T2	0.500	0.508	0.187	0.203	0.031
		T2A	●	○	●	○	●	●	○		T2A	0.500	0.508	0.187	0.203	0.031
		A	○	○	○	○	○	○	○		A	0.500	0.508	0.187	0.203	0.031
	CNGA-433	T1	●	○	●	○	○		○	CNGA-120412	T1	0.500	0.508	0.187	0.203	0.047
		T1A	●	●	●	●	○	○	○		T1A	0.500	0.508	0.187	0.203	0.047
		T2	●	○	●	○	●		○		T2	0.500	0.508	0.187	0.203	0.047
		T2A	●	○	●	○	○	●	○		T2A	0.500	0.508	0.187	0.203	0.047
		A	○	○	○	●	○	○	○		A	0.500	0.508	0.187	0.203	0.047
	CNGA-434	T1	●	○	●	○	○		○	CNGA-120416	T1	0.500	0.508	0.187	0.203	0.062
		T1A	●	●	●	●	○	○	○		T1A	0.500	0.508	0.187	0.203	0.062
		T2	○	○	○	○	●	○	○		T2	0.500	0.508	0.187	0.203	0.062
		T2A	●	○	●	○	○	○	○		T2A	0.500	0.508	0.187	0.203	0.060
		T3A	○	○	○	○	●	○	○		T3A	0.500	0.508	0.187	0.203	0.060
		A	○	○	○	●	○	○	○		A	0.500	0.508	0.187	0.203	0.060
	CNGA-453	T1	●	○	●	○	○		○	CNGA-120712	T1	0.500	0.508	0.312	0.203	0.047
		T2	○	○	○	○	●		○		T2	0.500	0.508	0.312	0.203	0.047
	CNGA-454	T2	○	○	○	○	●		○	CNGA-120716	T2	0.500	0.508	0.312	0.203	0.062
	CNGA-542	T2A	●	○	●	○	○	○	○	CNGA-160608	T2A	0.625	0.635	0.250	0.250	0.031
	CNGA-543	T1	●	○	●	○	○		○	CNGA-160612	T1	0.625	0.635	0.250	0.250	0.047
	CNGA-544	T2A	●	○	●	○	○	○	○	CNGA-160616	T2A	0.625	0.635	0.250	0.250	0.062
	CNGA-643	T2A	●	●	●	○	○	○	○	CNGA-190612	T2A	0.750	0.762	0.250	0.312	0.047
	CNGA-644	T2A	○	○	○	○	○	○	○	CNGA-190616	T2A	0.750	0.762	0.250	0.312	0.062
	CNGA-652	T2A	○	○	○	○	○	○	○	CNGA-190708	T2A	0.750	0.762	0.312	0.312	0.031
	CNGA-653	T2A	○	○	○	○	○	○	○	CNGA-190712	T2A	0.750	0.762	0.312	0.312	0.047
	CNGA-654	T2A	○	○	○	○	○	○	○	CNGA-190716	T2A	0.750	0.762	0.312	0.312	0.062

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19

Additional Edge Preps – page T 45



Page T 42 – grade description

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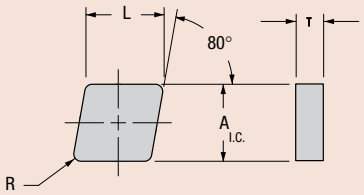
● Stocked Standard
○ Stocked or Available Upon Request
Not Recommended

80° Diamond Inserts
Negative (CNGN)



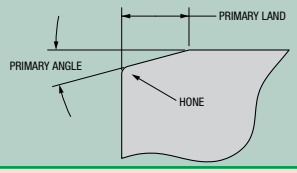
Shape: 80° Diamond	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
CNGN	CNGN-431	T1	●	○	●	○	○		○	CNGN-120404	T1	0.500	0.508	0.187	0.015
	CNGN-432	T1	●	●	●	●	○		○	CNGN-120408	T1	0.500	0.508	0.187	0.031
		T1A	●	○	●	○	○	○	○		T1A	0.500	0.508	0.187	0.031
		T2	●	○	●	○	●		○		T2	0.500	0.508	0.187	0.031
		T2A	●	○	●	○	○	●	○		T2A	0.500	0.508	0.187	0.031
		A	○	○	○	○	○	○	○		A	0.500	0.508	0.187	0.031
	CNGN-433	T1	●	○	●	○	○		○	CNGN-120412	T1	0.500	0.508	0.187	0.047
		T1A	●	○	●	●	○	○	○		T1A	0.500	0.508	0.187	0.047
		T2	○	○	○	○	●		○		T2	0.500	0.508	0.187	0.047
		T2A	●	○	○	○	○	●	○		T2A	0.500	0.508	0.187	0.047
		T9	○	○	○	○	●	○	○		T9	0.500	0.508	0.187	0.047
		A	○	○	○	●	○	○	○		A	0.500	0.508	0.187	0.047
	CNGN-434	T1	●	●	●	○	○		○	CNGN-120416	T1	0.500	0.508	0.187	0.062
		T1A	○	○	○	●	○	○	○		T1A	0.500	0.508	0.187	0.062
		T2	●	○	○	○	●		○		T2	0.500	0.508	0.187	0.062
		T2A	●	○	○	○	●	○	○		T2A	0.500	0.508	0.187	0.062
		A	○	○	○	●	○	○	○		A	0.500	0.508	0.187	0.062
	CNGN-451	T1	○	○	○	○	○		○	CNGN-120704	T1	0.500	0.508	0.312	0.015
	CNGN-452	T1	●	○	●	○	○		○	CNGN-120708	T1	0.500	0.508	0.312	0.031
		T2	○	○	○	○	○		○		T2	0.500	0.508	0.312	0.031
		T2A	●	○	○	○	○	○	○		T2A	0.500	0.508	0.312	0.031
	CNGN-453	T1	●	●	●	○	○		○	CNGN-120712	T1	0.500	0.508	0.312	0.047
		T1A	○	○	○	●	●		○		T1A	0.500	0.508	0.312	0.047
		T2	○	○	○	○	●		○		T2	0.500	0.5 08	0.312	0.047
		T2A	●	○	○	○	○	○	○		T2A	0.500	0.508	0.312	0.047
		A	○	○	○	●	○	○	○		A	0.500	0.508	0.312	0.047
	CNGN-454	T1	●	●	○	○	○		○	CNGN-120716	T1	0.500	0.508	0.312	0.062
		T1A	○	○	○	●	●		○		T1A	0.500	0.508	0.312	0.062
		T2	○	○	○	○	●		○		T2	0.500	0.508	0.312	0.062
		T2A	●	○	○	○	●	○	○		T2A	0.500	0.508	0.312	0.062
		A	○	○	○	●	○	○	○		A	0.500	0.508	0.312	0.062
	CNGN-542	T1	●	○	○	○	○		○	CNGN-160608	T1	0.625	0.635	0.250	0.031
	CNGN-543	T1	●	○	○	○	○		○	CNGN-160612	T1	0.625	0.635	0.250	0.047
		T2A	○	○	○	○	○	○	○		T2A	0.625	0.635	0.250	0.047
	CNGN-642	T1	○	○	○	○	○		○	CNGN-190608	T1	0.750	0.762	0.250	0.031
	CNGN-643	T1	●	○	●	○	○		○	CNGN-190612	T1	0.750	0.762	0.250	0.047
		T2	○	○	○	○	○		○		T2	0.750	0.762	0.250	0.047
		T2A	●	○	●	○	○	○	○		T2A	0.750	0.762	0.250	0.047
	CNGN-644	T2A	○	○	○	○	○	○	○	CNGN-190616	T2A	0.750	0.762	0.250	0.062
	CNGN-658	T2A	○	○	○	○	○	○	○	CNGN-190732	T2A	0.750	0.762	0.312	0.125

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3

Additional Edge Preps – page T 45



Page T 42 – grade description

Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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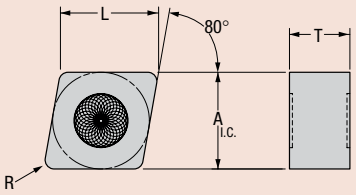
80° Diamond Inserts

Rough Stuff®



Shape: 80° Diamond	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Si_3N_4 GSN100	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
	CNGX-452-RS	T2	❍	❍	❍	❍	**CNGX-120708-RS**	T2	0.500	0.508	0.312	0.031
		T2A	❍	❍	❍	❍		T2A	0.500	0.508	0.312	0.031
	CNGX-453-RS	T2	❍	❍	❍	❍	**CNGX-120712-RS**	T2	0.500	0.508	0.312	0.047
		T2A	❍	❍	❍	❍		T2A	0.500	0.508	0.312	0.047
	CNGX-454-RS	T2	❍	❍	❍	❍	**CNGX-120716-RS**	T2	0.500	0.508	0.312	0.062
		T2A	❍	❍	❍	❍		T2A	0.500	0.508	0.312	0.062

Ceramic Classification

WG-300	WG-600	WG-700	GSN100
Whisker			Si_3N_4

Whisker Ceramic — Silicon Nitride

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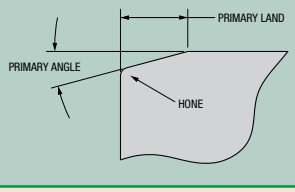
Additional Edge Preps – page T 45



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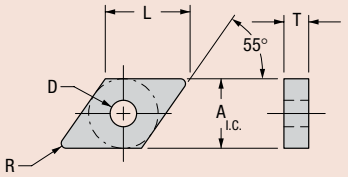
● ● Stocked Standard — ❍ ❍ Stocked or Available Upon Request — Not Recommended

55° Diamond Inserts
Negative (DNGA)



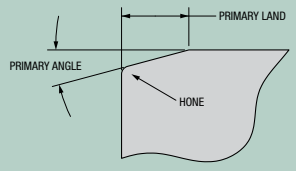
Shape: 55° Diamond	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si3N4 GSN100	Al2O3-TiC GEM-7	Al2O3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	D	R
DNGA	DNGA-322	T1	○	○	○	○	○		○	DNGA-110308	T1	0.375	0.458	0.125	0.150	0.031
	DNGA-323	T1	○	○	○	○	○		○	DNGA-110312	T1	0.375	0.458	0.125	0.150	0.047
	DNGA-324	T1	○	○	○	○	○		○	DNGA-110316	T1	0.375	0.458	0.125	0.150	0.062
	DNGA-332	T1	○	○	○	○	○		○	DNGA-110408	T1	0.375	0.458	0.187	0.150	0.031
	DNGA-431	T1	●	○	○	○	○		○	DNGA-150404	T1	0.500	0.610	0.187	0.203	0.015
		T2	●	○	○	○	○		○		T2	0.500	0.610	0.187	0.203	0.015
	DNGA-432	T1	●	○	○	○	○		○	DNGA-150408	T1	0.500	0.610	0.187	0.203	0.031
		T1A	●	○	○	○	○	○	○		T1A	0.500	0.610	0.187	0.203	0.031
		T2	●	○	○	○	●		○		T2	0.500	0.610	0.187	0.203	0.031
		T2A	●	○	○	○	○	●	○		T2A	0.500	0.610	0.187	0.203	0.031
		A	○	○	○	○	○	○	○		A	0.500	0.610	0.187	0.203	0.031
	DNGA-433	T1	●	○	○	○	○		○	DNGA-150412	T1	0.500	0.610	0.187	0.203	0.047
		T1A	●	○	○	○	○	○	○		T1A	0.500	0.610	0.187	0.203	0.047
		T2	●	○	○	○	●		○		T2	0.500	0.610	0.187	0.203	0.047
		T2A	●	○	○	○	○	●	○		T2A	0.500	0.610	0.187	0.203	0.047
	DNGA-434	T1	●	○	○	○	○		○	DNGA-150416	T1	0.500	0.610	0.187	0.203	0.062
		T1A	●	○	○	○	○	○	○		T1A	0.500	0.610	0.187	0.203	0.062
		T2A	●	○	○	○	○	○	○		T2A	0.500	0.610	0.187	0.203	0.062
	DNGA-443	T1	○	○	○	○	○		○	DNGA-150612	T1	0.500	0.610	0.250	0.203	0.047
	DNGA-543	T2A	●	○	○	○	○	○	○	DNGA-190612	T2A	0.625	0.763	0.250	0.250	0.047

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3
WG-300, WG-600, WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker	Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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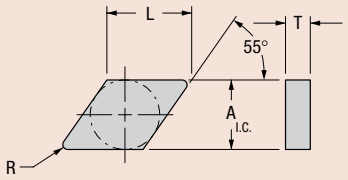
55° Diamond Inserts
Negative (DNGN)



Shape: 55° Diamond	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
DNGN	DNGN-322	T1	❍	❍	❍	❍	❍		❍	DNGN-110308	T1	0.375	0.458	0.125	0.031
	DNGN-323	T1	❍	❍	❍	❍	❍		❍	DNGN-110312	T1	0.375	0.458	0.125	0.047
	DNGN-324	T1	❍	❍	❍	❍	❍		❍	DNGN-110316	T1	0.375	0.458	0.125	0.062
	DNGN-432	T1	●	❍	●	❍	❍		❍	DNGN-150408	T1	0.500	0.610	0.187	0.031
		T2A	❍	❍	❍	❍	❍	❍	❍		T2A	0.500	0.610	0.187	0.031
	DNGN-433	T1	●	❍	●	❍	❍		❍	DNGN-150412	T1	0.500	0.610	0.187	0.047
	DNGN-434	T1	●	❍	❍	❍	❍		❍	DNGN-150416	T1	0.500	0.610	0.187	0.062
		T2A	❍	❍	❍	❍	❍	❍	❍		T2A	0.500	0.610	0.187	0.062

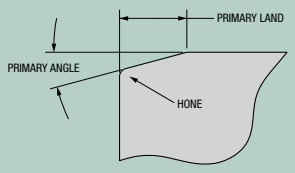
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



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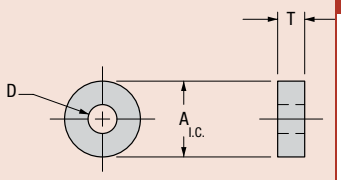
● ● Stocked Standard
❍ ❍ Stocked or Available Upon Request
Not Recommended

Round Inserts
Negative (RNGA)



Shape: Round	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTiN-1	Si3N4 GSN100	Al2O3-TiC GEM-7	Al2O3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	T	D
RNGA	RNGA-32	T1	❍	❍	❍	❍	❍		❍	RNGA-090300	T1	0.375	0.125	0.150
	RNGA-33	T1	❍	❍	❍	❍	❍		❍	RNGA-090400	T1	0.375	0.187	0.150
	RNGA-43	T1	❍	❍	❍	❍	❍		❍	RNGA-120400	T1	0.500	0.187	0.203
	RNGA-45	T1	❍	❍	❍	❍	❍		❍	RNGA-120700	T1	0.500	0.312	0.203
	RNGA-55	T2A	❍	❍	❍	❍	❍	❍	❍	RNGA-150700	T2A	0.625	0.312	0.250
	RNGA-65	T2A	❍	❍	❍	❍	❍	❍	❍	RNGA-190700	T2A	0.750	0.312	0.312
	RNGA-85	T2A	❍	❍	❍	❍	❍	❍	❍	RNGA-250700	T2A	1.000	0.312	0.359

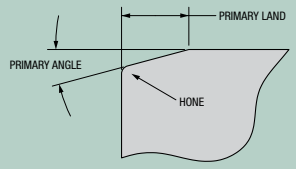
Ceramic Classification

Whisker Ceramic — Phase Toughened — Silicon Nitride — Alumina TiC — Al_2O_3

WG-300 WG-600 WG-700 Whisker | XSYTiN-1 Phase Toughened | GSN100 Si_3N_4 | GEM-7 Al_2O_3-TiC | GEM-19 Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



Not Recommended — Stocked or Available Upon Request (❍ ❍) — Stocked Standard (● ●)

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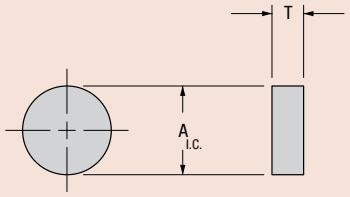
Round Inserts
Negative (RNGN)



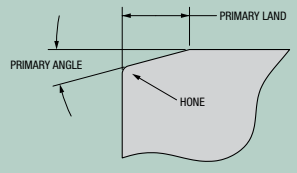
Shape: Round	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	T
RNGN	RNGN-32	T1	●	○	○	○	○		○	RNGN-090300	T1	0.375	0.125
		T1A	●	●	●	●	○	○	○		T1A	0.375	0.125
		T2A	●	○	○	○	○	○	○		T2A	0.375	0.125
		A	○	○	○	●	○	○	○		A	0.375	0.125
	RNGN-33	T1	●	○	●	○	○		○	RNGN-090400	T1	0.375	0.187
		T1A	●	○	●	○	○	○	○		T1A	0.375	0.187
		T2A	●	○	●	○	○	○	○		T2A	0.375	0.187
	RNGN-42	T1A	●	○	○	●	○	○	○	RNGN-120300	T1A	0.500	0.125
		T2A	○	○	○	○	○	○	○		T2A	0.500	0.125
		A	○	○	○	●	○	○	○	RNGN-120400	T1	0.500	0.125
	RNGN-43	T1	●	○	●	●	○		○		T1A	0.500	0.187
		T1A	●	●	●	○	○	○	○		T2	0.500	0.187
		T2	●	○	●	●	●		○		T2A	0.500	0.187
		T2A	●	●	●	○	○	●	○		A	0.500	0.187
		A	○	○	○	○	○	○	○	RNGN-120700	T1	0.500	0.187
	RNGN-45	T1	●	●	●	●	●		○		T1A	0.500	0.312
		T1A	●	●	●	●	●	○	○		T2	0.500	0.312
		T2	●	○	●	●	●		○		T2A	0.500	0.312
		T2A	●	●	●	○	●	●	○		T5A	0.500	0.312
		T5A	○	○	○	○	●	○	○		A	0.500	0.312
		A	●	○	○	●	●	○	○	RNGN-150700	T1	0.500	0.312
	RNGN-55	T1	●	○	○	○	○		○		T2A	0.625	0.312
		T2A	○	○	○	○	○	○	○	RNGN-190600	T2A	0.625	0.312
	RNGN-64	T2A	○	○	○	○	○	○	○	RNGN-190700	T1	0.750	0.250
	RNGN-65	T1	●	○	○	●	○		○		T1A	0.750	0.312
		T1A	○	○	○	○	○	○	○		T2A	0.750	0.312
		T2A	●	○	●	○	○	○	○			0.750	0.312
		A	○	○	○	●	○	○	○			0.750	0.312
	RNGN-84	T2A	○	○	○	○	○	○	○	RNGN-250600	T2A	1.000	0.250
	RNGN-85	T2A	○	○	○	○	○	○	○	RNGN-250700	T2A	1.000	0.312
	RNGN-86	T2A	○	○	○	○	○	○	○	RNGN-250900	T2A	1.000	0.375
	RNGN-106	T2A	○	○	○	○	○	○	○	RNGN-310900	T2A	1.250	0.375

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3

Additional Edge Preps – page T 45



Page T 42 – grade description

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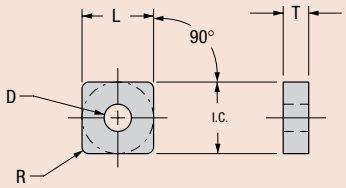
● ● Stocked Standard
○ ○ Stocked or Available Upon Request
Not Recommended

Square Inserts
Negative (SNGA)



Shape: Square	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTiN-1	Si3N4 GSN100	Al2O3-TiC GEM-7	Al2O3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	D	R
SNGA	SNGA-432	T2	●	❍	❍	❍	❍		❍	SNGA-120408	T2	0.500	0.500	0.187	0.203	0.031
	SNGA-433	T1	●	❍	❍	❍	❍		❍	SNGA-120412	T1	0.500	0.500	0.187	0.203	0.047
		T2	❍	❍	❍	❍	●		❍		T2	0.500	0.500	0.187	0.203	0.047
		T2A	❍	❍	❍	❍	❍	❍	❍		T2A	0.500	0.500	0.187	0.203	0.047
	SNGA-434	T1	❍	❍	❍	❍	❍		❍	SNGA-120416	T1	0.500	0.500	0.187	0.203	0.062
		T2	❍	❍	❍	❍	●		❍		T2	0.500	0.500	0.187	0.203	0.062
	SNGA-452	T1	❍	❍	❍	❍	❍		❍	SNGA-120708	T1	0.500	0.500	0.312	0.203	0.031
	SNGA-453	T1	❍	❍	❍	❍	❍		❍	SNGA-120712	T1	0.500	0.500	0.312	0.203	0.047
		T2	❍	❍	❍	❍	●		❍		T2	0.500	0.500	0.312	0.203	0.047
	SNGA-454	T1	❍	❍	❍	❍	❍		❍	SNGA-120716	T1	0.500	0.500	0.312	0.203	0.062
		T2	❍	❍	❍	❍	●		❍		T2	0.500	0.500	0.312	0.203	0.062
	SNGA-542	T2A	❍	❍	❍	❍	❍	❍	❍	SNGA-150608	T2A	0.625	0.625	0.250	0.250	0.031
	SNGA-543	T2A	❍	❍	❍	❍	❍	❍	❍	SNGA-150612	T2A	0.625	0.625	0.250	0.250	0.047
	SNGA-544	T2A	❍	❍	❍	❍	❍	❍	❍	SNGA-150616	T2A	0.625	0.625	0.250	0.250	0.062
	SNGA-642	T2A	❍	❍	❍	❍	❍	❍	❍	SNGA-190608	T2A	0.750	0.750	0.250	0.312	0.031
	SNGA-643	T2A	❍	❍	❍	❍	❍	❍	❍	SNGA-190612	T2A	0.750	0.750	0.250	0.312	0.047
	SNGA-644	T2A	❍	❍	❍	❍	❍	❍	❍	SNGA-190616	T2A	0.750	0.750	0.250	0.312	0.062

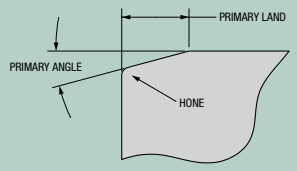
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300	WG-600	WG-700	XSYTiN-1	GSN100	GEM-7	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



Not Recommended | Stocked or Available Upon Request ❍ ❍ | Stocked Standard ● ●

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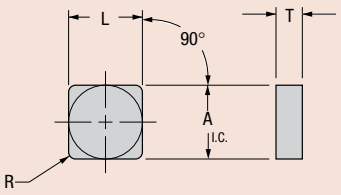
Square Inserts
Negative (SNGN)



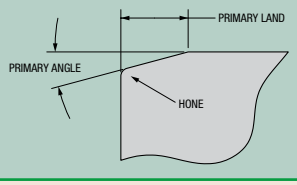
Shape: Square	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
SNGN	SNGN-322	T2A	○	○	○	○	○	○	○	SNGN-090308	T2A	0.375	0.375	0.125	0.031
	SNGN-333	T2	○	○	○	○	○		○	SNGN-090412	T2	0.375	0.375	0.187	0.047
	SNGN-432	T1	●	○	○	○	○		○	SNGN-120408	T1	0.500	0.500	0.187	0.031
		T1A	●	○	○	○	○	○	○		T1A	0.500	0.500	0.187	0.031
		T2	○	○	○	○	○		○		T2	0.500	0.500	0.187	0.031
		T2A	●	○	○	○	○	○			T2A	0.500	0.500	0.187	0.031
		A	○	○	○	○	○	○			A	0.500	0.500	0.187	0.031
	SNGN-433	T1	●	○	●	○	○		○	SNGN-120412	T1	0.500	0.500	0.187	0.047
		T1A	○	○	○	●	●		○		T1A	0.500	0.500	0.187	0.047
		T2	●	○	●	●	●		○		T2	0.500	0.500	0.187	0.047
		T2A	●	○	●	○	●	○	○		T2A	0.500	0.500	0.187	0.047
		A	○	○	○	●	○	○	○		A	0.500	0.500	0.187	0.047
	SNGN-434	T1	●	○	○	○	○		○	SNGN-120416	T1	0.500	0.500	0.187	0.062
		T1A	○	○	○	●	●		○		T1A	0.500	0.500	0.187	0.062
		T2	●	○	○	●	●		○		T2	0.500	0.500	0.187	0.062
		T2A	●	○	○	○	○	●	○		T2A	0.500	0.500	0.187	0.062
		A	○	○	○	●	○	○	○		A	0.500	0.500	0.187	0.062
	SNGN-452	T1	●	○	●	○	○		○	SNGN-120708	T1	0.500	0.500	0.312	0.031
		T2	●	○	○	○	○		○		T2	0.500	0.500	0.312	0.031
	SNGN-453	T1	●	○	●	○	○		○	SNGN-120712	T1	0.500	0.500	0.312	0.047
		T1A	○	○	○	●	○	○	○		T1A	0.500	0.500	0.312	0.047
		T2	●	○	○	●	●		○		T2	0.500	0.500	0.312	0.047
		T2A	●	○	○	○	○	○	○		T2A	0.500	0.500	0.312	0.047
		A	○	○	○	●	○	○	○		A	0.500	0.500	0.312	0.047
	SNGN-454	T1	●	○	○	○	○		○	SNGN-120716	T1	0.500	0.500	0.312	0.062
		T1A	○	○	○	●	○	○	○		T1A	0.500	0.500	0.312	0.062
		T2	○	○	○	●	●		○		T2	0.500	0.500	0.312	0.062
		T2A	●	○	○	○	○	○	○		T2A	0.500	0.500	0.312	0.062
		A	○	○	○	●	○	○	○		A	0.500	0.500	0.312	0.062
	SNGN-542	T2A	○	○	○	○	○	○		SNGN-150608	T2A	0.625	0.625	0.250	0.031
	SNGN-543	T1	●	○	●	○	○		○	SNGN-150612	T1	0.625	0.625	0.250	0.047
		T2A	○	○	○	○	○	○	○		T2A	0.625	0.625	0.250	0.047
	SNGN-544	T1	○	○	○	○	○		○	SNGN-150616	T1	0.625	0.625	0.250	0.062
	SNGN-6416	T2A	○	○	○	○	○	○	○	SNGN-190663	T2A	0.750	0.750	0.250	0.250
	SNGN-642	T2A	○	○	○	○	○	○	○	SNGN-190608	T2A	0.750	0.750	0.250	0.031
	SNGN-643	T1	●	○	●	●	○		○	SNGN-190612	T1	0.750	0.750	0.250	0.047
		T2A	●	○	○	○	○	○	○		T2A	0.750	0.750	0.250	0.047
		A	○	○	○	●	○	○	○		A	0.750	0.750	0.250	0.047

Ceramic Classification

WG-300 / WG-600 / WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



Continued on next page.

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● Stocked Standard
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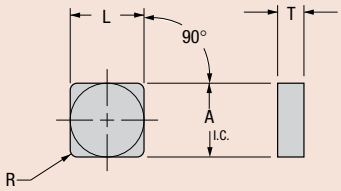
Not Recommended

Square Inserts
Negative (SNGN) *(continued)*



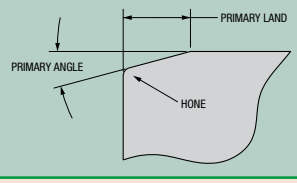
Shape: Square	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
SNGN	SNGN-644	T1	●	○	●	●	○		○	SNGN-190616	T1	0.750	0.750	0.250	0.062
		T1A	●	○	○	○	○	○	○		T1A	0.750	0.750	0.250	0.062
		T2A	●	○	○	○	○	○	○		T2A	0.750	0.750	0.250	0.062
		A	○	○	○	●	○	○	○		A	0.750	0.750	0.250	0.062
	SNGN-652	T2A	○	○	●	○	○	○	○	SNGN-190708	T2A	0.750	0.750	0.312	0.031
	SNGN-653	T2A	○	○	○	○	○	○	○	SNGN-190712	T2A	0.750	0.750	0.312	0.047
	SNGN-654	T1	●	○	●	●	○		○	SNGN-190716	T1	0.750	0.750	0.312	0.062
		T2A	○	○	○	○	○	○	○		T2A	0.750	0.750	0.312	0.062
		A	○	○	○	●	○	○	○		A	0.750	0.750	0.312	0.062
	SNGN-655	T2A	○	○	○	○	○	○	○	SNGN-190720	T2A	0.750	0.750	0.312	0.078
	SNGN-656	A	○	○	○	●	○	○	○	SNGN-190723	A	0.750	0.750	0.312	0.094
	SNGN-866	T2A	○	○	○	○	○	○	○	SNGN-250923	T2A	1.000	1.000	0.375	0.094

Ceramic Classification

Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC | Al_2O_3

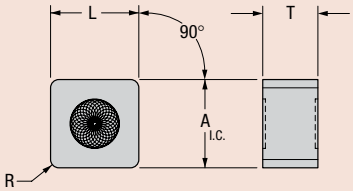
Whisker: WG-300, WG-600, WG-700 | Phase Toughened: XSYTIN-1 | Si_3N_4: GSN100 | Al_2O_3-TiC: GEM-7 | Al_2O_3: GEM-19

Additional Edge Preps – page T 45



Page T 42 – grade description

Square Inserts
Rough Stuff®



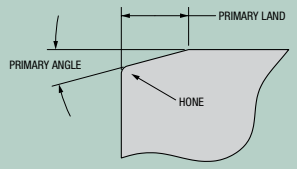
Shape: Square	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Si_3N_4 GSN100	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
	SNGX-452-RS	T2	○	○	○	○	SNGX-120708-RS	T2	0.500	0.500	0.312	0.031
		T2A	○	○	○	○		T2A	0.500	0.500	0.312	0.031
	SNGX-453-RS	T2	○	○	○	○	SNGX-120712-RS	T2	0.500	0.500	0.312	0.047
		T2A	○	○	○	○		T2A	0.500	0.500	0.312	0.047
	SNGX-454-RS	T2	○	○	○	○	SNGX-120716-RS	T2	0.500	0.500	0.312	0.062
		T2A	○	○	○	○		T2A	0.500	0.500	0.312	0.062

Ceramic Classification

Whisker Ceramic | Silicon Nitride

Whisker: WG-300, WG-600, WG-700 | Si_3N_4: GSN100

Additional Edge Preps - Page T 45



Page T 42 – grade description

Not Recommended | Stocked or Available Upon Request | Stocked Standard

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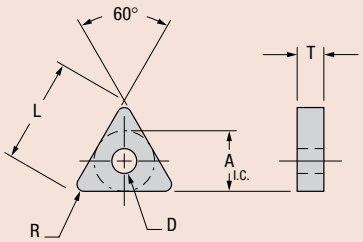
Triangle Inserts
Negative (TNGA)



Shape: Triangle	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	D	R
TNGA	**TNGA-331**	T1	❍	❍	❍	❍	❍		❍	**TNGA-160404**	T1	0.375	0.650	0.187	0.150	0.015
	TNGA-332	T1	●	❍	❍	❍	❍		❍	**TNGA-160408**	T1	0.375	0.650	0.187	0.150	0.031
		T2A	❍	❍	❍	❍	❍	❍	❍		T2A	0.375	0.650	0.187	0.150	0.031
	TNGA-333	T1	❍	❍	❍	❍	❍		❍	**TNGA-160412**	T1	0.375	0.650	0.187	0.150	0.047
	TNGA-334	T1	❍	❍	❍	❍	❍		❍	**TNGA-160416**	T1	0.375	0.650	0.187	0.150	0.062
	TNGA-432	T1	●	❍	●	❍	❍		❍	**TNGA-220408**	T1	0.500	0.866	0.187	0.203	0.031
		T1A	●	❍	❍	❍	❍	❍	❍		T1A	0.500	0.866	0.187	0.203	0.031
		T2A	●	❍	❍	❍	❍	●	❍		T2A	0.500	0.866	0.187	0.203	0.031
	TNGA-433	T2A	❍	❍	❍	❍	❍	❍	❍	**TNGA-220412**	T2A	0.500	0.866	0.187	0.203	0.047
	TNGA-434	T1	●	❍	❍	❍	❍		❍	**TNGA-220416**	T1	0.500	0.866	0.187	0.203	0.062
		A	❍	❍	❍	❍	❍	❍	❍		A	0.500	0.866	0.187	0.203	0.062
	TNGA-454	T1	❍	❍	❍	❍	❍		❍	**TNGA-220716**	T1	0.500	0.866	0.312	0.203	0.062

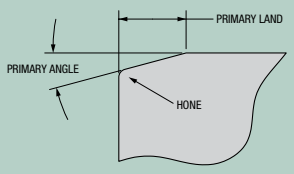
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300 WG-600 WG-700 XSYTIN-1 GSN100 GEM-7 GEM-19
Whisker Phase Toughened Si_3N_4 Al_2O_3-TiC Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



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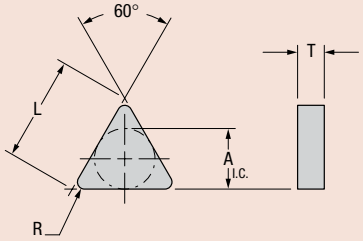
● ● Stocked Standard
❍ ❍ Stocked or Available Upon Request
Not Recommended

Triangle Inserts
Negative (TNGN)



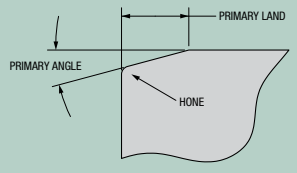
Shape: Triangle	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
TNGN	TNGN-222	T2A	○	○	○	○	○	○	○	TNGN-110308	T2A	0.250	0.433	0.125	0.031
		A	○	○	○	○	○	○	○		A	0.250	0.433	0.125	0.031
	TNGN-321	T1	○	○	○	○	○		○	TNGN-160304	T1	0.375	0.650	0.125	0.015
	TNGN-322	T1	○	○	○	○	○		○	TNGN-160308	T1	0.375	0.650	0.125	0.031
		T2	○	○	○	○	○		○		T2	0.375	0.650	0.125	0.031
		T2A	○	○	○	○	○	○	○		T2A	0.375	0.650	0.125	0.031
	TNGN-331	T1	○	○	○	○	○		○	TNGN-160404	T1	0.375	0.650	0.187	0.015
		T2	○	○	○	○	○		○		T2	0.375	0.650	0.187	0.015
	TNGN-332	T1	○	○	○	○	○		○	TNGN-160408	T1	0.375	0.650	0.187	0.031
		T2	○	○	○	○	○		○		T2	0.375	0.650	0.187	0.031
		T2A	●	○	○	○	○	○	○		T2A	0.375	0.650	0.187	0.031
	TNGN-333	T1	○	○	○	○	○		○	TNGN-160412	T1	0.375	0.650	0.187	0.047
		T2A	●	○	○	○	○	○	○		T2A	0.375	0.650	0.187	0.047
	TNGN-334	T1	○	○	○	○	○		○	TNGN-160416	T1	0.375	0.650	0.187	0.062
	TNGN-431	T1	●	○	○	○	○		○	TNGN-220404	T1	0.500	0.866	0.187	0.015
	TNGN-432	T1	●	○	○	○	○		○	TNGN-220408	T1	0.500	0.866	0.187	0.031
		T2A	●	○	○	○	○	●	○		T2A	0.500	0.866	0.187	0.031
		A	○	○	○	○	○	○	○		A	0.500	0.866	0.187	0.031
	TNGN-433	T1	●	○	●	○	○		○	TNGN-220412	T1	0.500	0.866	0.187	0.047
	TNGN-434	T1	●	○	●	○	○		○	TNGN-220416	T1	0.500	0.866	0.187	0.062
	TNGN-438	T2A	○	○	○	○	○	○	○	TNGN-220432	T2A	0.500	0.866	0.187	0.125
	TNGN-452	T2A	○	○	○	○	○	○	○	TNGN-220708	T2A	0.500	0.866	0.312	0.031
	TNGN-453	T1	●	○	○	○	○		○	TNGN-220712	T1	0.500	0.866	0.312	0.047
		T2A	○	○	○	○	○	○	○		T2A	0.500	0.866	0.312	0.047
	TNGN-454	T1	●	○	○	○	○		○	TNGN-220716	T1	0.500	0.866	0.312	0.062
		T2A	○	○	○	○	○	○	○		T2A	0.500	0.866	0.312	0.062
	TNGN-543	T2A	○	○	○	○	○	○	○	TNGN-270612	T2A	0.625	1.083	0.250	0.047
	TNGN-544	T1	○	○	○	○	○		○	TNGN-270616	T1	0.625	1.083	0.250	0.062
		T2	○	○	○	○	○		○		T2	0.625	1.083	0.250	0.062
	TNGN-548	T2	○	○	○	○	○		○	TNGN-270632	T2	0.625	1.083	0.250	0.125
	TNGN-666	T2A	○	○	○	○	○	○	○	TNGN-330924	T2A	0.750	1.299	0.375	0.094
	TNGN-868	T2A	○	○	○	○	○	○	○	TNGN-440932	T2A	1.000	1.732	0.375	0.125

Ceramic Classification

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3
Whisker Ceramic			Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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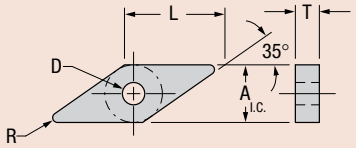
35° Diamond Inserts
Negative



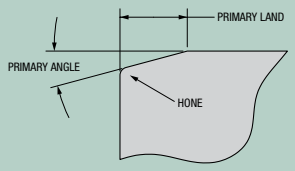
Shape: 35° Diamond	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	D	R
VNGA	VNGA-332	T1	●	❍	●	❍	❍		❍	VNGA-160408	T1	0.375	0.654	0.187	0.150	0.031
		T2A	❍	❍	❍	❍	❍	●	❍		T2A	0.375	0.654	0.187	0.150	0.031
	VNGA-333	T1	●	❍	●	❍	❍		❍	VNGA-160412	T1	0.375	0.654	0.187	0.150	0.047
	VNGA-432	T2A	●	❍	●	❍	❍	❍	❍	VNGA-220408	T2A	0.500	0.872	0.187	0.203	0.031
	VNGA-436	T1	●	❍	●	❍	❍		❍	VNGA-220424	T1	0.500	0.872	0.187	0.203	0.094

Ceramic Classification

WG-300 / WG-600 / WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



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● ● Stocked Standard
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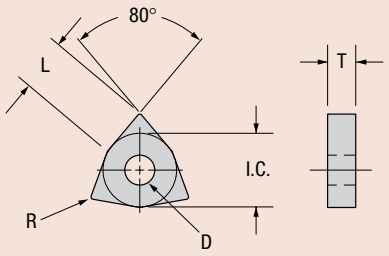
Not Recommended

Trigon Inserts
Negative



Shape: Trigon	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3–TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	D	R
WNGA	WNGA-331	T1	❍	❍	❍	❍	❍		❍	WNGA-060404	T1	0.375	0.257	0.187	0.152	0.015
	WNGA-332	T1	●	●	●	❍	❍		❍	WNGA-060408	T1	0.375	0.257	0.187	0.152	0.031
	WNGA-333	T1	❍	❍	❍	❍	❍		❍	WNGA-060412	T1	0.375	0.257	0.187	0.152	0.047
	WNGA-431	T1	●	❍	❍	❍	❍		❍	WNGA-080404	T1	0.500	0.342	0.187	0.203	0.015
		T1A	❍	❍	❍	❍	❍	❍	❍		T1A	0.500	0.342	0.187	0.203	0.015
	WNGA-432	T1	●	❍	●	❍	❍		❍	WNGA-080408	T1	0.500	0.342	0.187	0.203	0.031
		T1A	●	❍	❍	❍	❍	❍	❍		T1A	0.500	0.342	0.187	0.203	0.031
		T2A	●	❍	❍	❍	❍	❍	❍		T2A	0.500	0.342	0.187	0.203	0.031
	WNGA-433	T2	❍	❍	❍	❍	●		❍	WNGA-080412	T2	0.500	0.342	0.187	0.203	0.047
		T2A	❍	❍	❍	❍	❍	❍	❍		T2A	0.500	0.342	0.187	0.203	0.047

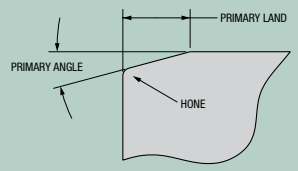
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3–TiC GEM-7	Al_2O_3 GEM-19

Page T 42 – grade description

Additional Edge Preps – page T 45



Not Recommended | Stocked or Available Upon Request ❍ ❍ | Stocked Standard ● ●

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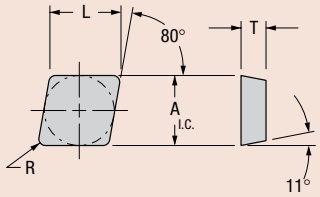
80° Diamond Inserts
Positive Flat Top



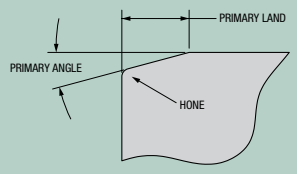
Shape: 80° Diamond	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
CPGN	CPGN-321	T1	●	❍	●	❍	❍		❍	CPGN-090304	T1	0.375	0.380	0.125	0.015
	CPGN-322	T1	●	❍	●	❍	❍		❍	CPGN-090308	T1	0.375	0.380	0.125	0.031
	CPGN-323	T1	❍	❍	❍	❍	❍		❍	CPGN-090312	T1	0.375	0.380	0.125	0.047
	CPGN-422	T1	❍	❍	❍	❍	❍		❍	CPGN-120308	T1	0.500	0.508	0.125	0.031
	CPGN-424	T2A	❍	❍	❍	❍	❍	❍	❍	CPGN-120316	T2A	0.500	0.508	0.125	0.062
	CPGN-432	T1	●	❍	●	❍	❍		❍	CPGN-120408	T1	0.500	0.508	0.187	0.031
	CPGN-433	T1	●	❍	●	❍	❍		❍	CPGN-120412	T1	0.500	0.508	0.187	0.047
		T1A	❍	❍	❍	●	❍	❍	❍		T1A	0.500	0.508	0.187	0.047
		T2	❍	❍	❍	❍	❍		❍		T2	0.500	0.508	0.187	0.047
		T2A	❍	❍	❍	❍	●	❍	❍		T2A	0.500	0.508	0.187	0.047
		A	❍	❍	❍	●	❍	❍	❍		A	0.500	0.508	0.187	0.047
	CPGN-434	T1	●	❍	●	❍	❍		❍	CPGN-120416	T1	0.500	0.508	0.187	0.062

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

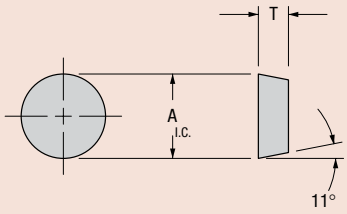
WG-300 · WG-600 · WG-700 · XSYTIN-1 (Phase Toughened) · GSN100 (Si_3N_4) · GEM-7 (Al_2O_3-TiC) · GEM-19 (Al_2O_3) — Whisker

Additional Edge Preps – page T 45



Page T 42 – grade description

Round Inserts
Positive Flat Top



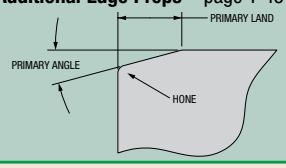
Shape: Round	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	T
RPGN	RPGN-32	T1	●	●	●	❍	●		❍	RPGN-090300	T1	0.375	0.125
		T1A	●	●	●	●	❍	❍	❍		T1A	0.375	0.125
		T2A	❍	❍	❍	❍	❍	❍	❍		T2A	0.375	0.125
		A	❍	❍	❍	●	❍	❍	❍		T2A	0.375	0.125
	RPGN-43	T1	●	❍	●	❍	●		❍	RPGN-120400	T1	0.500	0.187
		T1A	●	●	●	●	●	❍	❍		T1A	0.500	0.187
		T2	❍	❍	●	●	●		❍		T2	0.500	0.187
		T2A	●	❍	❍	❍	●	❍	❍		T2A	0.500	0.187
		A	❍	❍	❍	●	❍	❍	❍		A	0.500	0.187

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300 · WG-600 · WG-700 · XSYTIN-1 (Phase Toughened) · GSN100 (Si_3N_4) · GEM-7 (Al_2O_3-TiC) · GEM-19 (Al_2O_3) — Whisker

Additional Edge Preps – page T 45



Page T 42 – grade description

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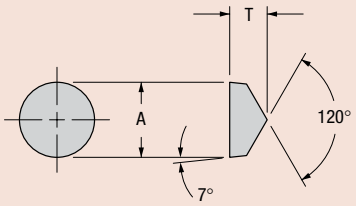
● ● Stocked Standard · ❍ ❍ Stocked or Available Upon Request · Not Recommended

Round V-Bottom Inserts
Positive (RCGN-V)



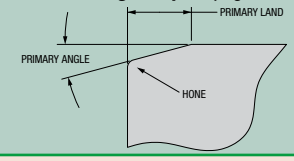
Shape: Round V-Bottom	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si₃N₄ GSN100	Al₂O₃-TiC GEM-7	Al₂O₃ GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	Dimensions (inches) T
RCGN	RCGN-2V	T1	●	●	●	●	○		○	RCGX-060400	T1	0.250	0.187
		T2A	●	○	○	○	○	●	○		T2A	0.250	0.187
		A	○	○	○	●	○	○	○		A	0.250	0.187
	RCGN-3V	T1	●	●	●	●	●		○	RCGX-090700	T1	0.375	0.312
		T1A	○	○	○	○	○	○	○		T1A	0.375	0.312
		T2A	●	○	○	○	○	●	○		T2A	0.375	0.312
		A	○	○	○	●	○	○	○		A	0.375	0.312
	RCGN-4V	T1	●	●	●	●	●		○	RCGX-120700	T1	0.500	0.312
		T1A	●	●	●	○	○	○	○		T1A	0.500	0.312
		T2	●	○	●	○	○		○		T2	0.500	0.312
		T2A	●	●	●	○	○	●	○		T2A	0.500	0.312
		A	○	○	○	●	○	○	○		A	0.500	0.312
	RCGN-6V	T2A	○	○	○	○	○	○	○	RCGX-191200	T2A	0.750	0.500

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

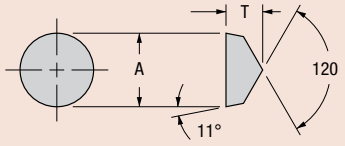
WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3

Additional Edge Preps – page T 45

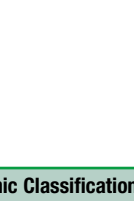


Page T 42 – grade description

Round V-Bottom Inserts
Positive (RPGN-V)



Shape: Round V-Bottom	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si₃N₄ GSN100	Al₂O₃-TiC GEM-7	Al₂O₃ GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	Dimensions (inches) T
RPGN	RPGN-2V	T1	●	●	●	●	○		○	RPGX-060400	T1	0.250	0.187
		T2	○	○	○	○	●	○	○		T2	0.250	0.187
		T2A	●	○	●	○	○	○	○		T2A	0.250	0.187
		A	○	○	○	●	○	○	○		A	0.250	0.187
	RPGN-3V	T1	●	●	●	●	○		○	RPGX-090700	T1	0.375	0.312
		T1A	○	○	○	○	●	○	○		T1A	0.375	0.312
		T2	○	○	○	○	●	○	○		T2	0.375	0.312
		T2A	●	●	●	○	○	○	○		T2A	0.375	0.312
		A	○	○	○	●	○	○	○		A	0.375	0.312
	RPGN-4V	T1	○	●	●	●	○		○	RPGX-120700	T1	0.500	0.312
		T1A	●	○	●	○	○	○	○		T1A	0.500	0.312
		T2	○	○	○	○	●		○		T2	0.500	0.312
		T2A	●	●	○	○	○	○	○		T2A	0.500	0.312
		A	○	○	○	●	○	○	○		A	0.500	0.312

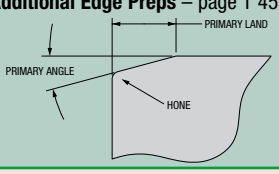


Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3

Additional Edge Preps – page T 45



Page T 42 – grade description

Not Recommended | Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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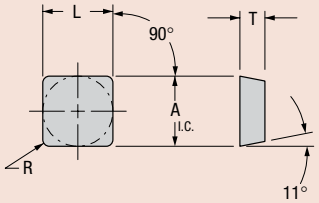
Square Inserts
Positive Flat Top



Shape: Square	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
SPGN	SPGN-322	T1	●	○	○	○	○		○	SPGN-090308	T1	0.375	0.375	0.125	0.031
		T1A	○	○	○	●	●		○		T1A	0.375	0.375	0.125	0.031
		A	○	○	○	●	○	○	○		A	0.375	0.375	0.125	0.031
	SPGN-422	T1	●	○	○	○	○		○	SPGN-120308	T1	0.500	0.500	0.125	0.031
		T2A	○	○	○	○	○	○	○		T2A	0.500	0.500	0.125	0.031
	SPGN-423	T1	○	○	○	○	○		○	SPGN-120312	T1	0.500	0.500	0.125	0.047
		A	○	○	○	○	○	○	○		A	0.500	0.500	0.125	0.047
	SPGN-432	T1	●	○	●	○	○		○	SPGN-120408	T1	0.500	0.500	0.187	0.031
		T1A	○	○	●	●	○		○		T1A	0.500	0.500	0.187	0.031
		T2	○	○	○	●	○	○	○		T2	0.500	0.500	0.187	0.031
		T2A	●	○	○	○	○	○	○		T2A	0.500	0.500	0.187	0.031
		A	○	○	○	●	○	○	○		A	0.500	0.500	0.187	0.031
	SPGN-433	T1	●	○	●	○	○			SPGN-120412	T1	0.500	0.500	0.187	0.047
		T1A	○	○	●	●	○		○		T1A	0.500	0.500	0.187	0.047
		T2	○	○	○	●	○	○	○		T2	0.500	0.500	0.187	0.047
		T2A	○	○	○	○	○	○	○		T2A	0.500	0.500	0.187	0.047
		A	○	○	○	●	○	○	○		A	0.500	0.500	0.187	0.047
	SPGN-434	T1	●	○	●	○	○		○	SPGN-120416	T1	0.500	0.500	0.187	0.062
		T2	○	○	○	○	○		○		T2	0.500	0.500	0.187	0.062
		T2A	●	○	○	○	●	○	○		T2A	0.500	0.500	0.187	0.062
	SPGN-632	T2A	○	○	○	○	○	○	○	SPGN-190408	T2A	0.750	0.750	0.187	0.031
	SPGN-633	T2A	○	○	○	○	○	○	○	SPGN-190412	T2A	0.750	0.750	0.187	0.047
	SPGN-634	T2A	○	○	○	○	○	○	○	SPGN-190416	T2A	0.750	0.750	0.187	0.062
	SPGN-642	T1A	○	○	○	○	○	○	○	SPGN-190608	T1A	0.750	0.750	0.250	0.031

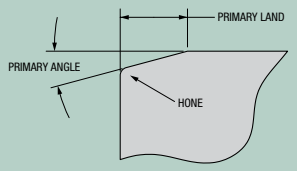
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



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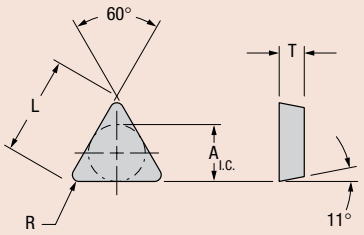
● Stocked Standard
○ Stocked or Available Upon Request
Not Recommended

Triangle Inserts
Positive Flat Top



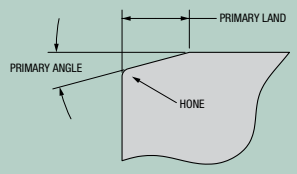
Shape: Triangle	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTiN-1	Si3N4 GSN100	Al2O3-TiC GEM-7	Al2O3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
TPGN	**TPGN-221**	T1	●	❍	●	❍		❍		**TPGN-110304**	T1	0.250	0.433	0.125	0.015
	TPGN-222	T1	●	❍	●	❍	❍		❍	**TPGN-110308**	T1	0.250	0.433	0.125	0.031
		T1A	●	❍	❍	❍	❍	❍	❍		T1A	0.250	0.433	0.125	0.031
		T2A	●	❍	❍	❍	❍	❍	❍		T2A	0.250	0.433	0.125	0.031
	TPGN-321	T1	●	❍	●	❍	❍		❍	**TPGN-160304**	T1	0.375	0.650	0.125	0.015
		T2A	❍	❍	❍	❍	❍	❍	❍		T2A	0.375	0.650	0.125	0.015
	TPGN-322	T1	●	❍	●	❍	❍		❍	**TPGN-160308**	T1	0.375	0.650	0.125	0.031
		T1A	❍	❍	❍	❍	❍	❍	❍		T1A	0.375	0.650	0.125	0.031
		T2A	●	❍	❍	❍	●	●	❍		T2A	0.375	0.650	0.125	0.031
		A	❍	❍	❍	❍	❍	❍	❍		A	0.375	0.650	0.125	0.031
	TPGN-323	T1	●	❍	●	❍	❍		❍	**TPGN-160312**	T1	0.375	0.650	0.125	0.047
		T1A	❍	❍	❍	❍	❍	●	❍		T1A	0.375	0.650	0.125	0.047
		A	❍	❍	❍	❍	❍	❍	❍		A	0.375	0.650	0.125	0.047
	TPGN-324	T1	●	❍	❍	❍	❍		❍	**TPGN-160316**	T1	0.375	0.650	0.125	0.062
	TPGN-431	T1	●	❍	●	❍	❍		❍	**TPGN-220404**	T1	0.500	0.866	0.187	0.015
	TPGN-432	T1	●	❍	●	❍	❍		❍	**TPGN-220408**	T1	0.500	0.866	0.187	0.031
		T2A	❍	❍	❍	❍	❍	❍	❍		T2A	0.500	0.866	0.187	0.031
	TPGN-433	T1	●	❍	●	❍	❍		❍	**TPGN-220412**	T1	0.500	0.866	0.187	0.047
	TPGN-434	T1	●	❍	●	❍	❍		❍	**TPGN-220416**	T1	0.500	0.866	0.187	0.062

Ceramic Classification

WG-300 / WG-600 / WG-700	XSYTiN-1	GSN100	GEM-7	GEM-19
Whisker	Phase Toughened	Si_3N_4	Al_2O_3-TiC	Al_2O_3
Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

Page T 42 – grade description

Additional Edge Preps – page T 45



Not Recommended | Stocked or Available Upon Request ❍ ❍ | Stocked Standard ● ●

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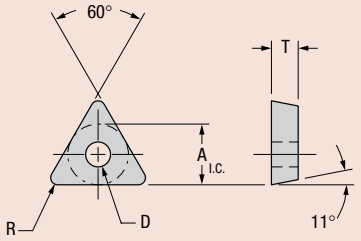
Triangle Inserts
Positive (TP)



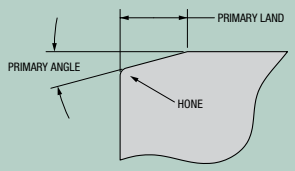
Shape: Triangle	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	T	D	R
TP	TP-41	A	●	❍	❍	❍	❍	❍	❍	TP-41	A	0.250	0.093	0.137	0.015
	TP-42	A	❍	❍	❍	❍	❍	❍	❍	TP-42	A	0.250	0.093	0.137	0.031
	TP-62	A	❍	❍	❍	❍	❍	❍	❍	TP-62	A	0.375	0.125	0.163	0.031
	TP-64	A	❍	❍	❍	❍	❍	❍	❍	TP-64	A	0.375	0.125	0.163	0.062
	TP-82	A	❍	❍	❍	❍	❍	❍	❍	TP-82	A	0.500	0.187	0.203	0.031

Ceramic Classification

Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC | Al_2O_3

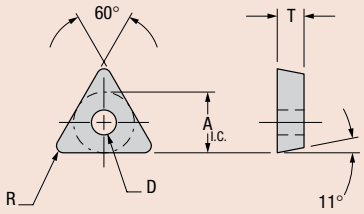
WG-300 WG-600 WG-700 XSYTIN-1 GSN100 GEM-7 GEM-19
Whisker | Phase Toughened | Si_3N_4 | Al_2O_3-TiC | Al_2O_3

Additional Edge Preps – page T 45



Page T 42 – grade description

Triangle Inserts
Positive (TPGA)



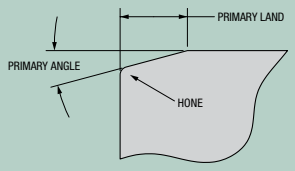
Shape: Triangle	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep	Dimensions (inches) A	T	R	D
TPGA	TPGA-321	T1	❍	❍	❍	❍	❍		❍	TPGA-160304	T1	0.375	0.125	0.015	0.150
		T1A	❍	❍	❍	❍	❍	❍	❍		T1A	0.375	0.125	0.015	0.150
	TPGA-322	T1A	❍	❍	❍	❍	❍	❍		TPGA-160308	T1A	0.375	0.125	0.031	0.150

Ceramic Classification

Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC | Al_2O_3

WG-300 WG-600 WG-700 XSYTIN-1 GSN100 GEM-7 GEM-19
Whisker | Phase Toughened | Si_3N_4 | Al_2O_3-TiC | Al_2O_3

Additional Edge Preps – page T 45



Page T 42 – grade description

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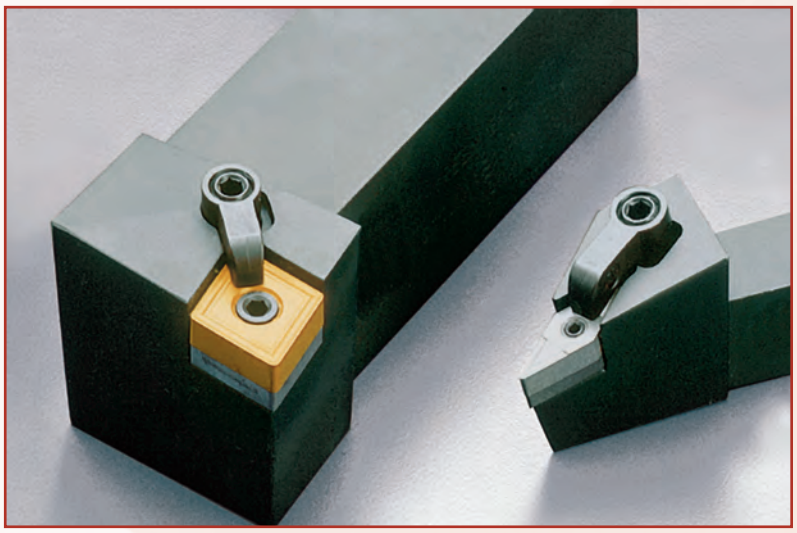
● ● Stocked Standard | ❍ ❍ Stocked or Available Upon Request | Not Recommended

Industry-Standard Toolholders

Greenleaf manufactures a complete line of industry-standard toolholders in conformance with ANSI specifications in 4140 and 4150 alloy steel, hardened up to 42 Rc and oxide coated.



Greenleaf Tune-Up Kits

A Tune-Up Kit consists of all the standard hardware to refurbish a particular toolholder, boring bar, or milling cutter. A toolholder will have a readily visible, laser-inscribed Tune-Up Kit number on it for ease in ordering. This number will prevent any confusion created by searching a catalog for hardware, and it will help reduce downtime.

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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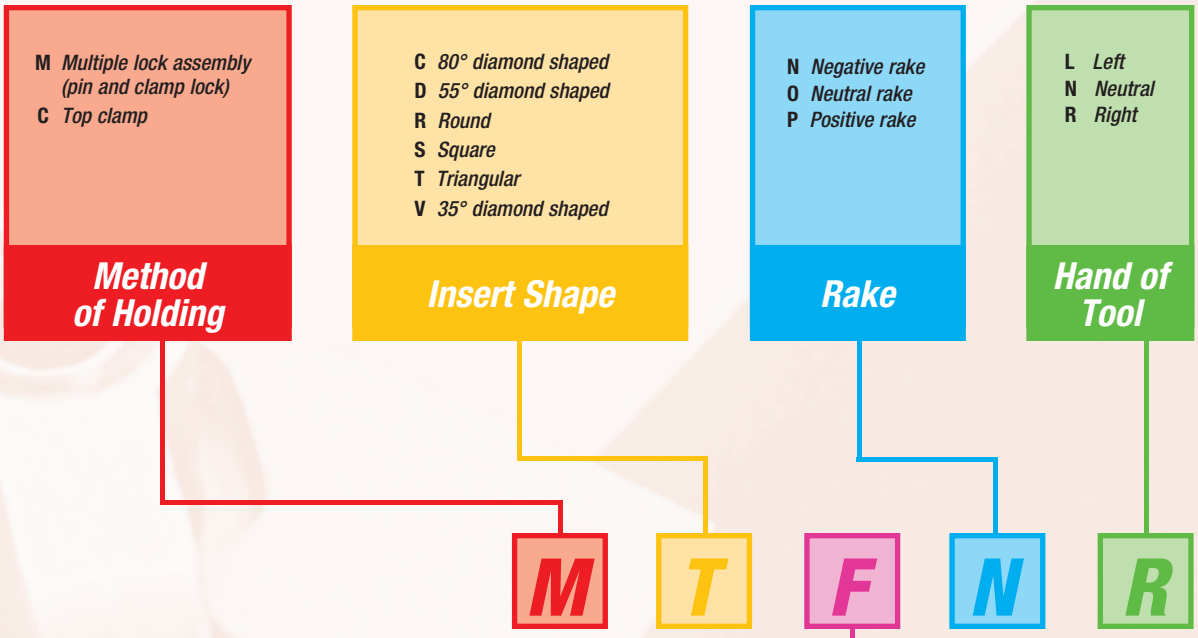
Industry-Standard Toolholder Identification System



Toolholder Style

- **A** *Straight shank with 0° (90°) side cutting edge angle*
- **B** *Straight shank with 15° (75°) side cutting edge angle*
- **C** *Straight shank with 0° (90°) end cutting edge angle*
- **D** *Straight shank with 45° side cutting edge angle*
- **E** *Straight shank with 30° (60°) side cutting edge angle*
- **F** *Offset shank with 0° (90°) end cutting edge angle*
- **G** *Offset shank with 0° (90°) side cutting edge angle*
- †**H** *Offset shank for I.D. threading and shallow grooving*
- †**I** *Offset shank with 27.5° (62.5°) end cutting edge angle*
- **J** *Offset shank with negative 3° (93°) side cutting edge angle*
- **K** *Offset shank with 15° (75°) end or side cutting edge angle*
- **L** *Offset shank with negative 5° (95°) end or side cutting edge angle*
- **M** *Straight shank with 50° (40°) side cutting edge angle*
- **N** *Straight shank with 27° (63°) side cutting edge angle*
- †**O** *Straight shank with centrally located round insert*
- **P** *Straight shank with 27.5° (62.5°) side cutting edge angle*
- **R** *Offset shank with 15° (75°) side cutting edge angle*
- **S** *Offset shank with 45° side cutting edge angle*
- †**T** *Offset shank with negative 27.5° (62.5°) side or end cutting edge angle*
- †**U** *Offset shank for deep grooving*
- †**V** *Offset shank with negative 17.5° (72.5°) side or end cutting edge angle*
- **W** *Offset shank with 10° (80°) side cutting edge angle*

NOTE:
The angles shown in parentheses are the angles as shown in the ANSI standard.
† Greenleaf standard.

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NOTE:
All toolholders are shipped qualified over insert gage radius to ±.003" on C and F dimensions as standard. Some toolholders are qualifiable on length only (C dimension).

All toolholders to be qualified other than above should be designated with the appropriate letter under heading "Shank Qualifications."

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Industry-Standard Toolholder Usage Reference Guide

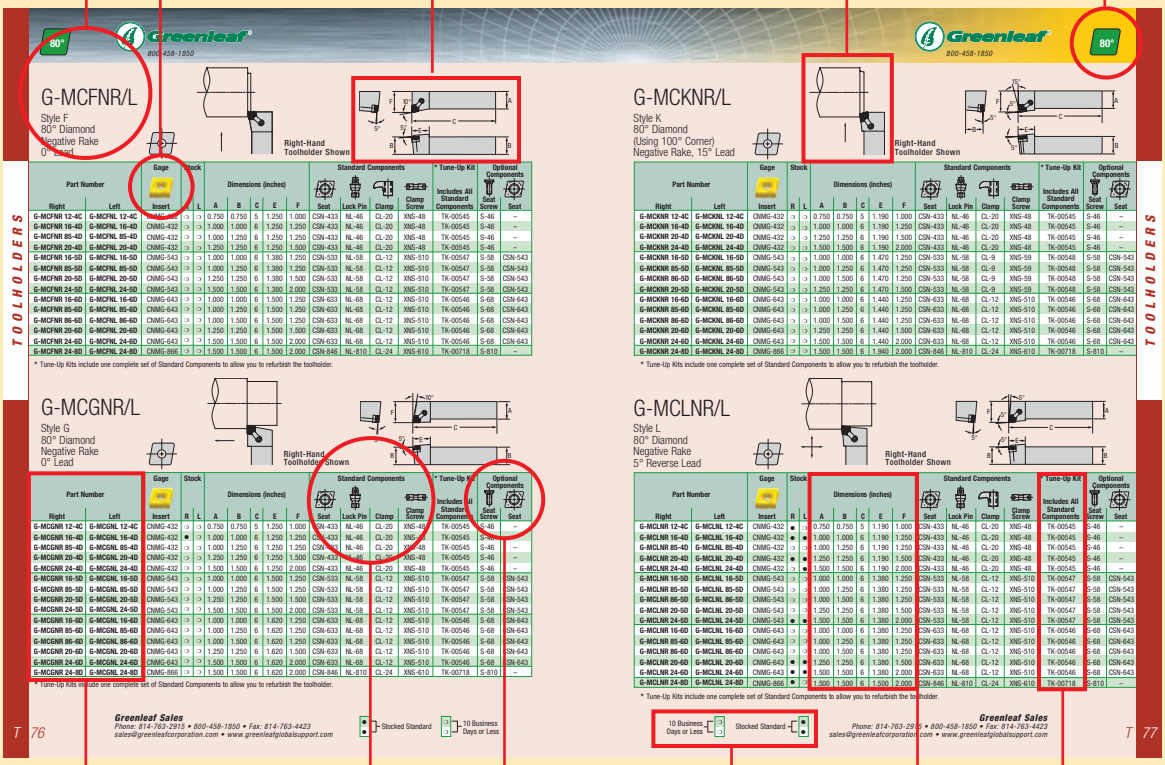
Toolholder Style

Toolholder Dimensions

Insert Type

Toolholder Application

Insert Geometry



Part Number

Optional Components

Stocking Program

Tune-up Kits

Standard Components

Dimensions

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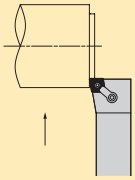
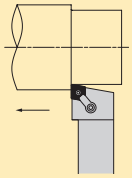
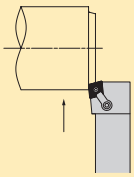
80° Diamond – Negative



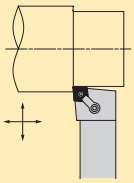
G-MCFNR/L
Style F
80° Diamond
Negative Rake
0° Lead
page: T 76



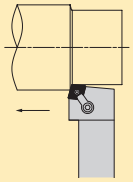
G-MCGNR/L
Style G
80° Diamond
Negative Rake
0° Lead
page: T 76



G-MCKNR/L
Style K
80° Diamond
(Using 100° Corner)
Negative Rake
15° Lead
page: T 77

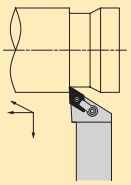


G-MCLNR/L
Style L
80° Diamond
Negative Rake
5° Reverse Lead
page: T 77

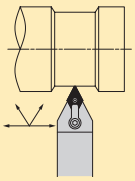


G-MCRNR/L
Style R
80° Diamond
(Using 100° Corner)
Negative Rake
15° Lead
page: T 78

55° Diamond – Negative

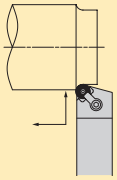


G-MDJNR/L
Style J
55° Diamond
Negative Rake
3° Reverse Lead
page: T 79

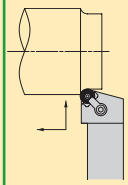


G-MDPNN
Style P
55° Diamond
Negative Rake
27° 30' Lead
page: T 79

Round – Negative

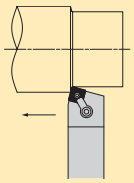


G-MRANR/L
Style A
Round
Negative Rake
page: T 80

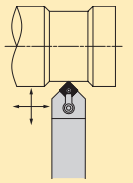


G-MRGNR/L
Style G
Round
Negative Rake
page: T 80

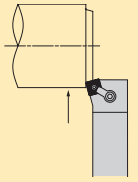
Square – Negative



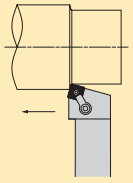
G-MSBNR/L
Style B
Square
Negative Rake
15° Lead
page: T 81



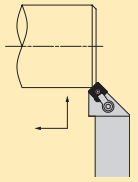
G-MSDNN
Style D
Square
Negative Rake
45° Lead
page: T 82



G-MSKNR/L
Style K
Square
Negative Rake
15° Lead
page: T 82

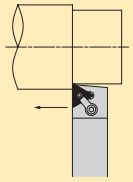


G-MSRNR/L
Style R
Square
Negative Rake
15° Lead
page: T 83



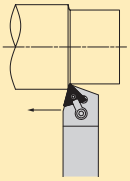
G-MSSNR/L
Style S
Square
Negative Rake
45° Lead
page: T 83

Triangle – Negative

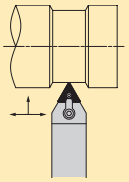


G-MTANR/L
Style A
Triangle
Negative Rake
0° Lead
page: T 84

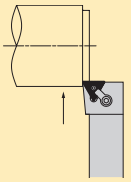
Triangle – Negative *contd.*



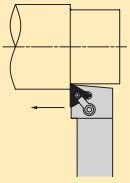
G-MTBNR/L
Style B
Triangle
Negative Rake
15° Lead
page: T 84



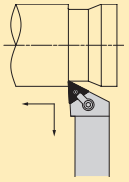
G-MTENNS
Style E
Triangle
Negative Rake
30° Lead
page: T 85



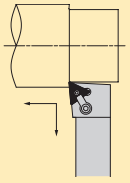
G-MTFNR/L
Style F
Triangle
Negative Rake
0° Lead
page: T 86



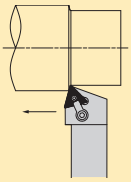
G-MTGNR/L
Style G
Triangle
Negative Rake
0° Lead
page: T 87



G-MTJNRS
Style J
Triangle
Negative Rake
3° Reverse Lead
page: T 87

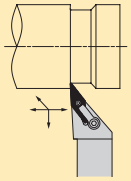


G-MTLNR/L
Style L
Triangle
Negative Rake
5° Reverse Lead
page: T 88

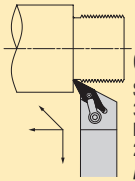


G-MTRNR/L
Style R
Triangle
Negative Rake
15° Lead
page: T 88

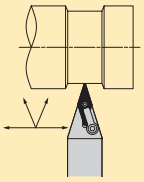
35° Diamond – Negative



G-MVJNR/L
Style J
35° Diamond
Negative Rake
3° Reverse Lead
page: T 89

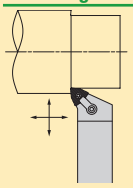


G-MVTNR/L
Style T
35° Diamond
Negative Rake
27° 30' Lead
page: T 89



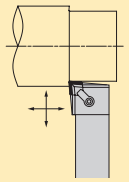
G-MVVNN
Style V
35° Diamond
Negative Rake
17°30' Reverse Lead
page: T 90

Trigon – Negative

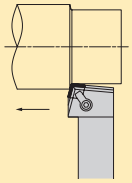


G-MWLNR/L
Style L
Trigon
Negative Rake
5° Reverse Lead
page: T 90

80° Diamond – Positive

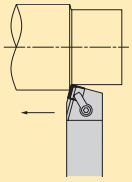


G-CCLPR/L
Style L
80° Diamond
Positive Rake
5° Reverse Lead
page: T 91

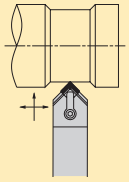


G-CCRPR/L
Style R
80° Diamond
(Using 100° Corner)
Positive Rake
15° Lead
page: T 91

Square – Positive

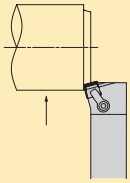


G-CSBPR/L
Style B
Square
Positive Rake
15° Lead
page: T 92



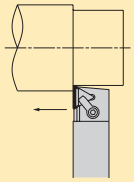
G-CSDPN
Style D
Square
Positive Rake
45° Lead
page: T 92

Square – Positive *contd.*

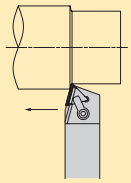


G-CSKPR/L
Style K
Square
Positive Rake
15° Lead
page: T 93

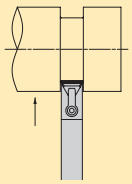
Triangle – Positive



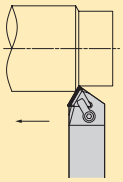
G-CTAPR/L
Style A
Triangle
Positive Rake
0° Lead
page: T 94



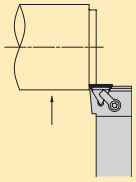
G-CTBPR/L
Style B
Triangle
Positive Rake
15° Lead
page: T 94



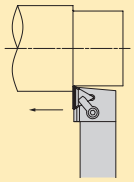
G-CTCPN
Style C
Triangle
Positive Rake
0° Lead
page: T 95



G-CTEOR/L
Style E
Triangle
Positive Rake
30° Lead
page: T 95

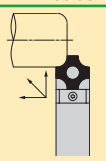


G-CTFPR/L
Style F
Triangle
Positive Rake
0° Lead
page: T 96



G-CTGPR/L
Style G
Triangle
Positive Rake
0° Lead
page: T 96

Radius Forming



GSRN
Style GSRN
page: T 97

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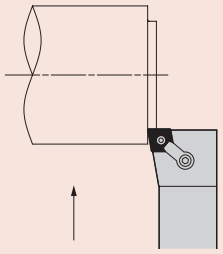
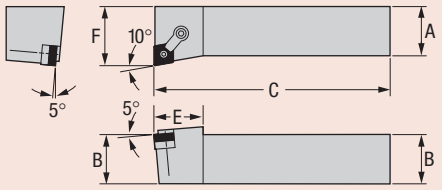
sales@greenleafcorporation.com • www.greenleafglobalsupport.com

G-MCFNR/L

Style F
80° Diamond
Negative Rake
0° Lead



Right-Hand
Toolholder Shown

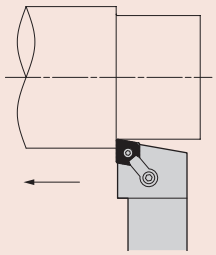


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MCFNR 12-4C	G-MCFNL 12-4C	CNMG-432	❍	❍	0.750	0.750	5	1.250	1.000	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCFNR 16-4D	G-MCFNL 16-4D	CNMG-432	❍	❍	1.000	1.000	6	1.250	1.250	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCFNR 85-4D	G-MCFNL 85-4D	CNMG-432	❍	❍	1.000	1.250	6	1.250	1.250	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCFNR 20-4D	G-MCFNL 20-4D	CNMG-432	❍	❍	1.250	1.250	6	1.250	1.500	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCFNR 16-5D	G-MCFNL 16-5D	CNMG-543	❍	❍	1.000	1.000	6	1.380	1.250	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCFNR 85-5D	G-MCFNL 85-5D	CNMG-543	❍	❍	1.000	1.250	6	1.380	1.250	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCFNR 20-5D	G-MCFNL 20-5D	CNMG-543	❍	❍	1.250	1.250	6	1.380	1.500	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCFNR 24-5D	G-MCFNL 24-5D	CNMG-543	❍	❍	1.500	1.500	6	1.380	2.000	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCFNR 16-6D	G-MCFNL 16-6D	CNMG-643	❍	❍	1.000	1.000	6	1.500	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCFNR 85-6D	G-MCFNL 85-6D	CNMG-643	❍	❍	1.000	1.250	6	1.500	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCFNR 86-6D	G-MCFNL 86-6D	CNMG-643	❍	❍	1.000	1.500	6	1.500	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCFNR 20-6D	G-MCFNL 20-6D	CNMG-643	❍	❍	1.250	1.250	6	1.500	1.500	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCFNR 24-6D	G-MCFNL 24-6D	CNMG-643	❍	❍	1.500	1.500	6	1.500	2.000	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCFNR 24-8D	G-MCFNL 24-8D	CNMG-866	❍	❍	1.500	1.500	6	1.500	2.000	CSN-846	NL-810	CL-24	XNS-610	TK-00718	S-810	–

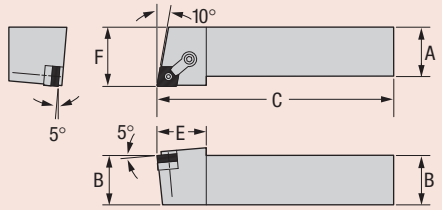
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-MCGNR/L

Style G
80° Diamond
Negative Rake
0° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MCGNR 12-4C	G-MCGNL 12-4C	CNMG-432	❍	❍	0.750	0.750	5	1.250	1.000	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCGNR 16-4D	G-MCGNL 16-4D	CNMG-432	●	❍	1.000	1.000	6	1.250	1.250	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCGNR 85-4D	G-MCGNL 85-4D	CNMG-432	❍	❍	1.000	1.250	6	1.250	1.250	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCGNR 20-4D	G-MCGNL 20-4D	CNMG-432	❍	❍	1.250	1.250	6	1.250	1.500	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCGNR 24-4D	G-MCGNL 24-4D	CNMG-432	❍	❍	1.500	1.500	6	1.250	2.000	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCGNR 16-5D	G-MCGNL 16-5D	CNMG-543	❍	❍	1.000	1.000	6	1.500	1.250	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCGNR 85-5D	G-MCGNL 85-5D	CNMG-543	❍	❍	1.000	1.250	6	1.500	1.250	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCGNR 20-5D	G-MCGNL 20-5D	CNMG-543	❍	❍	1.250	1.250	6	1.500	1.500	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCGNR 24-5D	G-MCGNL 24-5D	CNMG-543	❍	❍	1.500	1.500	6	1.500	2.000	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCGNR 16-6D	G-MCGNL 16-6D	CNMG-643	❍	❍	1.000	1.000	6	1.500	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCGNR 85-6D	G-MCGNL 85-6D	CNMG-643	❍	❍	1.000	1.250	6	1.500	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCGNR 86-6D	G-MCGNL 86-6D	CNMG-643	❍	❍	1.000	1.500	6	1.500	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCGNR 20-6D	G-MCGNL 20-6D	CNMG-643	❍	❍	1.250	1.250	6	1.500	1.500	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCGNR 24-6D	G-MCGNL 24-6D	CNMG-643	❍	❍	1.500	1.500	6	1.500	2.000	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCGNR 24-8D	G-MCGNL 24-8D	CNMG-866	❍	❍	1.500	1.500	6	1.630	2.000	CSN-846	NL-810	CL-24	XNS-610	TK-00718	S-810	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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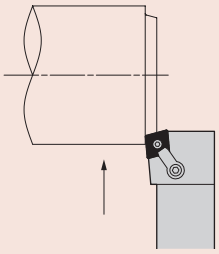
● ● Stocked Standard

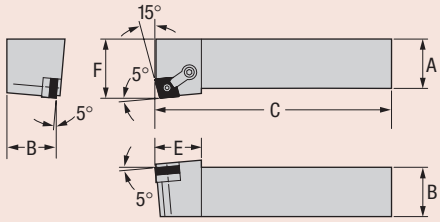
❍ ❍ 10 Business Days or Less

G-MCKNR/L

Style K
80° Diamond
(Using 100° Corner)
Negative Rake, 15° Lead



Right-Hand
Toolholder Shown

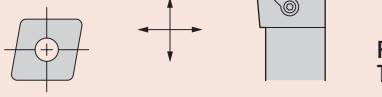


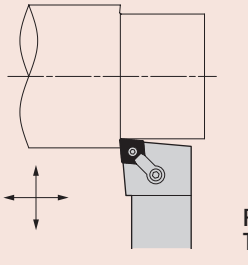
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MCKNR 12-4C	G-MCKNL 12-4C	CNMG-432	❍	❍	0.750	0.750	5	1.190	1.000	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCKNR 16-4D	G-MCKNL 16-4D	CNMG-432	❍	❍	1.000	1.000	6	1.190	1.250	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCKNR 20-4D	G-MCKNL 20-4D	CNMG-432	❍	❍	1.250	1.250	6	1.190	1.500	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCKNR 24-4D	G-MCKNL 24-4D	CNMG-432	❍	❍	1.500	1.500	6	1.190	2.000	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCKNR 16-5D	G-MCKNL 16-5D	CNMG-543	❍	❍	1.000	1.000	6	1.440	1.250	CSN-533	NL-58	CL-9	XNS-59	TK-00548	S-58	CSN-543
G-MCKNR 85-5D	G-MCKNL 85-5D	CNMG-543	❍	❍	1.000	1.250	6	1.440	1.250	CSN-533	NL-58	CL-9	XNS-59	TK-00548	S-58	CSN-543
G-MCKNR 86-5D	G-MCKNL 86-5D	CNMG-543	❍	❍	1.000	1.500	6	1.440	1.250	CSN-533	NL-58	CL-9	XNS-59	TK-00548	S-58	CSN-543
G-MCKNR 20-5D	G-MCKNL 20-5D	CNMG-543	❍	❍	1.250	1.250	6	1.440	1.500	CSN-533	NL-58	CL-9	XNS-59	TK-00548	S-58	CSN-543
G-MCKNR 16-6D	G-MCKNL 16-6D	CNMG-643	❍	❍	1.000	1.000	6	1.440	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCKNR 85-6D	G-MCKNL 85-6D	CNMG-643	❍	❍	1.000	1.250	6	1.440	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCKNR 86-6D	G-MCKNL 86-6D	CNMG-643	❍	❍	1.000	1.500	6	1.440	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCKNR 20-6D	G-MCKNL 20-6D	CNMG-643	❍	❍	1.250	1.250	6	1.440	1.500	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCKNR 24-6D	G-MCKNL 24-6D	CNMG-643	❍	❍	1.500	1.500	6	1.440	2.000	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCKNR 24-8D	G-MCKNL 24-8D	CNMG-866	❍	❍	1.500	1.500	6	1.940	2.000	CSN-846	NL-810	CL-24	XNS-610	TK-00718	S-810	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

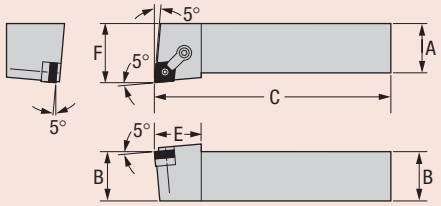
G-MCLNR/L

Style L
80° Diamond
Negative Rake
5° Reverse Lead





Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MCLNR 12-4C	G-MCLNL 12-4C	CNMG-432	●	❍	0.750	0.750	5	1.190	1.000	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCLNR 16-4D	G-MCLNL 16-4D	CNMG-432	●	●	1.000	1.000	6	1.190	1.250	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCLNR 85-4D	G-MCLNL 85-4D	CNMG-432	❍	❍	1.000	1.250	6	1.190	1.250	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCLNR 20-4D	G-MCLNL 20-4D	CNMG-432	●	●	1.250	1.250	6	1.190	1.500	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCLNR 24-4D	G-MCLNL 24-4D	CNMG-432	❍	●	1.500	1.500	6	1.190	2.000	CSN-433	NL-46	CL-20	XNS-48	TK-00545	S-46	–
G-MCLNR 16-5D	G-MCLNL 16-5D	CNMG-543	❍	❍	1.000	1.000	6	1.380	1.250	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCLNR 85-5D	G-MCLNL 85-5D	CNMG-543	❍	❍	1.000	1.250	6	1.380	1.250	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCLNR 86-5D	G-MCLNL 86-5D	CNMG-543	❍	❍	1.000	1.500	6	1.380	1.250	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCLNR 20-5D	G-MCLNL 20-5D	CNMG-543	❍	❍	1.250	1.250	6	1.380	1.500	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCLNR 24-5D	G-MCLNL 24-5D	CNMG-543	●	●	1.500	1.500	6	1.380	2.000	CSN-533	NL-58	CL-12	XNS-510	TK-00547	S-58	CSN-543
G-MCLNR 16-6D	G-MCLNL 16-6D	CNMG-643	❍	❍	1.000	1.000	6	1.380	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCLNR 85-6D	G-MCLNL 85-6D	CNMG-643	❍	❍	1.000	1.250	6	1.380	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCLNR 86-6D	G-MCLNL 86-6D	CNMG-643	❍	❍	1.000	1.500	6	1.380	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCLNR 20-6D	G-MCLNL 20-6D	CNMG-643	●	●	1.250	1.250	6	1.380	1.500	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCLNR 24-6D	G-MCLNL 24-6D	CNMG-643	●	●	1.500	1.500	6	1.380	2.000	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCLNR 24-8D	G-MCLNL 24-8D	CNMG-866	●	❍	1.500	1.500	6	1.500	2.000	CSN-846	NL-810	CL-24	XNS-610	TK-00718	S-810	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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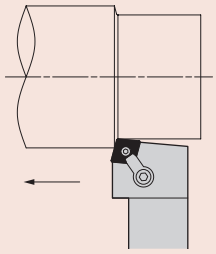
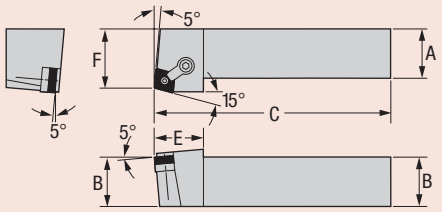
G-MCRNR/L

Style R
80° Diamond
(Using 100° Corner)
Negative Rake, 15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MCRNR 12-4C	**G-MCRNL 12-4C**	CNMG-432	❍	❍	0.750	0.750	5	1.250	1.000	CSN-433	NL-46	CL-9	XNS-59	TK-00549	S-46	–
G-MCRNR 16-4D	**G-MCRNL 16-4D**	CNMG-432	●	●	1.000	1.000	6	1.250	1.250	CSN-433	NL-46	CL-9	XNS-59	TK-00549	S-46	–
G-MCRNR 20-4D	**G-MCRNL 20-4D**	CNMG-432	❍	❍	1.250	1.250	6	1.250	1.500	CSN-433	NL-46	CL-9	XNS-59	TK-00549	S-46	–
G-MCRNR 24-4D	**G-MCRNL 24-4D**	CNMG-432	❍	❍	1.500	1.500	6	1.250	2.000	CSN-433	NL-46	CL-9	XNS-59	TK-00549	S-46	–
G-MCRNR 16-5D	**G-MCRNL 16-5D**	CNMG-543	❍	❍	1.000	1.000	6	1.340	1.250	CSN-533	NL-58	CL-9	XNS-510	TK-00550	S-58	CSN-543
G-MCRNR 85-5D	**G-MCRNL 85-5D**	CNMG-543	❍	❍	1.000	1.250	6	1.340	1.250	CSN-533	NL-58	CL-9	XNS-510	TK-00550	S-58	CSN-543
G-MCRNR 86-5D	**G-MCRNL 86-5D**	CNMG-543	❍	❍	1.000	1.500	6	1.340	1.250	CSN-533	NL-58	CL-9	XNS-510	TK-00550	S-58	CSN-543
G-MCRNR 20-5D	**G-MCRNL 20-5D**	CNMG-543	❍	❍	1.250	1.250	6	1.340	1.500	CSN-533	NL-58	CL-9	XNS-510	TK-00550	S-58	CSN-543
G-MCRNR 85-6D	**G-MCRNL 85-6D**	CNMG-643	❍	❍	1.000	1.250	6	1.480	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCRNR 86-6D	**G-MCRNL 86-6D**	CNMG-643	❍	❍	1.000	1.500	6	1.480	1.250	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCRNR 20-6D	**G-MCRNL 20-6D**	CNMG-643	❍	❍	1.250	1.250	6	1.480	1.500	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCRNR 24-6D	**G-MCRNL 24-6D**	CNMG-643	●	❍	1.500	1.500	6	1.480	2.000	CSN-633	NL-68	CL-12	XNS-510	TK-00546	S-68	CSN-643
G-MCRNR 24-8D	**G-MCRNL 24-8D**	CNMG-866	❍	❍	1.500	1.500	6	1.620	2.000	CSN-846	NL-810	CL-24	XNS-610	TK-00718	S-810	–

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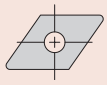
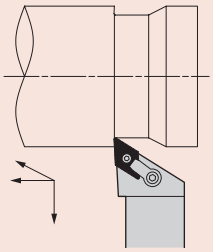
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

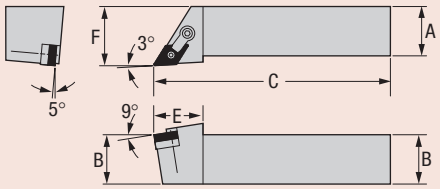
G-MDJNR/L

Style J
55° Diamond
Negative Rake
3° Reverse Lead





Right-Hand
Toolholder Shown

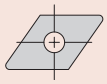


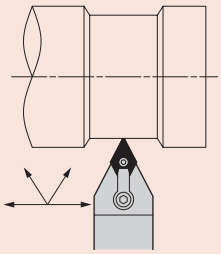
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MDJNR 12-4C	G-MDJNL 12-4C	DNMG-432	●	❍	0.750	0.750	5	1.380	1.000	DSN-433	NL-46	CL-20	XNS-48	TK-00551	S-46	DSN-423**
G-MDJNR 16-4D	G-MDJNL 16-4D	DNMG-432	●	●	1.000	1.000	6	1.380	1.250	DSN-433	NL-46	CL-20	XNS-48	TK-00551	S-46	DSN-423**
G-MDJNR 85-4D	G-MDJNL 85-4D	DNMG-432	❍	❍	1.000	1.250	6	1.380	1.250	DSN-433	NL-46	CL-20	XNS-48	TK-00551	S-46	DSN-423**
G-MDJNR 20-4D	G-MDJNL 20-4D	DNMG-432	●	●	1.250	1.250	6	1.380	1.500	DSN-433	NL-46	CL-20	XNS-48	TK-00551	S-46	DSN-423**
G-MDJNR 24-4D	G-MDJNL 24-4D	DNMG-432	●	●	1.500	1.500	6	1.380	2.000	DSN-433	NL-46	CL-20	XNS-48	TK-00551	S-46	DSN-423**
G-MDJNR 16-5D	G-MDJNL 16-5D	DNMG-543	❍	❍	1.000	1.000	6	1.470	1.250	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543
G-MDJNR 85-5D	G-MDJNL 85-5D	DNMG-543	❍	❍	1.000	1.250	6	1.470	1.250	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543
G-MDJNR 86-5D	G-MDJNL 86-5D	DNMG-543	❍	❍	1.000	1.500	6	1.470	1.250	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543
G-MDJNR 20-5D	G-MDJNL 20-5D	DNMG-543	●	❍	1.250	1.250	6	1.470	1.500	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543
G-MDJNR 24-5D	G-MDJNL 24-5D	DNMG-543	❍	❍	1.500	1.500	6	1.470	2.000	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** Cannot be used with lock pin.

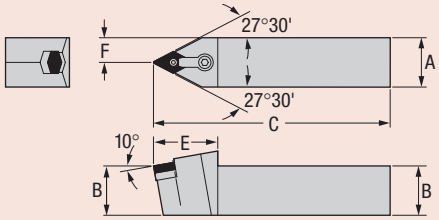
G-MDPNN

Style P
55° Diamond
Negative Rake
27° 30' Lead





Neutral
Toolholder Shown



Part Number		Gage	Stock	Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Neutral	Insert	N	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MDPNN 12-4C	DNMG-432	❍	0.750	0.750	5	1.620	0.375	DSN-433	NL-46	CL-12	XNS-510	TK-00553	S-46	DSN-423**
G-MDPNN 16-4D	DNMG-432	●	1.000	1.000	6	1.620	0.500	DSN-433	NL-46	CL-12	XNS-510	TK-00553	S-46	DSN-423**
G-MDPNN 85-4D	DNMG-432	❍	1.000	1.250	6	1.620	0.500	DSN-433	NL-46	CL-12	XNS-510	TK-00553	S-46	DSN-423**
G-MDPNN 20-4D	DNMG-432	●	1.250	1.250	6	1.620	0.625	DSN-433	NL-46	CL-12	XNS-510	TK-00553	S-46	DSN-423**
G-MDPNN 24-4D	DNMG-432	❍	1.500	1.500	6	1.620	0.750	DSN-433	NL-46	CL-12	XNS-510	TK-00553	S-46	DSN-423**
G-MDPNN 16-5D	DNMG-543	❍	1.000	1.000	6	1.920	0.500	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543
G-MDPNN 85-5D	DNMG-543	❍	1.000	1.250	6	1.920	0.500	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543
G-MDPNN 86-5D	DNMG-543	❍	1.000	1.500	6	1.920	0.500	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543
G-MDPNN 20-5D	DNMG-543	❍	1.250	1.250	6	1.920	0.625	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543
G-MDPNN 24-5D	DNMG-543	●	1.500	1.500	6	1.920	0.750	DSN-533	NL-58	CL-12	XNS-510	TK-00552	S-58	DSN-543

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** Cannot be used with lock pin.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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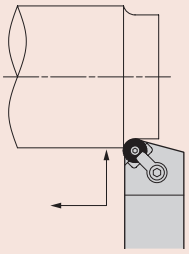
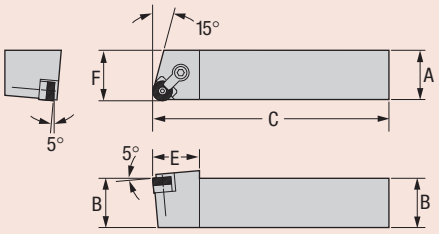
G-MRANR/L

Style A
Round
Negative Rake



Right-Hand
Toolholder Shown

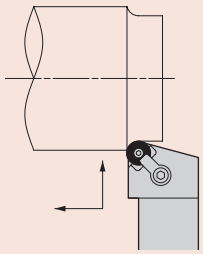


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MRANR 16-4D	G-MRANL 16-4D	RNMG-43	❍	❍	1.000	1.000	6	1.190	1.031	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRANR 85-4D	G-MRANL 85-4D	RNMG-43	❍	❍	1.000	1.250	6	1.190	1.031	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRANR 86-4D	G-MRANL 86-4D	RNMG-43	❍	❍	1.000	1.500	6	1.190	1.031	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRANR 20-4D	G-MRANL 20-4D	RNMG-43	❍	❍	1.250	1.250	6	1.190	1.281	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRANR 16-5D	G-MRANL 16-5D	RNMG-54	❍	❍	1.000	1.000	6	1.300	1.031	RSN-53	NL-58	CL-9	XNS-59	TK-00555	S-58	–
G-MRANR 85-5D	G-MRANL 85-5D	RNMG-54	❍	❍	1.000	1.250	6	1.300	1.031	RSN-53	NL-58	CL-9	XNS-59	TK-00555	S-58	–
G-MRANR 20-5D	G-MRANL 20-5D	RNMG-54	❍	❍	1.250	1.250	6	1.300	1.281	RSN-53	NL-58	CL-9	XNS-59	TK-00555	S-58	–
G-MRANR 16-6D	G-MRANL 16-6D	RNMG-64	❍	❍	1.000	1.000	6	1.560	1.031	RSN-63	NL-68	CL-12	XNS-59	TK-00556	S-68	–
G-MRANR 85-6D	G-MRANL 85-6D	RNMG-64	❍	❍	1.000	1.250	6	1.560	1.031	RSN-63	NL-68	CL-12	XNS-59	TK-00556	S-68	–
G-MRANR 20-6D	G-MRANL 20-6D	RNMG-64	❍	❍	1.250	1.250	6	1.560	1.281	RSN-63	NL-68	CL-12	XNS-59	TK-00556	S-68	–
G-MRANR 24-8D	G-MRANL 24-8D	RNMG-86	❍	❍	1.500	1.500	6	1.700	1.531	RSN-84	NL-810	CL-24	XNS-610	TK-00557	S-810	–

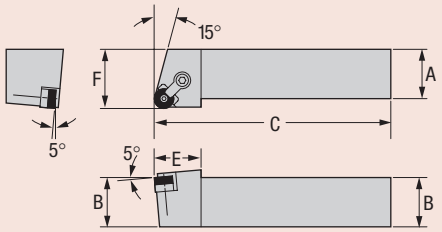
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-MRGNR/L

Style G
Round
Negative Rake



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MRGNR 12-3C	G-MRGNL 12-3C	RNMG-32	❍	❍	0.750	0.750	5	1.000	1.000	–	NL-33	CL-6	XNS-36	TK-00740	–	–
G-MRGNR 12-4C	G-MRGNL 12-4C	RNMG-43	❍	❍	0.750	0.750	5	1.190	1.000	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRGNR 16-4D	G-MRGNL 16-4D	RNMG-43	●	●	1.000	1.000	6	1.190	1.250	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRGNR 85-4D	G-MRGNL 85-4D	RNMG-43	●	●	1.000	1.250	6	1.190	1.250	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRGNR 86-4D	G-MRGNL 86-4D	RNMG-43	❍	❍	1.000	1.500	6	1.190	1.250	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRGNR 20-4D	G-MRGNL 20-4D	RNMG-43	●	●	1.250	1.250	6	1.190	1.500	IRSN-43	NL-46	CL-9	XNS-59	TK-00554	S-46	IRSN-44
G-MRGNR 16-5D	G-MRGNL 16-5D	RNMG-54	❍	❍	1.000	1.000	6	1.380	1.250	RSN-53	NL-58	CL-9	XNS-59	TK-00555	S-58	–
G-MRGNR 85-5D	G-MRGNL 85-5D	RNMG-54	❍	❍	1.000	1.250	6	1.380	1.250	RSN-53	NL-58	CL-9	XNS-59	TK-00555	S-58	–
G-MRGNR 20-5D	G-MRGNL 20-5D	RNMG-54	❍	❍	1.250	1.250	6	1.380	1.500	RSN-53	NL-58	CL-9	XNS-59	TK-00555	S-58	–
G-MRGNR 16-6D	G-MRGNL 16-6D	RNMG-64	❍	❍	1.000	1.000	6	1.520	1.250	RSN-63	NL-68	CL-12	XNS-59	TK-00556	S-68	–
G-MRGNR 85-6D	G-MRGNL 85-6D	RNMG-64	❍	❍	1.000	1.250	6	1.520	1.250	RSN-63	NL-68	CL-12	XNS-59	TK-00556	S-68	–
G-MRGNR 20-6D	G-MRGNL 20-6D	RNMG-64	●	●	1.250	1.250	6	1.520	1.500	RSN-63	NL-68	CL-12	XNS-59	TK-00556	S-68	–
G-MRGNR 24-8D	G-MRGNL 24-8D	RNMG-86	❍	❍	1.500	1.500	6	1.700	2.000	RSN-84	NL-810	CL-24	XNS-610	TK-00557	S-810	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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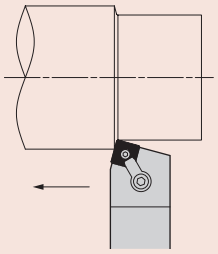
● ● Stocked Standard

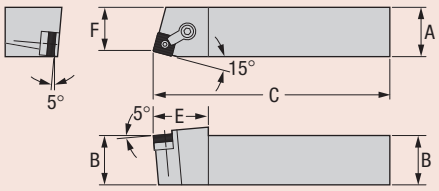
❍ ❍ 10 Business Days or Less

G-MSBNR/L

Style B
Square
Negative Rake
15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MSBNR 8-3C	G-MSBNL 8-3C	SNMG-322	❍	❍	0.500	0.500	5	1.060	0.500	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSBNR 10-3C	G-MSBNL 10-3C	SNMG-322	❍	❍	0.625	0.625	5	1.060	0.500	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSBNR 12-3C	G-MSBNL 12-3C	SNMG-322	❍	❍	0.750	0.750	5	1.060	0.625	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSBNR 16-3D	G-MSBNL 16-3D	SNMG-322	❍	❍	1.000	1.000	6	1.060	0.875	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSBNR 12-4C	G-MSBNL 12-4C	SNMG-432	❍	❍	0.750	0.750	5	1.410	0.750	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSBNR 16-4D	G-MSBNL 16-4D	SNMG-432	❍	❍	1.000	1.000	6	1.410	0.843	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSBNR 85-4D	G-MSBNL 85-4D	SNMG-432	❍	❍	1.000	1.250	6	1.410	0.843	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSBNR 20-4D	G-MSBNL 20-4D	SNMG-432	❍	❍	1.250	1.250	6	1.410	1.093	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSBNR 16-5D	G-MSBNL 16-5D	SNMG-543	❍	❍	1.000	1.000	6	1.560	0.828	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSBNR 85-5D	G-MSBNL 85-5D	SNMG-543	❍	❍	1.000	1.250	6	1.560	0.828	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSBNR 20-5D	G-MSBNL 20-5D	SNMG-543	❍	❍	1.250	1.250	6	1.560	1.078	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSBNR 24-5D	G-MSBNL 24-5D	SNMG-543	❍	❍	1.500	1.500	6	1.560	1.328	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSBNR 20-6D	G-MSBNL 20-6D	SNMG-643	❍	❍	1.250	1.250	6	1.590	1.031	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSBNR 24-6D	G-MSBNL 24-6D	SNMG-643	❍	❍	1.500	1.500	6	1.590	1.281	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSBNR 24-8D	G-MSBNL 24-8D	SNMG-866	❍	❍	1.500	1.500	6	1.970	1.250	SSN-844	NL-810	CL-24	XNS-610	TK-00714	S-810	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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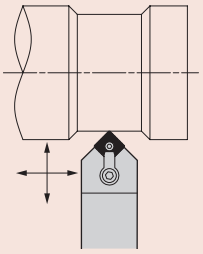
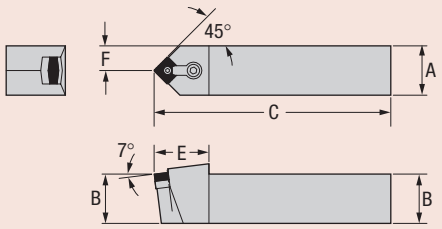
G-MSDNN

Style D
Square
Negative Rake
45° Lead



Neutral
Toolholder Shown

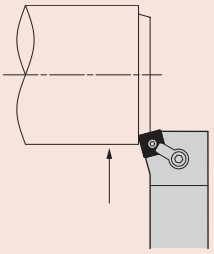


Part Number	Gage	Stock	Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Neutral	Insert	N	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MSDNN 8-3C	SNMG-322	❍	0.500	0.500	5	1.140	0.250	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSDNN 10-3C	SNMG-322	❍	0.625	0.625	5	1.140	0.312	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSDNN 12-3C	SNMG-322	❍	0.750	0.750	5	1.140	0.375	ISSN-322	NL-34L	CL-6	XNS-36	TK-00761	S-34	–
G-MSDNN 12-4C	SNMG-432	❍	0.750	0.750	5	1.390	0.375	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSDNN 16-4D	SNMG-432	●	1.000	1.000	6	1.390	0.500	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSDNN 85-4D	SNMG-432	❍	1.000	1.250	6	1.390	0.500	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSDNN 20-4D	SNMG-432	●	1.250	1.250	6	1.390	0.625	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSDNN 16-5D	SNMG-543	❍	1.000	1.000	6	1.610	0.500	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSDNN 85-5D	SNMG-543	❍	1.000	1.250	6	1.610	0.500	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSDNN 86-5D	SNMG-543	❍	1.000	1.500	6	1.610	0.500	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSDNN 20-5D	SNMG-543	❍	1.250	1.250	6	1.610	0.625	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSDNN 24-5D	SNMG-543	❍	1.500	1.500	6	1.610	0.750	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSDNN 85-6D	SNMG-643	❍	1.000	1.250	6	1.730	0.500	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSDNN 20-6D	SNMG-643	●	1.250	1.250	6	1.730	0.625	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSDNN 24-6D	SNMG-643	●	1.500	1.500	6	1.730	0.750	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSDNN 24-8D	SNMG-866	●	1.500	1.500	6	2.230	0.750	SSN-844	NL-810	CL-24	XNS-610	TK-00714	S-810	–

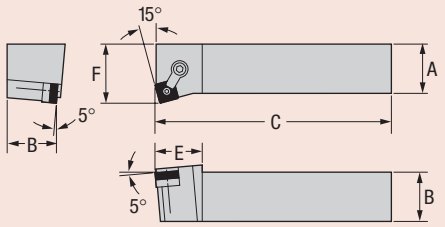
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-MSKNR/L

Style K
Square
Negative Rake
15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MSKNR 8-3C	G-MSKNL 8-3C	SNMG-322	❍	❍	0.500	0.500	5	1.000	0.625	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSKNR 10-3C	G-MSKNL 10-3C	SNMG-322	❍	❍	0.625	0.625	5	1.000	0.750	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSKNR 12-3C	G-MSKNL 12-3C	SNMG-322	❍	❍	0.750	0.750	5	1.000	0.875	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSKNR 16-3D	G-MSKNL 16-3D	SNMG-322	❍	❍	1.000	1.000	6	1.000	1.125	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSKNR 12-4C	G-MSKNL 12-4C	SNMG-432	❍	❍	0.750	0.750	5	1.220	1.000	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSKNR 16-4D	G-MSKNL 16-4D	SNMG-432	●	●	1.000	1.000	6	1.220	1.250	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSKNR 85-4D	G-MSKNL 85-4D	SNMG-432	❍	❍	1.000	1.250	6	1.220	1.250	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSKNR 20-4D	G-MSKNL 20-4D	SNMG-432	❍	❍	1.250	1.250	6	1.220	1.500	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSKNR 16-5D	G-MSKNL 16-5D	SNMG-543	❍	❍	1.000	1.000	6	1.440	1.250	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSKNR 85-5D	G-MSKNL 85-5D	SNMG-543	❍	❍	1.000	1.250	6	1.440	1.250	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSKNR 20-5D	G-MSKNL 20-5D	SNMG-543	❍	❍	1.250	1.250	6	1.440	1.500	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSKNR 85-6D	G-MSKNL 85-6D	SNMG-643	❍	❍	1.000	1.250	6	1.550	1.250	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSKNR 20-6D	G-MSKNL 20-6D	SNMG-643	❍	❍	1.250	1.250	6	1.550	1.500	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSKNR 24-6D	G-MSKNL 24-6D	SNMG-643	❍	❍	1.500	1.500	6	1.550	2.000	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSKNR 24-8D	G-MSKNL 24-8D	SNMG-866	❍	❍	1.500	1.500	6	1.970	2.000	SSN-844	NL-810	CL-24	XNS-610	TK-00714	S-810	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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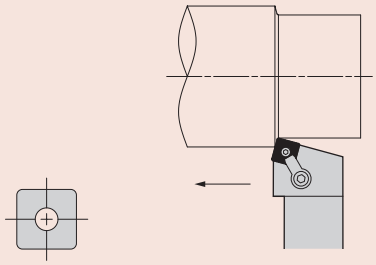
● ● Stocked Standard

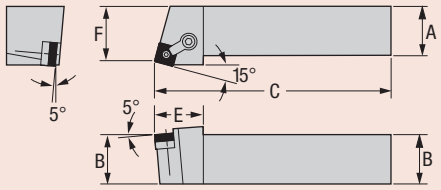
❍ ❍ 10 Business Days or Less

G-MSRNR/L

Style R
Square
Negative Rake
15° Lead



Right-Hand
Toolholder Shown

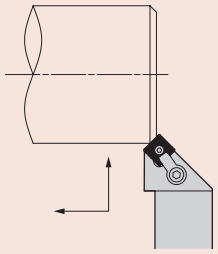


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MSRNR 8-3C	G-MSRNL 8-3C	SNMG-322	❍	❍	0.500	0.500	5	1.060	0.656	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSRNR 10-3C	G-MSRNL 10-3C	SNMG-322	❍	❍	0.625	0.625	5	1.060	0.781	ISSN-322	NL-34	CL-6	XNS-36	TK-00561	S-34	–
G-MSRNR 12-3C	G-MSRNL 12-3C	SNMG-322	❍	❍	0.750	0.750	5	1.060	0.906	ISSN-322	NL-34L	CL-6	XNS-36	TK-00761	S-34	–
G-MSRNR 12-4C	G-MSRNL 12-4C	SNMG-432	❍	❍	0.750	0.750	5	1.230	0.875	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSRNR 16-4D	G-MSRNL 16-4D	SNMG-432	●	●	1.000	1.000	6	1.230	1.125	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSRNR 85-4D	G-MSRNL 85-4D	SNMG-432	❍	❍	1.000	1.250	6	1.230	1.125	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSRNR 20-4D	G-MSRNL 20-4D	SNMG-432	●	●	1.250	1.250	6	1.230	1.375	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSRNR 16-5D	G-MSRNL 16-5D	SNMG-543	❍	❍	1.000	1.000	6	1.470	1.093	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSRNR 85-5D	G-MSRNL 85-5D	SNMG-543	❍	❍	1.000	1.250	6	1.470	1.093	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSRNR 20-5D	G-MSRNL 20-5D	SNMG-543	❍	❍	1.250	1.250	6	1.470	1.343	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSRNR 24-5D	G-MSRNL 24-5D	SNMG-543	❍	❍	1.500	1.500	6	1.470	1.843	SSN-533	NL-58	CL-12	XNS-510	TK-00559	S-58	ISSN-543
G-MSRNR 85-6D	G-MSRNL 85-6D	SNMG-643	❍	❍	1.000	1.250	6	1.500	1.062	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSRNR 86-6D	G-MSRNL 86-6D	SNMG-643	❍	❍	1.000	1.500	6	1.500	1.062	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSRNR 20-6D	G-MSRNL 20-6D	SNMG-643	●	●	1.250	1.250	6	1.500	1.312	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSRNR 24-6D	G-MSRNL 24-6D	SNMG-643	●	❍	1.500	1.500	6	1.500	1.812	ISSN-633	NL-68	CL-12	XNS-510	TK-00560	S-68	ISSN-643
G-MSRNR 24-8D	G-MSRNL 24-8D	SNMG-866	❍	❍	1.500	1.500	6	1.620	1.765	SSN-844	NL-810	CL-24	XNS-610	TK-00714	S-810	–

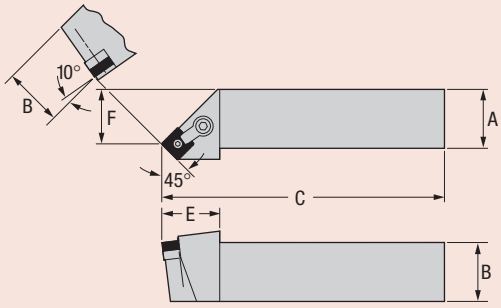
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-MSSNR/L

Style S
Square
Negative Rake
45° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MSSNR 12-4C	G-MSSNL 12-4C	SNMG-432	❍	❍	0.750	0.750	5	1.230	0.656	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSSNR 16-4D	G-MSSNL 16-4D	SNMG-432	●	●	1.000	1.000	6	1.230	0.906	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSSNR 85-4D	G-MSSNL 85-4D	SNMG-432	❍	❍	1.000	1.250	6	1.230	0.906	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSSNR 20-4D	G-MSSNL 20-4D	SNMG-432	●	●	1.250	1.250	6	1.230	1.156	ISSN-433	NL-46	CL-9	XNS-59	TK-00558	S-46	ISSN-443
G-MSSNR 16-5D	G-MSSNL 16-5D	SNMG-543	❍	❍	1.000	1.000	6	1.380	0.828	SSN-533	NL-58	CL-9	XNS-510	TK-00562	S-58	ISSN-543
G-MSSNR 85-5D	G-MSSNL 85-5D	SNMG-543	❍	❍	1.000	1.250	6	1.380	0.828	SSN-533	NL-58	CL-9	XNS-510	TK-00562	S-58	ISSN-543
G-MSSNR 86-5D	G-MSSNL 86-5D	SNMG-543	❍	❍	1.000	1.500	6	1.380	0.828	SSN-533	NL-58	CL-9	XNS-510	TK-00562	S-58	ISSN-543
G-MSSNR 20-5D	G-MSSNL 20-5D	SNMG-543	❍	❍	1.250	1.250	6	1.380	1.078	SSN-533	NL-58	CL-9	XNS-510	TK-00562	S-58	ISSN-543
G-MSSNR 24-5D	G-MSSNL 24-5D	SNMG-543	❍	❍	1.500	1.500	6	1.380	1.328	SSN-533	NL-58	CL-9	XNS-510	TK-00562	S-58	ISSN-543
G-MSSNR 85-6D	G-MSSNL 85-6D	SNMG-643	❍	❍	1.000	1.250	6	1.480	0.750	ISSN-633	NL-68	CL-9	XNS-510	TK-00563	S-68	ISSN-643
G-MSSNR 86-6D	G-MSSNL 86-6D	SNMG-643	❍	❍	1.000	1.500	6	1.480	0.750	ISSN-633	NL-68	CL-9	XNS-510	TK-00563	S-68	ISSN-643
G-MSSNR 20-6D	G-MSSNL 20-6D	SNMG-643	❍	❍	1.250	1.250	6	1.480	1.000	ISSN-633	NL-68	CL-9	XNS-510	TK-00563	S-68	ISSN-643
G-MSSNR 24-6D	G-MSSNL 24-6D	SNMG-643	❍	❍	1.500	1.500	6	1.480	1.500	ISSN-633	NL-68	CL-9	XNS-510	TK-00563	S-68	ISSN-643

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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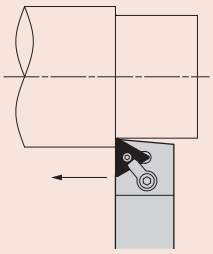
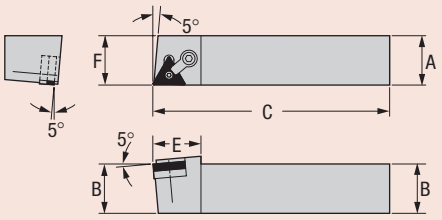
G-MTANR/L

Style A
Triangle
Negative Rake
0° Lead



Right-Hand
Toolholder Shown

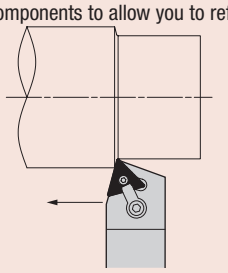


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MTANR 8-2C	G-MTANL 8-2C	TNMG-221	❍	❍	0.500	0.500	5	0.970	0.500	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTANR 10-2C	G-MTANL 10-2C	TNMG-221	❍	❍	0.625	0.625	5	0.970	0.625	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTANR 10-3C	G-MTANL 10-3C	TNMG-322	❍	❍	0.625	0.625	5	1.120	0.625	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTANR 12-3C	G-MTANL 12-3C	TNMG-322	❍	❍	0.750	0.750	5	1.120	0.750	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTANR 16-3D	G-MTANL 16-3D	TNMG-322	❍	❍	1.000	1.000	6	1.120	1.000	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTANR 85-3D	G-MTANL 85-3D	TNMG-322	❍	❍	1.000	1.250	6	1.120	1.000	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTANR 16-4D	G-MTANL 16-4D	TNMG-432	❍	❍	1.000	1.000	6	1.220	1.000	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTANR 85-4D	G-MTANL 85-4D	TNMG-432	❍	❍	1.000	1.250	6	1.220	1.000	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTANR 20-4D	G-MTANL 20-4D	TNMG-432	❍	❍	1.250	1.250	6	1.220	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTANR 24-4D	G-MTANL 24-4D	TNMG-432	❍	❍	1.500	1.500	6	1.220	1.500	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTANR 16-5D	G-MTANL 16-5D	TNMG-543	❍	❍	1.000	1.000	6	1.450	1.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTANR 85-5D	G-MTANL 85-5D	TNMG-543	❍	❍	1.000	1.250	6	1.450	1.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTANR 86-5D	G-MTANL 86-5D	TNMG-543	❍	❍	1.000	1.500	6	1.450	1.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTANR 20-5D	G-MTANL 20-5D	TNMG-543	❍	❍	1.250	1.250	6	1.450	1.250	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTANR 24-5D	G-MTANL 24-5D	TNMG-543	❍	❍	1.500	1.500	6	1.450	1.500	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTANR 24-6D	G-MTANL 24-6D	TNMG-663	❍	❍	1.500	1.500	6	1.480	1.500	TSN-637	NL-68L	CL-12	XNS-510	TK-00567	S-68	TSN-657

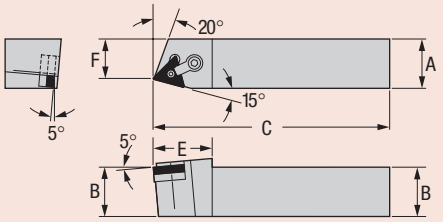
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** Cannot be used with lock pin.

G-MTBNR/L

Style B
Triangle
Negative Rake
15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MTBNR 8-2C	G-MTBNL 8-2C	TNMG-221	❍	❍	0.500	0.500	5	0.900	0.375	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTBNR 10-2C	G-MTBNL 10-2C	TNMG-221	❍	❍	0.625	0.625	5	0.900	0.500	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTBNR 10-3C	G-MTBNL 10-3C	TNMG-322	❍	❍	0.625	0.625	5	1.330	0.453	ITSN-333	NL-34L	CL-20	XNS-46	TK-00568	S-34	ITSN-323
G-MTBNR 12-3C	G-MTBNL 12-3C	TNMG-322	❍	❍	0.750	0.750	5	1.330	0.578	ITSN-333	NL-34L	CL-20	XNS-46	TK-00568	S-34	ITSN-323
G-MTBNR 16-3D	G-MTBNL 16-3D	TNMG-322	❍	❍	1.000	1.000	6	1.330	0.828	ITSN-333	NL-34L	CL-20	XNS-46	TK-00568	S-34	ITSN-323
G-MTBNR 85-3D	G-MTBNL 85-3D	TNMG-322	❍	❍	1.000	1.250	6	1.330	0.828	ITSN-333	NL-34L	CL-20	XNS-46	TK-00568	S-34	ITSN-323
G-MTBNR 16-4D	G-MTBNL 16-4D	TNMG-432	❍	❍	1.000	1.000	6	1.500	0.765	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTBNR 85-4D	G-MTBNL 85-4D	TNMG-432	❍	❍	1.000	1.250	6	1.500	0.765	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTBNR 20-4D	G-MTBNL 20-4D	TNMG-432	❍	❍	1.250	1.250	6	1.500	1.015	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTBNR 24-4D	G-MTBNL 24-4D	TNMG-432	❍	❍	1.500	1.500	6	1.500	1.265	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTBNR 16-5D	G-MTBNL 16-5D	TNMG-543	❍	❍	1.000	1.000	6	1.670	0.718	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTBNR 85-5D	G-MTBNL 85-5D	TNMG-543	❍	❍	1.000	1.250	6	1.670	0.718	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTBNR 20-5D	G-MTBNL 20-5D	TNMG-543	❍	❍	1.250	1.250	6	1.670	0.968	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTBNR 24-5D	G-MTBNL 24-5D	TNMG-543	❍	❍	1.500	1.500	6	1.670	1.218	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTBNR 24-6D	G-MTBNL 24-6D	TNMG-663	❍	❍	1.500	1.500	6	1.750	1.187	TSN-637	NL-68L	CL-12	XNS-510	TK-00567	S-68	TSN-657

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** Cannot be used with lock pin.

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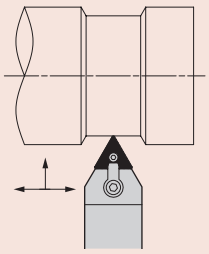
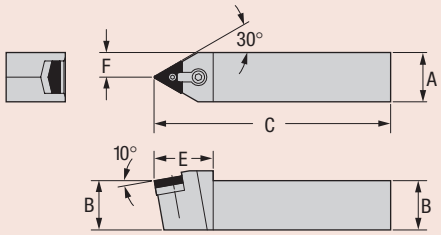
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

G-MTENNS

Style E
Triangle
Negative Rake
30° Lead



Neutral
Toolholder Shown



Part Number	Gage	Stock	Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Component	
Neutral	Insert	N	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MTENNS 8-2C	TNMG-221	❍	0.500	0.500	5	1.000	0.250	–	NL-23	CL-6	XNS-36	TK-00716	–	–
G-MTENNS 10-2C	TNMG-221	❍	0.625	0.625	5	1.000	0.312	–	NL-23	CL-6	XNS-36	TK-00716	–	–
G-MTENNS 10-3C	TNMG-322	❍	0.625	0.625	5	1.160	0.312	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTENNS 12-3C	TNMG-322	❍	0.750	0.750	5	1.160	0.375	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTENNS 16-3D	TNMG-322	❍	1.000	1.000	6	1.160	0.500	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTENNS 85-3D	TNMG-322	❍	1.000	1.250	6	1.160	0.500	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTENNS 12-4C	TNMG-432	❍	0.750	0.750	5	1.500	0.375	ITSN-433	NL-46	CL-9	XNS-59	TK-00725	S-46	–
G-MTENNS 16-4D	TNMG-432	●	1.000	1.000	6	1.500	0.500	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	–
G-MTENNS 85-4D	TNMG-432	❍	1.000	1.250	6	1.500	0.500	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	–
G-MTENNS 86-4D	TNMG-432	❍	1.000	1.500	6	1.500	0.500	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	–
G-MTENNS 20-4D	TNMG-432	❍	1.250	1.250	6	1.500	0.625	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	–
G-MTENNS 20-5D	TNMG-543	●	1.250	1.250	6	1.640	0.625	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	–
G-MTENNS 24-5D	TNMG-543	❍	1.500	1.500	6	1.640	0.750	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	–
G-MTENNS 24-6D	TNMG-663	❍	1.500	1.500	6	1.950	0.750	TSN-637	NL-68L	CL-12	XNS-510	TK-00567	S-68	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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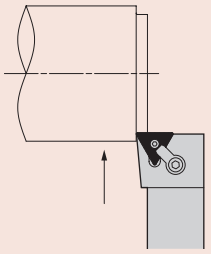
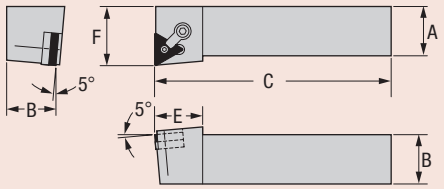
G-MTFNR/L

Style F
Triangle
Negative Rake
0° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MTFNR 8-2C	G-MTFNL 8-2C	TNMG-221	❍	❍	0.500	0.500	5	0.810	0.750	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTFNR 10-2C	G-MTFNL 10-2C	TNMG-221	❍	❍	0.625	0.625	5	0.810	0.875	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTFNR 10-3C	G-MTFNL 10-3C	TNMG-322	❍	❍	0.625	0.625	5	0.940	0.875	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTFNR 12-3C	G-MTFNL 12-3C	TNMG-322	❍	❍	0.750	0.750	5	0.940	1.000	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTFNR 16-3D	G-MTFNL 16-3D	TNMG-322	❍	❍	1.000	1.000	6	0.940	1.250	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTFNR 85-3D	G-MTFNL 85-3D	TNMG-322	❍	❍	1.000	1.250	6	0.940	1.250	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTFNR 20-3D	G-MTFNL 20-3D	TNMG-322	❍	❍	1.250	1.250	6	0.940	1.500	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTFNR 16-4D	G-MTFNL 16-4D	TNMG-432	●	●	1.000	1.000	6	1.220	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTFNR 85-4D	G-MTFNL 85-4D	TNMG-432	❍	❍	1.000	1.250	6	1.220	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTFNR 86-4D	G-MTFNL 86-4D	TNMG-432	❍	❍	1.000	1.500	6	1.220	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTFNR 20-4D	G-MTFNL 20-4D	TNMG-432	❍	❍	1.250	1.250	6	1.220	1.500	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTFNR 24-4D	G-MTFNL 24-4D	TNMG-432	❍	❍	1.500	1.500	6	1.220	2.000	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTFNR 16-5D	G-MTFNL 16-5D	TNMG-543	❍	❍	1.000	1.000	6	1.440	1.250	ITSN-533	NL-58	CL-12	XNS-510	TK-00569	S-58	ITSN-543
G-MTFNR 85-5D	G-MTFNL 85-5D	TNMG-543	❍	❍	1.000	1.250	6	1.440	1.250	ITSN-533	NL-58	CL-12	XNS-510	TK-00569	S-58	ITSN-543
G-MTFNR 86-5D	G-MTFNL 86-5D	TNMG-543	❍	❍	1.000	1.500	6	1.440	1.250	ITSN-533	NL-58	CL-12	XNS-510	TK-00569	S-58	ITSN-543
G-MTFNR 20-5D	G-MTFNL 20-5D	TNMG-543	❍	❍	1.250	1.250	6	1.440	1.500	ITSN-533	NL-58	CL-12	XNS-510	TK-00569	S-58	ITSN-543
G-MTFNR 24-5D	G-MTFNL 24-5D	TNMG-543	❍	❍	1.500	1.500	6	1.440	2.000	ITSN-533	NL-58	CL-12	XNS-510	TK-00569	S-58	ITSN-543
G-MTFNR 24-6D	G-MTFNL 24-6D	TNMG-663	●	●	1.500	1.500	6	1.500	2.000	TSN-637	NL-68L	CL-12	XNS-510	TK-00567	S-68	TSN-657

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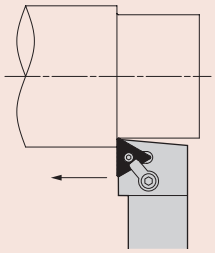
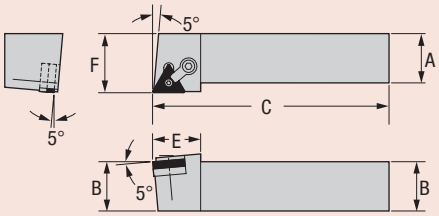
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

G-MTGNR/L

Style G
Triangle
Negative Rake
0° Lead



Right-Hand
Toolholder Shown

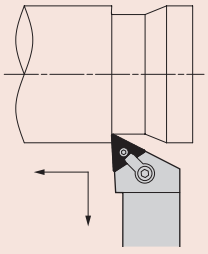


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MTGNR 8-2C	G-MTGNL 8-2C	TNMG-221	❍	❍	0.500	0.500	5	0.970	0.625	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTGNR 10-2C	G-MTGNL 10-2C	TNMG-221	❍	❍	0.625	0.625	5	0.970	0.750	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTGNR 10-3C	G-MTGNL 10-3C	TNMG-322	❍	❍	0.625	0.625	5	1.110	0.875	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTGNR 12-3C	G-MTGNL 12-3C	TNMG-322	❍	❍	0.750	0.750	5	1.110	1.000	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTGNR 16-3D	G-MTGNL 16-3D	TNMG-322	❍	❍	1.000	1.000	6	1.110	1.250	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTGNR 85-3D	G-MTGNL 85-3D	TNMG-322	❍	❍	1.000	1.250	6	1.110	1.250	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTGNR 20-3D	G-MTGNL 20-3D	TNMG-322	❍	❍	1.250	1.250	6	1.110	1.500	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTGNR 12-4C	G-MTGNL 12-4C	TNMG-432	❍	❍	0.750	0.750	5	1.220	1.000	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTGNR 16-4D	G-MTGNL 16-4D	TNMG-432	❍	❍	1.000	1.000	6	1.220	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTGNR 85-4D	G-MTGNL 85-4D	TNMG-432	❍	❍	1.000	1.250	6	1.220	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTGNR 86-4D	G-MTGNL 86-4D	TNMG-432	❍	❍	1.000	1.500	6	1.220	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTGNR 20-4D	G-MTGNL 20-4D	TNMG-432	❍	❍	1.250	1.250	6	1.220	1.500	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTGNR 24-4D	G-MTGNL 24-4D	TNMG-432	❍	❍	1.500	1.500	6	1.220	2.000	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTGNR 16-5D	G-MTGNL 16-5D	TNMG-543	❍	❍	1.000	1.000	6	1.440	1.250	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTGNR 85-5D	G-MTGNL 85-5D	TNMG-543	❍	❍	1.000	1.250	6	1.440	1.250	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTGNR 86-5D	G-MTGNL 86-5D	TNMG-543	❍	❍	1.000	1.500	6	1.440	1.250	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTGNR 20-5D	G-MTGNL 20-5D	TNMG-543	❍	❍	1.250	1.250	6	1.440	1.500	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTGNR 24-5D	G-MTGNL 24-5D	TNMG-543	❍	❍	1.500	1.500	6	1.440	2.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTGNR 24-6D	G-MTGNL 24-6D	TNMG-663	❍	❍	1.500	1.500	6	1.500	2.000	TSN-637	NL-68L	CL-12	XNS-510	TK-00567	S-68	TSN-657

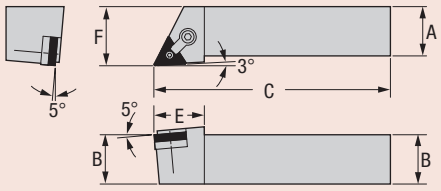
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** Cannot be used with lock pin.

G-MTJNRS

Style J
Triangle
Negative Rake
3° Reverse Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MTJNRS 12-3C	G-MTJNLS 12-3C	TNMG-322	❍	❍	0.750	0.750	5	1.120	1.000	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTJNRS 16-3D	G-MTJNLS 16-3D	TNMG-322	❍	❍	1.000	1.000	6	1.120	1.250	ITSN-333	NL-34L	CL-6	XNS-36	TK-00564	S-34	ITSN-323
G-MTJNRS 16-4D	G-MTJNLS 16-4D	TNMG-432	●	●	1.000	1.000	6	1.190	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	–
G-MTJNRS 85-4D	G-MTJNLS 85-4D	TNMG-432	❍	❍	1.000	1.250	6	1.190	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	–
G-MTJNRS 86-4D	G-MTJNLS 86-4D	TNMG-432	❍	❍	1.000	1.500	6	1.190	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	–
G-MTJNRS 20-4D	G-MTJNLS 20-4D	TNMG-432	❍	❍	1.250	1.250	6	1.190	1.500	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	–
G-MTJNRS 86-5D	G-MTJNLS 86-5D	TNMG-543	❍	❍	1.000	1.500	6	1.440	1.250	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	–
G-MTJNRS 20-5D	G-MTJNLS 20-5D	TNMG-543	●	●	1.250	1.250	6	1.440	1.500	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	–
G-MTJNRS 24-5D	G-MTJNLS 24-5D	TNMG-543	❍	❍	1.500	1.500	6	1.440	2.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	–
G-MTJNRS 24-6D	G-MTJNLS 24-6D	TNMG-663	❍	❍	1.500	1.500	6	1.670	2.000	TSN-637	NL-68L	CL-12	XNS-510	TK-00567	S-68	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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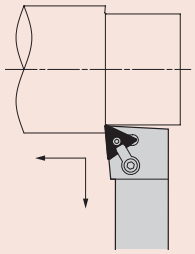
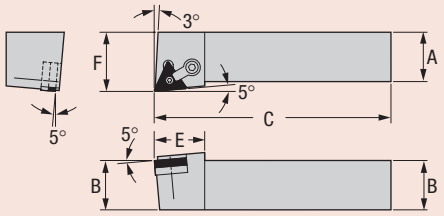
G-MTLNR/L

Style L
Triangle
Negative Rake
5° Reverse Lead



Right-Hand
Toolholder Shown

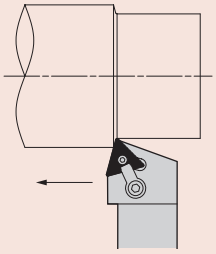


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MTLNR 16-4D	G-MTLNL 16-4D	TNMG-432	❍	❍	1.000	1.000	6	1.280	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTLNR 85-4D	G-MTLNL 85-4D	TNMG-432	❍	❍	1.000	1.250	6	1.280	1.250	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTLNR 20-4D	G-MTLNL 20-4D	TNMG-432	❍	❍	1.250	1.250	6	1.280	1.500	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTLNR 20-5D	G-MTLNL 20-5D	TNMG-543	❍	❍	1.250	1.250	6	1.410	1.500	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTLNR 24-5D	G-MTLNL 24-5D	TNMG-543	❍	❍	1.500	1.500	6	1.410	2.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTLNR 24-6D	G-MTLNL 24-6D	TNMG-663	❍	❍	1.500	1.500	6	1.530	2.000	TSN-637	NL-68L	CL-12	XNS-510	TK-00567	S-68	TSN-657

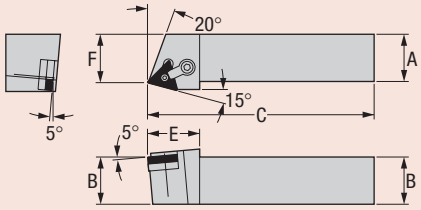
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** Cannot be used with lock pin.

G-MTRNR/L

Style R
Triangle
Negative Rake
15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw	Seat
G-MTRNR 8-2C	G-MTRNL 8-2C	TNMG-221	❍	❍	0.500	0.500	5	1.010	0.656	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTRNR 10-2C	G-MTRNL 10-2C	TNMG-221	❍	❍	0.625	0.625	5	1.010	0.781	–	NL-23	CL-19	XNS-36	TK-00742	–	–
G-MTRNR 10-3C	G-MTRNL 10-3C	TNMG-322	❍	❍	0.625	0.625	5	1.200	0.718	ITSN-333	NL-34L	CL-20	XNS-46	TK-00568	S-34	ITSN-323
G-MTRNR 12-3C	G-MTRNL 12-3C	TNMG-322	❍	❍	0.750	0.750	5	1.200	0.843	ITSN-333	NL-34L	CL-20	XNS-46	TK-00568	S-34	ITSN-323
G-MTRNR 16-3D	G-MTRNL 16-3D	TNMG-322	❍	❍	1.000	1.000	6	1.200	1.093	ITSN-333	NL-34L	CL-20	XNS-46	TK-00568	S-34	ITSN-323
G-MTRNR 85-3D	G-MTRNL 85-3D	TNMG-322	❍	❍	1.000	1.250	6	1.200	1.093	ITSN-333	NL-34L	CL-20	XNS-46	TK-00568	S-34	ITSN-323
G-MTRNR 16-4D	G-MTRNL 16-4D	TNMG-432	❍	❍	1.000	1.000	6	1.380	1.031	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTRNR 85-4D	G-MTRNL 85-4D	TNMG-432	❍	❍	1.000	1.250	6	1.380	1.031	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTRNR 20-4D	G-MTRNL 20-4D	TNMG-432	❍	❍	1.250	1.250	6	1.380	1.281	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTRNR 24-4D	G-MTRNL 24-4D	TNMG-432	❍	❍	1.500	1.500	6	1.380	1.781	ITSN-433	NL-46	CL-9	XNS-510	TK-00565	S-46	TS-424**
G-MTRNR 16-5D	G-MTRNL 16-5D	TNMG-543	❍	❍	1.000	1.000	6	1.620	1.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTRNR 85-5D	G-MTRNL 85-5D	TNMG-543	❍	❍	1.000	1.250	6	1.620	1.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTRNR 86-5D	G-MTRNL 86-5D	TNMG-543	❍	❍	1.000	1.500	6	1.620	1.000	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTRNR 20-5D	G-MTRNL 20-5D	TNMG-543	❍	❍	1.250	1.250	6	1.620	1.250	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTRNR 24-5D	G-MTRNL 24-5D	TNMG-543	❍	❍	1.500	1.500	6	1.620	1.750	ITSN-533	NL-58	CL-9	XNS-510	TK-00566	S-58	ITSN-543
G-MTRNR 24-6D	G-MTRNL 24-6D	TNMG-663	❍	❍	1.500	1.500	6	1.750	1.687	TSN-637	NL-68L	CL-12	XNS-510	TK-00567	S-68	TSN-657

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** Cannot be used with lock pin.

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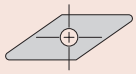
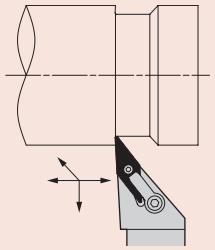
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

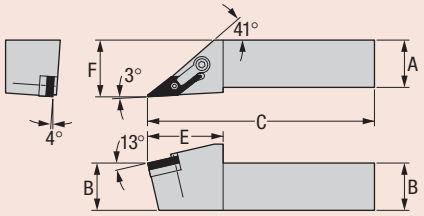
G-MVJNR/L

Style J
35° Diamond
Negative Rake
3° Reverse Lead





Right-Hand
Toolholder Shown

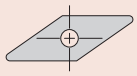


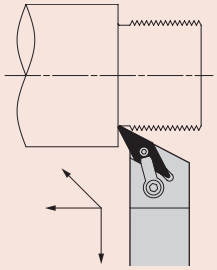
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Component
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw
G-MVJNR 12-3C	G-MVJNL 12-3C	VNMG-332	●	❍	0.750	0.750	5	1.680	1.000	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVJNR 16-3D	G-MVJNL 16-3D	VNMG-332	●	●	1.000	1.000	6	1.680	1.250	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVJNR 85-3D	G-MVJNL 85-3D	VNMG-332	❍	❍	1.000	1.250	6	1.680	1.250	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVJNR 86-3D	G-MVJNL 86-3D	VNMG-332	❍	❍	1.000	1.500	6	1.680	1.250	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVJNR 20-3D	G-MVJNL 20-3D	VNMG-332	●	●	1.250	1.250	6	1.680	1.500	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVJNR 24-3D	G-MVJNL 24-3D	VNMG-332	❍	❍	1.500	1.500	6	1.680	2.000	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVJNR 16-4D	G-MVJNL 16-4D	VNMG-432	●	●	1.000	1.000	6	2.000	1.250	IVSN-433	NL-46	CL-30	XNS-510	TK-00571	S-46
G-MVJNR 86-4D	G-MVJNL 86-4D	VNMG-432	❍	❍	1.000	1.500	6	2.000	1.250	IVSN-433	NL-46	CL-30	XNS-510	TK-00571	S-46
G-MVJNR 20-4D	G-MVJNL 20-4D	VNMG-432	❍	❍	1.250	1.250	6	2.000	1.500	IVSN-433	NL-46	CL-30	XNS-510	TK-00571	S-46
G-MVJNR 24-4D	G-MVJNL 24-4D	VNMG-432	❍	❍	1.500	1.500	6	2.000	2.000	IVSN-433	NL-46	CL-30	XNS-510	TK-00571	S-46

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

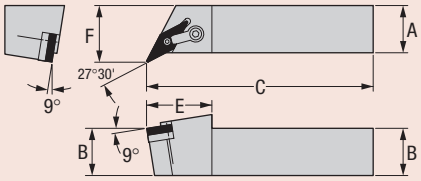
G-MVTNR/L

Style T
35° Diamond
Negative Rake
27° 30' Lead





Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Component
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw
G-MVTNR 12-3C	G-MVTNL 12-3C	VNMG-332	❍	❍	0.750	0.750	5	1.730	1.000	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVTNR 16-3D	G-MVTNL 16-3D	VNMG-332	❍	❍	1.000	1.000	6	1.730	1.250	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVTNR 85-3D	G-MVTNL 85-3D	VNMG-332	❍	❍	1.000	1.250	6	1.730	1.250	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVTNR 86-3D	G-MVTNL 86-3D	VNMG-332	❍	❍	1.000	1.500	6	1.730	1.250	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVTNR 20-3D	G-MVTNL 20-3D	VNMG-332	❍	❍	1.250	1.250	6	1.730	1.500	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVTNR 24-3D	G-MVTNL 24-3D	VNMG-332	❍	❍	1.500	1.500	6	1.730	1.750	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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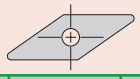
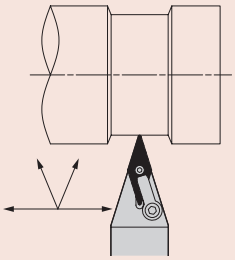
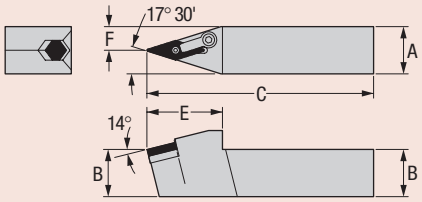
G-MVVNN

Style V
35° Diamond
Negative Rake
17° 30' Lead





Neutral
Toolholder Shown

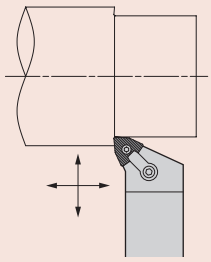


Part Number	Gage	Stock	Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Component
Neutral	Insert	N	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat Screw
G-MVVNN 12-3C	VNMG-332	❍	0.750	0.750	5	1.750	0.375	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVVNN 16-3D	VNMG-332	●	1.000	1.000	6	1.750	0.500	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVVNN 85-3D	VNMG-332	❍	1.000	1.250	6	1.750	0.500	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVVNN 86-3D	VNMG-332	❍	1.000	1.500	6	1.750	0.500	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVVNN 20-3D	VNMG-332	●	1.250	1.250	6	1.750	0.625	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVVNN 24-3D	VNMG-332	❍	1.500	1.500	6	1.750	0.750	IVSN-322	NL-34L	CL-30	XNS-510	TK-00570	S-34
G-MVVNN 16-4D	VNMG-432	❍	1.000	1.000	6	2.120	0.500	IVSN-433	NL-46	CL-30	XNS-510	TK-00571	S-46
G-MVVNN 20-4D	VNMG-432	❍	1.250	1.250	6	2.120	0.625	IVSN-433	NL-46	CL-30	XNS-510	TK-00571	S-46
G-MVVNN 24-4D	VNMG-432	❍	1.500	1.500	6	2.120	0.750	IVSN-433	NL-46	CL-30	XNS-510	TK-00571	S-46

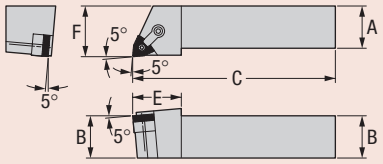
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-MWLNR/L

Style L
Trigon
Negative Rake
5° Reverse Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Component
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat
G-MWLNR 12-3C	G-MWLNL 12-3C	WNMG-332	●	❍	0.750	0.750	5	1.000	1.000	IWSN-323	NL-34L	CL-6	XNS-36	TK-00775	IWSN-332
G-MWLNR 16-3D	G-MWLNL 16-3D	WNMG-332	●	●	1.000	1.000	6	1.000	1.250	IWSN-323	NL-34L	CL-6	XNS-36	TK-00775	IWSN-332
G-MWLNR 20-3D	G-MWLNL 20-3D	WNMG-332	❍	❍	1.250	1.250	6	1.000	1.500	IWSN-323	NL-34L	CL-6	XNS-36	TK-00775	IWSN-332
G-MWLNR 24-3D	G-MWLNL 24-3D	WNMG-332	❍	❍	1.500	1.500	6	1.000	2.000	IWSN-323	NL-34L	CL-6	XNS-36	TK-00775	IWSN-332
G-MWLNR 12-4C	G-MWLNL 12-4C	WNMG-432	●	❍	0.750	0.750	5	1.188	1.000	IWSN-433	NL-46	CL-20	XNS-48	TK-00759	–
G-MWLNR 16-4D	G-MWLNL 16-4D	WNMG-432	●	●	1.000	1.000	6	1.188	1.250	IWSN-433	NL-46	CL-20	XNS-48	TK-00759	–
G-MWLNR 20-4D	G-MWLNL 20-4D	WNMG-432	●	●	1.250	1.250	6	1.188	1.500	IWSN-433	NL-46	CL-20	XNS-48	TK-00759	–
G-MWLNR 24-4D	G-MWLNL 24-4D	WNMG-432	●	❍	1.500	1.500	6	1.188	2.000	IWSN-433	NL-46	CL-20	XNS-48	TK-00759	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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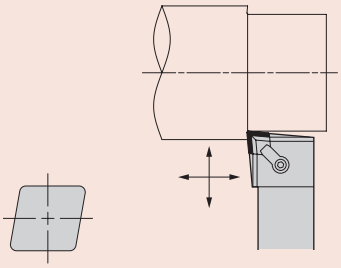
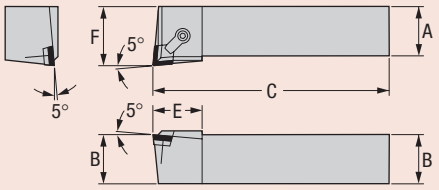
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

G-CCLPR/L

Style L
80° Diamond
Positive Rake
5° Reverse Lead



Right-Hand
Toolholder Shown

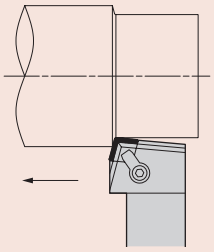


Part Number		Gage	Stock		Dimensions (inches)					Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CCLPR 12-4C	G-CCLPL 12-4C	CPGN-422	❍	❍	0.750	0.750	5	1.250	1.000	CSP-422	#4-40 x 3/8 FHCS	CL-20	XNS-47	CBDC-4L	TK-00531
G-CCLPR 16-4D	G-CCLPL 16-4D	CPGN-422	❍	❍	1.000	1.000	6	1.250	1.250	CSP-422	#4-40 x 3/8 FHCS	CL-20	XNS-47	CBDC-4L	TK-00531
G-CCLPR 85-4D	G-CCLPL 85-4D	CPGN-422	❍	❍	1.000	1.250	6	1.250	1.250	CSP-422	#4-40 x 3/8 FHCS	CL-20	XNS-47	CBDC-4L	TK-00531
G-CCLPR 20-4D	G-CCLPL 20-4D	CPGN-422	❍	❍	1.250	1.250	6	1.250	1.500	CSP-422	#4-40 x 3/8 FHCS	CL-20	XNS-47	CBDC-4L	TK-00531
G-CCLPR 24-4D	G-CCLPL 24-4D	CPGN-422	❍	❍	1.500	1.500	6	1.250	2.000	CSP-422	#4-40 x 3/8 FHCS	CL-20	XNS-47	CBDC-4L	TK-00531
G-CCLPR 16-6D	G-CCLPL 16-6D	CPGN-633	❍	❍	1.000	1.000	6	1.500	1.250	CSP-632	#5-40 x 3/8 FHCS	CL-30	XNS-59	CBDC-6G	TK-00532
G-CCLPR 85-6D	G-CCLPL 85-6D	CPGN-633	❍	❍	1.000	1.250	6	1.500	1.250	CSP-632	#5-40 x 3/8 FHCS	CL-30	XNS-59	CBDC-6G	TK-00532
G-CCLPR 86-6D	G-CCLPL 86-6D	CPGN-633	❍	❍	1.000	1.500	6	1.500	1.250	CSP-632	#5-40 x 3/8 FHCS	CL-30	XNS-59	CBDC-6G	TK-00532
G-CCLPR 20-6D	G-CCLPL 20-6D	CPGN-633	❍	❍	1.250	1.250	6	1.500	1.500	CSP-632	#5-40 x 3/8 FHCS	CL-30	XNS-59	CBDC-6G	TK-00532
G-CCLPR 24-6D	G-CCLPL 24-6D	CPGN-633	❍	❍	1.500	1.500	6	1.500	2.000	CSP-632	#5-40 x 3/8 FHCS	CL-30	XNS-59	CBDC-6G	TK-00532

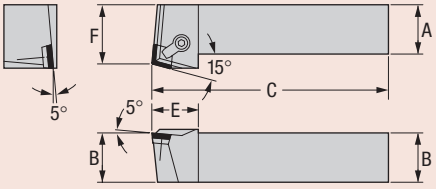
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-CCRPR/L

Style R
80° Diamond
(Using 100° Corner)
Positive Rake, 15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CCRPR 12-4C	G-CCRPL 12-4C	CPGN-422	❍	❍	0.750	0.750	5	1.220	1.000	CSP-422	#4-40 x 3/8 FHCS	CL-9	XNS-59	CBDC-415L	TK-00720
G-CCRPR 16-4D	G-CCRPL 16-4D	CPGN-422	❍	❍	1.000	1.000	6	1.220	1.250	CSP-422	#4-40 x 3/8 FHCS	CL-9	XNS-59	CBDC-415L	TK-00720
G-CCRPR 85-4D	G-CCRPL 85-4D	CPGN-422	❍	❍	1.000	1.250	6	1.220	1.250	CSP-422	#4-40 x 3/8 FHCS	CL-9	XNS-59	CBDC-415L	TK-00720
G-CCRPR 20-4D	G-CCRPL 20-4D	CPGN-422	❍	❍	1.250	1.250	6	1.220	1.500	CSP-422	#4-40 x 3/8 FHCS	CL-9	XNS-59	CBDC-415L	TK-00720
G-CCRPR 24-4D	G-CCRPL 24-4D	CPGN-422	❍	❍	1.500	1.500	6	1.220	2.000	CSP-422	#4-40 x 3/8 FHCS	CL-9	XNS-59	CBDC-415L	TK-00720
G-CCRPR 16-6D	G-CCRPL 16-6D	CPGN-633	❍	❍	1.000	1.000	6	1.310	1.250	CSP-632	#5-40 x 3/8 FHCS	CL-12	XNS-510	CBDC-615G	TK-00533
G-CCRPR 85-6D	G-CCRPL 85-6D	CPGN-633	❍	❍	1.000	1.250	6	1.310	1.250	CSP-632	#5-40 x 3/8 FHCS	CL-12	XNS-510	CBDC-615G	TK-00533
G-CCRPR 86-6D	G-CCRPL 86-6D	CPGN-633	❍	❍	1.000	1.500	6	1.310	1.250	CSP-632	#5-40 x 3/8 FHCS	CL-12	XNS-510	CBDC-615G	TK-00533
G-CCRPR 20-6D	G-CCRPL 20-6D	CPGN-633	❍	❍	1.250	1.250	6	1.310	1.500	CSP-632	#5-40 x 3/8 FHCS	CL-12	XNS-510	CBDC-615G	TK-00533
G-CCRPR 24-6D	G-CCRPL 24-6D	CPGN-633	❍	❍	1.500	1.500	6	1.310	2.000	CSP-632	#5-40 x 3/8 FHCS	CL-12	XNS-510	CBDC-615G	TK-00533

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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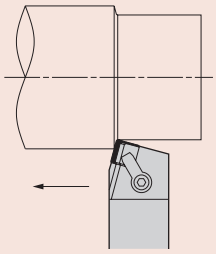
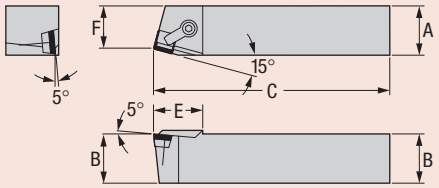
G-CSBPR/L

Style B
Square
Positive Rake
15° Lead



Right-Hand
Toolholder Shown

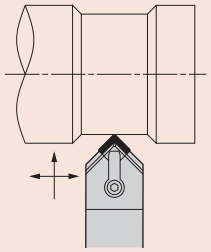


Part Number		Gage	Stock		Dimensions (inches)					Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CSBPR 12-4C	G-CSBPL 12-4C	SPGN-422	❍	❍	0.750	0.750	5	1.250	0.593	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-58	CBS-4G	TK-00712
G-CSBPR 16-4D	G-CSBPL 16-4D	SPGN-422	❍	❍	1.000	1.000	6	1.250	0.843	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-58	CBS-4G	TK-00712
G-CSBPR 20-4D	G-CSBPL 20-4D	SPGN-422	❍	❍	1.250	1.250	6	1.250	1.093	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBS-4G	TK-00753
G-CSBPR 24-4D	G-CSBPL 24-4D	SPGN-422	❍	❍	1.500	1.500	6	1.250	1.343	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBS-4G	TK-00753
G-CSBPR 16-6D	G-CSBPL 16-6D	SPGN-633	❍	❍	1.000	1.000	6	1.440	0.781	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-59	CBS-6G	TK-00726
G-CSBPR 20-6D	G-CSBPL 20-6D	SPGN-633	❍	❍	1.250	1.250	6	1.440	1.031	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6G	TK-00534
G-CSBPR 24-6D	G-CSBPL 24-6D	SPGN-633	❍	❍	1.500	1.500	6	1.440	1.281	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6G	TK-00534

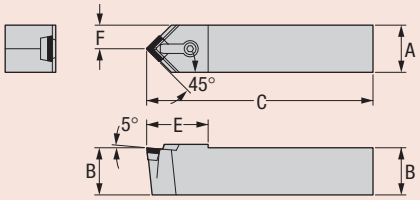
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-CSDPN

Style D
Square
Positive Rake
45° Lead



Neutral
Toolholder Shown



Part Number	Gage	Stock	Dimensions (inches)					Standard Components					* Tune-Up Kit
Neutral	Insert	N	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CSDPN 12-4C	SPGN-422	❍	0.750	0.750	5	1.620	0.375	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-59	CBS-4E	TK-00743
G-CSDPN 16-4D	SPGN-422	❍	1.000	1.000	6	1.620	0.500	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBS-4E	TK-00536
G-CSDPN 20-4D	SPGN-422	❍	1.250	1.250	6	1.620	0.625	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBS-4E	TK-00536
G-CSDPN 24-4D	SPGN-422	❍	1.500	1.500	6	1.620	0.750	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBS-4E	TK-00536
G-CSDPN 16-6D	SPGN-633	❍	1.000	1.000	6	1.750	0.500	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6E	TK-00535
G-CSDPN 20-6D	SPGN-633	❍	1.250	1.250	6	1.750	0.625	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6E	TK-00535
G-CSDPN 24-6D	SPGN-633	❍	1.500	1.500	6	1.750	0.750	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6E	TK-00535

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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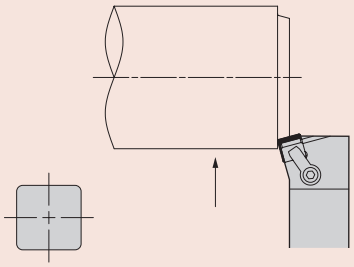
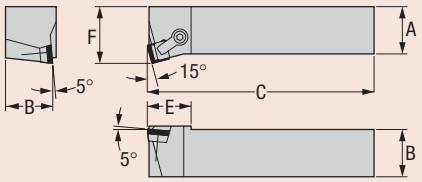
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

G-CSKPR/L

Style K
Square
Positive Rake
15° Lead





Right-Hand
Toolholder Shown

Part Number		Gage	Stock		Dimensions (inches)					Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CSKPR 12-4C	G-CSKPL 12-4C	SPGN-422	❍	❍	0.750	0.750	5	1.120	1.000	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-58	CBS-4G	TK-00712
G-CSKPR 16-4D	G-CSKPL 16-4D	SPGN-422	❍	❍	1.000	1.000	6	1.120	1.250	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-58	CBS-4G	TK-00712
G-CSKPR 85-4D	G-CSKPL 85-4D	SPGN-422	❍	❍	1.000	1.250	6	1.120	1.250	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBS-4G	TK-00753
G-CSKPR 20-4D	G-CSKPL 20-4D	SPGN-422	❍	❍	1.250	1.250	6	1.120	1.500	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBS-4G	TK-00753
G-CSKPR 24-4D	G-CSKPL 24-4D	SPGN-422	❍	❍	1.500	1.500	6	1.120	2.000	SP-40	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBS-4G	TK-00753
G-CSKPR 16-6D	G-CSKPL 16-6D	SPGN 633	❍	❍	1.000	1.000	6	1.500	1.250	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6G	TK-00534
G-CSKPR 85-6D	G-CSKPL 85-6D	SPGN 633	❍	❍	1.000	1.250	6	1.500	1.250	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6G	TK-00534
G-CSKPR 86-6D	G-CSKPL 86-6D	SPGN 633	❍	❍	1.000	1.500	6	1.500	1.250	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6G	TK-00534
G-CSKPR 20-6D	G-CSKPL 20-6D	SPGN 633	❍	❍	1.250	1.250	6	1.500	1.500	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6G	TK-00534
G-CSKPR 24-6D	G-CSKPL 24-6D	SPGN 633	❍	❍	1.500	1.500	6	1.500	2.000	SP-60	#10-32 x 1/2 FHCS	CL-30	XNS-510	CBS-6G	TK-00534

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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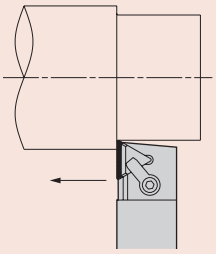
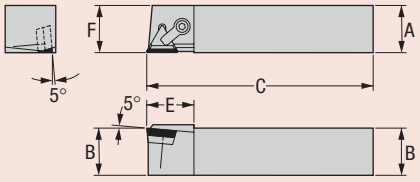
G-CTAPR/L

Style A
Triangle
Positive Rake
0° Lead



Right-Hand
Toolholder Shown

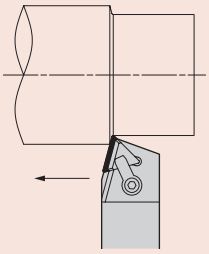


Part Number		Gage	Stock		Dimensions (inches)					Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CTAPR 12-3C	G-CTAPL 12-3C	TPGN-322	❍	❍	0.750	0.750	5	1.000	0.750	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTAPR 16-3D	G-CTAPL 16-3D	TPGN-322	❍	❍	1.000	1.000	6	1.000	1.000	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTAPR 85-3D	G-CTAPL 85-3D	TPGN-322	❍	❍	1.000	1.250	6	1.000	1.000	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTAPR 16-4D	G-CTAPL 16-4D	TPGN-432	●	❍	1.000	1.000	6	1.250	1.000	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-59	CBT-4G	TK-00537
G-CTAPR 85-4D	G-CTAPL 85-4D	TPGN-432	❍	❍	1.000	1.250	6	1.250	1.000	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTAPR 20-4D	G-CTAPL 20-4D	TPGN-432	❍	❍	1.250	1.250	6	1.250	1.250	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTAPR 24-4D	G-CTAPL 24-4D	TPGN-432	❍	❍	1.500	1.500	6	1.250	1.500	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTAPR 16-5D	G-CTAPL 16-5D	TPGN-543	❍	❍	1.000	1.000	6	1.380	1.000	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-59	CBT-5G	TK-00745
G-CTAPR 20-5D	G-CTAPL 20-5D	TPGN-543	❍	❍	1.250	1.250	6	1.380	1.250	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTAPR 24-5D	G-CTAPL 24-5D	TPGN-543	❍	❍	1.500	1.500	6	1.380	1.500	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTAPR 24-6D	G-CTAPL 24-6D	TPGN-666	❍	❍	1.500	1.500	6	1.500	1.500	SP-6	#10-32 x 1/2 FHCS	CL-12	XNS-510	CBT-6G	TK-00749

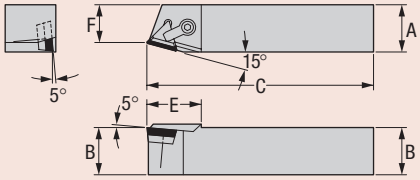
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-CTBPR/L

Style B
Triangle
Positive Rake
15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CTBPR 12-3C	G-CTBPL 12-3C	TPGN-322	❍	❍	0.750	0.750	5	1.000	0.578	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTBPR 16-3D	G-CTBPL 16-3D	TPGN-322	❍	❍	1.000	1.000	6	1.000	0.828	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTBPR 85-3D	G-CTBPL 85-3D	TPGN-322	❍	❍	1.000	1.250	6	1.000	1.078	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTBPR 16-4D	G-CTBPL 16-4D	TPGN-432	❍	❍	1.000	1.000	6	1.250	0.765	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-59	CBT-4G	TK-00537
G-CTBPR 85-4D	G-CTBPL 85-4D	TPGN-432	❍	❍	1.000	1.250	6	1.250	0.765	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTBPR 20-4D	G-CTBPL 20-4D	TPGN-432	❍	❍	1.250	1.250	6	1.250	1.015	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTBPR 24-4D	G-CTBPL 24-4D	TPGN-432	❍	❍	1.500	1.500	6	1.250	1.265	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTBPR 16-5D	G-CTBPL 16-5D	TPGN-543	❍	❍	1.000	1.000	6	1.500	0.718	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-59	CBT-5G	TK-00745
G-CTBPR 85-5D	G-CTBPL 85-5D	TPGN-543	❍	❍	1.000	1.250	6	1.500	0.718	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTBPR 86-5D	G-CTBPL 86-5D	TPGN-543	❍	❍	1.000	1.500	6	1.500	0.718	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTBPR 20-5D	G-CTBPL 20-5D	TPGN-543	❍	❍	1.250	1.250	6	1.500	0.968	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTBPR 24-5D	G-CTBPL 24-5D	TPGN-543	❍	❍	1.500	1.500	6	1.500	1.218	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTBPR 24-6D	G-CTBPL 24-6D	TPGN-666	❍	❍	1.500	1.500	6	1.560	1.187	SP-6	#10-32 x 1/2 FHCS	CL-12	XNS-510	CBT-6G	TK-00749

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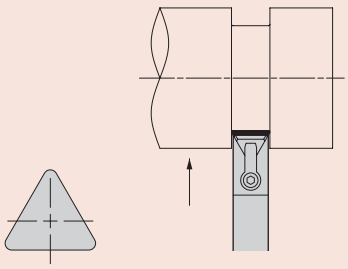
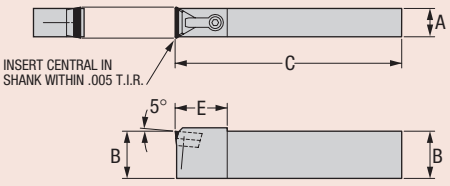
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

G-CTCPN

Style C
Triangle
Positive Rake
0° Lead





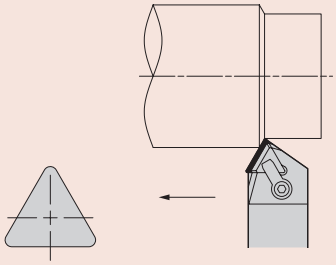
Neutral
Toolholder Shown

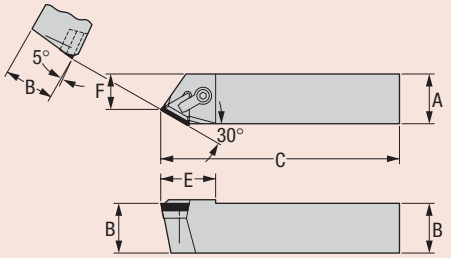
Part Number	Gage	Stock	Dimensions (inches)				Standard Components					* Tune-Up Kit
Neutral	Insert	N	A	B	C	E	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CTCPN 44-3D	TPGN-322	❍	0.500	1.000	6	1.250	TSP-321	#4-40 x 3/8 FHCS	CL-22	XNS-48	CBT-3G	TK-00540
G-CTCPN 64-4D	TPGN-432	❍	0.750	1.000	6	1.380	SP-4	#6-32 x 1/2 FHCS	CL-30	XNS-59	CBT-4G	TK-00541
G-CTCPN 65-4D	TPGN-432	❍	0.750	1.250	6	1.380	SP-4	#6-32 x 1/2 FHCS	CL-30	XNS-59	CBT-4G	TK-00541
G-CTCPN 66-4D	TPGN-432	❍	0.750	1.500	6	1.380	SP-4	#6-32 x 1/2 FHCS	CL-30	XNS-59	CBT-4G	TK-00541
G-CTCPN 76-5D	TPGN-543	❍	0.875	1.500	6	1.500	SP-5	#8-32 x 1/2 FHCS	CL-30	XNS-510	CBT-5G	TK-00542

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-CTEOR/L

Style E
Triangle
Positive Rake
30° Lead





Right-Hand
Toolholder Shown

Part Number		Gage	Stock		Dimensions (inches)					Standard Components						* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker		Includes All Standard Components
G-CTEOR 10-3C	G-CTEOL 10-3C	TPGN-322	❍	❍	0.625	0.625	5	1.060	0.375	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G		TK-00538
G-CTEOR 12-3C	G-CTEOL 12-3C	TPGN-322	❍	❍	0.750	0.750	5	1.060	0.500	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G		TK-00538
G-CTEOR 16-3D	G-CTEOL 16-3D	TPGN-322	❍	❍	1.000	1.000	6	1.060	0.750	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G		TK-00538
G-CTEOR 85-3D	G-CTEOL 85-3D	TPGN-322	❍	❍	1.000	1.250	6	1.060	0.750	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G		TK-00538
G-CTEOR 16-4D	G-CTEOL 16-4D	TPGN-432	❍	❍	1.000	1.000	6	1.380	0.640	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-59	CBT-4G		TK-00537
G-CTEOR 85-4D	G-CTEOL 85-4D	TPGN-432	❍	❍	1.000	1.250	6	1.380	0.640	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G		TK-00539
G-CTEOR 20-4D	G-CTEOL 20-4D	TPGN-432	❍	❍	1.250	1.250	6	1.380	0.890	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G		TK-00539
G-CTEOR 24-4D	G-CTEOL 24-4D	TPGN-432	❍	❍	1.500	1.500	6	1.380	1.140	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G		TK-00539
G-CTEOR 20-5D	G-CTEOL 20-5D	TPGN-543	❍	❍	1.250	1.250	6	1.560	0.812	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G		TK-00544
G-CTEOR 24-5D	G-CTEOL 24-5D	TPGN-543	❍	❍	1.500	1.500	6	1.560	1.062	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G		TK-00544
G-CTEOR 24-6D	G-CTEOL 24-6D	TPGN-666	❍	❍	1.500	1.500	6	1.750	0.968	SP-6	#10-32 x 5/8 FHCS	CL-12	XNS-510	CBT-6G		TK-01795

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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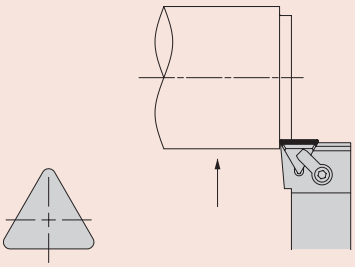
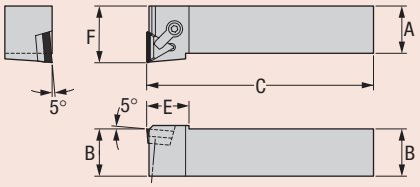
G-CTFPR/L

Style F
Triangle
Positive Rake
0° Lead



Right-Hand
Toolholder Shown

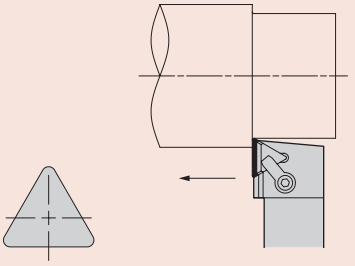


Part Number		Gage	Stock		Dimensions (inches)					Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CTFPR 10-3C	G-CTFPL 10-3C	TPGN-322	❍	❍	0.625	0.625	5	1.000	0.875	TSP-321	#4-40 x 3/8 FHCS	CL-6	XNS-36	CBT-3G	TK-00543
G-CTFPR 12-3C	G-CTFPL 12-3C	TPGN-322	❍	❍	0.750	0.750	5	1.000	1.000	TSP-321	#4-40 x 3/8 FHCS	CL-6	XNS-36	CBT-3G	TK-00543
G-CTFPR 16-3D	G-CTFPL 16-3D	TPGN-322	❍	❍	1.000	1.000	6	1.000	1.250	TSP-321	#4-40 x 3/8 FHCS	CL-6	XNS-36	CBT-3G	TK-00543
G-CTFPR 85-3D	G-CTFPL 85-3D	TPGN-322	❍	❍	1.000	1.250	6	1.000	1.250	TSP-321	#4-40 x 3/8 FHCS	CL-6	XNS-36	CBT-3G	TK-00543
G-CTFPR 16-4D	G-CTFPL 16-4D	TPGN-432	❍	❍	1.000	1.000	6	1.120	1.250	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-59	CBT-4G	TK-00537
G-CTFPR 85-4D	G-CTFPL 85-4D	TPGN-432	❍	❍	1.000	1.250	6	1.120	1.250	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTFPR 20-4D	G-CTFPL 20-4D	TPGN-432	❍	❍	1.250	1.250	6	1.120	1.500	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTFPR 24-4D	G-CTFPL 24-4D	TPGN-432	❍	❍	1.500	1.500	6	1.120	2.000	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTFPR 16-5D	G-CTFPL 16-5D	TPGN-543	❍	❍	1.000	1.000	6	1.500	1.250	SP-5	#8-32 x 1/2 FHCS	CL-30	XNS-59	CBT-5G	TK-00918
G-CTFPR 85-5D	G-CTFPL 85-5D	TPGN-543	❍	❍	1.000	1.250	6	1.500	1.250	SP-5	#8-32 x 1/2 FHCS	CL-30	XNS-510	CBT-5G	TK-00542
G-CTFPR 86-5D	G-CTFPL 86-5D	TPGN-543	❍	❍	1.000	1.500	6	1.500	1.250	SP-5	#8-32 x 1/2 FHCS	CL-30	XNS-510	CBT-5G	TK-00542
G-CTFPR 20-5D	G-CTFPL 20-5D	TPGN-543	❍	❍	1.250	1.250	6	1.500	1.500	SP-5	#8-32 x 1/2 FHCS	CL-30	XNS-510	CBT-5G	TK-00542
G-CTFPR 24-5D	G-CTFPL 24-5D	TPGN-543	❍	❍	1.500	1.500	6	1.500	2.000	SP-5	#8-32 x 1/2 FHCS	CL-30	XNS-510	CBT-5G	TK-00542
G-CTFPR 24-6D	G-CTFPL 24-6D	TPGN-666	–	–	1.500	1.500	6	1.500	2.000	SP-6	#10-32 x 1/2 FHCS	CL-12	XNS-510	CBT-6G	TK-00749

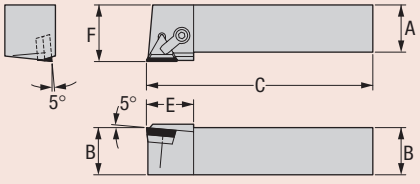
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

G-CTGPR/L

Style G
Triangle
Positive Rake
0° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Seat	Seat Screw	Clamp	Clamp Screw	Chip Breaker	Includes All Standard Components
G-CTGPR 10-3C	G-CTGPL 10-3C	TPGN-322	❍	❍	0.625	0.625	5	1.000	0.875	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTGPR 12-3C	G-CTGPL 12-3C	TPGN-322	❍	❍	0.750	0.750	5	1.000	1.000	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTGPR 16-3D	G-CTGPL 16-3D	TPGN-322	❍	❍	1.000	1.000	6	1.000	1.250	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTGPR 85-3D	G-CTGPL 85-3D	TPGN-322	❍	❍	1.000	1.250	6	1.000	1.250	TSP-321	#4-40 x 3/8 FHCS	CL-7	XNS-36	CBT-3G	TK-00538
G-CTGPR 16-4D	G-CTGPL 16-4D	TPGN-432	❍	❍	1.000	1.000	6	1.250	1.250	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-59	CBT-4G	TK-00537
G-CTGPR 85-4D	G-CTGPL 85-4D	TPGN-432	❍	❍	1.000	1.250	6	1.250	1.250	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTGPR 20-4D	G-CTGPL 20-4D	TPGN-432	❍	❍	1.250	1.250	6	1.250	1.500	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTGPR 24-4D	G-CTGPL 24-4D	TPGN-432	❍	❍	1.500	1.500	6	1.250	2.000	SP-4	#6-32 x 1/2 FHCS	CL-12	XNS-510	CBT-4G	TK-00539
G-CTGPR 16-5D	G-CTGPL 16-5D	TPGN-543	❍	❍	1.000	1.000	6	1.380	1.250	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-59	CBT-5G	TK-00745
G-CTGPR 85-5D	G-CTGPL 85-5D	TPGN-543	❍	❍	1.000	1.250	6	1.380	1.250	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTGPR 86-5D	G-CTGPL 86-5D	TPGN-543	❍	❍	1.000	1.500	6	1.380	1.250	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTGPR 20-5D	G-CTGPL 20-5D	TPGN-543	❍	❍	1.250	1.250	6	1.380	1.500	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTGPR 24-5D	G-CTGPL 24-5D	TPGN-543	❍	❍	1.500	1.500	6	1.380	2.000	SP-5	#8-32 x 1/2 FHCS	CL-12	XNS-510	CBT-5G	TK-00544
G-CTGPR 24-6D	G-CTGPL 24-6D	TPGN-666	–	–	1.500	1.500	6	1.500	2.000	SP-6	#10-32 x 1/2 FHCS	CL-12	XNS-510	CBT-6G	TK-00749

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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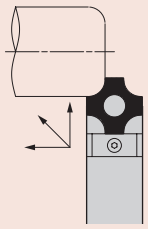
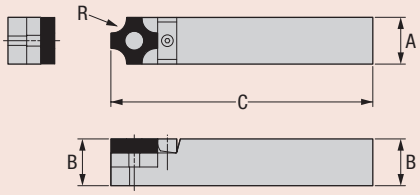
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

GSRN

Style GSRN



Neutral
Toolholder Shown



Part Number	Stock	Dimensions (inches)			Standard Components				Tune-Up Kit	Insert Options	
					Shim	Center Pin	Clamp	Clamp Screw	Includes All Standard Components	Insert	R
Neutral	N	A	B	C							
GSRN-646	●	0.750	1.000	6.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR4	0.062
										SNMA-64IR6	0.093
GSRN-656	❍	0.750	1.250	6.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR8	0.125
GSRN-666	●	0.750	1.500	7.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR10	0.156
GSRN-168	●	1.000	1.000	6.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR12	0.187
GSRN-858	❍	1.000	1.250	7.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR14	0.218
GSRN-868	●	1.000	1.500	8.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR16	0.250
GSRN-2010	●	1.250	1.250	7.000	SR10	30454	30319-2	30320	TK-00573	SNMA-106IR20	0.312
GSRN-2410	●	1.500	1.500	8.000	SR10	30454	30319-2	30320	TK-00573	SNMA-106IR24	0.375
GSRN-2412	●	1.500	1.500	8.000	SR12	30454	30319-2	30320	TK-00574	SNMA-126IR28	0.437
										SNMA-126IR32	0.500

These toolholders are Greenleaf standard and do not conform to the ANSI identification system.

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Advanced Ceramic Toolholders

Greenleaf toolholder systems for use with ceramic inserts are based upon industry standard hardware. However, geometry and pocket depth are designed to maximize ceramic performance. Negative tools have a 10° negative side rake rather than the 5° usually found in tools for carbide inserts. This will increase clearance and, in turn, tool life. The additional pocket depth allows for thicker inserts with shims available to adjust the thickness stack-up for thinner tools if necessary.

The standard clamp is the long series to secure the inserts without a hole which is a stronger set-up. (Short clamps are an optional item.) All tools are fully heat-treated alloy steel and are qualified to ±.003" on the "F" and "C" dimensions.

Greenleaf has designated a "C" prefix for a ceramic insert toolholder and an "H" prefix for ceramic insert toolholder for hard material machining.

Rough Stuff® Surface Treatment
Greatly improved insert-gripping power for greater accuracy, speed and pocket retention. Available on WG-300®, WG-600®, WG-700™, and GSN100™ ceramics.
U.S. Patent No. 6,712,564 B1

Greenleaf Tune-Up Kits

A Tune-Up Kit consists of all the standard hardware to refurbish a particular toolholder, boring bar, or milling cutter. A toolholder will have a readily visible, laser-inscribed Tune-Up Kit number on it for ease in ordering. This number will prevent any confusion created by searching a catalog for hardware, and it will help reduce downtime.

Greenleaf Corporation is continually upgrading its products. For the most current information, please visit our web site at:

www.greenleafglobalsupport.com

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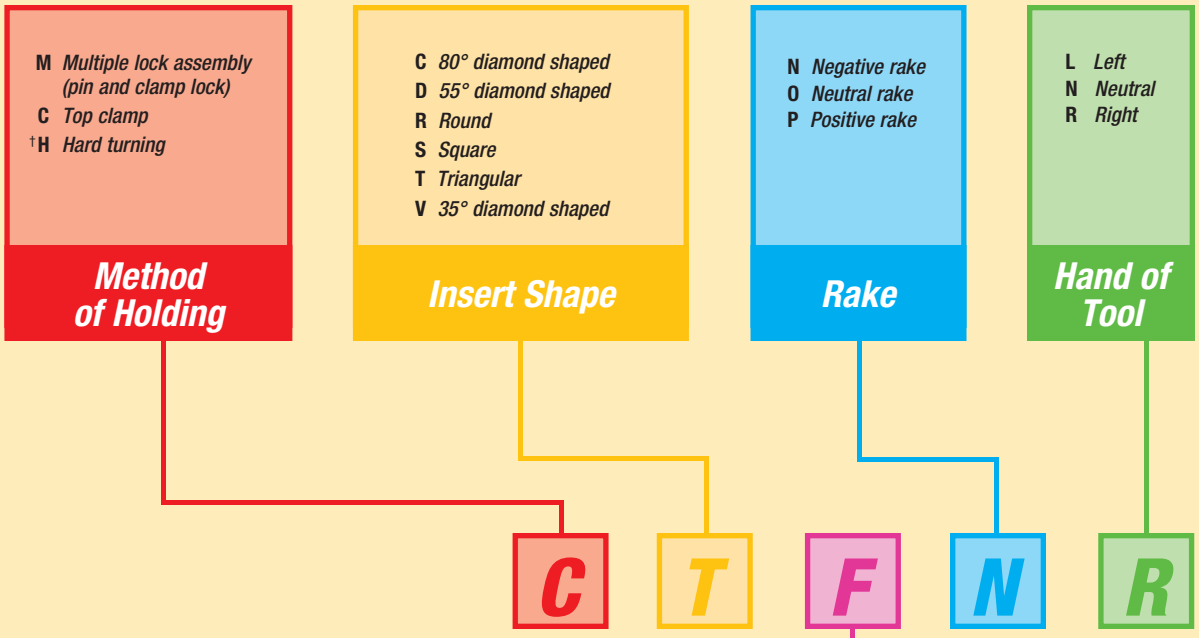
Advanced Ceramic Toolholder Identification System



Toolholder Style

- **A** *Straight shank with 0° (90°) side cutting edge angle*
- **B** *Straight shank with 15° (75°) side cutting edge angle*
- **C** *Straight shank with 0° (90°) end cutting edge angle*
- **D** *Straight shank with 45° side cutting edge angle*
- **E** *Straight shank with 30° (60°) side cutting edge angle*
- **F** *Offset shank with 0° (90°) end cutting edge angle*
- **G** *Offset shank with 0° (90°) side cutting edge angle*
- **†H** *Offset shank for I.D. threading and shallow grooving*
- **† I** *Offset shank with 27.5° (62.5°) end cutting edge angle*
- **J** *Offset shank with negative 3° (93°) side cutting edge angle*
- **K** *Offset shank with 15° (75°) end or side cutting edge angle*
- **L** *Offset shank with negative 5° (95°) end or side cutting edge angle*
- **M** *Straight shank with 50° (40°) side cutting edge angle*
- **N** *Straight shank with 27° (63°) side cutting edge angle*
- **†O** *Straight shank with centrally located round insert*
- **P** *Straight shank with 27.5° (62.5°) side cutting edge angle*
- **R** *Offset shank with 15° (75°) side cutting edge angle*
- **S** *Offset shank with 45° side cutting edge angle*
- **†T** *Offset shank with negative 27.5° (62.5°) side or end cutting edge angle*
- **†U** *Offset shank for deep grooving*
- **†V** *Offset shank with negative 17.5° (72.5°) side or end cutting edge angle*
- **W** *Offset shank with 10° (80°) side cutting edge angle*

NOTE:
The angles shown in parentheses are the angles as shown in the ANSI standard.
† Greenleaf standard.

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NOTE:
All toolholders are shipped qualified over insert gage radius to ±.003" on C and F dimensions as standard. Some toolholders are qualifiable on length only (C dimension).

All toolholders to be qualified other than above should be designated with the appropriate letter under heading "Shank Qualifications."

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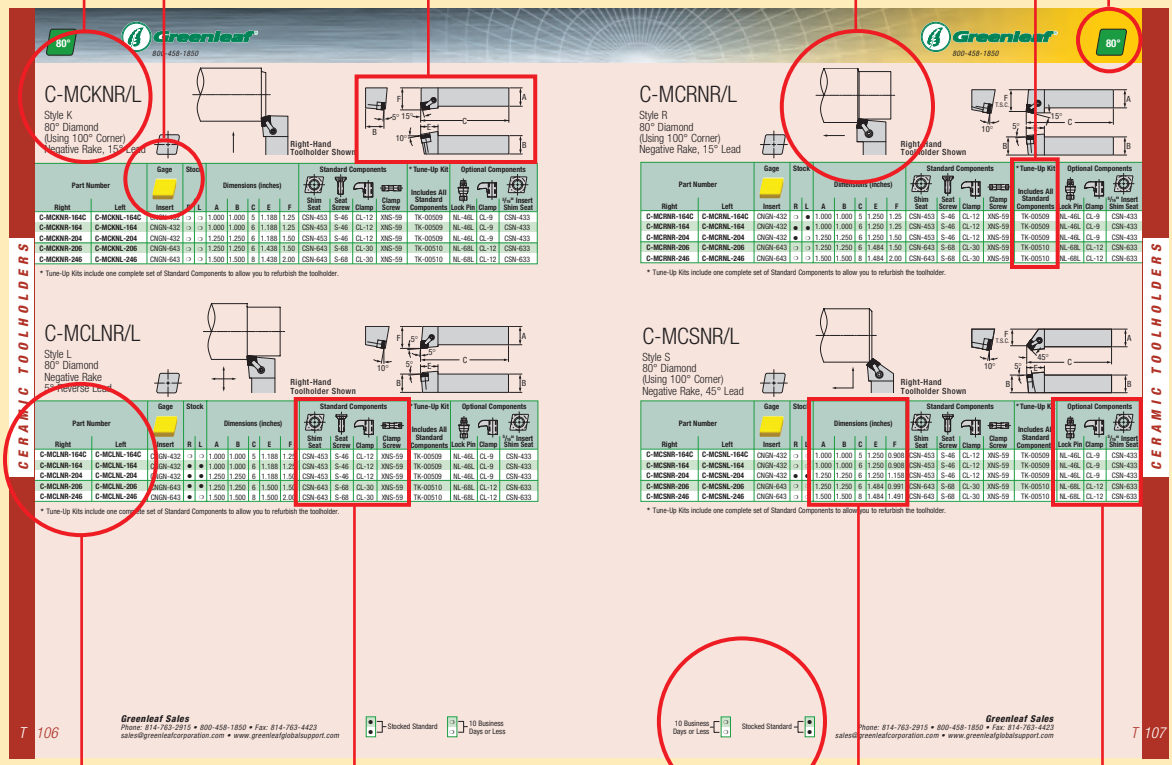
Advanced Ceramic Toolholder Usage Reference Guide



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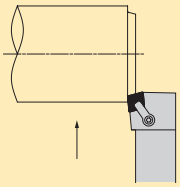
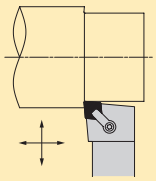
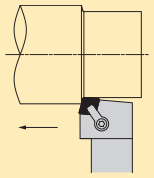
80°/100° Diamond – Negative



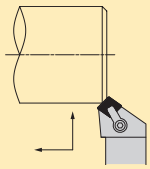
C-MCKNR/L
Style K
80° Diamond
(Using 100° Corner)
Negative Rake
15° Lead
page: T 106



C-MCLNR/L
Style L
80° Diamond
Negative Rake
5° Reverse Lead
page: T 106

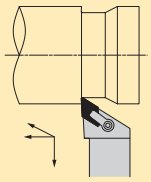


C-MCRNR/L
Style R
80° Diamond
(Using 100° Corner)
Negative Rake
15° Reverse
page: T 107

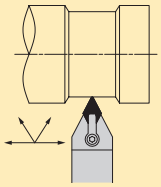


C-MCSNR/L
Style S
80° Diamond
(Using 100° Corner)
Negative Rake
45° Lead
page: T 107

55° Diamond – Negative

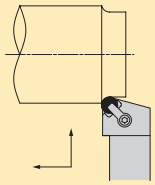


C-MDJNR/L
Style J
55° Diamond
Negative Rake
3° Reverse Lead
page: T 108

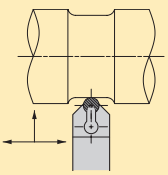


C-MDPNN
Style P
55° Diamond
Negative Rake
27°30' Lead
page: T 108

Round – Negative

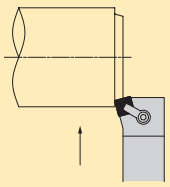


C-MRGNR/L
Style G
Round
Negative Rake
page: T 109

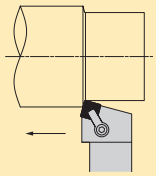


C-MRDNN
Style D
Round
Negative Rake
page: T 109

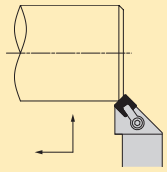
Square – Negative



C-MSKNR/L
Style K
Square
Negative Rake
15° Lead
page: T 110

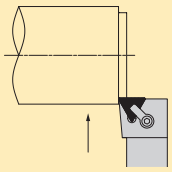


C-MSRNR/L
Style R
Square
Negative Rake
15° Lead
page: T 110

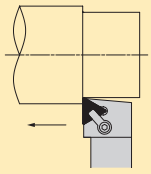


C-MSSNR/L
Style S
Square
Negative Rake
45° Lead
page: T 111

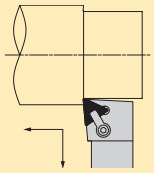
Triangle – Negative



C-MTFNR/L
Style F
Triangle
Negative Rake
0° Lead
page: T 112

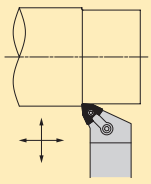


C-MTGNR/L
Style G
Triangle
Negative Rake
0° Lead
page: T 112



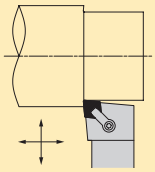
C-MTLNR/L
Style L
Triangle
Negative Rake
5° Reverse Lead
page: T 113

Trigon – Negative

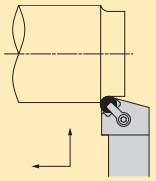


C-MWLNR/L
Style L
Trigon
Negative Rake
5° Reverse Lead
page: T 113

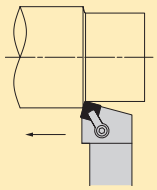
Hard-Turning – Negative



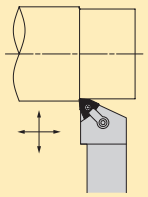
H-MCLNR/L
Style L
80° Diamond
Negative Rake
5° Reverse Lead
page: T 114



H-MRGNR/L
Style G
Round
Negative Rake
page: T 114

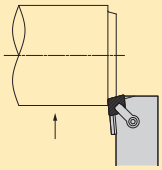


H-MSRNR/L
Style R
Square
Negative Rake
15° Lead
page: T 115

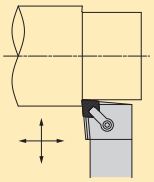


H-MWLNR/L
Style L
Trigon
Negative Rake
5° Reverse Lead
page: T 115

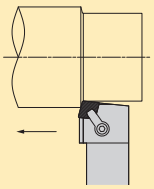
80°/100° Diamond – Positive



C-CCKPR/L
Style K
80° Diamond
(Using 100° Corner)
Positive Rake
15° Lead
page: T 116

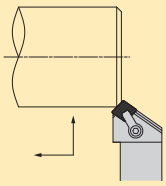


C-CCLPR/L
Style L
80° Diamond
Positive Rake
5° Reverse Lead
page: T 116



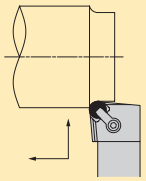
C-CCRPR/L
Style R
80° Diamond
(Using 100° Corner)
Positive Rake
15° Lead
page: T 116

80°/100° Diamond – Positive *continued*



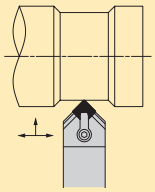
C-CCSPR/L
Style S
80° Diamond
(Using 100° Corner)
Positive Rake
45° Lead
page: T 117

Round – Positive

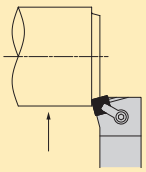


C-CRGPR/L
Style G
Round
Positive Rake
page: T 117

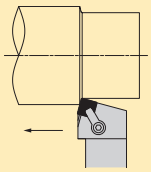
Square – Positive



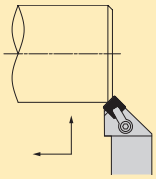
C-CSDPN
Style D
Square
Positive Rake
45° Lead
page: T 118



C-CSKPR/L
Style K
Square
Positive Rake
15° Lead
page: T 118



C-CSRPR/L
Style R
Square
Positive Rake
15° Lead
page: T 119



C-CSSPR/L
Style S
Square
Positive Rake
45° Lead
page: T 119

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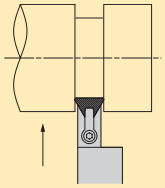
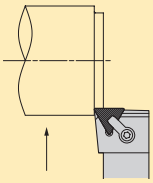
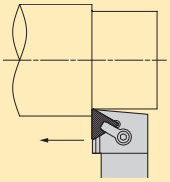
Triangle – Positive



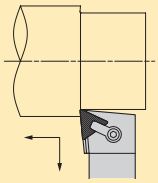
C-CTCPR/L
Style C
Triangle
Positive Rake
0° Lead
page: T 120



C-CTFPR/L
Style F
Triangle
Positive Rake
0° Lead
page: T 120



C-CTGPR/L
Style G
Triangle
Positive Rake
0° Lead
page: T 121



C-CTLPR/L
Style L
Triangle
Positive Rake
5° Reverse Lead
page: T 121

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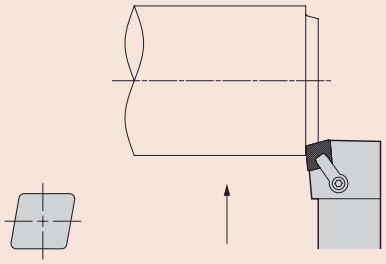
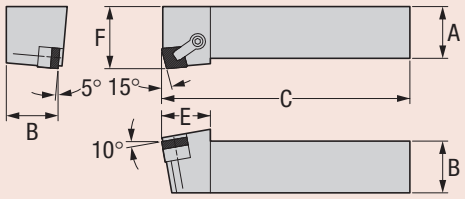
C-MCKNR/L

Style K
80° Diamond
(Using 100° Corner)
Negative Rake, 15° Lead



Right-Hand
Toolholder Shown

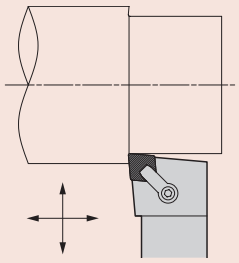


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MCKNR-164C	C-MCKNL-164C	CNGN-432	❍	❍	1.000	1.000	5	1.188	1.25	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCKNR-164	C-MCKNL-164	CNGN-432	❍	❍	1.000	1.000	6	1.188	1.25	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCKNR-204	C-MCKNL-204	CNGN-432	❍	❍	1.250	1.250	6	1.188	1.50	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCKNR-206	C-MCKNL-206	CNGN-643	❍	❍	1.250	1.250	6	1.438	1.50	CSN-643	S-68	CL-30	XNS-59	TK-00510	NL-68L	CL-12	CSN-633
C-MCKNR-246	C-MCKNL-246	CNGN-643	❍	❍	1.500	1.500	8	1.438	2.00	CSN-643	S-68	CL-30	XNS-59	TK-00510	NL-68L	CL-12	CSN-633

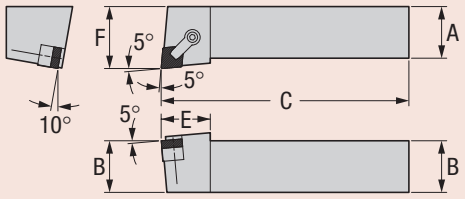
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-MCLNR/L

Style L
80° Diamond
Negative Rake
5° Reverse Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MCLNR-164C	C-MCLNL-164C	CNGN-432	❍	❍	1.000	1.000	5	1.188	1.25	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCLNR-164	C-MCLNL-164	CNGN-432	●	●	1.000	1.000	6	1.188	1.25	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCLNR-204	C-MCLNL-204	CNGN-432	●	●	1.250	1.250	6	1.188	1.50	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCLNR-206	C-MCLNL-206	CNGN-643	●	●	1.250	1.250	6	1.500	1.50	CSN-643	S-68	CL-30	XNS-59	TK-00510	NL-68L	CL-12	CSN-633
C-MCLNR-246	C-MCLNL-246	CNGN-643	●	❍	1.500	1.500	8	1.500	2.00	CSN-643	S-68	CL-30	XNS-59	TK-00510	NL-68L	CL-12	CSN-633

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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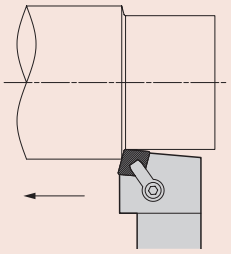
● ● Stocked Standard

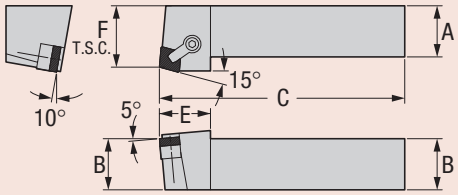
❍ ❍ 10 Business Days or Less

C-MCRNR/L

Style R
80° Diamond
(Using 100° Corner)
Negative Rake, 15° Lead



Right-Hand
Toolholder Shown

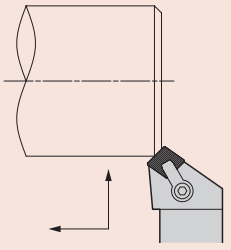


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MCRNR-164C	C-MCRNL-164C	CNGN-432	❍	●	1.000	1.000	5	1.250	1.25	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCRNR-164	C-MCRNL-164	CNGN-432	●	●	1.000	1.000	6	1.250	1.25	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCRNR-204	C-MCRNL-204	CNGN-432	●	❍	1.250	1.250	6	1.250	1.50	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCRNR-206	C-MCRNL-206	CNGN-643	❍	❍	1.250	1.250	6	1.484	1.50	CSN-643	S-68	CL-30	XNS-59	TK-00510	NL-68L	CL-12	CSN-633
C-MCRNR-246	C-MCRNL-246	CNGN-643	❍	❍	1.500	1.500	8	1.484	2.00	CSN-643	S-68	CL-30	XNS-59	TK-00510	NL-68L	CL-12	CSN-633

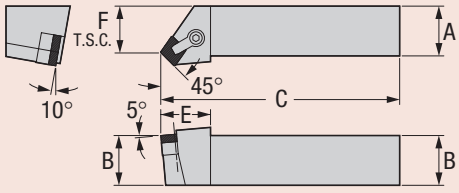
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-MCSNR/L

Style S
80° Diamond
(Using 100° Corner)
Negative Rake, 45° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MCSNR-164C	C-MCSNL-164C	CNGN-432	❍	❍	1.000	1.000	5	1.250	0.908	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCSNR-164	C-MCSNL-164	CNGN-432	❍	❍	1.000	1.000	6	1.250	0.908	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCSNR-204	C-MCSNL-204	CNGN-432	●	●	1.250	1.250	6	1.250	1.158	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
C-MCSNR-206	C-MCSNL-206	CNGN-643	❍	❍	1.250	1.250	6	1.484	0.991	CSN-643	S-68	CL-30	XNS-59	TK-00510	NL-68L	CL-12	CSN-633
C-MCSNR-246	C-MCSNL-246	CNGN-643	❍	❍	1.500	1.500	8	1.484	1.491	CSN-643	S-68	CL-30	XNS-59	TK-00510	NL-68L	CL-12	CSN-633

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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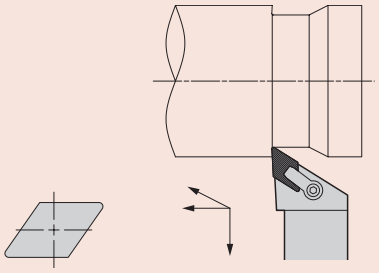
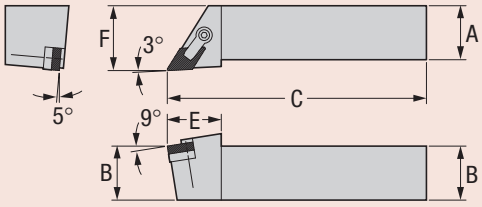
C-MDJNR/L

Style J
55° Diamond
Negative Rake
3° Reverse Lead



Right-Hand
Toolholder Shown

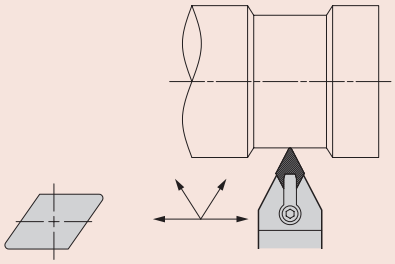


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp
C-MDJNR-163C	C-MDJNL-163C	DNGN-322	○	○	1.000	1.000	5	1.000	1.250	DSN-333	S-34	CL-7	XNS-36	TK-00511	NL-34L	CL-6
C-MDJNR-163	C-MDJNL-163	DNGN-322	○	○	1.000	1.000	6	1.000	1.250	DSN-333	S-34	CL-7	XNS-36	TK-00511	NL-34L	CL-6
C-MDJNR-203	C-MDJNL-203	DNGN-322	○	○	1.250	1.250	6	1.000	1.500	DSN-333	S-34	CL-7	XNS-36	TK-00511	NL-34L	CL-6
C-MDJNR-164C	C-MDJNL-164C	DNGN-432	○	●	1.000	1.000	5	1.250	1.250	DSN-433	S-46	CL-22	XNS-48	TK-00512	NL-46	CL-20
C-MDJNR-164	C-MDJNL-164	DNGN-432	●	●	1.000	1.000	6	1.250	1.250	DSN-433	S-46	CL-22	XNS-48	TK-00512	NL-46	CL-20
C-MDJNR-204	C-MDJNL-204	DNGN-432	○	○	1.250	1.250	6	1.250	1.500	DSN-433	S-46	CL-22	XNS-48	TK-00512	NL-46	CL-20
C-MDJNR-244	C-MDJNL-244	DNGN-432	○	○	1.500	1.500	8	1.250	2.000	DSN-433	S-46	CL-22	XNS-48	TK-00512	NL-46	CL-20

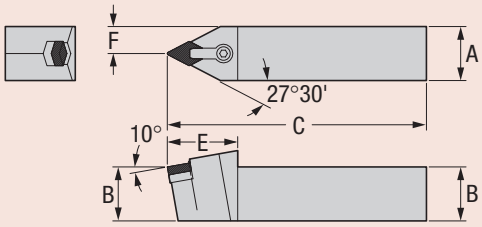
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-MDPNN

Style P
55° Diamond
Negative Rake
27° 30' Lead



Neutral
Toolholder Shown



Part Number	Gage	Stock	Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components	
Neutral	Insert		A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp
C-MDPNN-163C	DNGN-322	○	1.000	1.000	5	1.500	0.500	DSN-333	S-34	CL-12	XNS-59	TK-00513	NL-34L	CL-9
C-MDPNN-163	DNGN-322	○	1.000	1.000	6	1.500	0.500	DSN-333	S-34	CL-12	XNS-59	TK-00513	NL-34L	CL-9
C-MDPNN-203	DNGN-322	○	1.250	1.250	6	1.500	0.625	DSN-333	S-34	CL-12	XNS-59	TK-00513	NL-34L	CL-9
C-MDPNN-164C	DNGN-432	○	1.000	1.000	5	1.625	0.500	DSN-433	S-46	CL-30	XNS-59	TK-00514	NL-46	CL-12
C-MDPNN-164	DNGN-432	●	1.000	1.000	6	1.625	0.500	DSN-433	S-46	CL-30	XNS-59	TK-00514	NL-46	CL-12
C-MDPNN-204	DNGN-432	○	1.250	1.250	6	1.625	0.625	DSN-433	S-46	CL-30	XNS-59	TK-00514	NL-46	CL-12
C-MDPNN-244	DNGN-432	○	1.500	1.500	8	1.625	0.750	DSN-433	S-46	CL-30	XNS-59	TK-00514	NL-46	CL-12

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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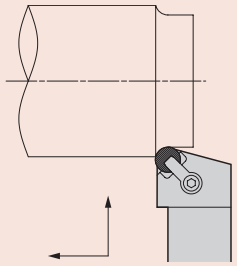
● ● Stocked Standard

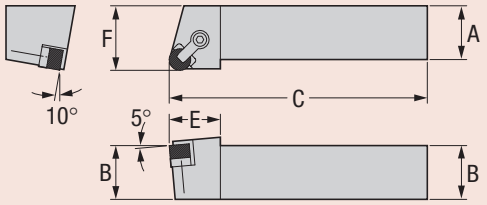
○ ○ 10 Business Days or Less

C-MRGNR/L

Style G
Round
Negative Rake



Right-Hand
Toolholder Shown

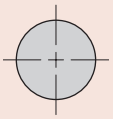


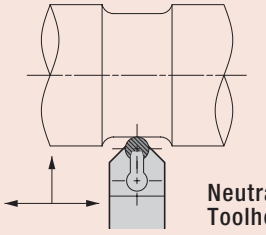
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit Includes All Std. Compo-nents	Optional Components #1		Optional Components #2	
										Shim Seat	Seat Screw	Clamp	Clamp Screw		Lock Pin	Clamp	Ins. Thk.	Shim Seat
Right	Left	Insert	R	L	A	B	C	E	F									
C-MRGNR-163C	C-MRGNL-163C	RNGN-33	❍	❍	1.000	1.000	5	1.000	1.250	RSN-32	S-34	CL-7	XNS-36	TK-00515	NL-34L	CL-6	1/8"	RSN-33
C-MRGNR-163	C-MRGNL-163	RNGN-33	●	●	1.000	1.000	6	1.000	1.250	RSN-32	S-34	CL-7	XNS-36	TK-00515	NL-34L	CL-6	1/8"	RSN-33
C-MRGNR-203	C-MRGNL-203	RNGN-33	●	●	1.250	1.250	6	1.000	1.500	RSN-32	S-34	CL-7	XNS-36	TK-00515	NL-34L	CL-6	1/8"	RSN-33
C-MRGNR-164C	C-MRGNL-164C	RNGN-45	●	●	1.000	1.000	5	1.188	1.250	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	3/16"	IRSN-45
C-MRGNR-164	C-MRGNL-164	RNGN-45	●	●	1.000	1.000	6	1.188	1.250	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	3/16"	IRSN-45
C-MRGNR-204	C-MRGNL-204	RNGN-45	●	●	1.250	1.250	6	1.188	1.500	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	3/16"	IRSN-45
C-MRGNR-244	C-MRGNL-244	RNGN-45	●	●	1.500	1.500	8	1.188	2.000	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	3/16"	IRSN-45
C-MRGNR-165C	C-MRGNL-165C	RNGN-55	❍	❍	1.000	1.000	5	1.375	1.250	RSN-53	S-58	CL-12	XNS-59	TK-00517	NSP-5	CL-9	–	–
C-MRGNR-165	C-MRGNL-165	RNGN-55	❍	❍	1.000	1.000	6	1.375	1.250	RSN-53	S-58	CL-12	XNS-59	TK-00517	NSP-5	CL-9	–	–
C-MRGNR-205	C-MRGNL-205	RNGN-55	●	❍	1.250	1.250	6	1.375	1.500	RSN-53	S-58	CL-12	XNS-59	TK-00517	NSP-5	CL-9	–	–
C-MRGNR-245	C-MRGNL-245	RNGN-55	❍	❍	1.500	1.500	8	1.375	2.000	RSN-53	S-58	CL-12	XNS-59	TK-00517	NSP-5	CL-9	–	–
C-MRGNR-166C	C-MRGNL-166C	RNGN-65	❍	❍	1.000	1.000	5	1.516	1.250	RSN-63	S-68	CL-30	XNS-59	TK-00518	NL-68L	CL-12	–	–
C-MRGNR-166	C-MRGNL-166	RNGN-65	●	❍	1.000	1.000	6	1.516	1.250	RSN-63	S-68	CL-30	XNS-59	TK-00518	NL-68L	CL-12	–	–
C-MRGNR-206	C-MRGNL-206	RNGN-65	●	●	1.250	1.250	6	1.516	1.500	RSN-63	S-68	CL-30	XNS-59	TK-00518	NL-68L	CL-12	–	–
C-MRGNR-246	C-MRGNL-246	RNGN-65	●	●	1.500	1.500	8	1.516	2.000	RSN-63	S-68	CL-30	XNS-59	TK-00518	NL-68L	CL-12	–	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

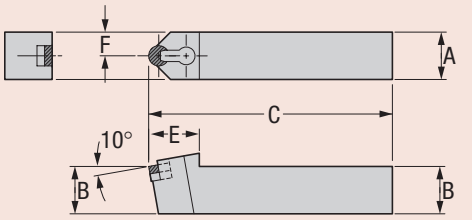
C-MRDNN

Style D
Round
Negative Rake





Neutral
Toolholder Shown



Part Number	Gage	Stock	Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components #1		Optional Components #2	
								Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	Insert Thcknss	Shim Seat
Neutral	Insert		A	B	C	E	F									
C-MRDNN-163C	RNGN-33	❍	1.000	1.000	5	1.000	0.500	RSN-32	S-34	CL-7	XNS-36	TK-00515	NL-34L	CL-6	1/8"	RSN-33
C-MRDNN-163	RNGN-33	❍	1.000	1.000	6	1.000	0.500	RSN-32	S-34	CL-7	XNS-36	TK-00515	NL-34L	CL-6	1/8"	RSN-33
C-MRDNN-203	RNGN-33	❍	1.250	1.250	6	1.000	0.625	RSN-32	S-34	CL-7	XNS-36	TK-00515	NL-34L	CL-6	1/8"	RSN-33
C-MRDNN-164C	RNGN-45	❍	1.000	1.000	5	1.375	0.500	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	3/16"	IRSN-45
C-MRDNN-164	RNGN-45	●	1.000	1.000	6	1.375	0.500	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	3/16"	IRSN-45
C-MRDNN-204	RNGN-45	●	1.250	1.250	6	1.375	0.625	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	3/16"	IRSN-45
C-MRDNN-244	RNGN-45	●	1.500	1.500	8	1.375	0.750	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	3/16"	IRSN-45
C-MRDNN-165C	RNGN-55	❍	1.000	1.000	5	1.375	0.500	RSN-53	S-58	CL-12	XNS-59	TK-00517	NSP-5	CL-9	–	–
C-MRDNN-165	RNGN-55	❍	1.000	1.000	6	1.375	0.500	RSN-53	S-58	CL-12	XNS-59	TK-00517	NSP-5	CL-9	–	–
C-MRDNN-205	RNGN-55	❍	1.250	1.250	6	1.375	0.625	RSN-53	S-58	CL-12	XNS-59	TK-00517	NSP-5	CL-9	–	–
C-MRDNN-245	RNGN-55	❍	1.500	1.500	8	1.375	0.750	RSN-53	S-58	CL-12	XNS-59	TK-00517	NSP-5	CL-9	–	–
C-MRDNN-166C	RNGN-65	❍	1.000	1.000	5	1.562	0.500	RSN-63	S-68	CL-30	XNS-59	TK-00518	NL-68L	CL-12	–	–
C-MRDNN-166	RNGN-65	❍	1.000	1.000	6	1.562	0.500	RSN-63	S-68	CL-30	XNS-59	TK-00518	NL-68L	CL-12	–	–
C-MRDNN-206	RNGN-65	❍	1.250	1.250	6	1.562	0.625	RSN-63	S-68	CL-30	XNS-59	TK-00518	NL-68L	CL-12	–	–
C-MRDNN-246	RNGN-65	❍	1.500	1.500	8	1.562	0.750	RSN-63	S-68	CL-30	XNS-59	TK-00518	NL-68L	CL-12	–	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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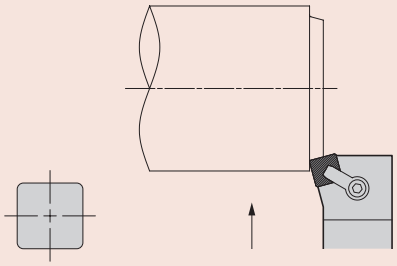
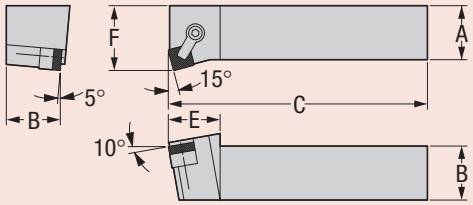
C-MSKNR/L

Style K
Square
Negative Rake
15° Lead



Right-Hand
Toolholder Shown

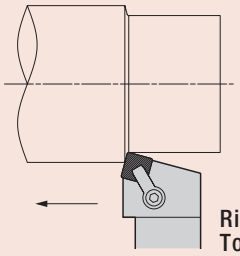


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MSKNR-164C	C-MSKNL-164C	SNGN-432	❍	❍	1.000	1.000	5	1.219	1.250	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSKNR-164	C-MSKNL-164	SNGN-432	❍	❍	1.000	1.000	6	1.219	1.250	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSKNR-204	C-MSKNL-204	SNGN-432	●	❍	1.250	1.250	6	1.219	1.500	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSKNR-205	C-MSKNL-205	SNGN-543	❍	❍	1.250	1.250	6	1.438	1.500	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9	–
C-MSKNR-245	C-MSKNL-245	SNGN-543	❍	❍	1.500	1.500	8	1.438	2.000	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9	–
C-MSKNR-206	C-MSKNL-206	SNGN-643	●	●	1.250	1.250	6	1.547	1.500	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12	**ISSN-623
C-MSKNR-246	C-MSKNL-246	SNGN-643	❍	❍	1.500	1.500	8	1.547	2.000	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12	**ISSN-623

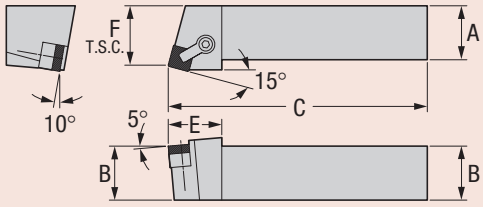
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** The lock pin option can NOT be used with this shim.

C-MSRNR/L

Style R
Square
Negative Rake
15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MSRNR-164C	C-MSRNL-164C	SNGN-432	❍	❍	1.000	1.000	5	1.234	1.125	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSRNR-164	C-MSRNL-164	SNGN-432	●	❍	1.000	1.000	6	1.234	1.125	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSRNR-204	C-MSRNL-204	SNGN-432	●	❍	1.250	1.250	6	1.234	1.375	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSRNR-205	C-MSRNL-205	SNGN-543	❍	❍	1.250	1.250	6	1.469	1.343	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9	–
C-MSRNR-245	C-MSRNL-245	SNGN-543	❍	❍	1.500	1.500	8	1.469	1.843	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9	–
C-MSRNR-206	C-MSRNL-206	SNGN-643	●	●	1.250	1.250	6	1.500	1.312	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12	**ISSN-623
C-MSRNR-246	C-MSRNL-246	SNGN-643	●	●	1.500	1.500	8	1.500	1.812	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12	**ISSN-623

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** The lock pin option can NOT be used with this shim.

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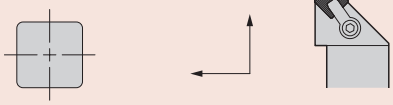
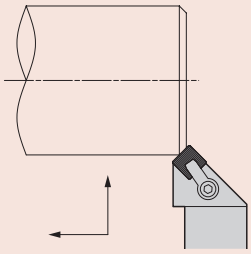
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

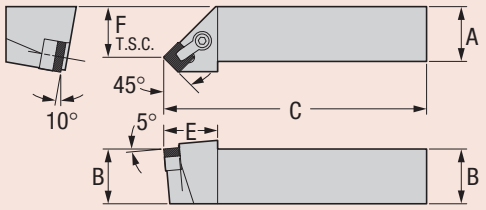
C-MSSNR/L

Style S
Square
Negative Rake
45° Lead





Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MSSNR-164C	**C-MSSNL-164C**	SNGN-432	❍	❍	1.000	1.000	5	1.234	0.906	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSSNR-164	**C-MSSNL-164**	SNGN-432	●	❍	1.000	1.000	6	1.234	0.906	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSSNR-204	**C-MSSNL-204**	SNGN-432	●	❍	1.250	1.250	6	1.234	1.156	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
C-MSSNR-205	**C-MSSNL-205**	SNGN-543	❍	❍	1.250	1.250	6	1.375	1.078	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9	–
C-MSSNR-245	**C-MSSNL-245**	SNGN-543	❍	❍	1.500	1.500	8	1.375	1.578	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9	–
C-MSSNR-206	**C-MSSNL-206**	SNGN-643	●	●	1.250	1.250	6	1.484	1.000	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12	**ISSN-623
C-MSSNR-246	**C-MSSNL-246**	SNGN-643	❍	❍	1.500	1.500	8	1.484	1.500	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12	**ISSN-623

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.
** The lock pin option can NOT be used with this shim.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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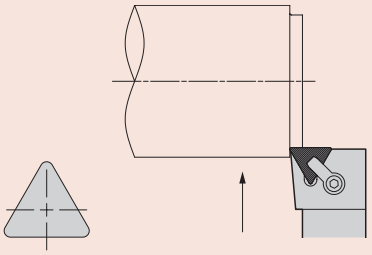
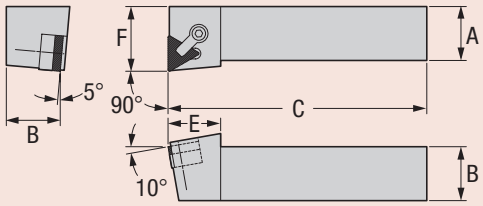
C-MTFNR/L

Style F
Triangle
Negative Rake
0° Lead





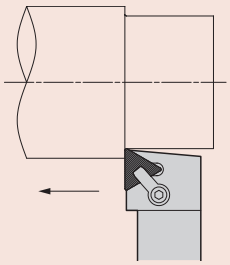
Right-Hand
Toolholder Shown

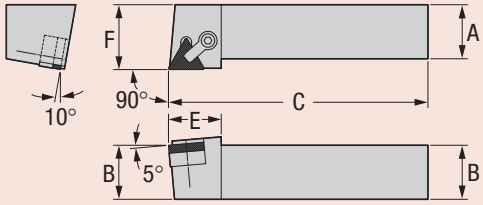
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MTFNR-163C	C-MTFNL-163C	TNGN-332	❍	❍	1.000	1.000	5	0.938	1.250	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTFNR-163	C-MTFNL-163	TNGN-332	❍	❍	1.000	1.000	6	0.938	1.250	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTFNR-203	C-MTFNL-203	TNGN-332	❍	❍	1.250	1.250	6	0.938	1.500	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTFNR-164C	C-MTFNL-164C	TNGN-432	❍	❍	1.000	1.000	5	1.219	1.250	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTFNR-164	C-MTFNL-164	TNGN-432	❍	❍	1.000	1.000	6	1.219	1.250	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTFNR-204	C-MTFNL-204	TNGN-432	❍	●	1.250	1.250	6	1.219	1.500	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTFNR-244	C-MTFNL-244	TNGN-432	❍	❍	1.500	1.500	8	1.219	2.000	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-MTGNR/L

Style G
Triangle
Negative Rake
0° Lead





Right-Hand
Toolholder Shown

Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
C-MTGNR-163C	C-MTGNL-163C	TNGN-332	❍	❍	1.000	1.000	5	1.109	1.250	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTGNR-163	C-MTGNL-163	TNGN-332	❍	❍	1.000	1.000	6	1.109	1.250	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTGNR-203	C-MTGNL-203	TNGN-332	❍	❍	1.250	1.250	6	1.109	1.500	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTGNR-164C	C-MTGNL-164C	TNGN-432	❍	❍	1.000	1.000	5	1.188	1.250	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTGNR-164	C-MTGNL-164	TNGN-432	●	❍	1.000	1.000	6	1.188	1.250	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTGNR-204	C-MTGNL-204	TNGN-432	❍	❍	1.250	1.250	6	1.188	1.500	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTGNR-244	C-MTGNL-244	TNGN-432	❍	❍	1.500	1.500	8	1.188	2.000	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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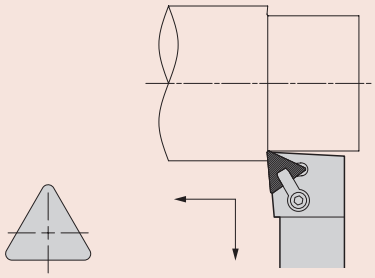
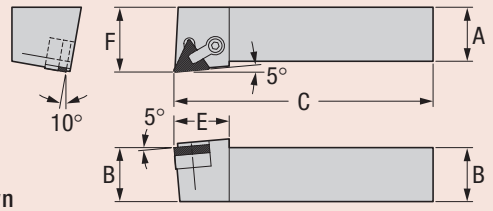
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

C-MTLNR/L

Style L
Triangle
Negative Rake
5° Reverse Lead





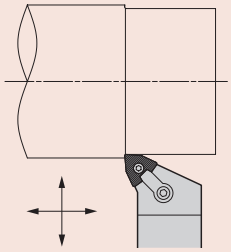
Right-Hand
Toolholder Shown

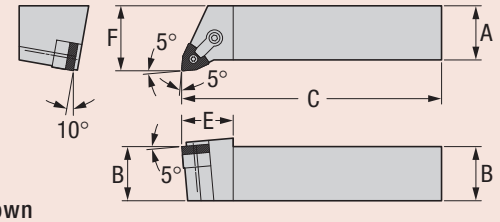
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
										Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
Right	Left	Insert	R	L	A	B	C	E	F								
C-MTLNR-163C	C-MTLNL-163C	TNGN-332	❍	❍	1.000	1.000	5	1.109	1.250	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTLNR-163	C-MTLNL-163	TNGN-332	❍	❍	1.000	1.000	6	1.109	1.250	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTLNR-203	C-MTLNL-203	TNGN-332	❍	❍	1.250	1.250	6	1.109	1.500	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6	–
C-MTLNR-164C	C-MTLNL-164C	TNGN-432	❍	❍	1.000	1.000	5	1.188	1.250	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTLNR-164	C-MTLNL-164	TNGN-432	❍	❍	1.000	1.000	6	1.188	1.250	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTLNR-204	C-MTLNL-204	TNGN-432	❍	❍	1.250	1.250	6	1.188	1.500	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433
C-MTLNR-244	C-MTLNL-244	TNGN-432	❍	❍	1.500	1.500	8	1.188	2.000	ITSN-453	S-46	CL-12	XNS-59	TK-00523	NL-46L	CL-9	ITSN-433

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-MWLNR/L

Style L
Trigon
Negative Rake
5° Reverse Lead





Right-Hand
Toolholder Shown

Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit
										Shim Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components
Right	Left	Insert	R	L	A	B	C	E	F					
C-MWLNR-123B	C-MWLNL-123B	WNGA-332	❍	❍	0.750	0.750	4.5	1.000	1.000	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
C-MWLNR-163	C-MWLNL-163	WNGA-332	❍	❍	1.000	1.000	6	1.000	1.250	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
C-MWLNR-203	C-MWLNL-203	WNGA-332	❍	❍	1.250	1.250	6	1.000	1.500	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
C-MWLNR-243	C-MWLNL-243	WNGA-332	❍	❍	1.500	1.500	8	1.000	2.000	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
C-MWLNR-124B	C-MWLNL-124B	WNGA-432	❍	❍	0.750	0.750	4.5	1.078	1.000	IWSN-453	NL-46L	CL-20	XNS-48	TK-00766
C-MWLNR-164	C-MWLNL-164	WNGA-432	●	❍	1.000	1.000	6	1.078	1.250	IWSN-453	NL-46L	CL-20	XNS-48	TK-00766
C-MWLNR-204	C-MWLNL-204	WNGA-432	❍	❍	1.250	1.250	6	1.078	1.500	IWSN-453	NL-46L	CL-20	XNS-48	TK-00766
C-MWLNR-244	C-MWLNL-244	WNGA-432	❍	❍	1.500	1.500	8	1.078	2.000	IWSN-453	NL-46L	CL-20	XNS-48	TK-00766

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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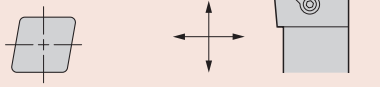
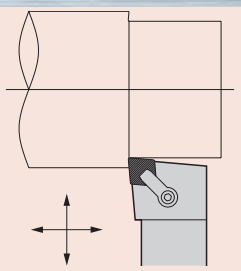
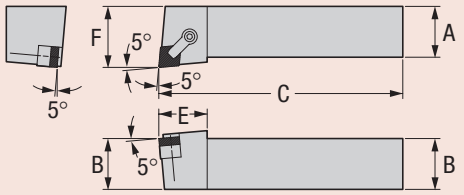
H-MCLNR/L

Style L
80° Diamond
Negative Rake
5° Reverse Lead





Right-Hand
Toolholder Shown

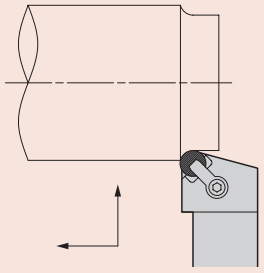


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
H-MCLNR-164C	H-MCLNL-164C	CNGN-432	❍	❍	1.000	1.000	5	1.188	1.250	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
H-MCLNR-164	H-MCLNL-164	CNGN-432	●	❍	1.000	1.000	6	1.188	1.250	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433
H-MCLNR-204	H-MCLNL-204	CNGN-432	●	❍	1.250	1.250	6	1.188	1.500	CSN-453	S-46	CL-12	XNS-59	TK-00509	NL-46L	CL-9	CSN-433

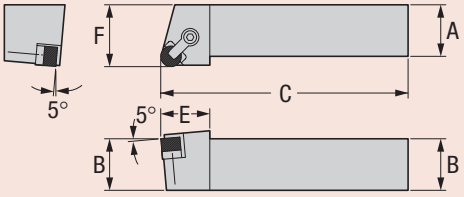
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

H-MRGNR/L

Style G
Round
Negative Rake



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	3/16" Insert Shim Seat
H-MRGNR-164C	H-MRGNL-164C	RNGN-45	❍	❍	1.000	1.000	5	1.188	1.250	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	IRSN-45
H-MRGNR-164	H-MRGNL-164	RNGN-45	●	●	1.000	1.000	6	1.188	1.250	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	IRSN-45
H-MRGNR-204	H-MRGNL-204	RNGN-45	●	●	1.250	1.250	6	1.188	1.500	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	IRSN-45
H-MRGNR-244	H-MRGNL-244	RNGN-45	●	❍	1.500	1.500	8	1.188	2.000	IRSN-43	S-46	CL-12	XNS-59	TK-00516	NL-46L	CL-9	IRSN-45

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

These toolholders are for hard turning with ceramic inserts using industry standard components.

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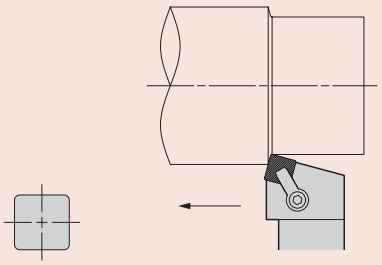
● ● Stocked Standard

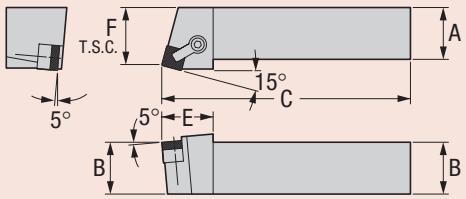
❍ ❍ 10 Business Days or Less

H-MSRNR/L

Style R
Square
Negative Rake
15° Lead



Right-Hand
Toolholder Shown

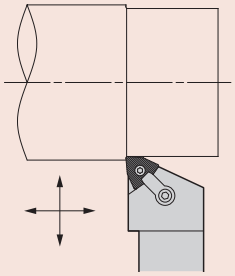


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit	Optional Components		
										Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp	5/16" Insert Shim Seat
Right	Left	Insert	R	L	A	B	C	E	F								
H-MSRNR-164C	H-MSRNL-164C	SNGN-432	❍	❍	1.000	1.000	5	1.234	1.125	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
H-MSRNR-164	H-MSRNL-164	SNGN-432	❍	❍	1.000	1.000	6	1.234	1.125	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433
H-MSRNR-204	H-MSRNL-204	SNGN-432	❍	❍	1.250	1.250	6	1.234	1.375	ISSN-453	S-46	CL-12	XNS-59	TK-00519	NL-46L	CL-9	ISSN-433

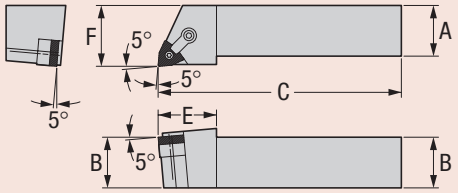
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

H-MWLNR/L

Style L
Trigon
Negative Rake
5° Reverse Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit
										Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
Right	Left	Insert	R	L	A	B	C	E	F					
H-MWLNR-123B	H-MWLNL-123B	WNGA-332	❍	❍	0.750	0.750	4.5	1.000	1.000	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
H-MWLNR-163	H-MWLNL-163	WNGA-332	❍	❍	1.000	1.000	6	1.000	1.250	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
H-MWLNR-203	H-MWLNL-203	WNGA-332	❍	❍	1.250	1.250	6	1.000	1.500	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
H-MWLNR-243	H-MWLNL-243	WNGA-332	❍	❍	1.500	1.500	8	1.000	2.000	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
H-MWLNR-124B	H-MWLNL-124B	WNGA-432	❍	❍	0.750	0.750	4.5	1.078	1.000	IWSN-453	NL-46L	CL-20	XNS-48	TK-00766
H-MWLNR-164	H-MWLNL-164	WNGA-432	❍	❍	1.000	1.000	6	1.078	1.250	IWSN-453	NL-46L	CL-20	XNS-48	TK-00766
H-MWLNR-204	H-MWLNL-204	WNGA-432	❍	❍	1.250	1.250	6	1.078	1.500	IWSN-453	NL-46L	CL-20	XNS-48	TK-00766
H-MWLNR-244	H-MWLNL-244	WNGA-432	❍	❍	1.500	1.500	8	1.078	2.000	IWSN-453	NL-46L	CL-20	XNS-48	TK-00766

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

These toolholders are for hard turning with ceramic inserts using industry standard components.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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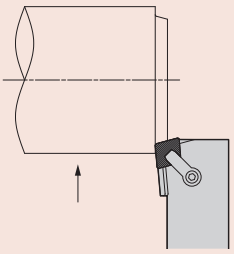
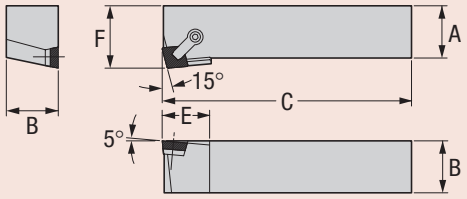
C-CCKPR/L

Style K
80° Diamond (Using 100° Corner)
Positive Rake
15° Lead



Right-Hand
Toolholder Shown

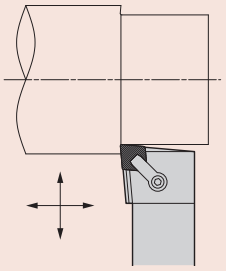


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CCKPR-164C	C-CCKPL-164C	CPGN-432	❍	❍	1.000	1.000	5	1.188	1.250	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
C-CCKPR-164	C-CCKPL-164	CPGN-432	❍	❍	1.000	1.000	6	1.188	1.250	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
C-CCKPR-204	C-CCKPL-204	CPGN-432	❍	❍	1.250	1.250	6	1.188	1.500	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501

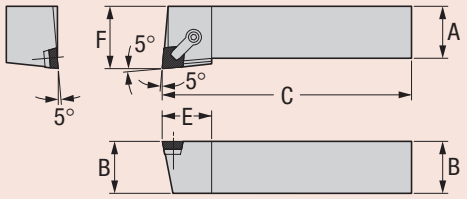
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-CCLPR/L

Style L
80° Diamond
Positive Rake
5° Reverse Lead



Right-Hand
Toolholder Shown

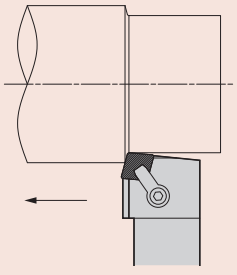


Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CCLPR-164C	C-CCLPL-164C	CPGN-432	❍	❍	1.000	1.000	5	1.188	1.250	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
C-CCLPR-164	C-CCLPL-164	CPGN-432	❍	❍	1.000	1.000	6	1.188	1.250	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
C-CCLPR-204	C-CCLPL-204	CPGN-432	❍	❍	1.250	1.250	6	1.188	1.500	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501

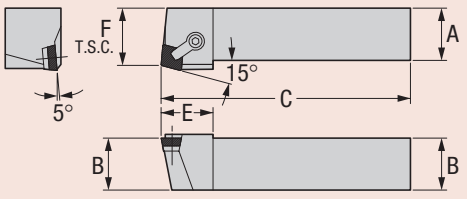
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-CCRPR/L

Style R
80° Diamond (Using 100° Corner)
Positive Rake
15° Lead



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CCRPR-164C	C-CCRPL-164C	CPGN-432	❍	❍	1.000	1.000	5	1.250	1.250	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
C-CCRPR-164	C-CCRPL-164	CPGN-432	❍	❍	1.000	1.000	6	1.250	1.250	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
C-CCRPR-204	C-CCRPL-204	CPGN-432	❍	❍	1.250	1.250	6	1.250	1.500	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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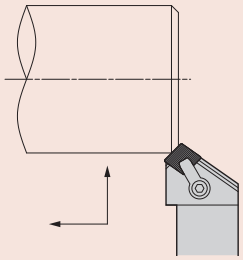
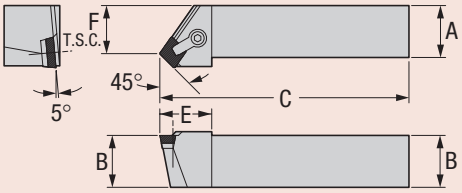
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

C-CCSPR/L

Style S
80° Diamond (Using 100° Corner)
Positive Rake
45° Lead





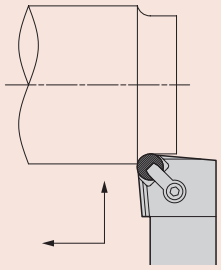
Right-Hand
Toolholder Shown

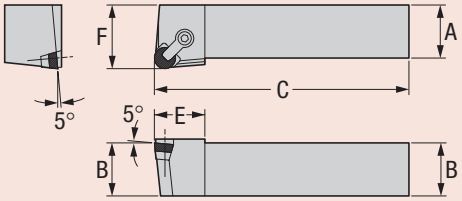
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CCSPR-164C	C-CCSPL-164C	CPGN-432	❍	❍	1.000	1.000	5	1.250	1.250	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
C-CCSPR-164	C-CCSPL-164	CPGN-432	❍	❍	1.000	1.000	6	1.250	1.250	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
C-CCSPR-204	C-CCSPL-204	CPGN-432	❍	❍	1.250	1.250	6	1.250	1.500	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-CRGPR/L

Style G
Round
Positive Rake





Right-Hand
Toolholder Shown

Part Number		Gage	Stock		Dimensions (inches)					Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CRGPR-163C	C-CRGPL-163C	RPGN-32	❍	❍	1.000	1.000	5	1.000	1.250	SP-34	#2-56x 1/4 S.H.C.S.	CL-7	XNS-36	TK-00502
C-CRGPR-163	C-CRGPL-163	RPGN-32	❍	❍	1.000	1.000	6	1.000	1.250	SP-34	#2-56x 1/4 S.H.C.S.	CL-7	XNS-36	TK-00502
C-CRGPR-203	C-CRGPL-203	RPGN-32	❍	❍	1.250	1.250	6	1.000	1.500	SP-34	#2-56x 1/4 S.H.C.S.	CL-7	XNS-36	TK-00502
C-CRGPR-164C	C-CRGPL-164C	RPGN-43	❍	❍	1.000	1.000	5	1.188	1.250	SP-44	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00503
C-CRGPR-164	C-CRGPL-164	RPGN-43	●	●	1.000	1.000	6	1.188	1.250	SP-44	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00503
C-CRGPR-204	C-CRGPL-204	RPGN-43	●	●	1.250	1.250	6	1.188	1.500	SP-44	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00503
C-CRGPR-244	C-CRGPL-244	RPGN-43	●	❍	1.500	1.500	8	1.188	2.000	SP-44	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00503

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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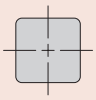
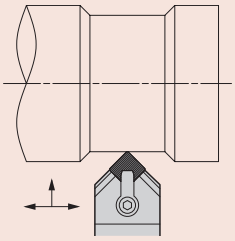
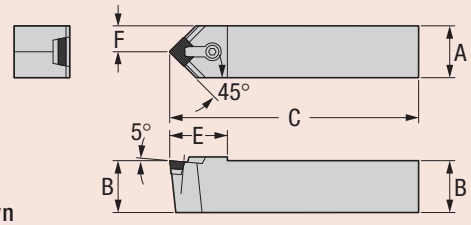
C-CSDPN

Style D
Square
Positive Rake
45° Lead





Neutral
Toolholder Shown

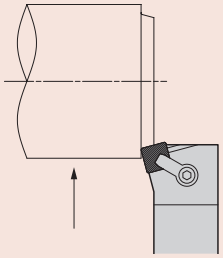


Part Number	Gage Insert	Stock	Dimensions (inches) A	B	C	E	F	Standard Components Shim Seat	Seat Screw	Clamp	Clamp Screw	*Tune-Up Kit Includes All Standard Components
C-CSDPN-164C	SPGN-432	❍	1.000	1.000	5	1.391	0.500	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
C-CSDPN-164	SPGN-432	❍	1.000	1.000	6	1.391	0.500	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
C-CSDPN-204	SPGN-432	●	1.250	1.250	6	1.391	0.625	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504

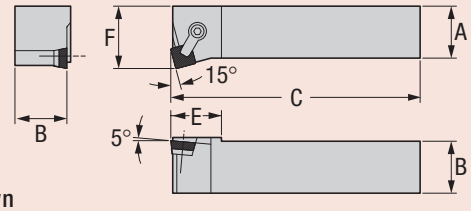
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-CSKPR/L

Style K
Square
Positive Rake
15° Lead



Right-Hand
Toolholder Shown



Part Number Right	Part Number Left	Gage Insert	Stock R	Stock L	Dimensions (inches) A	B	C	E	F	Standard Components Shim Seat	Seat Screw	Clamp	Clamp Screw	*Tune-Up Kit Includes All Standard Components
C-CSKPR-164C	**C-CSKPL-164C**	SPGN-432	❍	❍	1.000	1.000	5	1.219	1.250	SP-41	#4-40X 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
C-CSKPR-164	**C-CSKPL-164**	SPGN-432	❍	❍	1.000	1.000	6	1.219	1.250	SP-41	#4-40X 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
C-CSKPR-204	**C-CSKPL-204**	SPGN-432	❍	❍	1.250	1.250	6	1.219	1.500	SP-41	#4-40X 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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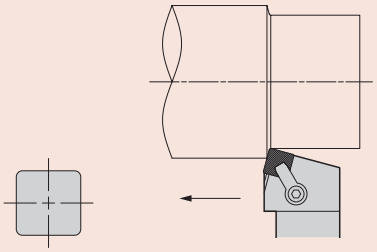
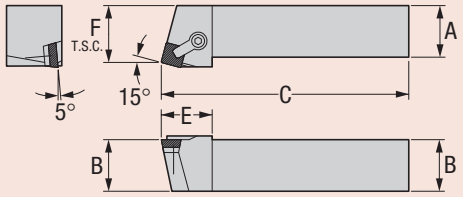
● Stocked Standard
❍ 10 Business Days or Less

C-CSRPR/L

Style R
Square
Positive Rake
15° Lead





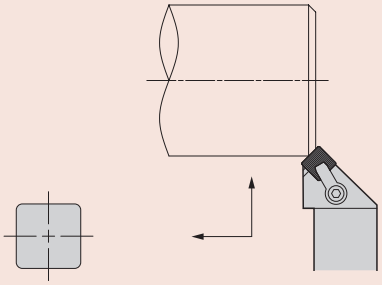
Right-Hand
Toolholder Shown

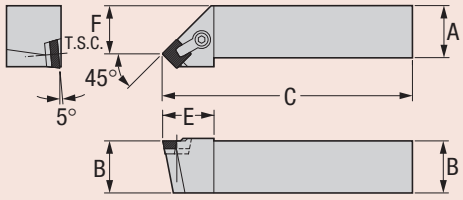
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				*Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CSRPR-164C	**C-CSRPL-164C**	SPGN-432	❍	❍	1.000	1.000	5	1.234	1.125	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
C-CSRPR-164	**C-CSRPL-164**	SPGN-432	❍	❍	1.000	1.000	6	1.234	1.125	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
C-CSRPR-204	**C-CSRPL-204**	SPGN-432	❍	❍	1.250	1.250	6	1.234	1.375	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

C-CSSPR/L

Style S
Square
Positive Rake
45° Lead





Right-Hand
Toolholder Shown

Part Number		Gage	Stock		Dimensions (inches)					Standard Components				*Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CSSPR-164C	**C-CSSPL-164C**	SPGN-432	❍	❍	1.000	1.000	5	1.234	0.906	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
C-CSSPR-164	**C-CSSPL-164**	SPGN-432	❍	❍	1.000	1.000	6	1.234	0.906	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
C-CSSPR-204	**C-CSSPL-204**	SPGN-432	❍	❍	1.250	1.250	6	1.234	1.156	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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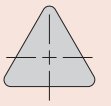
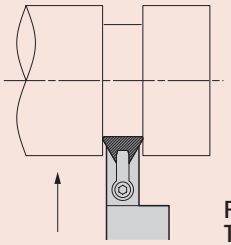
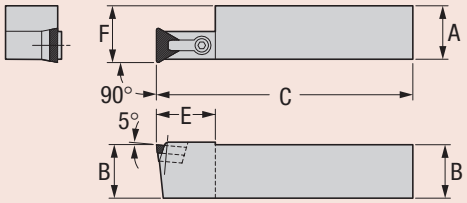
C-CTCPR/L

Style C
Triangle
Positive Rake
0° Lead





Right-Hand
Toolholder Shown

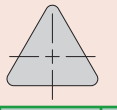


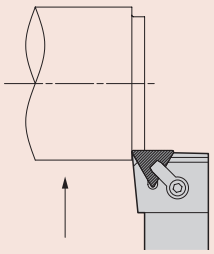
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				*Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CTCPR-163C	C-CTCPL-163C	TPGN-322	❍	❍	1.000	1.000	5	1.125	1.047	SP3A	#4-40x 3/8 F.H.C.S.	CL-22	XNS-48	TK-00505
C-CTCPR-163	C-CTCPL-163	TPGN-322	❍	❍	1.000	1.000	6	1.125	1.047	SP3A	#4-40x 3/8 F.H.C.S.	CL-22	XNS-48	TK-00505
C-CTCPR-203	C-CTCPL-203	TPGN-322	❍	❍	1.250	1.250	6	1.125	1.297	SP3A	#4-40x 3/8 F.H.C.S.	CL-22	XNS-48	TK-00505
C-CTCPR-164C	C-CTCPL-164C	TPGN-432	❍	❍	1.000	1.000	5	1.375	1.078	SP-4	#6-32x 1/2 F.H.C.S.	CL-30	XNS-59	TK-00506
C-CTCPR-164	C-CTCPL-164	TPGN-432	❍	❍	1.000	1.000	6	1.375	1.078	SP-4	#6-32x 1/2 F.H.C.S.	CL-30	XNS-59	TK-00506
C-CTCPR-204	C-CTCPL-204	TPGN-432	❍	❍	1.250	1.250	6	1.375	1.328	SP-4	#6-32x 1/2 F.H.C.S.	CL-30	XNS-59	TK-00506
C-CTCPR-244	C-CTCPL-244	TPGN-432	❍	❍	1.500	1.500	8	1.375	1.578	SP-4	#6-32x 1/2 F.H.C.S.	CL-30	XNS-59	TK-00506

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

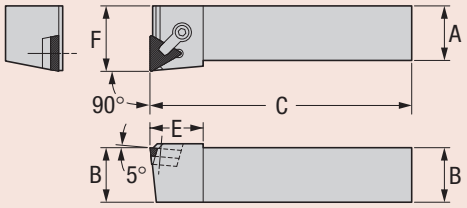
C-CTFPR/L

Style F
Triangle
Positive Rake
0° Lead





Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				*Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CTFPR-163C	C-CTFPL-163C	TPGN-322	❍	❍	1.000	1.000	5	0.938	1.250	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTFPR-163	C-CTFPL-163	TPGN-322	❍	❍	1.000	1.000	6	0.938	1.250	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTFPR-203	C-CTFPL-203	TPGN-322	❍	❍	1.250	1.250	6	0.938	1.500	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTFPR-164C	C-CTFPL-164C	TPGN-432	❍	❍	1.000	1.000	5	1.219	1.250	SP4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTFPR-164	C-CTFPL-164	TPGN-432	❍	❍	1.000	1.000	6	1.219	1.250	SP4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTFPR-204	C-CTFPL-204	TPGN-432	❍	❍	1.250	1.250	6	1.219	1.500	SP4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTFPR-244	C-CTFPL-244	TPGN-432	❍	❍	1.500	1.500	8	1.219	2.000	SP4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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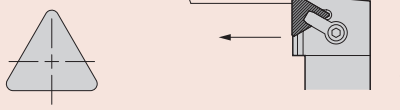
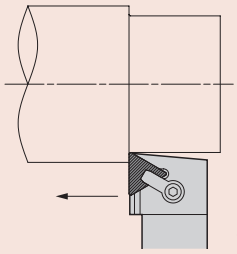
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

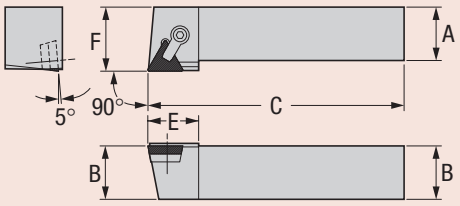
C-CTGPR/L

Style G
Triangle
Positive Rake
0° Lead





Right-Hand
Toolholder Shown

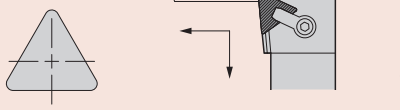


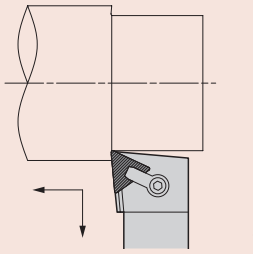
Part Number		Gage	Stock		Dimensions (inches)					Standard Components				*Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CTGPR-163C	C-CTGPL-163C	TPGN-322	❍	❍	1.000	1.000	5	1.109	1.250	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTGPR-163	C-CTGPL-163	TPGN-322	❍	❍	1.000	1.000	6	1.109	1.250	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTGPR-203	C-CTGPL-203	TPGN-322	❍	❍	1.250	1.250	6	1.109	1.500	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTGPR-164C	C-CTGPL-164C	TPGN-432	❍	❍	1.000	1.000	5	1.188	1.250	SP-4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTGPR-164	C-CTGPL-164	TPGN-432	❍	❍	1.000	1.000	6	1.188	1.250	SP-4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTGPR-204	C-CTGPL-204	TPGN-432	❍	❍	1.250	1.250	6	1.188	1.500	SP-4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTGPR-244	C-CTGPL-244	TPGN-432	❍	❍	1.500	1.500	8	1.188	2.000	SP-4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

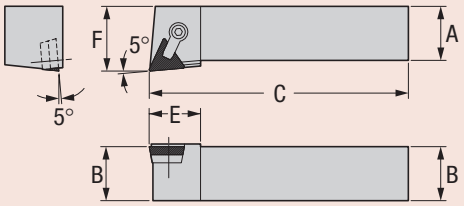
C-CTLPR/L

Style L
Triangle
Positive Rake
5° Reverse Lead





Right-Hand
Toolholder Shown



Part Number		Gage	Stock		Dimensions (inches)					Standard Components				*Tune-Up Kit
Right	Left	Insert	R	L	A	B	C	E	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
C-CTLPR-163C	C-CTLPL-163C	TPGN-322	❍	❍	1.000	1.000	5	1.109	1.250	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTLPR-163	C-CTLPL-163	TPGN-322	❍	❍	1.000	1.000	6	1.109	1.250	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTLPR-203	C-CTLPL-203	TPGN-322	❍	❍	1.250	1.250	6	1.109	1.500	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
C-CTLPR-164C	C-CTLPL-164C	TPGN-432	❍	❍	1.000	1.000	5	1.188	1.250	SP4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTLPR-164	C-CTLPL-164	TPGN-432	❍	❍	1.000	1.000	6	1.188	1.250	SP4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTLPR-204	C-CTLPL-204	TPGN-432	❍	❍	1.250	1.250	6	1.188	1.500	SP4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
C-CTLPR-244	C-CTLPL-244	TPGN-432	❍	❍	1.500	1.500	8	1.188	2.000	SP4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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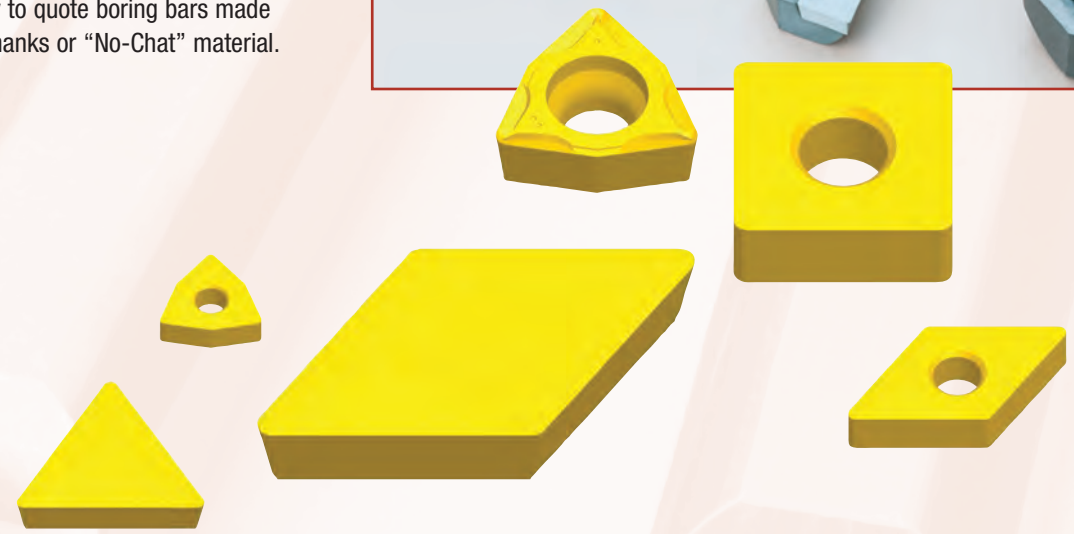
Industry-Standard Boring Bars for Carbide Inserts

The boring bar systems and cartridges in this catalog are designed around industry standard hardware. This gives complete interchangeability with other tooling components and minimizes spare parts inventories.

Most bars incorporate “through the bar” coolant feed with directable outlet nozzle.

Greenleaf uses heat treated alloy steel to insure a consistent high quality product for maximum life performance.

Custom engineered tooling is a Greenleaf specialty and we will be pleased to quote your special requirements for boring. Additionally, Greenleaf has the capability to quote boring bars made of heavy metal shanks or “No-Chat” material.



Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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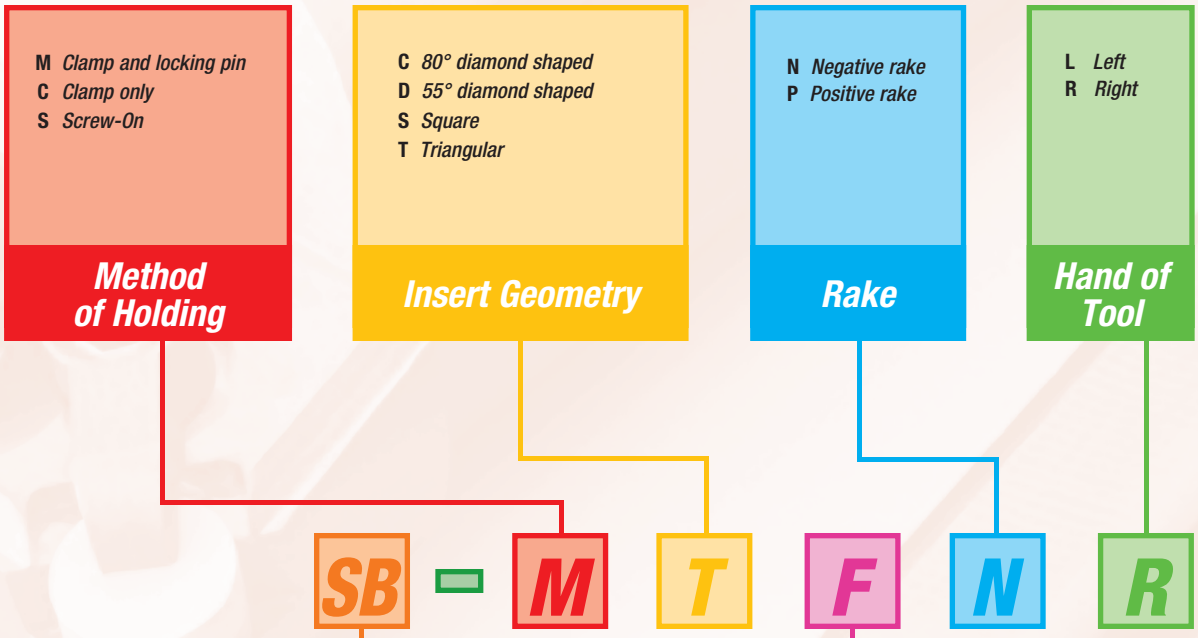
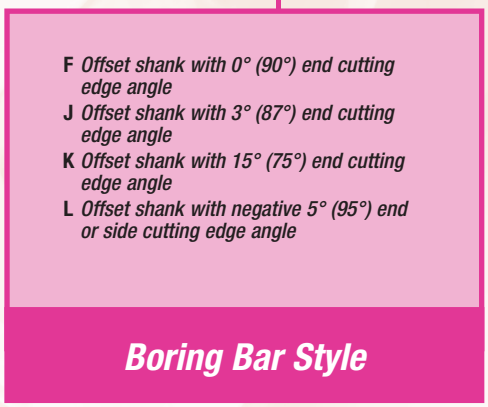
Boring Bar Identification System





NOTE:
The angles shown in parentheses are the angles as shown in the ANSI standard.

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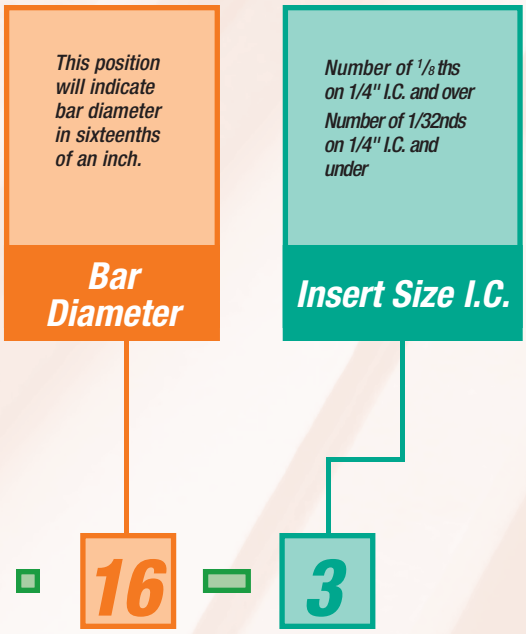

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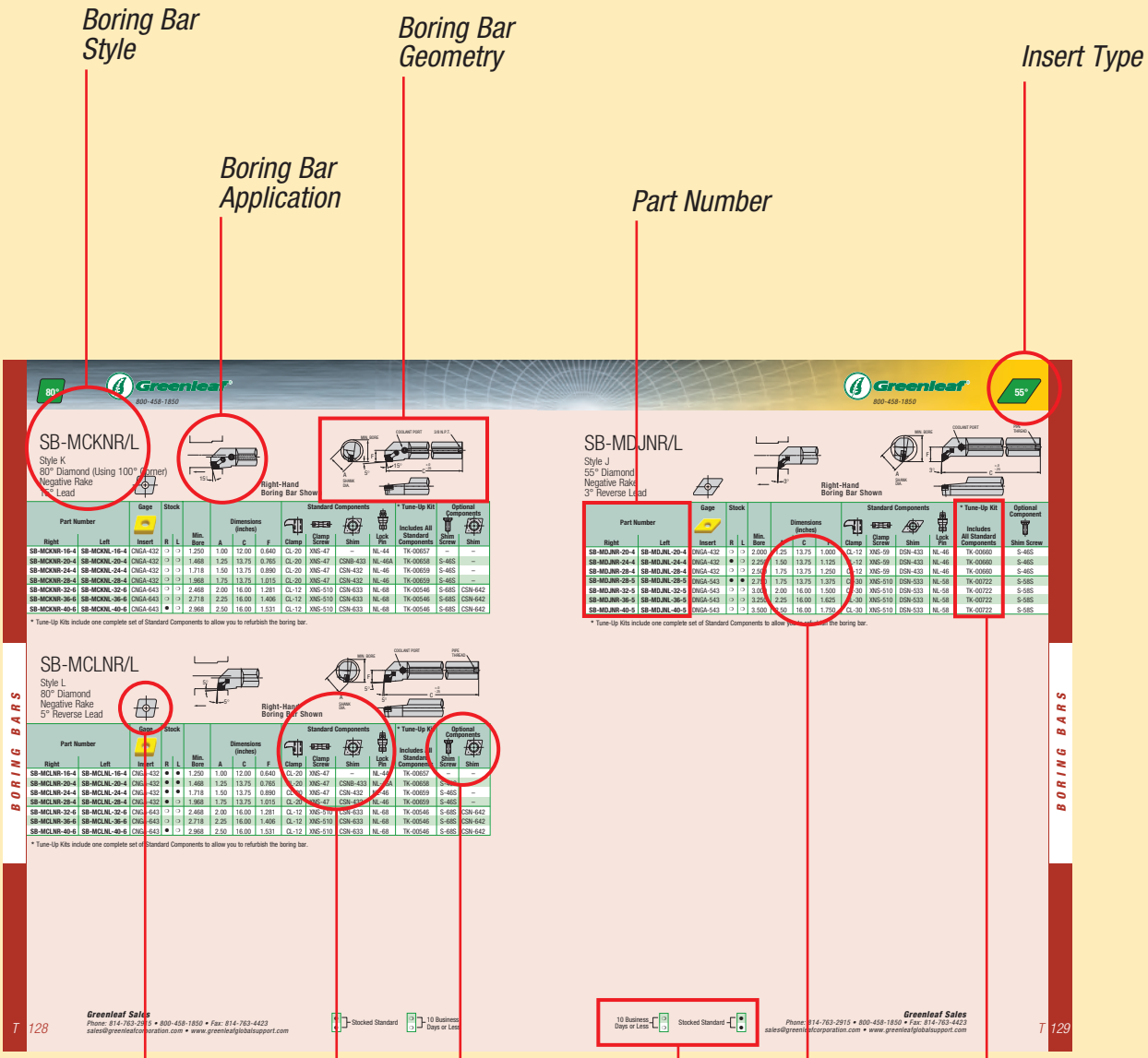
Boring Bar Usage Reference Guide



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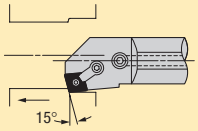
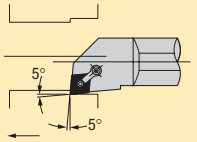
80° Diamond – Negative

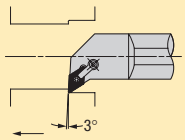


SB-MCKNR/L
Style K
80° Diamond
(Using 100° Corner)
Negative Rake
15° Lead
page: T 128



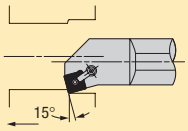
SB-MCLNR/L
Style L
80° Diamond
Negative Rake
5° Reverse Lead
page: T 128

55° Diamond – Negative



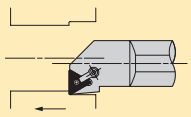
SB-MDJNR/L
Style J
55° Diamond
Negative Rake
3° Reverse Lead
page: T 129

Square – Negative

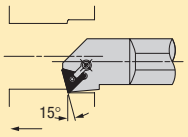


SB-MSKNR/L
Style K
Square
Negative Rake
15° Lead
page: T 130

Triangle – Negative

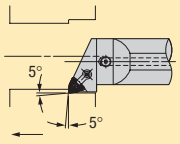


SB-MTFNR/L
Style F
Triangle
Negative Rake
0° Lead
page: T 131



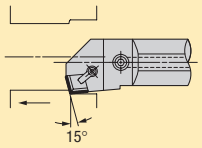
SB-MTKNR/L
Style K
Triangle
Negative Rake
15° Lead
page: T 131

Trigon – Negative

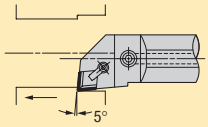


SB-MWLNR/L
Style L
80° Trigon
Negative Rake
5° Reverse Lead
page: T 132

80° Diamond – Positive

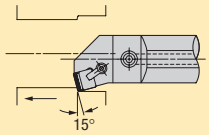


SB-CCKPR/L
Style K
80° Diamond
(Using 100° Corner)
Positive Rake
15° Lead
page: T 133



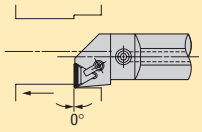
SB-CCLPR/L
Style L
80° Diamond
Positive Rake
5° Reverse Lead
page: T 133

Square – Positive

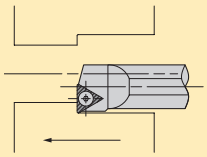


SB-CSKPR/L
Style K
Square
Positive Rake
15° Lead
page: T 134

Triangle – Positive

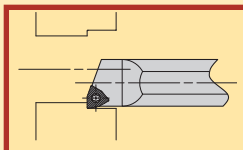


SB-CTFPR/L
Style F
Triangle
Positive Rake
0° Lead
page: T 135

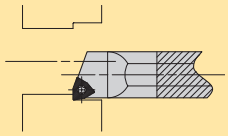


S-STFNR/L
Style F
Triangle
Positive Rake
0° Lead
page: T 135

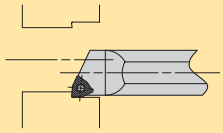
Screw-On Trigon



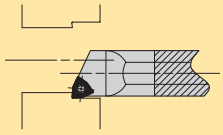
C-SWFCR/L
Style F
Screw-On Trigon
Solid Steel
0° Lead
page: T 136



S-SWFCR/L
Style F
Screw-On Trigon
Heavy Metal
Fixed Steel Head
0° Lead
page: T 136



S-SWLCR/L
Style L
Screw-On Trigon
Solid Steel
5° Reverse Lead
page: T 137



C-SWLCR/L
Style L
Screw-On Trigon
Heavy Metal
Fixed Steel Head
5° Reverse Lead
page: T 137

These Boring Bars do not follow the Boring Bar Identification System.

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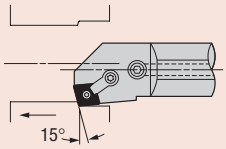
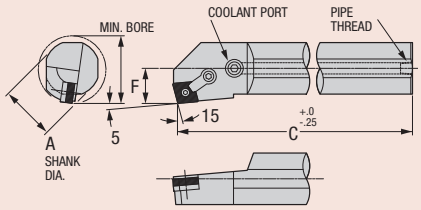
SB-MCKNR/L

Style K
80° Diamond (Using 100° Corner)
Negative Rake
15° Lead





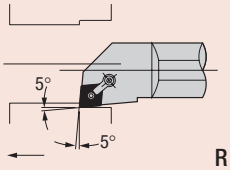
Right-Hand
Boring Bar Shown

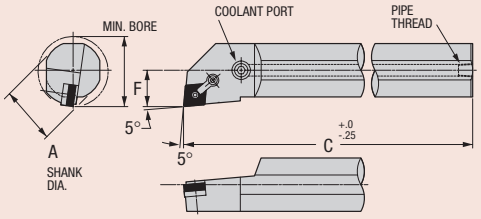
Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Bore	A	C	F	Clamp	Clamp Screw	Shim	Lock Pin	Includes All Standard Components	Shim Screw	Shim
SB-MCKNR-16-4	SB-MCKNL-16-4	CNGA-432	❍	❍	1.250	1.00	12.00	0.640	CL-20	XNS-47	–	NL-44	TK-00657	–	–
SB-MCKNR-20-4	SB-MCKNL-20-4	CNGA-432	❍	❍	1.468	1.25	13.75	0.765	CL-20	XNS-47	CSNB-433	NL-46A	TK-00658	S-46S	–
SB-MCKNR-24-4	SB-MCKNL-24-4	CNGA-432	❍	❍	1.718	1.50	13.75	0.890	CL-20	XNS-47	CSN-432	NL-46	TK-00659	S-46S	–
SB-MCKNR-28-4	SB-MCKNL-28-4	CNGA-432	❍	❍	1.968	1.75	13.75	1.015	CL-20	XNS-47	CSN-432	NL-46	TK-00659	S-46S	–
SB-MCKNR-32-6	SB-MCKNL-32-6	CNGA-643	❍	❍	2.468	2.00	16.00	1.281	CL-12	XNS-510	CSN-633	NL-68	TK-00546	S-68S	CSN-642
SB-MCKNR-36-6	SB-MCKNL-36-6	CNGA-643	❍	❍	2.718	2.25	16.00	1.406	CL-12	XNS-510	CSN-633	NL-68	TK-00546	S-68S	CSN-642
SB-MCKNR-40-6	SB-MCKNL-40-6	CNGA-643	●	❍	2.968	2.50	16.00	1.531	CL-12	XNS-510	CSN-633	NL-68	TK-00546	S-68S	CSN-642

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

SB-MCLNR/L

Style L
80° Diamond
Negative Rake
5° Reverse Lead





Right-Hand
Boring Bar Shown

Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Bore	A	C	F	Clamp	Clamp Screw	Shim	Lock Pin	Includes All Standard Components	Shim Screw	Shim
SB-MCLNR-16-4	SB-MCLNL-16-4	CNGA-432	●	●	1.250	1.00	12.00	0.640	CL-20	XNS-47	–	NL-44	TK-00657	–	–
SB-MCLNR-20-4	SB-MCLNL-20-4	CNGA-432	●	●	1.468	1.25	13.75	0.765	CL-20	XNS-47	CSNB-433	NL-46A	TK-00658	S-46S	–
SB-MCLNR-24-4	SB-MCLNL-24-4	CNGA-432	●	●	1.718	1.50	13.75	0.890	CL-20	XNS-47	CSN-432	NL-46	TK-00659	S-46S	–
SB-MCLNR-28-4	SB-MCLNL-28-4	CNGA-432	●	❍	1.968	1.75	13.75	1.015	CL-20	XNS-47	CSN-432	NL-46	TK-00659	S-46S	–
SB-MCLNR-32-6	SB-MCLNL-32-6	CNGA-643	❍	❍	2.468	2.00	16.00	1.281	CL-12	XNS-510	CSN-633	NL-68	TK-00546	S-68S	CSN-642
SB-MCLNR-36-6	SB-MCLNL-36-6	CNGA-643	❍	❍	2.718	2.25	16.00	1.406	CL-12	XNS-510	CSN-633	NL-68	TK-00546	S-68S	CSN-642
SB-MCLNR-40-6	SB-MCLNL-40-6	CNGA-643	●	❍	2.968	2.50	16.00	1.531	CL-12	XNS-510	CSN-633	NL-68	TK-00546	S-68S	CSN-642

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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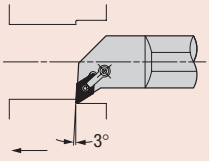
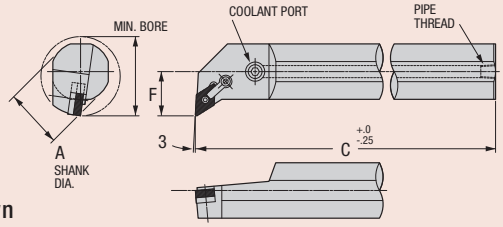
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

SB-MDJNR/L

Style J
55° Diamond
Negative Rake
3° Reverse Lead



Right-Hand
Boring Bar Shown



Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components				* Tune-Up Kit	Optional Component
Right	Left	Insert	R	L		A	C	F	Clamp	Clamp Screw	Shim	Lock Pin	Includes All Standard Components	Shim Screw
SB-MDJNR-20-4	**SB-MDJNL-20-4**	DNGA-432	❍	❍	2.000	1.25	13.75	1.000	CL-12	XNS-59	DSN-433	NL-46	TK-00660	S-46S
SB-MDJNR-24-4	**SB-MDJNL-24-4**	DNGA-432	●	❍	2.250	1.50	13.75	1.125	CL-12	XNS-59	DSN-433	NL-46	TK-00660	S-46S
SB-MDJNR-28-4	**SB-MDJNL-28-4**	DNGA-432	❍	❍	2.500	1.75	13.75	1.250	CL-12	XNS-59	DSN-433	NL-46	TK-00660	S-46S
SB-MDJNR-28-5	**SB-MDJNL-28-5**	DNGA-543	●	●	2.750	1.75	13.75	1.375	CL-30	XNS-510	DSN-533	NL-58	TK-00722	S-58S
SB-MDJNR-32-5	**SB-MDJNL-32-5**	DNGA-543	❍	❍	3.000	2.00	16.00	1.500	CL-30	XNS-510	DSN-533	NL-58	TK-00722	S-58S
SB-MDJNR-36-5	**SB-MDJNL-36-5**	DNGA-543	❍	❍	3.250	2.25	16.00	1.625	CL-30	XNS-510	DSN-533	NL-58	TK-00722	S-58S
SB-MDJNR-40-5	**SB-MDJNL-40-5**	DNGA-543	❍	❍	3.500	2.50	16.00	1.750	CL-30	XNS-510	DSN-533	NL-58	TK-00722	S-58S

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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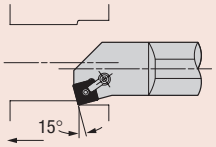
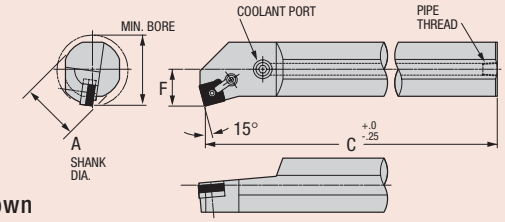
SB-MSKNR/L

Style K
Square
Negative Rake
15° Lead





Right-Hand
Boring Bar Shown

Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L		A	C	F	Clamp	Clamp Screw	Shim	Lock Pin	Includes All Standard Components	Shim Screw	Shim
SB-MSKNR-16-4	SB-MSKNL-16-4	SNGA-432	❍	❍	1.250	1.00	12.00	0.640	CL-6	XNS-36	–	NL-44	TK-00661	–	–
SB-MSKNR-20-4	SB-MSKNL-20-4	SNGA-432	❍	❍	1.468	1.25	13.75	0.765	CL-9	XNS-59	ISSNB-433	NL-46	TK-00662	S-46S	–
SB-MSKNR-24-4	SB-MSKNL-24-4	SNGA-432	❍	❍	1.718	1.50	13.75	0.890	CL-9	XNS-59	ISSN-433	NL-46	TK-00558	S-46S	–
SB-MSKNR-28-4	SB-MSKNL-28-4	SNGA-432	❍	❍	1.968	1.75	13.75	1.015	CL-9	XNS-59	ISSN-433	NL-46	TK-00558	S-46S	–
SB-MSKNR-32-5	SB-MSKNL-32-5	SNGA-543	❍	❍	2.468	2.00	16.00	1.281	CL-12	XNS-510	SSN-533	NL-58	TK-00559	S-58S	ISSN-543
SB-MSKNR-36-5	SB-MSKNL-36-5	SNGA-543	❍	❍	2.718	2.25	16.00	1.406	CL-12	XNS-510	SSN-533	NL-58	TK-00559	S-58S	ISSN-543
SB-MSKNR-32-6	SB-MSKNL-32-6	SNGA-643	❍	❍	2.468	2.00	16.00	1.281	CL-12	XNS-510	ISSN-633	NL-68	TK-00560	S-68S	ISSN-643
SB-MSKNR-36-6	SB-MSKNL-36-6	SNGA-643	❍	❍	2.718	2.25	16.00	1.406	CL-12	XNS-510	ISSN-633	NL-68	TK-00560	S-68S	ISSN-643
SB-MSKNR-40-6	SB-MSKNL-40-6	SNGA-643	❍	❍	2.968	2.50	16.00	1.531	CL-12	XNS-510	ISSN-633	NL-68	TK-00560	S-68S	ISSN-643

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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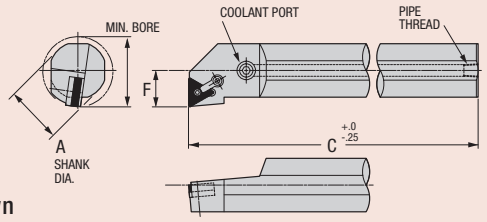
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

SB-MTFNR/L

Style F
Triangle
Negative Rake
0° Lead



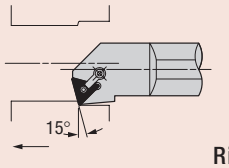
Right-Hand
Boring Bar Shown

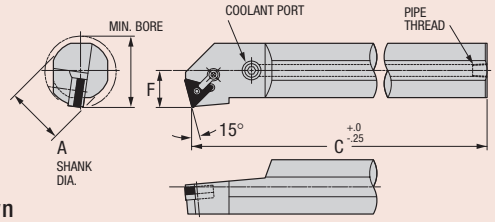
Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Bore	A	C	F	Clamp	Clamp Screw	Shim	Lock Pin	Includes All Standard Components	Shim Screw	Shim
SB-MTFNR-16-3	SB-MTFNL-16-3	TNGA-332	●	❍	1.250	1.00	12.00	0.640	CL-6	XNS-35	–	NL-33L	TK-00663	–	–
SB-MTFNR-20-3	SB-MTFNL-20-3	TNGA-332	❍	❍	1.468	1.25	13.75	0.765	CL-6	XNS-35	ITSN-322	NL-34L	TK-00664	S-34S	–
SB-MTFNR-24-3	SB-MTFNL-24-3	TNGA-332	❍	❍	1.718	1.50	13.75	0.890	CL-6	XNS-35	ITSN-322	NL-34L	TK-00664	S-34S	–
SB-MTFNR-28-3	SB-MTFNL-28-3	TNGA-332	❍	❍	1.968	1.75	13.75	1.015	CL-6	XNS-35	ITSN-322	NL-34L	TK-00664	S-34S	–
SB-MTFNR-24-4	SB-MTFNL-24-4	TNGA-432	●	❍	1.968	1.50	13.75	1.031	CL-9	XNS-59	ITSN-432	NL-46	TK-00665	S-46S	TS-424
SB-MTFNR-28-4	SB-MTFNL-28-4	TNGA-432	❍	❍	2.218	1.75	13.75	1.156	CL-9	XNS-59	ITSN-432	NL-46	TK-00665	S-46S	TS-424
SB-MTFNR-32-5	SB-MTFNL-32-5	TNGA-543	❍	●	2.468	2.00	16.00	1.281	CL-12	XNS-510	ITSN-533	NL-58	TK-00569	S-58S	–
SB-MTFNR-36-5	SB-MTFNL-36-5	TNGA-543	❍	❍	2.718	2.25	16.00	1.406	CL-12	XNS-510	ITSN-533	NL-58	TK-00569	S-58S	–
SB-MTFNR-40-5	SB-MTFNL-40-5	TNGA-543	❍	●	2.968	2.50	16.00	1.531	CL-12	XNS-510	ITSN-533	NL-58	TK-00569	S-58S	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

SB-MTKNR/L

Style K
Triangle
Negative Rake
15° Lead





Right-Hand
Boring Bar Shown

Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				* Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Bore	A	C	F	Clamp	Clamp Screw	Shim	Lock Pin	Includes All Standard Components	Shim Screw	Shim
SB-MTKNR-16-3	SB-MTKNL-16-3	TNGA-332	❍	❍	1.250	1.00	12.00	0.640	CL-6	XNS-35	–	NL-33L	TK-00663	–	–
SB-MTKNR-20-3	SB-MTKNL-20-3	TNGA-332	❍	❍	1.468	1.25	13.75	0.765	CL-6	XNS-35	ITSN-322	NL-34L	TK-00664	S-34S	–
SB-MTKNR-24-3	SB-MTKNL-24-3	TNGA-332	❍	❍	1.718	1.50	13.75	0.890	CL-6	XNS-35	ITSN-322	NL-34L	TK-00664	S-34S	–
SB-MTKNR-28-3	SB-MTKNL-28-3	TNGA-332	❍	❍	1.968	1.75	13.75	1.015	CL-6	XNS-35	ITSN-322	NL-34L	TK-00664	S-34S	–
SB-MTKNR-24-4	SB-MTKNL-24-4	TNGA-432	●	●	1.968	1.50	13.75	1.031	CL-9	XNS-59	ITSN-432	NL-46	TK-00665	S-46S	TS-424
SB-MTKNR-28-4	SB-MTKNL-28-4	TNGA-432	❍	❍	2.218	1.75	13.75	1.156	CL-9	XNS-59	ITSN-432	NL-46	TK-00665	S-46S	TS-424
SB-MTKNR-32-5	SB-MTKNL-32-5	TNGA-543	❍	❍	2.468	2.00	16.00	1.281	CL-12	XNS-510	ITSN-533	NL-58	TK-00569	S-58S	–
SB-MTKNR-36-5	SB-MTKNL-36-5	TNGA-543	●	●	2.718	2.25	16.00	1.406	CL-12	XNS-510	ITSN-533	NL-58	TK-00569	S-58S	–
SB-MTKNR-40-5	SB-MTKNL-40-5	TNGA-543	❍	❍	2.968	2.50	16.00	1.531	CL-12	XNS-510	ITSN-533	NL-58	TK-00569	S-58S	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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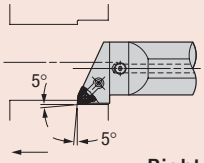
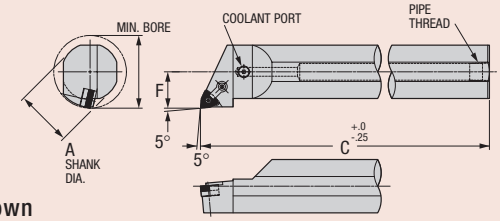
SB-MWLNR/L

Style L
80° Trigon
Negative Rake
5° Reverse Lead



Right-Hand
Boring Bar Shown



Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components				* Tune-Up Kit	Optional Component
Right	Left	Insert	R	L		A	C	F	Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components	Seat
†SB-MWLNR-12-3	†SB-MWLNL-12-3	WNMA-332	●	❍	0.930	0.75	10.00	0.500	–	NL-33L	CL-6	XNS-36	TK-00796	–
SB-MWLNR-16-3	SB-MWLNL-16-3	WNMA-332	●	❍	1.200	1.00	12.00	0.640	–	NL-33L	CL-6	XNS-36	TK-00796	–
SB-MWLNR-20-3	SB-MWLNL-20-3	WNMA-332	❍	❍	1.470	1.25	13.75	0.765	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777	IWSN-332
SB-MWLNR-24-3	SB-MWLNL-24-3	WNMA-332	❍	❍	1.780	1.50	13.75	0.890	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777	IWSN-332
SB-MWLNR-16-4	SB-MWLNL-16-4	WNMA-432	❍	❍	1.280	1.00	12.00	0.640	–	NL-44	CL-20	XNS-47	TK-00657	–
SB-MWLNR-20-4	SB-MWLNL-20-4	WNMA-432	❍	❍	1.530	1.25	13.75	0.765	IWSN-433	NL-46	CL-20	XNS-48	TK-00759	–
SB-MWLNR-24-4	SB-MWLNL-24-4	WNMA-432	●	❍	1.780	1.50	13.75	0.890	IWSN-433	NL-46	CL-20	XNS-48	TK-00759	–

***** Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.
† Coolant port not available.

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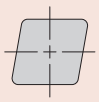
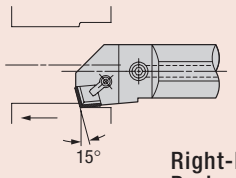
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

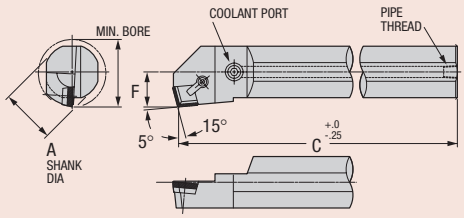
SB-CCKPR/L

Style K
80° Diamond
(Using 100° Corner)
Positive Rake, 15° Lead





Right-Hand
Boring Bar Shown

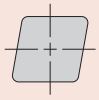


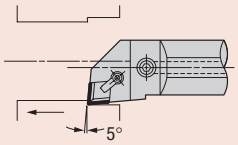
Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	Bore	A	C	F	Clamp	Clamp Screw	Shim	Shim Screw	Chip-breaker	Includes All Standard Components
SB-CCKPR-16-4	SB-CCKPL-16-4	CPGN-422	❍	❍	1.250	1.00	12.00	0.640	CL-7	XNS-35	–	–	CBDC-415L	TK-00820
SB-CCKPR-20-4	SB-CCKPL-20-4	CPGN-422	❍	❍	1.468	1.25	13.75	0.765	CL-20	XNS-47	CSP-422	#4-40 x 1/4 F.H.C.S.	CBDC-415L	TK-00921
SB-CCKPR-24-4	SB-CCKPL-24-4	CPGN-422	❍	❍	1.718	1.50	13.75	0.890	CL-20	XNS-47	CSP-422	#4-40 x 1/4 F.H.C.S.	CBDC-415L	TK-00921
SB-CCKPR-28-4	SB-CCKPL-28-4	CPGN-422	❍	❍	1.968	1.75	13.75	1.015	CL-20	XNS-47	CSP-422	#4-40 x 1/4 F.H.C.S.	CBDC-415L	TK-00921
SB-CCKPR-32-6	SB-CCKPL-32-6	CPGN-633	❍	❍	2.468	2.00	16.00	1.281	CL-30	XNS-59	CSP-632	#5-40 x 3/8 F.H.C.S.	CBDC-615G	TK-00920
SB-CCKPR-36-6	SB-CCKPL-36-6	CPGN-633	❍	❍	2.718	2.25	16.00	1.406	CL-30	XNS-59	CSP-632	#5-40 x 3/8 F.H.C.S.	CBDC-615G	TK-00920
SB-CCKPR-40-6	SB-CCKPL-40-6	CPGN-633	❍	❍	2.968	2.50	16.00	1.531	CL-30	XNS-59	CSP-632	#5-40 x 3/8 F.H.C.S.	CBDC-615G	TK-00920

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

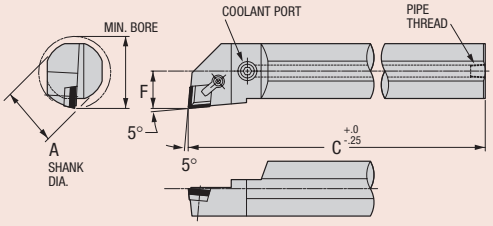
SB-CCLPR/L

Style L
80° Diamond
Positive Rake
5° Reverse Lead





Right-Hand
Boring Bar Shown



Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L	Bore	A	C	F	Clamp	Clamp Screw	Shim	Shim Screw	Chip-breaker	Includes All Standard Components
SB-CCLPR-16-4	SB-CCLPL-16-4	CPGN-422	❍	❍	1.250	1.00	12.00	0.640	CL-7	XNS-35	–	–	CBDC-4L	TK-00705
SB-CCLPR-20-4	SB-CCLPL-20-4	CPGN-422	❍	❍	1.468	1.25	13.75	0.765	CL-20	XNS-47	CSP-422	#4-40 x 1/4 F.H.C.S.	CBDC-4L	TK-00746
SB-CCLPR-24-4	SB-CCLPL-24-4	CPGN-422	❍	❍	1.718	1.50	13.75	0.890	CL-20	XNS-47	CSP-422	#4-40 x 1/4 F.H.C.S.	CBDC-4L	TK-00746
SB-CCLPR-28-4	SB-CCLPL-28-4	CPGN-422	❍	❍	1.968	1.75	13.75	1.015	CL-20	XNS-47	CSP-422	#4-40 x 1/4 F.H.C.S.	CBDC-4L	TK-00746
SB-CCLPR-32-6	SB-CCLPL-32-6	CPGN-633	❍	❍	2.468	2.00	16.00	1.281	CL-30	XNS-59	CSP-632	#5-40 x 3/8 F.H.C.S.	CBDC-6G	TK-00532
SB-CCLPR-36-6	SB-CCLPL-36-6	CPGN-633	❍	❍	2.718	2.25	16.00	1.406	CL-30	XNS-59	CSP-632	#5-40 x 3/8 F.H.C.S.	CBDC-6G	TK-00532
SB-CCLPR-40-6	SB-CCLPL-40-6	CPGN-633	❍	❍	2.968	2.50	16.00	1.531	CL-30	XNS-59	CSP-632	#5-40 x 3/8 F.H.C.S.	CBDC-6G	TK-00532

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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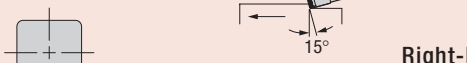
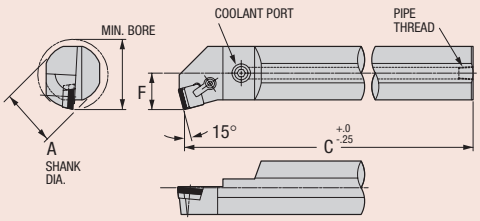
SB-CSKPR/L

Style K
Square
Positive Rake
15° Lead



Right-Hand
Boring Bar Shown



Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L		A	C	F	Clamp	Clamp Screw	Shim	Shim Screw	Chip-breaker	Includes All Standard Components
SB-CSKPR-16-4	SB-CSKPL-16-4	SPGN-422	❍	❍	1.250	1.00	12.00	0.640	CL-7	XNS-35	–	–	CBS-4G	TK-00757
SB-CSKPR-20-4	SB-CSKPL-20-4	SPGN-422	❍	❍	1.468	1.25	13.75	0.765	CL-20	XNS-47	–	–	CBS-4G	TK-00776
SB-CSKPR-24-4	SB-CSKPL-24-4	SPGN-422	❍	❍	1.718	1.50	13.75	0.890	CL-20	XNS-47	SP-40	#6-32 x 1/2 F.H.C.S.	CBS-4G	TK-02168
SB-CSKPR-28-4	SB-CSKPL-28-4	SPGN-422	❍	❍	1.968	1.75	13.75	1.015	CL-20	XNS-47	SP-40	#6-32 x 1/2 F.H.C.S.	CBS-4G	TK-02168
SB-CSKPR-32-6	SB-CSKPL-32-6	SPGN-633	❍	❍	2.468	2.00	16.00	1.281	CL-30	XNS-59	SP-60	#8-32 x 1/2 F.H.C.S.	CBS-6G	TK-00825
SB-CSKPR-36-6	SB-CSKPL-36-6	SPGN-633	❍	❍	2.718	2.25	16.00	1.406	CL-30	XNS-59	SP-60	#8-32 x 1/2 F.H.C.S.	CBS-6G	TK-00825
SB-CSKPR-40-6	SB-CSKPL-40-6	SPGN-633	❍	❍	2.968	2.50	16.00	1.531	CL-30	XNS-59	SP-60	#8-32 x 1/2 F.H.C.S.	CBS-6G	TK-00825

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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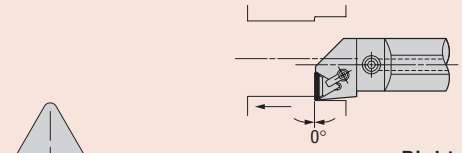
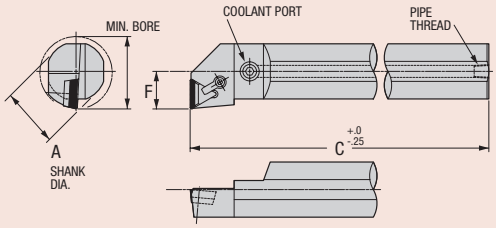
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

SB-CTFPR/L

Style F
Triangle
Positive Rake
0° Lead



Right-Hand
Boring Bar Shown

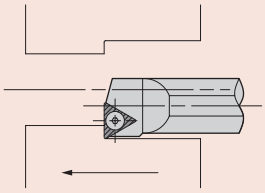


Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components					* Tune-Up Kit
Right	Left	Insert	R	L		A	C	F	Clamp	Clamp Screw	Shim	Shim Screw	Chip-breaker	Includes All Standard Components
SB-CTFPR-16-3	SB-CTFPL-16-3	TPGN-322	❍	❍	1.250	1.00	12.00	0.640	CL-7	XNS-35	–	–	CBT-3G	TK-00655
SB-CTFPR-20-3	SB-CTFPL-20-3	TPGN-322	❍	❍	1.468	1.25	13.75	0.765	CL-6	XNS-35	TSP-321	#4-40 x 3/8 F.H.C.S.	CBT-3G	TK-00653
SB-CTFPR-24-3	SB-CTFPL-24-3	TPGN-322	❍	❍	1.718	1.50	13.75	0.890	CL-6	XNS-35	TSP-321	#4-40 x 3/8 F.H.C.S.	CBT-3G	TK-00653
SB-CTFPR-28-3	SB-CTFPL-28-3	TPGN-322	❍	❍	1.968	1.75	13.75	1.015	CL-6	XNS-35	TSP-321	#4-40 x 3/8 F.H.C.S.	CBT-3G	TK-00653
SB-CTFPR-24-4	SB-CTFPL-24-4	TPGN-432	❍	❍	1.968	1.50	13.75	1.031	CL-12	XNS-58	SP-4	#6-32 x 1/2 F.H.C.S.	CBT-4G	TK-00654
SB-CTFPR-28-4	SB-CTFPL-28-4	TPGN-432	❍	❍	2.218	1.75	13.75	1.156	CL-12	XNS-58	SP-4	#6-32 x 1/2 F.H.C.S.	CBT-4G	TK-00654
SB-CTFPR-32-5	SB-CTFPL-32-5	TPGN-543	❍	❍	2.468	2.00	16.00	1.281	CL-12	XNS-510	SP-5	#8-32 x 1/2 F.H.C.S.	CBT-5G	TK-00656
SB-CTFPR-36-5	SB-CTFPL-36-5	TPGN-543	❍	❍	2.718	2.25	16.00	1.406	CL-12	XNS-510	SP-5	#8-32 x 1/2 F.H.C.S.	CBT-5G	TK-00656
SB-CTFPR-40-5	SB-CTFPL-40-5	TPGN-543	❍	❍	2.968	2.50	16.00	1.531	CL-12	XNS-510	SP-5	#8-32 x 1/2 F.H.C.S.	CBT-5G	TK-00656

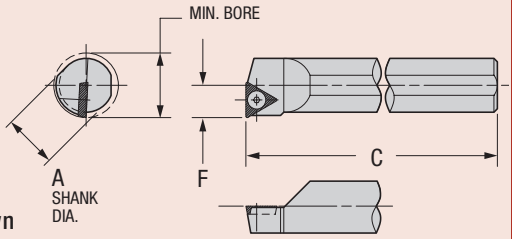
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

S-STFNR/L

Style F
Triangle
Positive Rake
0° Lead



Right-Hand
Boring Bar Shown



Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Component	* Tune-Up Kit
Right	Left	Insert	R	L		A	C	F	Insert Screw	Includes All Standard Components
S-STFNR-6-2	S-STFNL-6-2	TP41	❍	❍	0.500	0.375	6	0.250	#4-40 x 1/4 BHCS	TK-00922
S-STFNR-8-2	S-STFNL-8-2	TP41	❍	❍	0.625	0.500	8	0.312	#4-40 x 1/4 BHCS	TK-00922
S-STFNR-10-2	S-STFNL-10-2	TP41	❍	❍	0.750	0.625	10	0.375	#4-40 x 1/4 BHCS	TK-00922
S-STFNR-12-3	S-STFNL-12-3	TPGA-322	❍	❍	1.000	0.750	10	0.500	#6-32 x 3/8 BHCS	TK-00923

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

See page T 38 for carbide inserts.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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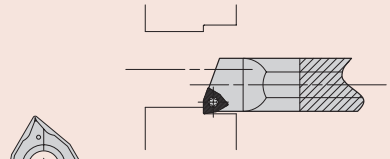
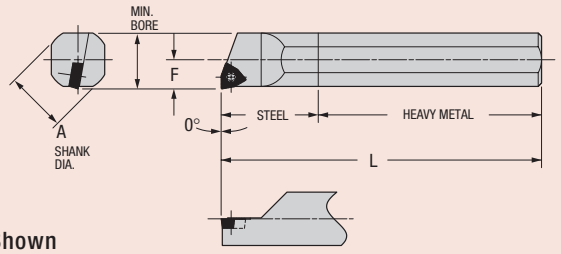
C-SWFCR/L

Style F
Screw-On Trigon
Heavy Metal, Fixed Steel Head
0° Lead





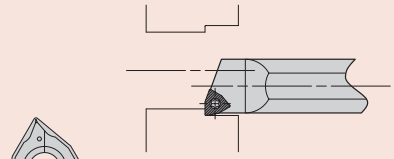
Right-Hand
Boring Bar Shown

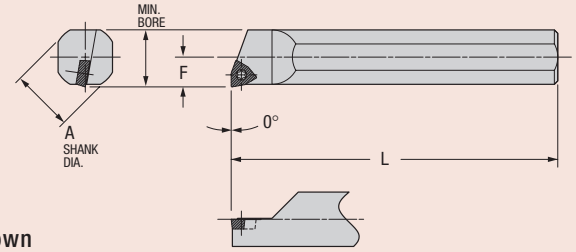
Part Number		Gage	Stock			Dimensions (inches)			Standard Component	* Tune-Up Kit
Right	Left	Insert	R	L	Min. Bore Dia.	A	F	L	Insert Screw	Includes All Standard Components
C06-SWFCR-2-060	C06-SWFCL-2-060	WCMT-21.51	❍	❍	0.438	0.375	0.219	6.0	PT-589T	TK-00804
C06-SWFCR-2-080	C06-SWFCL-2-080	WCMT-21.51	❍	❍	0.438	0.375	0.219	8.0	PT-589T	TK-00804
C08-SWFCR-2-060	C08-SWFCL-2-060	WCMT-21.51	❍	❍	0.563	0.500	0.281	6.0	PT-589T	TK-00804
C08-SWFCR-2-080	C08-SWFCL-2-080	WCMT-21.51	❍	❍	0.563	0.500	0.281	8.0	PT-589T	TK-00804
C10-SWFCR-3-060	C10-SWFCL-3-060	WCMT-32.51	❍	❍	0.719	0.625	0.359	6.0	PT-559T	TK-00807
C10-SWFCR-3-100	C10-SWFCL-3-100	WCMT-32.51	❍	❍	0.719	0.625	0.359	10.0	PT-559T	TK-00807
C12-SWFCR-3-060	C12-SWFCL-3-060	WCMT-32.51	❍	❍	0.844	0.750	0.422	6.0	PT-559T	TK-00807
C12-SWFCR-3-100	C12-SWFCL-3-100	WCMT-32.51	❍	❍	0.844	0.750	0.422	10.0	PT-559T	TK-00807
C16-SWFCR-3-060	C16-SWFCL-3-060	WCMT-32.51	❍	❍	1.094	1.000	0.547	6.0	PT-559T	TK-00807
C16-SWFCR-3-120	C16-SWFCL-3-120	WCMT-32.51	❍	❍	1.094	1.000	0.547	12.0	PT-559T	TK-00807

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

S-SWFCR/L

Style F
Screw-On Trigon
Solid Steel
0° Lead





Right-Hand
Boring Bar Shown

Part Number		Gage	Stock			Dimensions (inches)			Standard Component	* Tune-Up Kit
Right	Left	Insert	R	L	Min. Bore Dia.	A	F	L	Insert Screw	Includes All Standard Components
S06-SWFCR-2-050	S06-SWFCL-2-050	WCMT-21.51	❍	❍	0.438	0.375	0.219	5.0	PT-589T	TK-00804
S08-SWFCR-2-060	S08-SWFCL-2-060	WCMT-21.51	❍	❍	0.563	0.500	0.281	6.0	PT-589T	TK-00804
S08-SWFCR-3-025	S08-SWFCL-3-025	WCMT-32.51	❍	❍	0.625	0.500	0.312	2.5	PT-559T	TK-00807
S08-SWFCR-3-060	S08-SWFCL-3-060	WCMT-32.51	❍	❍	0.625	0.500	0.312	6.0	PT-559T	TK-00807
S10-SWFCR-3-040	S10-SWFCL-3-040	WCMT-32.51	❍	❍	0.719	0.625	0.359	4.0	PT-559T	TK-00807
S10-SWFCR-3-070	S10-SWFCL-3-070	WCMT-32.51	❍	❍	0.719	0.625	0.359	7.0	PT-559T	TK-00807
S12-SWFCR-3-040	S12-SWFCL-3-040	WCMT-32.51	❍	❍	0.844	0.750	0.422	4.0	PT-559T	TK-00807
S12-SWFCR-3-080	S12-SWFCL-3-080	WCMT-32.51	❍	❍	0.844	0.750	0.422	8.0	PT-559T	TK-00807
S16-SWFCR-3-050	S16-SWFCL-3-050	WCMT-32.51	❍	❍	1.094	1.000	0.547	5.0	PT-559T	TK-00807
S16-SWFCR-3-100	S16-SWFCL-3-100	WCMT-32.51	❍	❍	1.094	1.000	0.547	10.0	PT-559T	TK-00807
S20-SWFCR-3-120	S20-SWFCL-3-120	WCMT-32.51	❍	❍	1.344	1.250	0.672	12.0	PT-559T	TK-00807

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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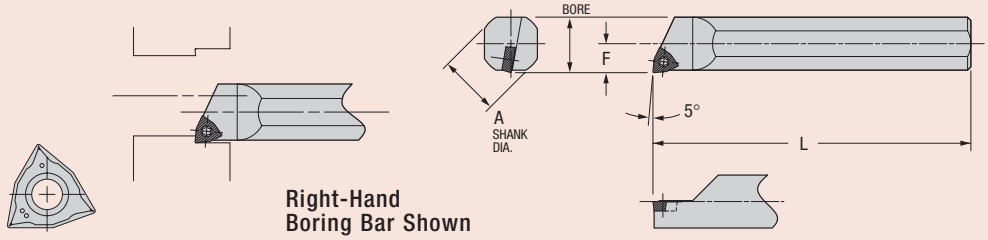
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

S-SWLCR/L

Style L
Screw-On Trigon
Solid Steel
5° Reverse Lead



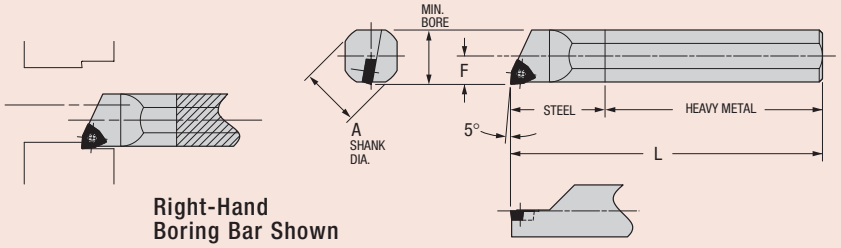
Right-Hand
Boring Bar Shown

Part Number		Gage	Stock			Dimensions (inches)			Standard Component	* Tune-Up Kit
Right	Left	Insert	R	L	Min. Bore Dia.	A	F	L	Insert Screw	Includes All Standard Components
S06-SWLCR-2-050	S06-SWLCL-2-050	WCMT-21.51	○	○	0.438	0.375	0.219	5.0	PT-589T	TK-00804
S08-SWLCR-2-060	S08-SWLCL-2-060	WCMT-21.51	○	○	0.563	0.500	0.281	6.0	PT-589T	TK-00804
S08-SWLCR-3-025	S08-SWLCL-3-025	WCMT-32.51	●	○	0.625	0.500	0.312	2.5	PT-559T	TK-00807
S08-SWLCR-3-060	S08-SWLCL-3-060	WCMT-32.51	○	○	0.625	0.500	0.312	6.0	PT-559T	TK-00807
S10-SWLCR-3-040	S10-SWLCL-3-040	WCMT-32.51	○	○	0.719	0.625	0.359	4.0	PT-559T	TK-00807
S10-SWLCR-3-070	S10-SWLCL-3-070	WCMT-32.51	○	○	0.719	0.625	0.359	7.0	PT-559T	TK-00807
S12-SWLCR-3-040	S12-SWLCL-3-040	WCMT-32.51	○	○	0.844	0.750	0.422	4.0	PT-559T	TK-00807
S12-SWLCR-3-080	S12-SWLCL-3-080	WCMT-32.51	○	○	0.844	0.750	0.422	8.0	PT-559T	TK-00807
S16-SWLCR-3-050	S16-SWLCL-3-050	WCMT-32.51	○	○	1.094	1.000	0.547	5.0	PT-559T	TK-00807
S16-SWLCR-3-100	S16-SWLCL-3-100	WCMT-32.51	○	○	1.094	1.000	0.547	10.0	PT-559T	TK-00807
S20-SWLCR-3-120	S20-SWLCL-3-120	WCMT-32.51	○	○	1.344	1.250	0.672	12.0	PT-559T	TK-00807

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

C-SWLCR/L

Style L
Screw-On Trigon
Heavy Metal, Fixed Steel Head
5° Reverse Lead



Right-Hand
Boring Bar Shown

Part Number		Gage	Stock			Dimensions (inches)			Standard Component	* Tune-Up Kit
Right	Left	Insert	R	L	Min. Bore Dia.	A	F	L	Insert Screw	Includes All Standard Components
C06-SWLCR-2-060	C06-SWLCL-2-060	WCMT-21.51	○	○	0.438	0.375	0.219	6.0	PT-589T	TK-00804
C06-SWLCR-2-080	C06-SWLCL-2-080	WCMT-21.51	○	○	0.438	0.375	0.219	8.0	PT-589T	TK-00804
C08-SWLCR-2-060	C08-SWLCL-2-060	WCMT-21.51	○	○	0.563	0.500	0.281	6.0	PT-589T	TK-00804
C08-SWLCR-2-080	C08-SWLCL-2-080	WCMT-21.51	○	○	0.563	0.500	0.281	8.0	PT-589T	TK-00804
C10-SWLCR-3-060	C10-SWLCL-3-060	WCMT-32.51	○	○	0.719	0.625	0.359	6.0	PT-559T	TK-00807
C10-SWLCR-3-100	C10-SWLCL-3-100	WCMT-32.51	○	○	0.719	0.625	0.359	10.0	PT-559T	TK-00807
C12-SWLCR-3-060	C12-SWLCL-3-060	WCMT-32.51	○	○	0.844	0.750	0.422	6.0	PT-559T	TK-00807
C12-SWLCR-3-100	C12-SWLCL-3-100	WCMT-32.51	○	○	0.844	0.750	0.422	10.0	PT-559T	TK-00807
C16-SWLCR-3-060	C16-SWLCL-3-060	WCMT-32.51	○	○	1.094	1.000	0.547	6.0	PT-559T	TK-00807
C16-SWLCR-3-120	C16-SWLCL-3-120	WCMT-32.51	○	○	1.094	1.000	0.547	12.0	PT-559T	TK-00807

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

10 Business Days or Less ○ ○
Stocked Standard ● ●

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Boring Bars for Ceramic Inserts

This section contains boring bars using ceramic inserts that Greenleaf believes are most often used by industry.

In addition to tempered-steel bars, Greenleaf also can supply *Heavy Metal* or *"No Chat"* high-density steel bars that can reduce, and sometimes eliminate, "chatter" for those applications that require a longer reach.

Greenleaf's boring bar capability includes numerous additional styles not shown in this catalog. Contact us if you do not see the bar you need. Our special design and build services can be counted on to meet your individual needs.

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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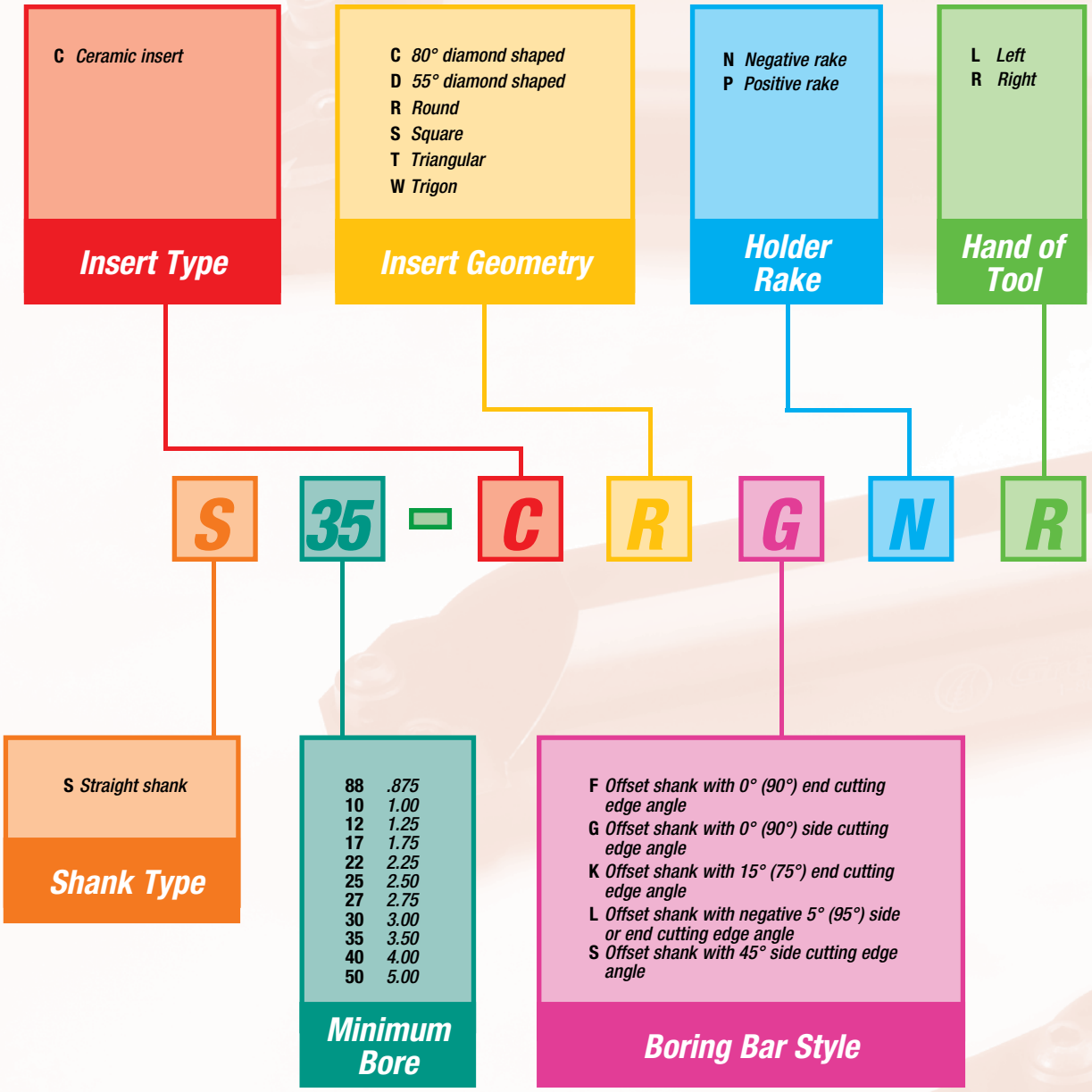
Ceramic-Insert Boring Bar Identification System



NOTE:
The angles shown in parentheses are the angles as shown in the ANSI standard.

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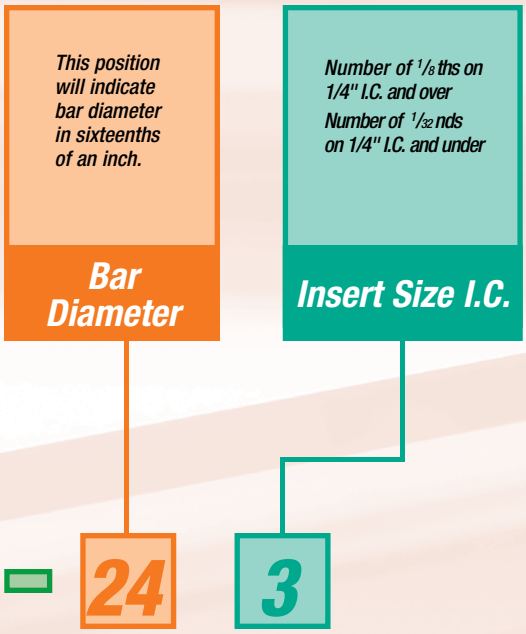

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Ceramic-Insert Boring Bar Usage Reference Guide

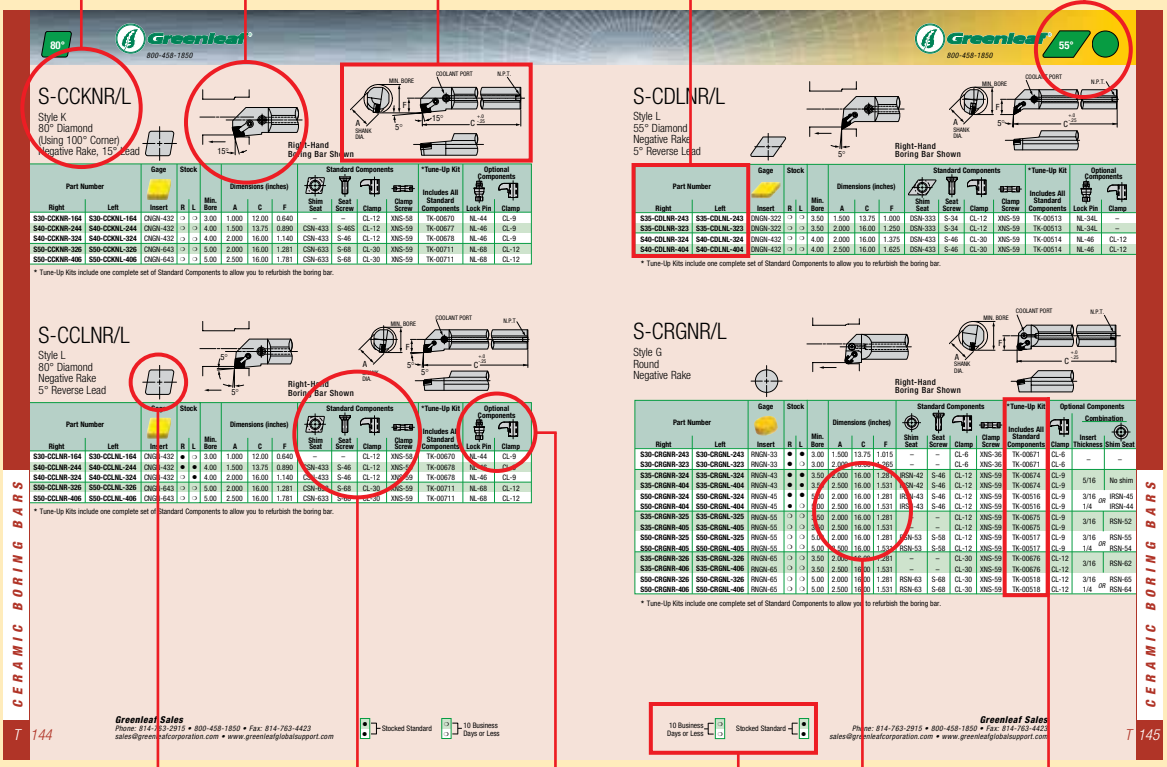
Boring Bar Style

Boring Bar Geometry

Insert Type

Boring Bar Application

Part Number



Insert Geometry

Optional Components

Dimensions

Standard Components

Stocking Program

Tune-Up Kits

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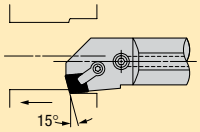
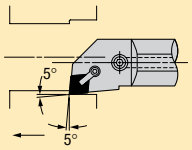
80°/100° Diamond – Negative

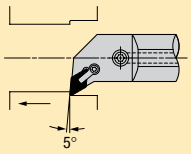


S-CCKNR/L
Style K
80° Diamond
(Using 100° Corner)
Negative Rake
15° Lead
page: T 144



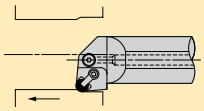
S-CCLNR/L
Style L
80° Diamond
Negative Rake
5° Reverse Lead
page: T 144

55° Diamond – Negative



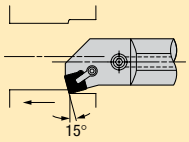
S-CDLNR/L
Style L
55° Diamond
Negative Rake
5° Reverse Lead
page: T 145

Round – Negative

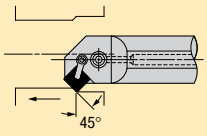


S-CRGNR/L
Style G
Round
Negative Rake
page: T 145

Square – Negative

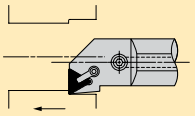


S-CSKNR/L
Style K
Square
Negative Rake
15° Lead
page: T 146



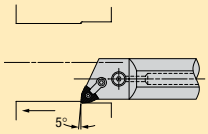
S-CSSNR/L
Style S
Square
Negative Rake
45° Lead
page: T 146

Triangle – Negative



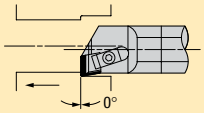
S-CTFNR/L
Style F
Triangle
Negative Rake
0° Lead
page: T 147

Trigon – Negative

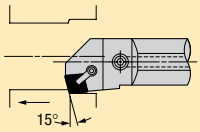


S-CWLNR/L
Style L
Trigon
Negative Rake
5° Reverse Lead
page: T 147

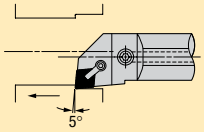
80° Diamond – Positive



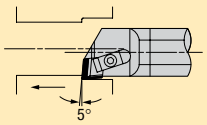
S-CCFPR/L
Style F
Heavy Metal Shank
80° Diamond
Positive Rake
0° Lead
page: T 148



S-CCKPR/L
Style K
80° Diamond
(Using 100° Corner)
Positive Rake
15° Lead
page: T 148

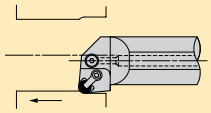


S-CCLPR/L
Style L
80° Diamond
Positive Rake
5° Reverse Lead
page: T 148



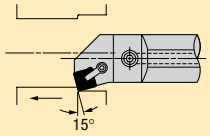
S-CCLPR/L
Style L
Heavy Metal Shank
80° Diamond
Positive Rake
5° Reverse Lead
page: T 149

Round – Positive

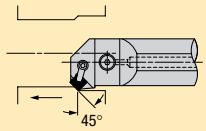


S-CRGPR/L
Style G
Round
Positive Rake
page: T 149

Square – Positive

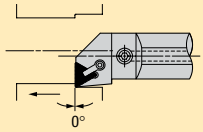


S-CSKPR/L
Style K
Square
Positive Rake
15° Lead
page: T 150

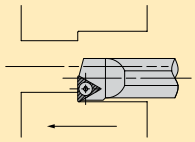


S-CSSPR/L
Style S
Square
Positive Rake
45° Lead
page: T 150

Triangle – Positive



S-CTFPR/L
Style F
Triangle
Positive Rake
0° Lead
page: T 151



S-STFNR/L
Style F
Triangle
Positive Rake
0° Lead
page: T 151

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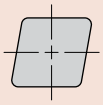
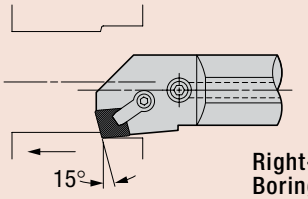
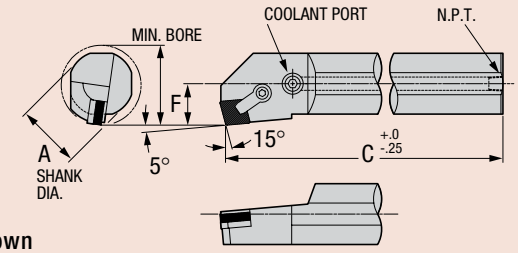
S-CCKNR/L

Style K
80° Diamond
(Using 100° Corner)
Negative Rake, 15° Lead





Right-Hand
Boring Bar Shown

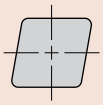


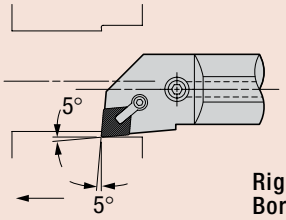
Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				*Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp
S30-CCKNR-164	S30-CCKNL-164	CNGN-432	❍	❍	3.00	1.000	12.00	0.640	–	–	CL-12	XNS-58	TK-00670	NL-44	CL-9
S40-CCKNR-244	S40-CCKNL-244	CNGN-432	❍	❍	4.00	1.500	13.75	0.890	CSN-433	S-46S	CL-12	XNS-59	TK-00677	NL-46	CL-9
S40-CCKNR-324	S40-CCKNL-324	CNGN-432	❍	❍	4.00	2.000	16.00	1.140	CSN-433	S-46	CL-12	XNS-59	TK-00678	NL-46	CL-9
S50-CCKNR-326	S50-CCKNL-326	CNGN-643	❍	❍	5.00	2.000	16.00	1.281	CSN-633	S-68	CL-30	XNS-59	TK-00711	NL-68	CL-12
S50-CCKNR-406	S50-CCKNL-406	CNGN-643	❍	❍	5.00	2.500	16.00	1.781	CSN-633	S-68	CL-30	XNS-59	TK-00711	NL-68	CL-12

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

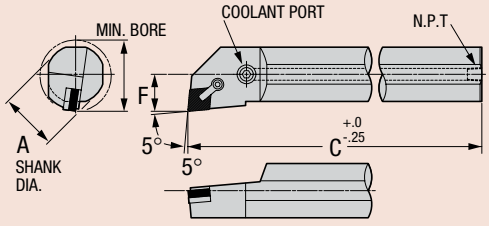
S-CCLNR/L

Style L
80° Diamond
Negative Rake
5° Reverse Lead





Right-Hand
Boring Bar Shown



Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				*Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp
S30-CCLNR-164	S30-CCLNL-164	CNGN-432	●	❍	3.00	1.000	12.00	0.640	–	–	CL-12	XNS-58	TK-00670	NL-44	CL-9
S40-CCLNR-244	S40-CCLNL-244	CNGN-432	●	●	4.00	1.500	13.75	0.890	CSN-433	S-46	CL-12	XNS-59	TK-00678	NL-46	CL-9
S40-CCLNR-324	S40-CCLNL-324	CNGN-432	❍	●	4.00	2.000	16.00	1.140	CSN-433	S-46	CL-12	XNS-59	TK-00678	NL-46	CL-9
S50-CCLNR-326	S50-CCLNL-326	CNGN-643	❍	❍	5.00	2.000	16.00	1.281	CSN-633	S-68	CL-30	XNS-59	TK-00711	NL-68	CL-12
S50-CCLNR-406	S50-CCLNL-406	CNGN-643	❍	❍	5.00	2.500	16.00	1.781	CSN-633	S-68	CL-30	XNS-59	TK-00711	NL-68	CL-12

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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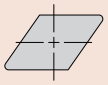
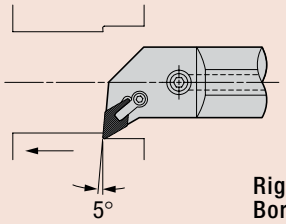
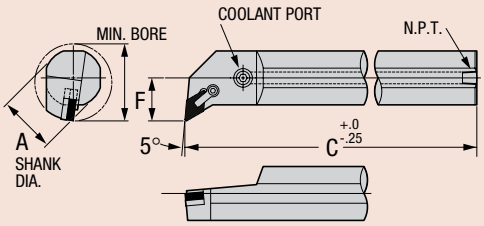
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

S-CDLNR/L

Style L
55° Diamond
Negative Rake
5° Reverse Lead







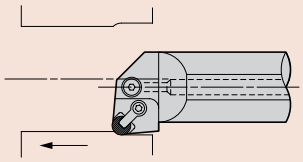
Right-Hand
Boring Bar Shown

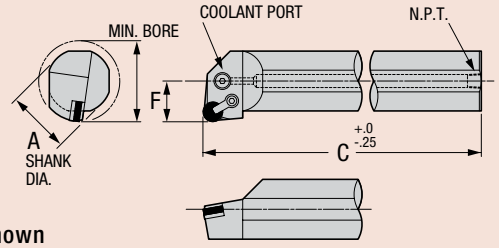
Part Number		Gage	Stock			Dimensions (inches)			Standard Components				*Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Min. Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp
S35-CDLNR-243	S35-CDLNL-243	DNGN-322	❍	❍	3.50	1.500	13.75	1.000	DSN-333	S-34	CL-12	XNS-59	TK-00513	NL-34L	–
S35-CDLNR-323	S35-CDLNL-323	DNGN-322	❍	❍	3.50	2.000	16.00	1.250	DSN-333	S-34	CL-12	XNS-59	TK-00513	NL-34L	–
S40-CDLNR-324	S40-CDLNL-324	DNGN-432	❍	❍	4.00	2.000	16.00	1.375	DSN-433	S-46	CL-30	XNS-59	TK-00514	NL-46	CL-12
S40-CDLNR-404	S40-CDLNL-404	DNGN-432	❍	❍	4.00	2.500	16.00	1.625	DSN-433	S-46	CL-30	XNS-59	TK-00514	NL-46	CL-12

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

S-CRGNR/L

Style G
Round
Negative Rake





Right-Hand
Boring Bar Shown

Part Number		Gage	Stock			Dimensions (inches)			Standard Components				*Tune-Up Kit	Optional Components		
Right	Left	Insert	R	L	Min. Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Clamp	Combination Insert Thickness	Combination Shim Seat
S30-CRGNR-243	S30-CRGNL-243	RNGN-33	●	●	3.00	1.500	13.75	1.015	–	–	CL-6	XNS-36	TK-00671	CL-6	–	–
S30-CRGNR-323	S30-CRGNL-323	RNGN-33	●	❍	3.00	2.000	16.00	1.265	–	–	CL-6	XNS-36	TK-00671	CL-6		
S35-CRGNR-324	S35-CRGNL-324	RNGN-43	●	●	3.50	2.000	16.00	1.281	IRSN-42	S-46	CL-12	XNS-59	TK-00674	CL-9	5/16	No shim
S35-CRGNR-404	S35-CRGNL-404	RNGN-43	●	●	3.50	2.500	16.00	1.531	IRSN-42	S-46	CL-12	XNS-59	TK-00674	CL-9		
S50-CRGNR-324	S50-CRGNL-324	RNGN-45	●	●	5.00	2.000	16.00	1.281	IRSN-43	S-46	CL-12	XNS-59	TK-00516	CL-9	3/16 *OR*	IRSN-45
S50-CRGNR-404	S50-CRGNL-404	RNGN-45	●	❍	5.00	2.500	16.00	1.531	IRSN-43	S-46	CL-12	XNS-59	TK-00516	CL-9	1/4 *OR*	IRSN-44
S35-CRGNR-325	S35-CRGNL-325	RNGN-55	❍	❍	3.50	2.000	16.00	1.281	–	–	CL-12	XNS-59	TK-00675	CL-9	3/16	RSN-52
S35-CRGNR-405	S35-CRGNL-405	RNGN-55	❍	❍	3.50	2.500	16.00	1.531	–	–	CL-12	XNS-59	TK-00675	CL-9		
S50-CRGNR-325	S50-CRGNL-325	RNGN-55	❍	❍	5.00	2.000	16.00	1.281	RSN-53	S-58	CL-12	XNS-59	TK-00517	CL-9	3/16 *OR*	RSN-55
S50-CRGNR-405	S50-CRGNL-405	RNGN-55	❍	❍	5.00	2.500	16.00	1.531	RSN-53	S-58	CL-12	XNS-59	TK-00517	CL-9	1/4 *OR*	RSN-54
S35-CRGNR-326	S35-CRGNL-326	RNGN-65	❍	❍	3.50	2.000	16.00	1.281	–	–	CL-30	XNS-59	TK-00676	CL-12	3/16	RSN-62
S35-CRGNR-406	S35-CRGNL-406	RNGN-65	❍	❍	3.50	2.500	16.00	1.531	–	–	CL-30	XNS-59	TK-00676	CL-12		
S50-CRGNR-326	S50-CRGNL-326	RNGN-65	❍	❍	5.00	2.000	16.00	1.281	RSN-63	S-68	CL-30	XNS-59	TK-00518	CL-12	3/16 *OR*	RSN-65
S50-CRGNR-406	S50-CRGNL-406	RNGN-65	❍	❍	5.00	2.500	16.00	1.531	RSN-63	S-68	CL-30	XNS-59	TK-00518	CL-12	1/4 *OR*	RSN-64

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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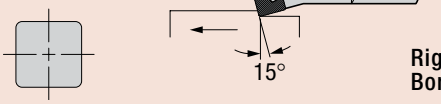
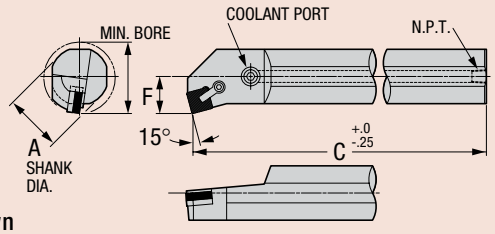
S-CSKNR/L

Style K
Square
Negative Rake
15° Lead





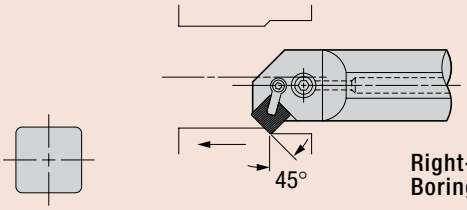
Right-Hand
Boring Bar Shown

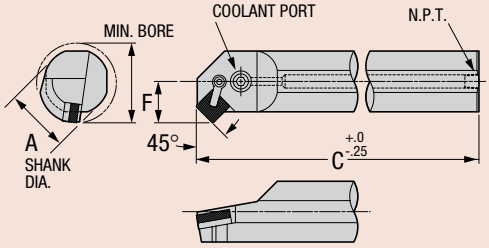
Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				*Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp
S30-CSKNR-164	S30-CSKNL-164	SNGN-432	❍	❍	3.00	1.000	12.00	0.640	–	–	CL-12	XNS-58	TK-00672	NL-44	CL-9
S40-CSKNR-244	S40-CSKNL-244	SNGN-432	❍	❍	4.00	1.500	13.75	0.890	ISSN-433	S-46	CL-12	XNS-59	TK-00723	NL-46	CL-9
S40-CSKNR-324	S40-CSKNL-324	SNGN-432	❍	❍	4.00	2.000	16.00	1.140	ISSN-433	S-46	CL-12	XNS-59	TK-00679	NL-46	CL-9
S50-CSKNR-325	S50-CSKNL-325	SNGN-543	❍	❍	5.00	2.000	16.00	1.281	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9
S50-CSKNR-405	S50-CSKNL-405	SNGN-543	❍	❍	5.00	2.500	16.00	1.531	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9
S50-CSKNR-326	S50-CSKNL-326	SNGN-643	❍	❍	5.00	2.000	16.00	1.281	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12
S50-CSKNR-406	S50-CSKNL-406	SNGN-643	❍	❍	5.00	2.500	16.00	1.531	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

S-CSSNR/L

Style S
Square
Negative Rake
45° Lead





Right-Hand
Boring Bar Shown

Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				*Tune-Up Kit	Optional Components	
Right	Left	Insert	R	L	Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components	Lock Pin	Clamp
S30-CSSNR-164	S30-CSSNL-164	SNGN-432	❍	❍	3.00	1.000	12.00	0.640	–	–	CL-12	XNS-59	TK-00675	NL-44	CL-9
S40-CSSNR-244	S40-CSSNL-244	SNGN-432	❍	❍	4.00	1.500	13.75	0.890	ISSN-433	S-46	CL-12	XNS-59	TK-00679	NL-46	CL-9
S40-CSSNR-324	S40-CSSNL-324	SNGN-432	❍	❍	4.00	2.000	16.00	1.140	ISSN-433	S-46	CL-12	XNS-59	TK-00679	NL-46	CL-9
S50-CSSNR-325	S50-CSSNL-325	SNGN-543	❍	❍	5.00	2.000	16.00	1.281	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9
S50-CSSNR-405	S50-CSSNL-405	SNGN-543	❍	❍	5.00	2.500	16.00	1.531	SSN-533	S-58	CL-12	XNS-59	TK-00520	NL-58	CL-9
S50-CSSNR-326	S50-CSSNL-326	SNGN-643	❍	❍	5.00	2.000	16.00	1.281	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12
S50-CSSNR-406	S50-CSSNL-406	SNGN-643	❍	❍	5.00	2.500	16.00	1.531	ISSN-633	S-68	CL-30	XNS-59	TK-00521	NL-68	CL-12

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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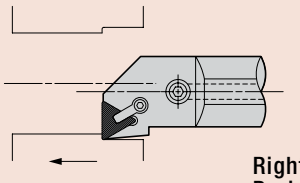
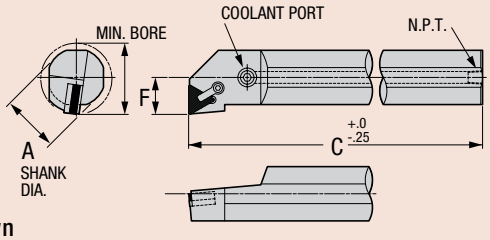
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

S-CTFNR/L

Style F
Triangle
Negative Rake
0° Lead





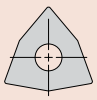
Right-Hand
Boring Bar Shown

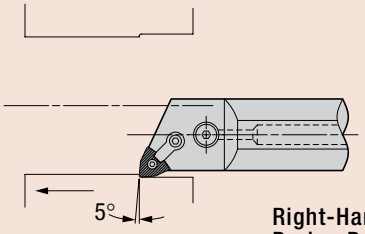
Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components				*Tune-Up Kit	Optional Components	
									Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components		
Right	Left	Insert	R	L		A	C	F						Lock Pin	Clamp
S30-CTFNR-163	S30-CTFNL-163	TNGN-332	❍	❍	3.00	1.000	12.00	0.640	–	–	CL-7	XNS-36	TK-00719	NL-33L	CL-6
S35-CTFNR-243	S35-CTFNL-243	TNGN-332	❍	❍	3.50	1.500	13.75	0.890	ITSN-322	S-34	CL-7	XNS-36	TK-00522	NL-34L	CL-6
S40-CTFNR-244	S40-CTFNL-244	TNGN-432	❍	❍	4.00	1.500	13.75	1.031	ITSN-432	S-46	CL-12	XNS-59	TK-00680	NL-46	CL-9
S40-CTFNR-324	S40-CTFNL-324	TNGN-432	❍	❍	4.00	2.000	16.00	1.281	ITSN-432	S-46	CL-12	XNS-59	TK-00680	NL-46	CL-9
S40-CTFNR-404	S40-CTFNL-404	TNGN-432	❍	❍	4.00	2.500	16.00	1.531	ITSN-432	S-46	CL-12	XNS-59	TK-00680	NL-46	CL-9

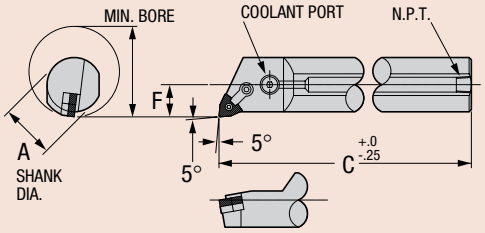
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

S-CWLNR/L

Style L
Trigon
Negative Rake
5° Reverse Lead







Right-Hand
Boring Bar Shown

Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components				* Tune-Up Kit
									Shim Seat	Lock Pin	Clamp	Clamp Screw	Includes All Standard Components
Right	Left	Insert	R	L		A	C	F					
S30-CWLNR-163	S30-CWLNL-163	WNGA-332	❍	❍	3.00	1.000	12.00	0.640	–	NL-33L	CL-6	XNS-36	TK-00740
S35-CWLNR-243	S35-CWLNL-243	WNGA-332	❍	❍	3.50	1.500	13.75	0.890	IWSN-322	NL-34L	CL-6	XNS-36	TK-00777
S30-CWLNR-164	S30-CWLNL-164	WNGA-432	❍	❍	3.00	1.000	12.00	0.640	–	NL-44	CL-20	XNS-48	TK-00887
S40-CWLNR-244	S40-CWLNL-244	WNGA-432	❍	❍	4.00	1.500	13.75	0.890	IWSN-433	NL-46	CL-20	XNS-48	TK-00759
S40-CWLNR-324	S40-CWLNL-324	WNGA-432	❍	❍	4.00	2.000	16.00	1.281	IWSN-433	NL-46	CL-20	XNS-48	TK-00759

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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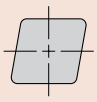
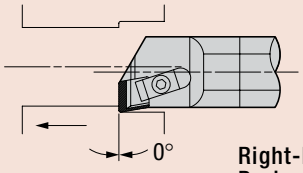
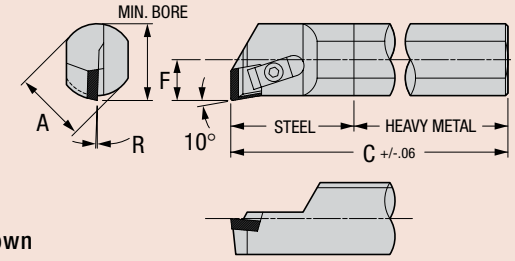
S-CCFPR/L

Style F
Heavy Metal Shank
80° Diamond
Positive Rake, 0° Lead





Right-Hand
Boring Bar Shown



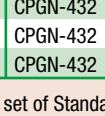
Part Number		Gage	Stock			Dimensions (inches)				Standard Components					* Tune-Up Kit Includes All Std. Compo-nents	Optional Components	
Right	Left	Insert	R	L	Min. Bore	A	C	F	R	Clamp	Clamp Screw	Chip-breaker	Chip-breaker	Eff. Width		† Chip-breaker	Eff. Width
S88-CCFPR-123	—	CPGN-321	❍	❍	0.875	0.750	10	0.437	3°	33704	#6-32 x 1/2 B.H.C.S.	307378-R	—	.093"	TK-00682	307377-R	0.062
—	S88-CCFPL-123	CPGN-321	❍	❍	0.875	0.750	10	0.437	3°	33704	#6-32 x 1/2 B.H.C.S.	—	307378-L	.093"	TK-00681	307377-L	0.062
S10-CCFPR-143	—	CPGN-321	❍	❍	1.000	0.875	10	0.500	2°	33704	#6-32 x 1/2 B.H.C.S.	307378-R	—	.093"	TK-00682	307379-R	0.125
—	S10-CCFPL-143	CPGN-321	❍	❍	1.000	0.875	10	0.500	2°	33704	#6-32 x 1/2 B.H.C.S.	—	307378-L	.093"	TK-00681	307379-L	0.125

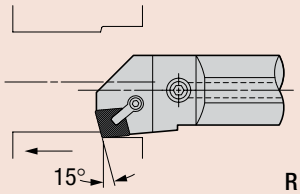
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

† Specifiy left or right chipbreaker when ordering. (example: 307377-R for right)

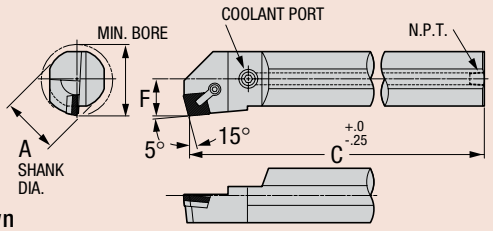
S-CCKPR/L

Style K
80° Diamond
(Using 100° Corner)
Positive Rake, 15° Lead





Right-Hand
Boring Bar Shown

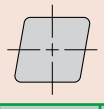


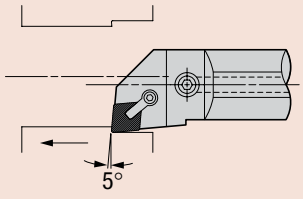
Part Number		Gage	Stock			Dimensions (inches)			Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	Min. Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
S12-CCKPR-164	S12-CCKPL-164	CPGN-432	❍	❍	1.250	1.000	12.00	0.640	–	–	CL-22	XNS-46	TK-00666
S17-CCKPR-244	S17-CCKPL-244	CPGN-432	❍	❍	1.718	1.500	13.75	0.890	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
S22-CCKPR-324	S22-CCKPL-324	CPGN-432	❍	❍	2.218	2.000	16.00	1.140	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
S27-CCKPR-404	S27-CCKPL-404	CPGN-432	❍	❍	2.718	2.500	16.00	1.390	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

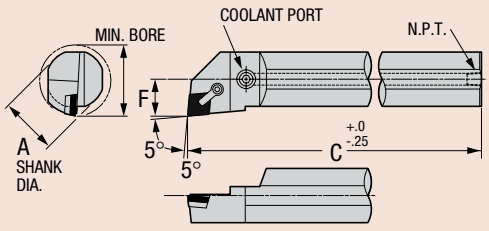
S-CCLPR/L

Style L
80° Diamond
Positive Rake
5° Reverse Lead





Right-Hand
Boring Bar Shown



Part Number		Gage	Stock			Dimensions (inches)			Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	Min. Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
S12-CCLPR-164	S12-CCLPL-164	CPGN-432	●	❍	1.250	1.000	12.00	0.640	–	–	CL-22	XNS-46	TK-00666
S17-CCLPR-244	S17-CCLPL-244	CPGN-432	❍	❍	1.718	1.500	13.75	0.890	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501
S22-CCLPR-324	S22-CCLPL-324	CPGN-432	❍	❍	2.218	2.000	16.00	1.140	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00669
S27-CCLPR-404	S27-CCLPL-404	CPGN-432	❍	❍	2.718	2.500	16.00	1.390	SP-49	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00501

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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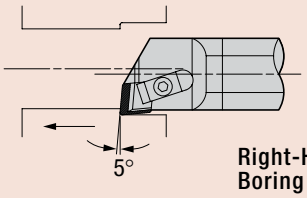
● ● Stocked Standard

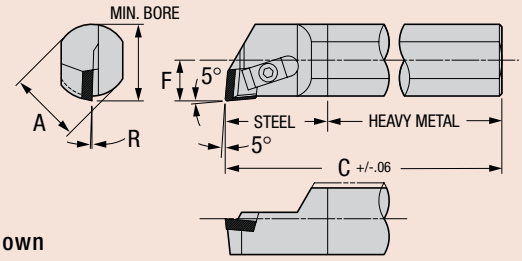
❍ ❍ 10 Business Days or Less

S-CCLPR/L

Style L, Heavy Metal Shank
80° Diamond
Positive Rake
5° Reverse Lead



Right-Hand
Boring Bar Shown



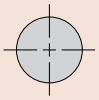
Part Number		Gage	Stock			Dimensions (inches)				Standard Components					* Tune-Up Kit Includes All Std. Compo-nents	Optional Components	
Right	Left	Insert	R	L	Min. Bore	A	C	F	R	Clamp	Clamp Screw	Chip-breaker	Chip-breaker	Eff. Width		† Chip-breaker	Eff. Width
S88-CCLPR-123	—	CPGN-321	❍	❍	0.875	0.750	10	0.437	3°	33704	#6-32 x 1/2 B.H.C.S.	307378-R	—	.093"	TK-00682	307377-R	0.062
—	**S88-CCLPL-123**	CPGN-321	❍	❍	0.875	0.750	10	0.437	3°	33704	#6-32 x 1/2 B.H.C.S.	—	307378-L	.093"	TK-00681	307377-L	0.062
S10-CCLPR-143	—	CPGN-321	❍	❍	1.000	0.875	10	0.500	2°	33704	#6-32 x 1/2 B.H.C.S.	307378-R	—	.093"	TK-00682	307379-R	0.125
—	**S10-CCLPL-143**	CPGN-321	❍	❍	1.000	0.875	10	0.500	2°	33704	#6-32 x 1/2 B.H.C.S.	—	307378-L	.093"	TK-00681	307379-R	0.125

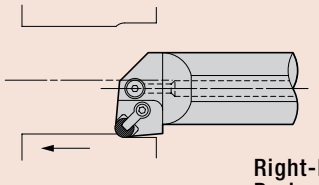
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

† Specifiy left or right chipbreaker when ordering. (example: 307377-R for right)

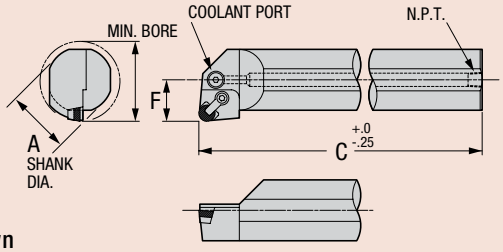
S-CRGPR/L

Style G
Round
Positive Rake





Right-Hand
Boring Bar Shown



Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components				* Tune-Up Kit Includes All Standard Components
Right	Left	Insert	R	L		A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	
S12-CRGPR-163	**S12-CRGPL-163**	RPGN-32	●	●	1.250	1.000	12.00	0.640	–	–	CL-7	XNS-36	TK-00667
S17-CRGPR-243	**S17-CRGPL-243**	RPGN-32	●	●	1.718	1.500	13.75	0.890	SP-34	#2-56x 1/4 S.H.C.S.	CL-7	XNS-36	TK-00502
S22-CRGPR-323	**S22-CRGPL-323**	RPGN-32	●	●	2.218	2.000	16.00	1.140	SP-34	#2-56x 1/4 S.H.C.S.	CL-7	XNS-36	TK-00502
S25-CRGPR-324	**S25-CRGPL-324**	RPGN-43	●	●	2.468	2.000	16.00	1.281	SP-44	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00503
S30-CRGPR-404	**S30-CRGPL-404**	RPGN-43	❍	❍	2.968	2.500	16.00	1.531	SP-44	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00503

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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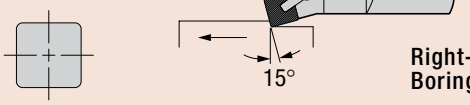
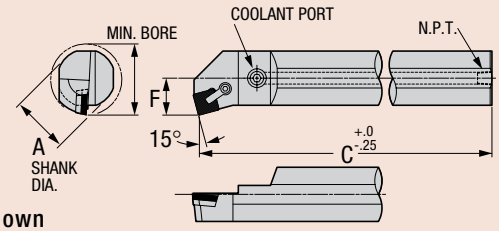
S-CSKPR/L

Style K
Square
Positive Rake
15° Lead





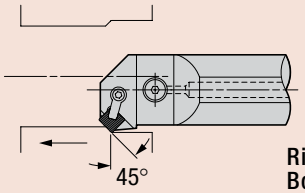
Right-Hand
Boring Bar Shown

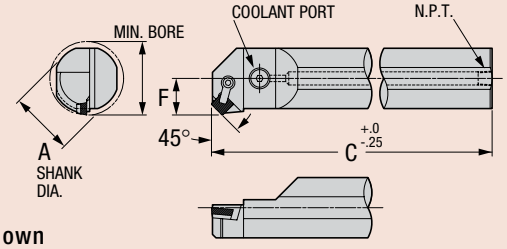
Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
S12-CSKPR-164	S12-CSKPL-164	SPGN-432	❍	❍	1.250	1.000	12.00	0.640	–	–	CL-7	XNS-36	TK-00667
S17-CSKPR-244	S17-CSKPL-244	SPGN-432	❍	❍	1.718	1.500	13.75	0.890	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
S22-CSKPR-324	S22-CSKPL-324	SPGN-432	❍	❍	2.218	2.000	16.00	1.140	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
S27-CSKPR-404	S27-CSKPL-404	SPGN-432	❍	❍	2.718	2.500	16.00	1.390	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

S-CSSPR/L

Style S
Square
Positive Rake
45° Lead





Right-Hand
Boring Bar Shown

Part Number		Gage	Stock		Min.	Dimensions (inches)			Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L	Bore	A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
S12-CSSPR-164	S12-CSSPL-164	SPGN-432	❍	❍	1.250	1.000	12.00	0.640	–	–	CL-7	XNS-36	TK-00667
S17-CSSPR-244	S17-CSSPL-244	SPGN-432	❍	❍	1.718	1.500	13.75	0.890	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-58	TK-03027
S22-CSSPR-324	S22-CSSPL-324	SPGN-432	❍	❍	2.218	2.000	16.00	1.140	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504
S27-CSSPR-404	S27-CSSPL-404	SPGN-432	❍	❍	2.718	2.500	16.00	1.390	SP-41	#4-40x 3/8 F.H.C.S.	CL-12	XNS-59	TK-00504

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

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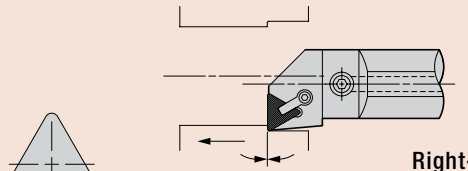
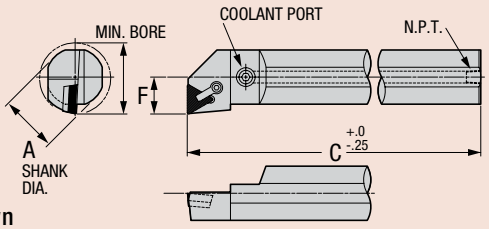
● ● Stocked Standard
❍ ❍ 10 Business Days or Less

S-CTFPR/L

Style F
Triangle
Positive Rake
0° Lead



Right-Hand
Boring Bar Shown

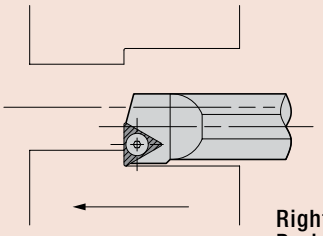


Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components				* Tune-Up Kit
Right	Left	Insert	R	L		A	C	F	Shim Seat	Seat Screw	Clamp	Clamp Screw	Includes All Standard Components
S12-CTFPR-163	S12-CTFPL-163	TPGN-322	❍	❍	1.250	1.000	12.00	0.640	–	–	CL-7	XNS-35	TK-00668
S17-CTFPR-243	S17-CTFPL-243	TPGN-322	❍	❍	1.718	1.500	13.75	0.890	SP3A	#4-40x 3/8 F.H.C.S.	CL-7	XNS-36	TK-00507
S20-CTFPR-244	S20-CTFPL-244	TPGN-432	❍	❍	1.968	1.500	13.75	1.031	SP-4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
S25-CTFPR-324	S25-CTFPL-324	TPGN-432	❍	❍	2.468	2.000	16.00	1.281	SP-4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508
S30-CTFPR-404	S30-CTFPL-404	TPGN-432	❍	❍	2.968	2.500	16.00	1.531	SP-4	#6-32x 1/2 F.H.C.S.	CL-12	XNS-59	TK-00508

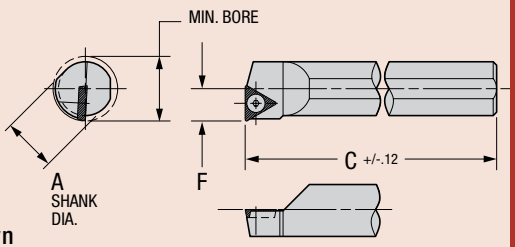
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

S-STFNR/L

Style F
Triangle
Positive Rake
0° Lead



Right-Hand
Boring Bar Shown



Part Number		Gage	Stock		Min. Bore	Dimensions (inches)			Standard Components	* Tune-Up Kit
Right	Left	Insert	R	L		A	C	F	Insert Screw	Includes All Standard Components
S-STFNR-6-2	S-STFNL-6-2	TP41	❍	❍	0.500	0.375	6	0.250	#4-40 x 1/4 BHCS	TK-00922
S-STFNR-8-2	S-STFNL-8-2	TP41	❍	❍	0.625	0.500	8	0.312	#4-40 x 1/4 BHCS	TK-00922
S-STFNR-10-2	S-STFNL-10-2	TP41	❍	❍	0.750	0.625	10	0.375	#4-40 x 1/4 BHCS	TK-00922
S-STFNR-12-3	S-STFNL-12-3	TPGA322	❍	❍	1.000	0.750	10	0.500	#6-32 x 3/8 BHCS	TK-00923

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the boring bar.

See page T 72 for ceramic inserts.

10 Business Days or Less ❍ ❍
Stocked Standard ● ●

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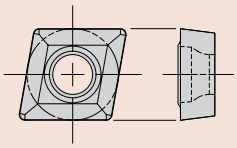
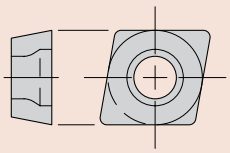
Additional Greenleaf Turning Inserts



CCMT 21.51 X2
CCMT 32.52 X2
CPMT 21.51 X2
CPMT 32.52 X2



CPMW 050204
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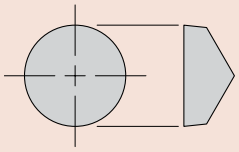

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RCMX 105
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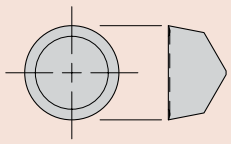
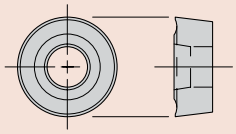
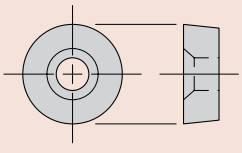
RCMX 106
(312242)



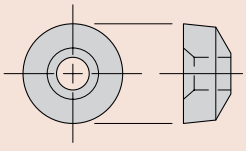
Ceramic
with Chipform
(425196)
(425022)



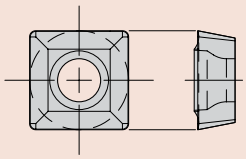
RCMM 43
RCMM 64
RCMM 86
RCGT 43 GP
(421930)
(310520)



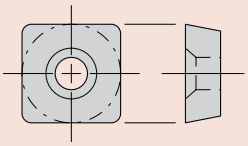
RD-8P
RD-9P
RD-10P
RD-12P
RD-16P



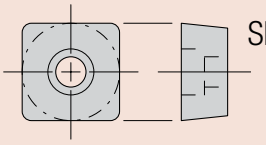
RD6-C
RD8-C



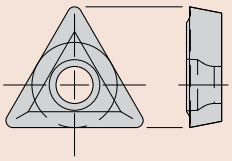
SCMT 32.52 X2
SCMT 432 X2



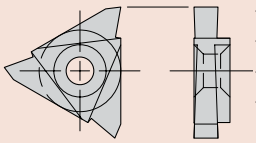
SD-7P
SD-8P
SD-12P



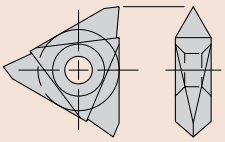
SDH-42



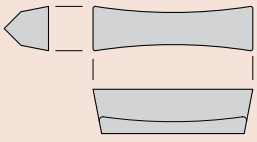
TCMT 21.51 X2
TCMT 32.52 X2
TPMT 21.51 X2
TPMT 32.52 X2



TPMA-_NG
TNMA-_NG
TNMC-_NG
TPMC-_NG

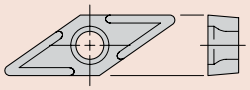


TPMA-_NV
TNMA-_NV
TNMC-_NV
TPMC-_NV



VDB 188RA
VDB 188A015
VDB 218RA
VDB 250 RB
VDB 250B015

ZT 1967
(420555)



VBMT
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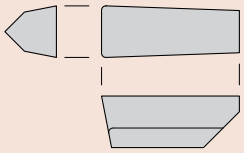

WG
Carbide

Stocked Standard

10 Business Days or Less

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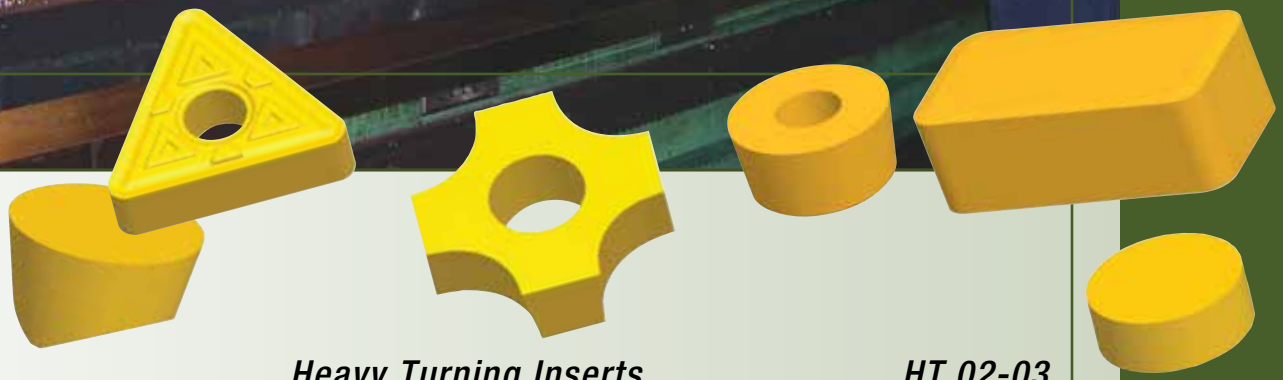

Heavy Turning Inserts ..... **HT 02-03**

Grade Descriptions ..... **HT 04-05**

Edge Preparations ..... **HT 06**

Chipform Application Range ..... **HT 07**

Pictorial Index ..... **HT 08-09**

Heavy Turning Inserts

- *Carbide* ..... **HT 10-20**
- *Radius Forming* ..... **HT 21**
- *Ceramic* ..... **HT 22-26**
- *Roll Turning* ..... **HT 27-32**
- *Heavy Turning Toolhoder* ..... **HT 33**

Heavy Turning Tooling Options ..... **HT 34-35**

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Heavy Turning Inserts

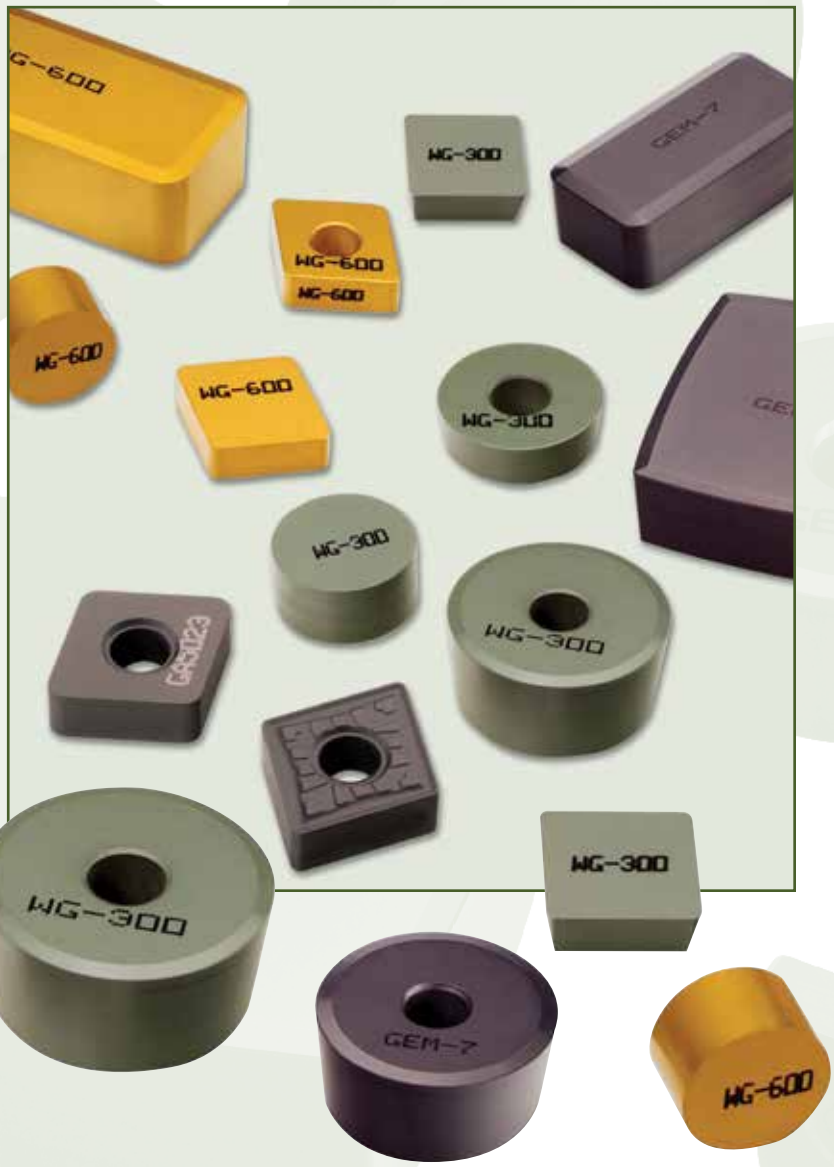
The manufacture of rolls for use in steel making is an area where machinability has been decreased significantly by the introduction of alloyed materials, especially chromium content. In addition, the use of forged rolls is increasing, and centrifugally cast products with high hardness levels and surface contamination are another challenge.

Ceramic cutting tools such as Greenleaf GEM-7™ composite material and WG-300® whiskered material are finding an important place in heavy turning when combined with rigid, well-designed holding systems.

Greenleaf has extensive experience in the design and manufacture of heavy-turning tooling systems. For more than thirty years, we have supplied O.E.M. packages to many of the largest lathe manufacturers – both domestic and overseas.

We will be pleased to quote tooling systems for any type of machine to effectively use ceramic or carbide inserts. Most of the options regularly manufactured are outlined on page HT 34.

Call a Greenleaf heavy-turning specialist at 800-458-1850 to discuss your particular needs.



Greenleaf Corporation is continually upgrading its products.
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CARBIDE

Greenleaf offers a comprehensive line of carbide inserts in grades ranging from sub-micron C-1 through C-8 classifications. An industry pioneer in coated carbide, Greenleaf offers a variety of uncoated, MT-CVD coated and PVD-coated grades. Carbide inserts are available in ANSI standard geometries with multi-purpose chip-breakers for heavy roughing through finishing.

COATED – MT-CVD

GA5023 A high-speed performance grade for turning and milling cast iron. GA5023 features an advanced MT-CVD coating specifically developed for abrasive wear resistance. Application ranges from roughing to finishing on most cast iron materials including gray iron, ductile, nodular and other alloyed irons. The high wear and shock resistance of GA5023 allows machining at high speeds and a variety of feeds.

GA5035 A high-performance MT-CVD coated grade for turning all types of steels, and selected stainless steels. GA5035 can be used in rough, semi-finish, and finish turning situations requiring resistance to heat deformation, thermal shock, and abrasion. GA5035 should be applied at high speeds and a range of feeds.

GA5036 A high-performance MT-CVD coated grade for milling steels at high speed. GA5036 should be used when milling forged and cast steels and selected ductile irons. GA5036 has a unique combination of toughness and heat resistance making it suitable for heavy- and light-duty milling at high cutting speeds.

GA5125 New high-performance MT-CVD coated carbide milling grade especially suited for manganese steel. GA5125 is also applicable on chrome-moly steel, tool steel and similar high alloy steels. GA5125 provides excellent resistance to abrasion, crater wear, thermal shock, deformation and edge build-up. GA5125 should be applied at high speeds with moderate feed rates.

COATED – PVD

G-915 Multi-layer PVD-coated grade, excellent for cut off, milling and turning high-temp alloys, stainless steel, and low carbon steels. The multi-layer PVD coating adds heat and abrasion resistance to the tough, shock-resistant substrate. G-915 should be run at moderate speeds and moderate to high feeds in milling and interrupted turning applications.

G-935 Multi-layer PVD-coated grade for steel milling and turning applications requiring additional resistance to mechanical and thermal shock. The multi-layered PVD coating increases the speed capability and wear resistance in tough milling and interrupted turning applications.

CARBIDE

UNCOATED

G-20M A sub-micron C-2 carbide grade suited for use in turning and milling titanium and nickel-based super-alloys. G-20M has the strength and edge wear characteristics to resist notching when turning high-strength materials.

G-50 Heavy roughing grade for steel and steel castings under difficult conditions, and ferritic stainless steels in most applications. G-50 is tough enough to enable the use of positive rakes for turning.

G-74 Roughing or finishing grade for steel and steel castings. G-74 has higher shock resistance than G-70, and should be applied at high speeds and moderate to heavy feeds. Well suited for turning of steel rolls.

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CERAMIC

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts in ANSI standard and special geometries. Some of the most prominent include:

WG-300® Whisker-reinforced ceramic with excellent wear and shock resistance at high surface speeds. WG-300 is very effective at machining nickel and cobalt based super-alloys, and other hard materials at metal removal rates up to 10 times higher than carbide.

WG-600® Coated whisker-reinforced ceramic offering longer tool life and better performance over uncoated ceramics due to outstanding thermal properties and shock-resistance at high cutting speeds. Application areas include rough and finish turning, as well as high-performance milling of high-strength alloys, hardened steels and select stainless steels. *U.S. Patent No. 6,447,896 B1.*

WG-700™ New whisker-reinforced Al_2O_3 ceramic substrate featuring improved toughness and a unique high-speed coating. WG-700 is ideal for machining nickel- and cobalt-based super alloys and other difficult-to-machines materials. WG-700 exhibits high metal-removal rates with exceptional tool life.
U.S. Patent No. 6,447,896 B1

XSYTIN™-1 New phase-toughened ceramic capable of extreme feed rates. XSYTIN™-1 excels at machining a wide variety of materials including steels, cast and ductile irons, high-temperature alloys and other challenging metals. XSYTIN™-1 is ideal for use in interrupted cuts, scale, abrasive casting materials and milling.

GSN100™ New engineered blend of silicon nitride and proprietary toughening agents that redefines productivity in the machining of cast iron. GSN100 delivers outstanding tool life at high cutting speeds in turning, grooving and milling applications.

GEM-7™ Al_2O_3 + TiC composite ceramic with a high degree of predictability in roll turning and hard alloy (up to 65 R/c) machining.

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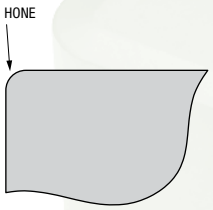
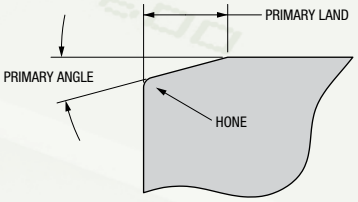
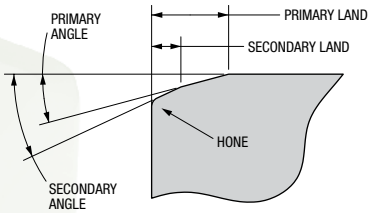


HONE



PRIMARY ANGLE



SECONDARY ANGLE

Edge Prep	Hone	Primary Land	Primary Angle	Secondary Land	Secondary Angle	Application
T2A	.0005 - .001" R.	.006 - .008"	20°			Scale applications, light interruptions, weld overlays, finish turning and milling of hardened materials.
T4A	.0005 - .001" R.	.075"	10°	.006 - .008"	25°	Heavy machining <3/4"IC - Roll turning, 3V, 4V, CDH-22, CDH-33.
T4B	.001 - .002" R.	.075"	10°	.006 - .008"	25°	Heavy machining <3/4"IC - Roll turning, 3V, 4V, CDH-22, CDH-33.
T10B	.001 - .002" R.	.090 - .100"	15°	.006 - .008"	30°	Heavy machining, iron and steel roll turning >3/4"IC, CDH-43, CDH-53.

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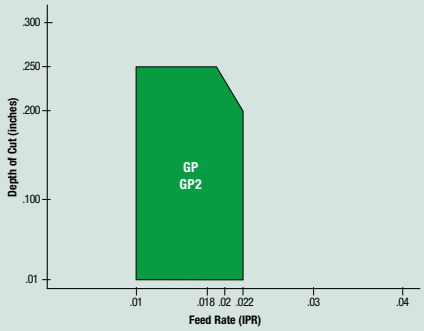
GENERAL PURPOSE

GP and GP2

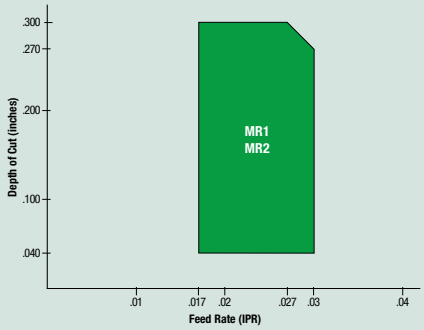
General purpose chipbreaker. Feed rates up to 0.02"/rev and 0.25" depth of cut.



MEDIUM ROUGHING

MR and MR2

Used for medium roughing of all material. Feeds up to 0.028"/rev and depths up to 0.30".

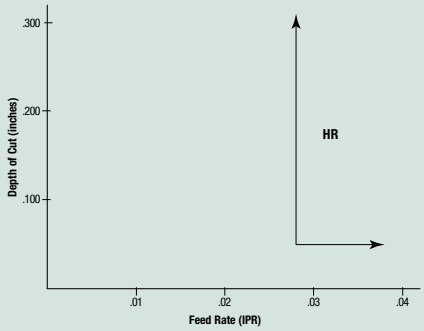


HEAVY ROUGHING

HR *single sided*

Heavy roughing for all materials. Feeds above 0.023"/rev. One-sided chipbreaker for heaviest feeds (MM).

Example: CNMM 644 HR



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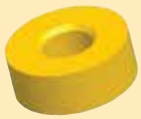
Carbide Inserts – Negative

80° Diamond
Chip Control
GP2, MR, HR – single sided
page: HT 10

80° Diamond
Flat Top
page: HT 11

80° Diamond
Flat Top
page: HT 11

Round
Chip Control
MR, MR – single sided
page: HT 12



Round
Flat Top
page: HT 13

Round
Flat Top
page: HT 13

Square
Chip Control
GP2, MR,
HR – single sided
page: HT 14

Carbide Inserts – Negative *continued*

Square
Flat Top
page: HT 15

Square
Flat Top
page: HT 16

Triangle
Chip Control
MR
page: HT 17

Triangle
Flat Top
page: HT 17

Triangle
Flat Top
TNGN, TNUN
page: HT 18

Carbide Inserts – Positive

Triangle
Flat Top
page: HT 19

Square
Flat Top
page: HT 20

Radius Forming

SNMA-IR
Insert and Toolholder
page: HT 21

Ceramic Inserts – Negative

80° Diamond
page: HT 22

Round
page: HT 23

Square
page: HT 24

Triangle
page: HT 25

Ceramic Inserts – Positive

Square
page: HT 26

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Roll Turning

Roll Turning
page: HT 27

Roll Turning
page: HT 28

Roll Turning
page: HT 29

Roll Turning
page: HT 30

Round
V-Bottom
page: HT 31

Round
V-Bottom
page: HT 31

Square
Negative
page: HT 32

Heavy Turning Toolhoder

H-SROON
Style K
Neutral
Carbide & Ceramic Inserts
page: HT 33

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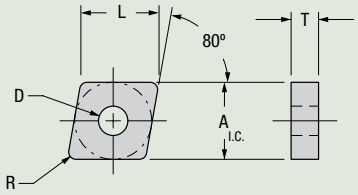
80° Diamond Inserts

Chip Control



	Shape: 80° Diamond	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
GENERAL PURPOSE	GP	CNMG-643-GP	●	❍	❍	❍	❍	❍	●		CNMG-190612-GP	0.750	0.761	0.250	0.312	0.047
MEDIUM ROUGHING	MR	CNMG-642-MR	❍	❍	❍	❍	❍	❍	❍		CNMG-190608-MR	0.750	0.761	0.250	0.312	0.031
		CNMG-643-MR	●	❍	●	●	●	●	●	❍	CNMG-190612-MR	0.750	0.761	0.250	0.312	0.047
		CNMG-644-MR	❍	❍	●	❍	●	❍	●		CNMG-190616-MR	0.750	0.761	0.250	0.312	0.062
HEAVY ROUGHING	HR – single sided	CNMM-643-HR	❍	❍	❍	❍	❍	❍	❍	❍	CNMM-190612-HR	0.750	0.761	0.250	0.312	0.047

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

GA5035 GA5125 GA5036 GA5023 G-915 GA5023 G-915 G-20M
P25 P25 P35 M20 M35 K15 S
Steel S. Steel Cast Iron H-T A.

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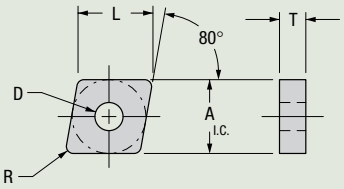
●● Stocked Standard

❍❍ Stocked or Available Upon Request

80° Diamond Inserts

Flat Top (CNMA)



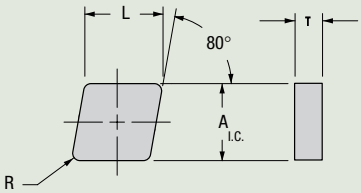
Shape: 80° Diamond	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
	CNMA-642	❍	❍	❍	❍	❍	❍	❍	❍	CNMA-190608	0.750	0.761	0.250	0.312	0.031
	CNMA-643	❍	❍	❍	❍	❍	❍	❍	❍	CNMA-190612	0.750	0.761	0.250	0.312	0.047
	CNMA-644	❍	❍	❍	❍	❍	❍	❍	❍	CNMA-190616	0.750	0.761	0.250	0.312	0.062
	CNMA-866	❍	❍	❍	❍	❍	❍	❍	❍	CNMA-250924	1.000	1.015	0.375	0.359	0.093

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

80° Diamond Inserts

Flat Top (CNGN)



Shape: 80° Diamond	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	CNGN-632	❍	❍	❍	❍	❍	❍	❍	❍	CNGN-190408	0.750	0.761	0.187	0.031
	CNGN-633	❍	❍	❍	❍	❍	❍	❍	❍	CNGN-190412	0.750	0.761	0.187	0.047
	CNGN-634	❍	❍	❍	❍	❍	❍	❍	❍	CNGN-190416	0.750	0.761	0.187	0.062
	CNGN-643	❍	❍	❍	❍	❍	❍	❍	❍	CNGN-190612	0.750	0.761	0.250	0.047
	CNGN-644	❍	❍	❍	❍	❍	❍	❍	❍	CNGN-190616	0.750	0.761	0.250	0.062

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

Stocked or Available Upon Request ❍ ❍ — Stocked Standard ● ●

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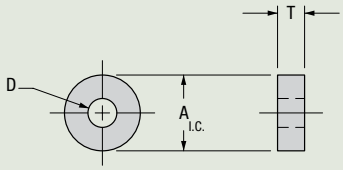
Round Inserts

Chip Control



	Shape: Round	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A	T	D
MEDIUM ROUGHING	MR	RNMG-64-MR	❍	●	❍	❍	❍	❍	❍	❍	RNMG-190600-MR	0.750	0.250	0.312
		RNMG-86-MR	❍	❍	❍	❍	❍	❍	❍	❍	RNMG-250900-MR	1.000	0.375	0.359
HEAVY ROUGHING	MR – single sided	RNMM-84-MR	❍	❍	❍	❍	❍	❍	❍	❍	RNMM-250600-MR	1.000	0.250	0.359

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5035 GA5125 GA5036 GA5023 G-915 GA5023 G-915 G-20M
P25 P25 P35 M20 M35 K15 S
Steel S. Steel Cast Iron H-T A.

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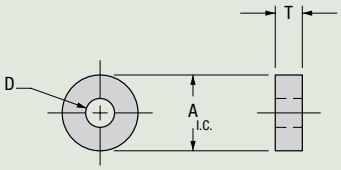
Round Inserts

Flat Top (RNMA)



Shape: Round	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	T	D
	RNMA-64	❍	❍	❍	❍	❍	❍	❍	❍	RNMA-190600	0.750	0.250	0.312
	RNMA-86	❍	❍	❍	❍	❍	❍	❍	❍	RNMA-250900	1.000	0.375	0.359

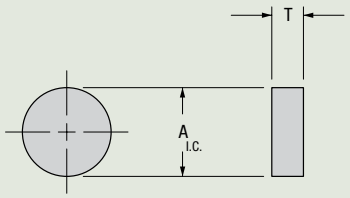
Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

Steel P25 GA5035 | Steel P25 GA5125 | Steel P35 GA5036 | S. Steel M20 GA5023 | S. Steel M35 G-915 | Cast Iron K15 GA5023 | H-T A. S G-915 | H-T A. S G-20M

Round Inserts

Flat Top (RNGN)



Shape: Round	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	T
	RNGN-63	❍	❍	❍	❍	❍	❍	❍	❍	RNGN-190400	0.750	0.187
	RNGN-84	❍	❍	❍	❍	❍	❍	❍	❍	RNGN-250600	1.000	0.250

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

Steel P25 GA5035 | Steel P25 GA5125 | Steel P35 GA5036 | S. Steel M20 GA5023 | S. Steel M35 G-915 | Cast Iron K15 GA5023 | H-T A. S G-915 | H-T A. S G-20M

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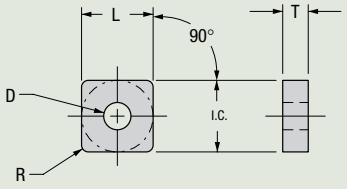
Square Inserts

Chip Control



	Shape: Square	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
GENERAL PURPOSE	GP2	SNMG-643-GP2	●	❍	●	❍	●	❍	●	❍	SNMG-190612-GP2	0.750	0.750	0.250	0.312	0.047
		SNMG-644-GP2	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-190616-GP2	0.750	0.750	0.250	0.312	0.062
MEDIUM ROUGHING	MR	SNMG-643-MR	●	❍	●	❍	●	❍	●	❍	SNMG-190612-MR	0.750	0.750	0.250	0.312	0.047
		SNMG-644-MR	❍	❍	●	❍	❍	❍	❍	●	SNMG-190616-MR	0.750	0.750	0.250	0.312	0.062
		SNMG-866-MR	❍	❍	❍	❍	❍	❍	❍	❍	SNMG-250924-MR	1.000	1.000	0.375	0.359	0.093
HEAVY ROUGHING	HR – single sided	SNMM-643-HR	❍	❍	❍	❍	❍	❍	❍	❍	SNMM-190612-HR	0.750	0.750	0.250	0.312	0.047
		SNMM-644-HR	❍	❍	❍	❍	❍	❍	❍	❍	SNMM-190616-HR	0.750	0.750	0.250	0.312	0.062

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5035 GA5125 GA5036 GA5023 G-915 GA5023 G-915 G-20M
P25 P25 P35 M20 M35 K15 S
Steel | S. Steel | Cast Iron | H-T A.

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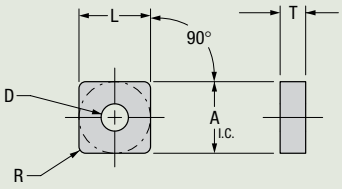
Square Inserts

Flat Top (SNMA)



Shape: Square	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
	SNMA-643	❍	❍	❍	❍	❍	❍	❍	❍	SNMA-190612	0.750	0.750	0.250	0.312	0.047
	SNMA-644	❍	❍	❍	❍	❍	❍	❍	❍	SNMA-190616	0.750	0.750	0.250	0.312	0.062
	SNMA-864	❍	❍	❍	❍	❍	❍	❍	❍	SNMA-250916	1.000	1.000	0.375	0.359	0.062
	SNMA-866	❍	❍	❍	❍	❍	❍	❍	❍	SNMA-250924	1.000	1.000	0.375	0.359	0.093

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

GA5035 GA5125 GA5036 GA5023 G-915 GA5023 G-915 G-20M
P25 P25 P35 M20 M35 K15 S
Steel S. Steel Cast Iron H-T A.

Stocked or Available Upon Request ❍ ❍

Stocked Standard ● ●

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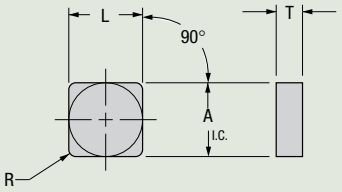
Square Inserts

Flat Top (SNGN/SNUN)



Shape: Square	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	SNGN-633	○	○	○	○	○	○	○	○	SNGN-190412	0.750	0.750	0.187	0.047
	SNGN-634	○	○	○	○	○	○	○	○	SNGN-190416	0.750	0.750	0.187	0.062
	SNGN-638	○	○	○	○	○	○	○	○	SNGN-190432	0.750	0.750	0.187	0.125
	SNGN-643	○	●	○	○	○	○	○	○	SNGN-190612	0.750	0.750	0.250	0.047
	SNGN-644	○	●	○	○	○	○	○	○	SNGN-190616	0.750	0.750	0.250	0.062
	SNGN-646	○	○	○	○	○	○	○	○	SNGN-190624	0.750	0.750	0.250	0.093
	SNGN-844	○	○	○	○	○	○	○	○	SNGN-250616	1.000	1.000	0.250	0.062
	SNGN-854	○	○	○	○	○	○	○	○	SNGN-250716	1.000	1.000	0.312	0.062
	SNGN-10412	○	○	○	○	○	○	○	○	SNGN-310648	1.250	1.250	0.250	0.187
	SNGN-1066	○	○	○	○	○	○	○	○	SNGN-310924	1.250	1.250	0.375	0.093
	SNGN-1068	○	○	○	○	○	○	○	○	SNGN-310932	1.250	1.250	0.375	0.125
	SNGN-1288	○	○	○	○	○	○	○	○	SNGN-381232	1.500	1.500	0.500	0.125
	SNUN-633	○	○	○	○	○	○	○	○	SNUN-190412	0.750	0.750	0.187	0.047
	SNUN-634	○	○	○	○	○	○	○	○	SNUN-190416	0.750	0.750	0.187	0.062
	SNUN-844	○	○	○	○	○	○	○	○	SNUN-250616	1.000	1.000	0.250	0.062
	SNUN-848	○	○	○	○	○	○	○	○	SNUN-250632	1.000	1.000	0.250	0.125
	SNUN-854	○	○	○	○	○	○	○	○	SNUN-250716	1.000	1.000	0.312	0.062
	SNUN-1066	○	○	○	○	○	○	○	○	SNUN-310924	1.250	1.250	0.375	0.093
	SNUN-1068	○	○	○	○	○	○	○	○	SNUN-310932	1.250	1.250	0.375	0.125
	SNUN-1288	○	○	○	○	○	○	○	○	SNUN-381232	1.500	1.500	0.500	0.125

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

GA5035 GA5125 GA5036 GA5023 G-915 GA5023 G-915 G-20M
P25 P25 P35 M20 M35 K15 S
Steel S. Steel Cast Iron H-T A.

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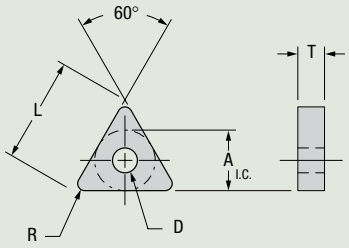
Triangle Inserts
Chip Control

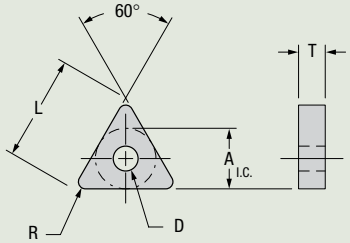


	Shape: Triangle	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
MEDIUM ROUGHING	MR	TNMG-666-MR	●	○	○	○	○	○	○	○	TNMG-330924-MR	0.750	1.299	0.375	0.312	0.094

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Triangle Inserts
Flat Top (TNMA)



Shape: Triangle	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	D	R
	TNMA-642	○	○	○	○	○	○	○	○	TNMA-330608	0.750	1.299	0.250	0.312	0.031
	TNMA-643	○	○	○	○	○	○	○	○	TNMA-330612	0.750	1.299	0.250	0.312	0.047
	TNMA-644	○	○	○	○	○	○	○	○	TNMA-330616	0.750	1.299	0.250	0.312	0.062
	TNMA-664	○	○	○	○	○	○	○	○	TNMA-330916	0.750	1.299	0.375	0.312	0.062
	TNMA-666	○	○	○	○	○	○	○	○	TNMA-330924	0.750	1.299	0.375	0.312	0.093
	TNMA-668	○	○	○	○	○	○	○	○	TNMA-330932	0.750	1.299	0.375	0.312	0.125

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Stocked or Available Upon Request ○ ○ | Stocked Standard ● ●

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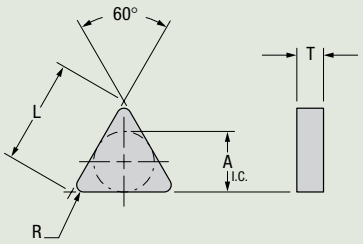
60°

Greenleaf®

Triangle Inserts

Flat Top (TNGN)



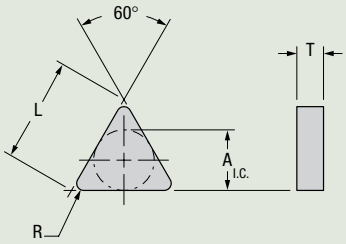
Shape: Triangle	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	TNGN-654	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-330716	0.750	1.299	0.312	0.062
	TNGN-656	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-330724	0.750	1.299	0.312	0.093
	TNGN-664	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-330916	0.750	1.299	0.375	0.062
	TNGN-666	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-330924	0.750	1.299	0.375	0.093
	TNGN-668	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-330932	0.750	1.299	0.375	0.125
	TNGN-776	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-381124	0.875	1.516	0.437	0.093
	TNGN-778	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-381132	0.875	1.516	0.437	0.125
	TNGN-7710	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-381140	0.875	1.516	0.437	0.156
	TNGN-878	❍	❍	❍	❍	❍	❍	❍	❍	TNGN-441132	1.000	1.732	0.437	0.125

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

Triangle Inserts

Flat Top (TNUN)



Shape: Triangle	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	TNUN-654	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330716	0.750	1.299	0.312	0.062
	TNUN-656	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330724	0.750	1.299	0.312	0.093
	TNUN-664	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330916	0.750	1.299	0.375	0.062
	TNUN-666	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330924	0.750	1.299	0.375	0.093
	TNUN-668	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-330932	0.750	1.299	0.375	0.125
	TNUN-776	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-381124	0.875	1.516	0.437	0.093
	TNUN-778	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-381132	0.875	1.516	0.437	0.125
	TNUN-7710	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-381140	0.875	1.516	0.437	0.156
	TNUN-878	❍	❍	❍	❍	❍	❍	❍	❍	TNUN-441132	1.000	1.732	0.437	0.125

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

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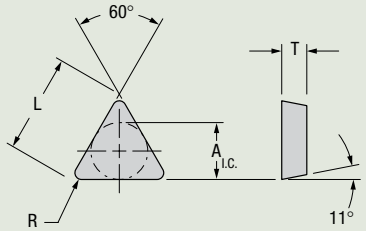
Triangle Inserts

Flat Top (TPGN/TPUN)



Shape: Triangle	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	TPGN-666	❍	❍	❍	❍	❍	❍	❍	❍	TPGN-330924	0.750	1.299	0.375	0.093
	TPUN-664	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-330916	0.750	1.299	0.375	0.062
	TPUN-666	❍	❍	❍	❍	❍	❍	❍	❍	TPUN-330924	0.750	1.299	0.375	0.093

Carbide Coatings

MT-CVD Coated — PVD Coated — Uncoated

GA5035	GA5125	GA5036	GA5023	G-915	GA5023	G-915	G-20M
P25	P25	P35	M20	M35	K15	S	
Steel			S. Steel		Cast Iron	H-T A.	

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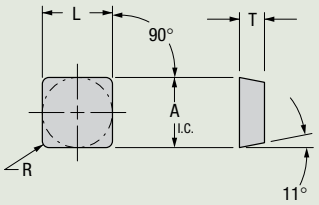
Square Inserts

Flat Top



Shape: Square	Part Number ANSI	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	S. Steel M20 GA5023	S. Steel M35 G-915	Cast Iron K15 GA5023	H-T A. S G-915	H-T A. S G-20M	Part Number ISO	Dimensions (inches) A I.C.	L	T	R
	SPGN-633	○	○	●	○	○	○	○	○	SPGN-190412	0.750	0.750	0.187	0.047
	SPGN-634	○	●	●	○	○	○	○	○	SPGN-190416	0.750	0.750	0.187	0.062
	SPGN-636	○	○	○	○	○	○	○	○	SPGN-190424	0.750	0.750	0.187	0.093
	SPGN-638	○	○	○	○	○	○	○	○	SPGN-190432	0.750	0.750	0.187	0.125
	SPUN-633	○	○	○	○	○	○	○	○	SPUN-190412	0.750	0.750	0.187	0.047
	SPUN-634	○	○	○	○	○	○	○	○	SPUN-190416	0.750	0.750	0.187	0.062
	SPUN-643	○	○	○	○	○	○	○	○	SPUN-190612	0.750	0.750	0.250	0.047
	SPUN-644	○	○	○	○	○	○	○	○	SPUN-190616	0.750	0.750	0.250	0.062
	SPUN-864	○	○	○	○	○	○	○	○	SPUN-250916	1.000	1.000	0.375	0.062
	SPUN-866	○	○	○	○	○	○	○	○	SPUN-250924	1.000	1.000	0.375	0.093
	SPUN-868	○	○	○	○	○	○	○	○	SPUN-250932	1.000	1.000	0.375	0.125
	SPUN-1068	○	○	○	○	○	○	○	○	SPUN-310932	1.250	1.250	0.375	0.125
	SPUN-1288	○	○	○	○	○	○	○	○	SPUN-381232	1.500	1.500	0.500	0.125

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

GA5035 GA5125 GA5036 GA5023 G-915 GA5023 G-915 G-20M
P25 P25 P35 M20 M35 K15 S
Steel S. Steel Cast Iron H-T A.

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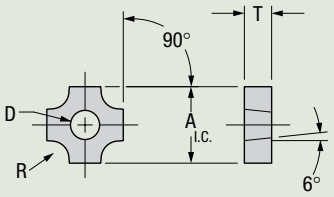
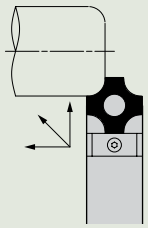
Radius Forming Inserts

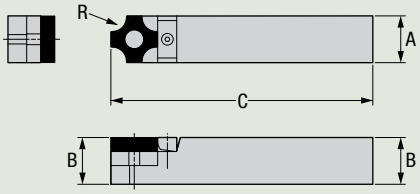
Shape: Square	Part Number ANSI	G-02	G-60	GA5035	GA5036	Part Number ISO	Dimensions (inches) A I.C.	T	D	R
	SNMA-64IR4	❍	●	❍	❍	SNMA-64IR4	0.750	0.250	0.312	0.062
	SNMA-64IR6	●	●	❍	❍	SNMA-64IR6	0.750	0.250	0.312	0.093
	SNMA-64IR8	❍	●	●	●	SNMA-64IR8	0.750	0.250	0.312	0.125
	SNMA-64IR10	❍	●	❍	❍	SNMA-64IR10	0.750	0.250	0.312	0.156
	SNMA-84IR12	❍	●	●	❍	SNMA-84IR12	1.000	0.250	0.359	0.187
	SNMA-84IR14	❍	●	❍	❍	SNMA-84IR14	1.000	0.250	0.359	0.218
	SNMA-84IR16	●	●	❍	❍	SNMA-84IR16	1.000	0.250	0.359	0.250
	SNMA-106IR20	❍	❍	❍	❍	SNMA-106IR20	1.250	0.375	0.500	0.312
	SNMA-106IR24	●	❍	❍	❍	SNMA-106IR24	1.250	0.375	0.500	0.375
	SNMA-126IR28	❍	●	❍	❍	SNMA-126IR28	1.500	0.375	0.500	0.437
	SNMA-126IR32	●	❍	❍	❍	SNMA-126IR32	1.500	0.375	0.500	0.500
Carbide Coatings: MT-CVD Coated, PVD Coated, Uncoated		G-02	G-60	GA5035	GA5036					



Style GSRN



Neutral Toolholder Shown



Part Number Neutral	Stock N	Dimensions (inches) A	B	C	Standard Components Shim	Center Pin	Clamp	Clamp Screw	Tune-Up Kit Includes All Standard Components	Insert Options Insert	R
GSRN-646	●	0.750	1.000	6.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR4	0.062
										SNMA-64IR6	0.093
GSRN-656	❍	0.750	1.250	6.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR8	0.125
GSRN-666	●	0.750	1.500	7.000	SR6	30309	30308-2	30301-1	TK-01117	SNMA-64IR10	0.156
GSRN-168	●	1.000	1.000	6.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR12	0.187
GSRN-858	❍	1.000	1.250	7.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR14	0.218
GSRN-868	●	1.000	1.500	8.000	SR8	30327-1	30308-2	30301-1	TK-00572	SNMA-84IR16	0.250
GSRN-2010	●	1.250	1.250	7.000	SR10	30454	30319-2	30320	TK-00573	SNMA-106IR20	0.312
GSRN-2410	●	1.500	1.500	8.000	SR10	30454	30319-2	30320	TK-00573	SNMA-106IR24	0.375
GSRN-2412	●	1.500	1.500	8.000	SR12	30454	30319-2	30320	TK-00574	SNMA-126IR28	0.437
										SNMA-126IR32	0.500

These toolholders are Greenleaf standard and do not conform to the ANSI identification system.

Inserts and Steel Products *Only*		Inserts *Only*		Steel Products	
10 Business Days or Less	❍ ❍	Stocked or Available Upon Request	❍ ❍	Stocked Standard	● ●

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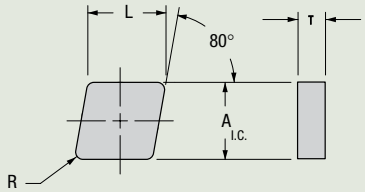
80° Diamond Inserts

Negative



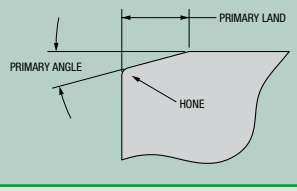
Shape: 80° Diamond	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTiN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
	CNGN-642	T2A	❍	❍	❍	❍	❍	❍	**CNGN-190608**	T2A	0.750	0.761	0.250	0.031
	CNGN-643	T4A	❍	❍	❍	❍	❍	❍	**CNGN-190612**	T4A	0.750	0.761	0.250	0.047
		T2A	❍	❍	●	❍	❍	❍		T2A	0.750	0.761	0.250	0.047
	CNGN-644	T2A	❍	❍	❍	❍	❍	❍	**CNGN-190616**	T2A	0.750	0.761	0.250	0.062

Ceramic Classification

WG-300 / WG-600 / WG-700	XSYTiN-1	GSN100	GEM-7
Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC

Page HT 04 – grade descriptions

Edge Prep Descriptions – HT 06



If edge prep is not shown, call Greenleaf Technical Service for assistance.

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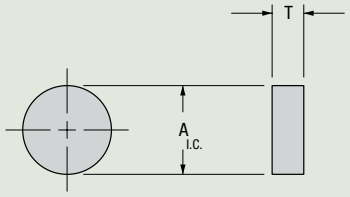
Round Inserts

Negative



Shape: Round	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	Dimensions (inches) T
	RNGN-64	T2A	○	○	○	○	○	○	**RNGN-190600**	T2A	0.750	0.250
	RNGN-65	T2A	●	○	●	○	○	○	**RNGN-190700**	T2A	0.750	0.312
		T10B	○	○	○	○	○	●		T10B	0.750	0.312
	RNGN-84	T2A	○	○	○	○	○	○	**RNGN-250600**	T2A	1.000	0.250
	RNGN-85	T2A	○	○	○	○	○	○	**RNGN-250700**	T2A	1.000	0.312
	RNGN-86	T2A	○	○	○	○	○	○	**RNGN-250900**	T2A	1.000	0.375
	RNGN-106	T4B	○	○	○	○	○	●	**RNGN-310900**	T4B	1.250	0.375
		T10B	○	○	○	○	○	●		T10B	1.250	0.375

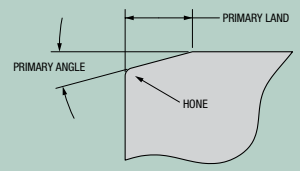
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC

WG-300 WG-600 WG-700 XSYTIN-1 GSN100 GEM-7
Whisker Phase Toughened Si_3N_4 Al_2O_3-TiC

Page HT 04 – grade descriptions

Edge Prep Descriptions – HT 06



If edge prep is not shown, call Greenleaf Technical Service for assistance.

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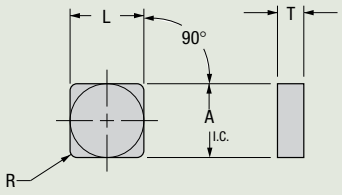
Square Inserts

Negative



Shape: Square	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTiN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
	SNGN-642	T2A	❍	❍	❍	❍	❍	❍	**SNGN-190608**	T2A	0.750	0.750	0.250	0.031
	SNGN-643	T2A	●	❍	❍	❍	❍	❍	**SNGN-190612**	T2A	0.750	0.750	0.250	0.047
	SNGN-644	T2A	●	❍	❍	❍	❍	❍	**SNGN-190616**	T2A	0.750	0.750	0.250	0.062
	SNGN-653	T2A	❍	❍	❍	❍	❍	❍	**SNGN-190712**	T2A	0.750	0.750	0.312	0.047
	SNGN-654	T10B	❍	❍	❍	❍	❍	❍	**SNGN-190716**	T10B	0.750	0.750	0.312	0.062
	SNGN-655	T2A	❍	❍	❍	❍	❍	❍	**SNGN-190720**	T2A	0.750	0.750	0.312	0.078
	SNGN-866	T10B	❍	❍	❍	❍	❍	❍	**SNGN-250924**	T10B	1.000	1.000	0.375	0.094

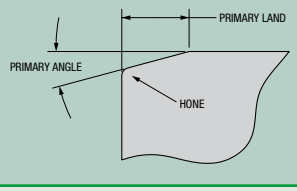
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC

WG-300	WG-600	WG-700	XSYTiN-1	GSN100	GEM-7
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC

Page HT 04 – grade descriptions

Edge Prep Descriptions – HT 06



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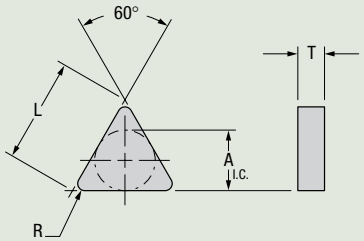
Triangle Inserts

Negative



Shape: Triangle	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
	TNGN-666	T4B	❍	❍	❍	❍	❍	❍	**TNGN-330924**	T4B	0.750	1.299	0.375	0.094
	TNGN-868	T10B	❍	❍	❍	❍	❍	❍	**TNGN-440932**	T10B	1.000	1.732	0.375	0.125

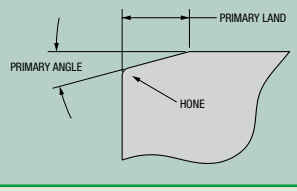
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC

Page HT 04 – grade descriptions

WG-300 | WG-600 | WG-700 | XSYTIN-1 | GSN100 | GEM-7
Whisker | Phase Toughened | Si_3N_4 | Al_2O_3-TiC

Edge Prep Descriptions – page HT 06



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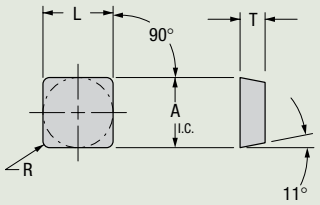
Square Inserts

Positive



Shape: Square	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTiN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	L	T	R
	SPGN-633	T2A	❍	❍	❍	❍	❍	❍	**SPGN-190412**	T2A	0.750	0.750	0.187	0.047
	SPGN-634	T2A	❍	❍	❍	❍	❍	❍	**SPGN-190416**	T2A	0.750	0.750	0.187	0.062
	SPGN-642	T2A	❍	❍	❍	❍	❍	❍	**SPGN-190608**	T2A	0.750	0.750	0.250	0.031

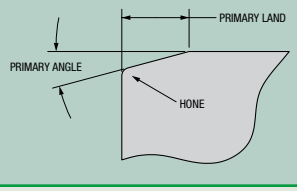
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC

WG-300	WG-600	WG-700	XSYTiN-1	GSN100	GEM-7
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC

Page HT 04 – grade descriptions

Edge Prep Descriptions – HT 06



If edge prep is not shown, call Greenleaf Technical Service for assistance.

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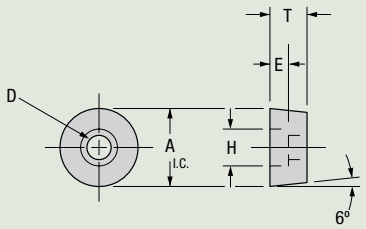
Roll Turning Inserts



Shape: CDH	Part Number ANSI	GA5035	G-935	G-50	G-74	Part Number ISO	Dimensions (inches) A I.C.	T	H	D	E
	CDH-42	❍	❍	❍	❍	CDH-42	1.000	0.500	0.406	0.265	0.250
	CDH-43	❍	❍	❍	❍	CDH-43	1.000	0.750	0.406	0.265	0.500
	CDH-51.5	❍	❍	❍	❍	CDH-51.5	1.250	0.375	–	0.390	–
	CDH-53	❍	❍	❍	❍	CDH-53	1.250	0.750	0.593	0.390	0.375

Carbide Coatings

GA5035	G-935	G-50	G-74
MT-CVD Coated	PVD Coated		Uncoated

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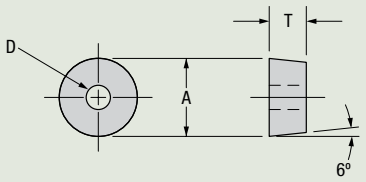
Roll Turning Inserts



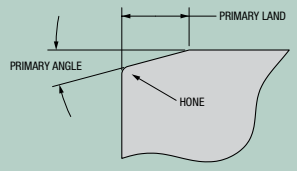
Shape: C-CDH	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	T	D
	C-CDH-21	T4B	❍	❍	❍	❍	❍	❍	**C-CDH-21**	T4B	0.500	0.250	0.125
		T10B	❍	❍	❍	❍	❍	❍		T10B	0.500	0.250	0.125
	C-CDH-22	T4B	❍	❍	❍	❍	❍	❍	**C-CDH-22**	T4B	0.500	0.500	0.125
		T10B	❍	❍	❍	❍	❍	❍		T10B	0.500	0.500	0.125
	C-CDH-31	T4B	❍	❍	❍	❍	❍	❍	**C-CDH-31**	T4B	0.750	0.250	0.265
		T10B	❍	❍	❍	❍	❍	❍		T10B	0.750	0.250	0.265
	C-CDH-31.5	T4B	❍	❍	❍	❍	❍	❍	**C-CDH-31.5**	T4B	0.750	0.375	0.265
		T10B	❍	❍	❍	❍	❍	❍		T10B	0.750	0.375	0.265
	C-CDH-42	T4B	❍	❍	❍	❍	❍	❍	**C-CDH-42**	T4B	1.000	0.500	0.265
		T10B	●	❍	❍	❍	❍	●		T10B	1.000	0.500	0.265
	C-CDH-43	T4B	❍	❍	❍	❍	❍	❍	**C-CDH-43**	T4B	1.000	0.750	0.265
		T10B	❍	❍	❍	❍	❍	❍		T10B	1.000	0.750	0.265
	C-CDH-51.5	T4B	❍	❍	❍	❍	❍	❍	**C-CDH-51.5**	T4B	1.250	0.375	0.390
		T10B	❍	❍	❍	❍	❍	❍		T10B	1.250	0.375	0.390
	C-CDH-53	T4B	❍	❍	❍	❍	❍	❍	**C-CDH-53**	T4B	1.250	0.750	0.390
		T10B	❍	❍	❍	❍	❍	●		T10B	1.250	0.750	0.390

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC

Edge Prep Descriptions – HT 06



Page HT 04 – grade descriptions

If edge prep is not shown, call Greenleaf Technical Service for assistance.

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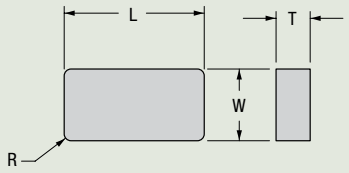
Roll Turning Inserts



Shape: LNUN	Part Number ANSI	GA5035	G-935	G-50	G-74	Part Number ISO	Dimensions (inches) W	L	T	R
	LNUN-4442	○	○	○	○	LNUN-4442	0.500	1.000	0.250	0.031
	LNUN-4444	○	○	○	○	LNUN-4444	0.500	1.000	0.250	0.062
	LNUN-4452	○	○	○	○	LNUN-4452	0.500	1.000	0.312	0.031
	LNUN-4454	○	○	○	○	LNUN-4454	0.500	1.000	0.312	0.062
	LNUN-5444	○	○	○	○	LNUN-5444	0.625	1.000	0.250	0.062
	LNUN-5464	○	○	○	○	LNUN-5464	0.625	1.000	0.375	0.062
	LNUN-5564	○	○	○	○	LNUN-5564	0.625	1.250	0.375	0.062
	LNUN-6568	○	○	○	○	LNUN-6568	0.750	1.250	0.375	0.125
	LNUN-6684	○	○	○	○	LNUN-6684	0.750	1.500	0.500	0.062
	LNUN-6688	○	○	●	○	LNUN-6688	0.750	1.500	0.500	0.125
	LNUN-66812	○	○	○	○	LNUN-66812	0.750	1.500	0.500	0.187
	LNUN-68812	○	○	○	○	LNUN-68812	0.750	2.000	0.500	0.187

Carbide Coatings

GA5035	G-935	G-50	G-74

MT-CVD Coated — PVD Coated — Uncoated

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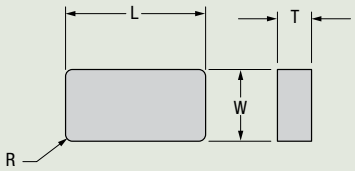
Roll Turning Inserts



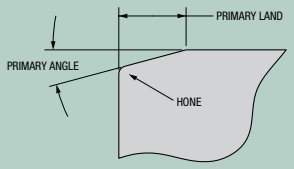
Shape: LNMN	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) W	L	T	R
	LNMN-4442	T4B	○	○	○	○	○	○	**LNMN-4442**	T4B	0.500	1.000	0.250	0.031
		T10B	○	○	○	○	○	○		T10B	0.500	1.000	0.250	0.031
	LNMN-4444	T4B	○	○	○	○	○	○	**LNMN-4444**	T4B	0.500	1.000	0.250	0.062
		T10B	○	○	○	○	○	○		T10B	0.500	1.000	0.250	0.062
	LNMN-4452	T4B	○	○	○	○	○	○	**LNMN-4452**	T4B	0.500	1.000	0.312	0.031
		T10B	○	○	○	○	○	○		T10B	0.500	1.000	0.312	0.031
	LNMN-4454	T4B	○	○	○	○	○	○	**LNMN-4454**	T4B	0.500	1.000	0.312	0.062
		T10B	○	○	○	○	○	○		T10B	0.500	1.000	0.312	0.062
	LNMN-5444	T4B	○	○	○	○	○	○	**LNMN-5444**	T4B	0.625	1.000	0.250	0.062
		T10B	○	○	○	○	○	○		T10B	0.625	1.000	0.250	0.062
	LNMN-5464	T4B	○	○	○	○	○	○	**LNMN-5464**	T4B	0.625	1.000	0.375	0.062
		T10B	○	○	○	○	○	●		T10B	0.625	1.000	0.375	0.062
	LNMN-5564	T4B	○	○	○	○	○	○	**LNMN-5564**	T4B	0.625	1.250	0.375	0.062
		T10B	○	○	○	○	○	○		T10B	0.625	1.250	0.375	0.062
	LNMN-6568	T4B	○	○	○	○	○	○	**LNMN-6568**	T4B	0.750	1.250	0.375	0.125
		T10B	○	○	○	○	○	○		T10B	0.750	1.250	0.375	0.125
	LNMN-6684	T4B	○	○	○	○	○	○	**LNMN-6684**	T4B	0.750	1.500	0.500	0.062
		T10B	○	○	○	○	○	○		T10B	0.750	1.500	0.500	0.062
	LNMN-6688	T4B	○	○	●	○	○	○	**LNMN-6688**	T4B	0.750	1.500	0.500	0.125
		T10B	●	●	●	○	○	●		T10B	0.750	1.500	0.500	0.125
	LNMN-66812	T4B	○	○	○	○	○	○	**LNMN-66812**	T4B	0.750	1.500	0.500	0.187
		T10B	○	○	○	○	○	○		T10B	0.750	1.500	0.500	0.187

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-7
Whisker			Phase Toughened	Si_3N_4	Al_2O_3-TiC

Edge Prep Descriptions – HT 06



Page HT 04 – grade descriptions

If edge prep is not shown, call Greenleaf Technical Service for assistance.

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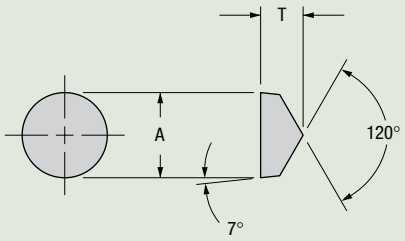
Round V-Bottom Inserts



Shape: Round V-Bottom	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	Dimensions (inches) T
	RCGN-2V	T2A	○	○	○	○	○	●	**RCGX-060400**	T2A	0.250	0.187
	RCGN-3V	T2A	●	○	○	○	○	●	**RCGX-090700**	T2A	0.375	0.312
		T4B	●	○	○	○	○	○		T5B	0.375	0.312
	RCGN-4V	T2A	●	●	●	○	○	●	**RCGX-120700**	T2A	0.500	0.312
		T4A	○	○	○	○	○	●		T4A	0.500	0.312
		T5A	●	○	○	○	○	●		T5A	0.500	0.312
		T5B	●	○	○	○	○	●		T5B	0.500	0.312
	RCGN-5V	T2A	○	○	○	○	○	○	**RCGX-151000**	T2A	0.625	0.394
	RCGX-106	T2A	○	○	○	○	○	○	**RCGX-191000**	T2A	0.750	0.394
	RCGN-6V	T2A	○	○	○	○	○	○	**RCGX-191200**	T2A	0.750	0.500

Ceramic Classification

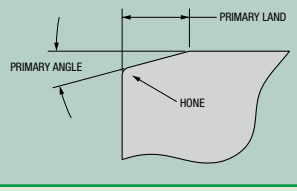
Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC

WG-300 | WG-600 | WG-700 | XSYTIN-1 | GSN100 | GEM-7

Whisker | Phase Toughened | Si_3N_4 | Al_2O_3-TiC

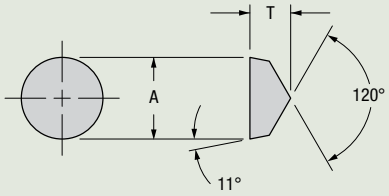
Page HT 04 – grade descriptions

Edge Prep Descriptions – HT 06



If edge prep is not shown, call Greenleaf Technical Service for assistance.

Round V-Bottom Inserts



Shape: Round V-Bottom	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	Dimensions (inches) T
	RPGN-2V	T2A	●	○	●	○	○	○	**RPGX-060400**	T2A	0.250	0.187
	RPGN-3V	T2A	●	●	●	○	○	○	**RPGX-090700**	T2A	0.375	0.312
		T4B	○	○	○	○	○	○		T4B	0.375	0.312
	RPGN-4V	T2A	●	●	○	○	○	○	**RPGX-120700**	T2A	0.500	0.312
		T4B	○	○	○	○	○	○		T4B	0.500	0.312

Ceramic Classification

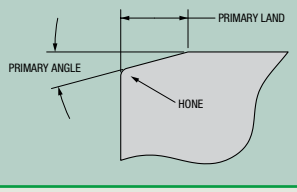
Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC

WG-300 | WG-600 | WG-700 | XSYTIN-1 | GSN100 | GEM-7

Whisker | Phase Toughened | Si_3N_4 | Al_2O_3-TiC

Page HT 04 – grade descriptions

Edge Prep Descriptions – HT 06



If edge prep is not shown, call Greenleaf Technical Service for assistance.

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Stocked Standard ● ●

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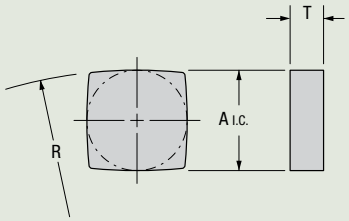
Square Inserts

Negative



Shape: Square	Part Number ANSI	Edge Prep	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Part Number ISO	Edge Prep	Dimensions (inches) A I.C.	T	R
	SNGN-128-R4.5	T4B	❍	❍	❍	❍	❍	❍	**SNGN-128-R4.5**	T4B	1.500	0.500	4.500

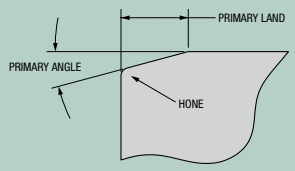
Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC

Page HT 04 – grade descriptions

Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7

Edge Prep Descriptions – HT 06



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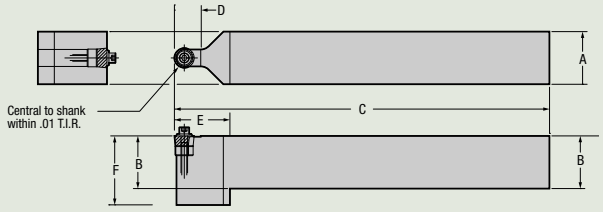
H-SROON

Neutral
Carbide and Ceramic Inserts



Part Number	Gage Insert	Dimensions (inches) A	B	C	D	E	F	Standard Components Shim	Shim Thickness	Insert Screw
H-SROON-24-3-1	C-CDH-31	1.500	1.500	12.0	1.5	2.25	2.00	313665	0.125	SHCS 1/4-20 x 1.25 long
H-SROON-32-3-1	CDH-31	2.000	2.000	12.0	1.5	N/A	N/A			
H-SROON-24-4-2	C-CDH-42	1.500	1.500	12.0	1.5	2.25	2.25	3291	0.250	SHCS 1/4-20 x 1.50 long
H-SROON-32-4-2	CDH-42	2.000	2.000	12.0	1.5	2.25	2.25			
H-SROON-32-5-1.5	C-CDH-51.5	2.000	2.000	12.0	2.0	2.50	2.50	313690	0.375	SHCS 3/8-16 x 2.00 long
	CDH-51.5									

C-CDH and CDH inserts can be found on pages HT27 and HT28.

Part Number	Gage Insert	Optional Inserts and Components Shim	Shim Thickness	Insert Screw	Chip breaker
H-SROON-24-3-1	C-CDH-31.5	N/A	N/A	SHCS 1/4-20 x 1.25 long	306727
H-SROON-32-3-1	CDH-31.5				
H-SROON-24-4-2	C-CDH-43	N/A	N/A	SHCS 1/4-20 x 1.50 long	304736
H-SROON-32-4-2	CDH-435				
H-SROON-32-5-1.5	C-CDH-53	N/A	N/A	SHCS 3/8-16 x 2.00 long	313602
	CDH-53				

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Stocked Standard ● ●

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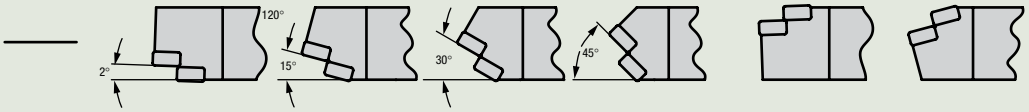
Inserts

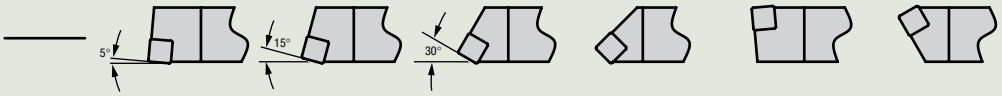
ROUND
V-BOTTOM
RPGN , RCGN STYLES

SINGLE
RECTANGULAR
LNU STYLE

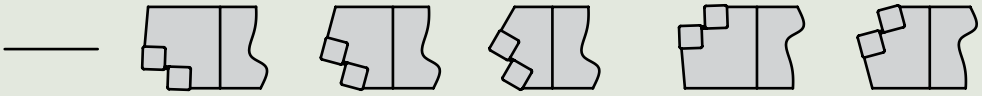
DOUBLE
RECTANGULAR
LNU STYLE



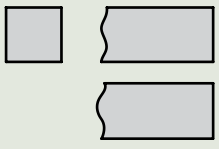
SINGLE SQUARE
NEGATIVE OR POSITIVE
SNUN , SPUN STYLES



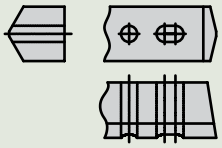
DOUBLE SQUARE
NEGATIVE OR POSITIVE
SNUN , SPUN STYLE



Shank Options



STRAIGHT
SHANK



CUSTOMIZED
V-BOTTOM
SHANK

FARREL
QUICK CHANGE

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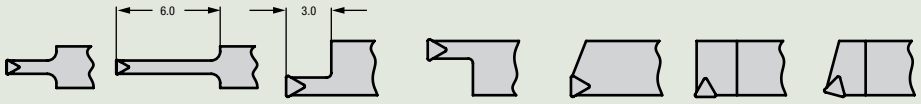
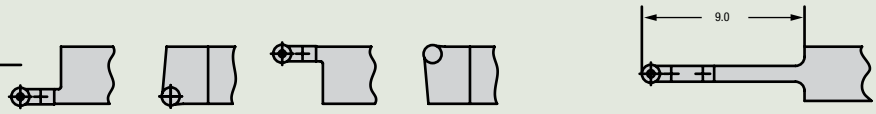
Inserts *continued*

TRIANGULAR INSERT
NEGATIVE OR POSITIVE
TPGN , TNUN STYLES



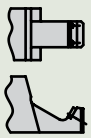
DIAMOND INSERT
NEGATIVE OR POSITIVE
CNGN , CPGN STYLES

ROUND INSERT
NEGATIVE OR POSITIVE
RNGN , RCGN STYLES
CDH STYLES

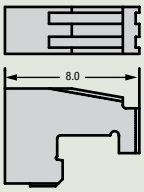


1-1/2 I.C.
FINISHING INSERT
SNGN-128R4.5

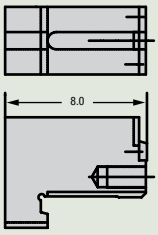
Shank Options *continued*



GREENLEAF
CAM LOCK



CUSTOMIZED
SHANK FOR
HERCULES
LATHES



CUSTOMIZED
SHANK FOR
WALDRICH
SIEGEN
LATHES

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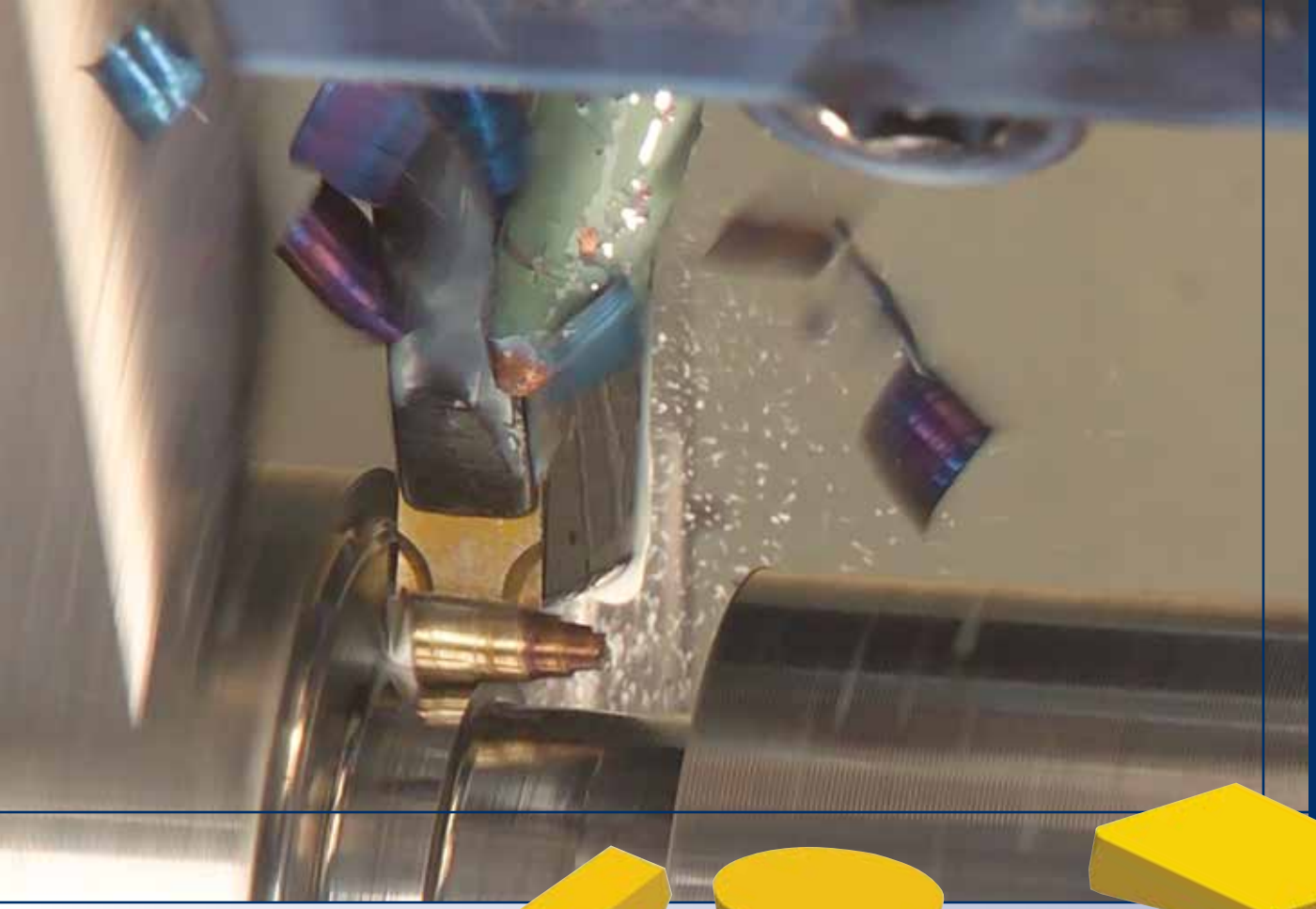

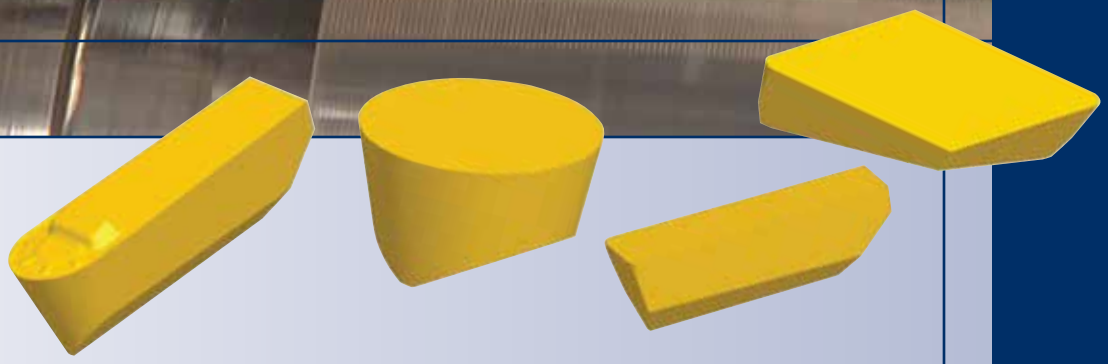

Grooving, Profiling and Cut-Off Inserts ..... ***GP 02-03***

Grade Descriptions ..... ***GP 04***
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Pictorial Index ..... ***GP 07***
Inserts ..... ***GP 08-20***

Toolholders and Bars ..... ***GP 21-46***

Support Blades ..... ***GP 47-62***

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Grooving, Profiling and Cut-Off Inserts

Greenleaf offers one of the most comprehensive lines of grooving, profiling and cut-off inserts in the industry. Every application on the shop floor can use this unique tooling system that accommodates both ceramic and carbide inserts.

Our advanced MT-CVD coated and PVD-coated grades have the strength and wear resistance needed for higher cutting speeds and longer tool life.

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts including WG-600®, the only commercially available, second generation, coated ceramic-composite cutting tool using whisker reinforcement. WG-600 is one of seven prominent advanced-ceramic grades that continue to increase productivity in industry.

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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CARBIDE

Greenleaf offers a comprehensive line of carbide inserts in grades ranging from sub-micron C-1 through C-8 classifications. An industry pioneer in coated carbide, Greenleaf offers a variety of uncoated, MT-CVD coated and PVD-coated grades. Carbide inserts are available in ANSI standard geometries with multi-purpose chipbreakers for heavy roughing through finishing.

COATED – MT-CVD

GA5025 A high-speed MT-CVD coated grade for turning, light roughing and finishing of carbon and alloy steels, as well as selected stainless steels.

GA5026 A high-speed grade developed for turning nickel- and cobalt-based super-alloys, stainless steels, and refractory metals. The advanced MT-CVD coating over a micro-grain substrate offers high wear resistance. GA5026 has exceptional resistance to the notching and deformation common to machining high strength materials. Apply at high speeds and light feeds in turning and selected milling applications.

GA5035 A high-performance MT-CVD coated grade for turning all types of steels, and selected stainless steels. GA5035 can be used in rough, semi-finish, and finish turning situations requiring resistance to heat deformation, thermal shock, and abrasion. GA5035 should be applied at high speeds and a range of feeds.

GA5125 New high-performance MT-CVD coated carbide milling grade especially suited for manganese steel. GA5125 is also applicable on chrome-moly steel, tool steel and similar high alloy steels. GA5125 provides excellent resistance to abrasion, crater wear, thermal shock, deformation and edge build-up. GA5125 should be applied at high speeds with moderate feed rates.

COATED – PVD

G-915 Multi-layer PVD-coated grade, excellent for cut off, milling and turning high-temp alloys, stainless steel, and low carbon steels. The multi-layer PVD coating adds heat and abrasion resistance to the tough, shock-resistant substrate. G-915 should be run at moderate speeds and moderate to high feeds in milling and interrupted turning applications.

G-920 PVD-coated grade for turning and milling high-strength materials such as high-temp alloys, titanium and stainless steel. G-920 is also an excellent grade for aluminum and refractory metals. This grade has the resistance to deformation and notching required for higher speeds than G-910.

G-925 Multi-layer PVD-coated grade specifically designed for machining abrasive and difficult-to-machine materials. Typical applications include high-temp alloys, titanium and other refractory metals, stainless steel, and many cast irons. G-925 exhibits excellent resistance to notching and deformation. Apply at moderate to high speeds and moderate feeds.

G-935 Multi-layer PVD-coated grade for steel milling and turning applications requiring additional resistance to mechanical and thermal shock. The multi-layered PVD coating increases the speed capability and wear resistance in tough milling and interrupted turning applications.

UNCOATED

G-20M A sub-micron C-2 carbide grade suited for use in turning and milling titanium and nickel-based super-alloys. G-20M has the strength and edge wear characteristics to resist notching when turning high-strength materials.

CERAMIC

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts in ANSI standard and special geometries. Some of the most prominent include:

WG-300® Whisker-reinforced ceramic with excellent wear and shock resistance at high surface speeds. WG-300 is very effective at machining nickel and cobalt based super-alloys, and other hard materials at metal removal rates up to 10 times higher than carbide.

WG-600® Coated whisker-reinforced ceramic offering longer tool life and better performance over uncoated ceramics due to outstanding thermal properties and shock-resistance at high cutting speeds. Application areas include rough and finish turning, as well as high-performance milling of high-strength alloys, hardened steels and select stainless steels. *U.S. Patent No. 6,447,896 B1.*

WG-700™ New whisker-reinforced Al_2O_3 ceramic substrate featuring improved toughness and a unique high-speed coating. WG-700 is ideal for machining nickel- and cobalt-based super alloys and other difficult-to-machine materials. WG-700 exhibits high metal-removal rates with exceptional tool life. *U.S. Patent No. 6,447,896 B1*

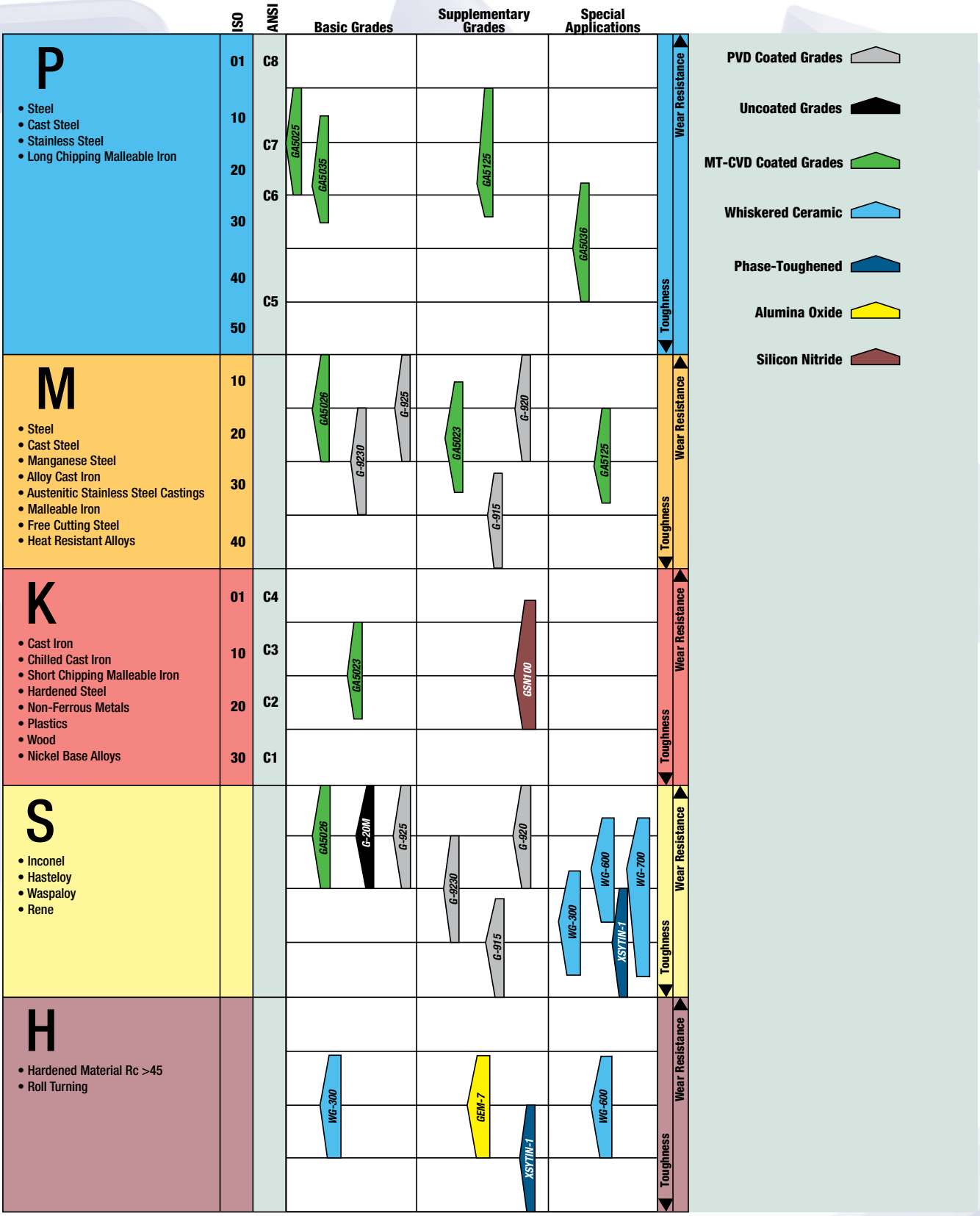
XSYTIN™-1 New phase-toughened ceramic capable of extreme feed rates. XSYTIN™-1 excels at machining a wide variety of materials including steels, cast and ductile irons, high-temperature alloys and other challenging metals. XSYTIN™-1 is ideal for use in interrupted cuts, scale, abrasive casting materials and milling.

GSN100™ New engineered blend of silicon nitride and proprietary toughening agents that redefines productivity in the machining of cast iron. GSN100 delivers outstanding tool life at high cutting speeds in turning, grooving and milling applications.

GEM-7™ Al_2O_3 + TiC composite ceramic with a high degree of predictability in roll turning and hard alloy (up to 65 R/c) machining.

GEM-19™ Cold pressed and sintered Al_2O_3 ceramic for economical roughing and finishing of cast iron grades application range on severe interruption or old machinery.

Insert Grade Reference for Grooving, Profiling and Cut Off



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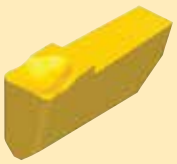
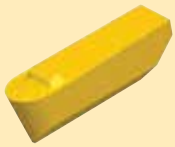
Greenleaf Cut-Off System

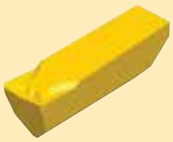


COS
page: GP 08

Single-Ended Groovers



Full Nose
page: GP 09

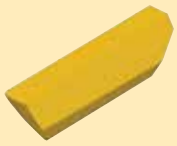


Flat Nose
page: GP 09

WG-Style
Full Nose
page: GP 10

WG-Style
Flat Nose
page: GP 11

WGC
Full Nose
page: GP 12

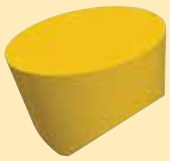


WGC
Flat Nose
page: GP 13

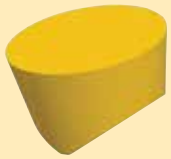
V-Bottom Round Inserts

RCGN
Positive: Carbide
page: GP 14

RCGN
Positive: Ceramic
page: GP 14

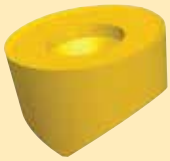


RPGN
Positive: Carbide
page: GP 15



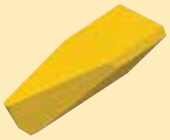
RPGN
Positive: Ceramic
page: GP 15

RCGR/RPGR
Positive Chipform
V-Bottom
page: GP 16



RCGT/RPGT
Positive Chipform
V-Bottom
page: GP 17

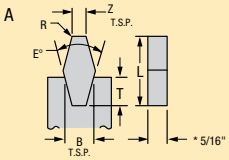
35° and 55° V-Bottom Diamond Inserts



VPG
35°
page: GP 18

VCGN
35°
page: GP 18

DPGN
55°
page: GP 19



Pulley and
Poly Groove
Inserts
page: GP 20

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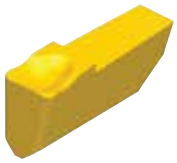
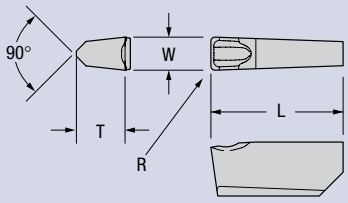
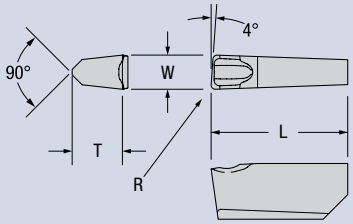
Greenleaf Cut-Off System

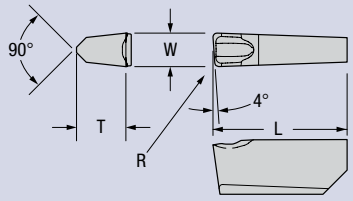
Shape: Groove/Turn	Part Number ANSI	G-915	Part Number ISO	Dimensions (inches) W	L	T	R
	COS-4094-0	●	COS-4094-0	0.094	0.500	0.187	0.010
	COS-4125-0	●	COS-4125-0	0.125	0.500	0.187	0.010
	COS-4187-0	●	COS-4187-0	0.187	0.500	0.187	0.010
	COS-4094-4L	●	COS-4094-4L	0.094	0.500	0.187	0.010
	COS-4125-4L	●	COS-4125-4L	0.125	0.500	0.187	0.010
	COS-4187-4L	●	COS-4187-4L	0.187	0.500	0.187	0.010
	COS-4094-4R	●	COS-4094-4R	0.094	0.500	0.187	0.010
	COS-4125-4R	●	COS-4125-4R	0.125	0.500	0.187	0.010
	COS-4187-4R	●	COS-4187-4R	0.187	0.500	0.187	0.010
Carbide Coatings PVD Coated		G-915					



0° Lead



4° Left Hand



4° Right Hand

See pages GP 31, GP 34 and GP 39 for toolholders.

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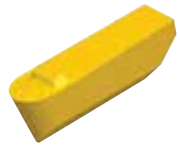
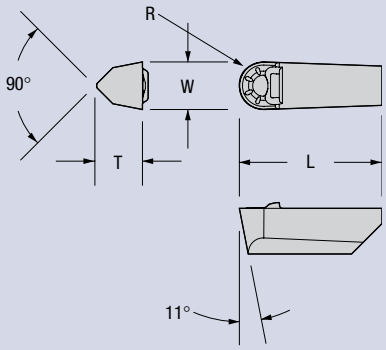
Full Nose Grooving Inserts

Shape: Groove/Turn	Part Number ANSI	GA5026	GA5035	G-935	G-925	G-915	Part Number ISO	Dimensions (inches) W	L	T	R
	GTS-4125	●	●	●		●	GTS-4125	0.125	0.500	0.187	Full
	GTS-4187	●	●	●		●	GTS-4187	0.187	0.500	0.187	Full
	GTS-6250	●	●	○	●	●	GTS-6250	0.250	0.750	0.250	Full

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

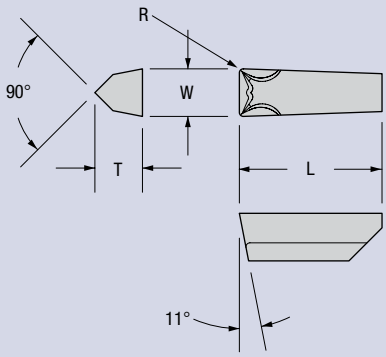


Flat Nose Grooving Inserts

Shape: Groove/Turn	Part Number ANSI	GA5026	GA5035	G-935	G-915	Part Number ISO	Dimensions (inches) W	L	T	R
	GTS-4125-1	●	●	●	●	GTS-4125-1	0.125	0.500	0.187	0.015
	GTS-4125-2	●	●	●	●	GTS-4125-2	0.125	0.500	0.187	0.031
	GTS-4187-1	●	●	●	●	GTS-4187-1	0.187	0.500	0.187	0.015
	GTS-4187-2	●	●	●	●	GTS-4187-2	0.187	0.500	0.187	0.031
	GTS-6250-1	●	●	●	●	GTS-6250-1	0.250	0.750	0.250	0.015
	GTS-6250-2	●	●	●	●	GTS-6250-2	0.250	0.750	0.250	0.031

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated



Stocked or Available Upon Request ○ ○

Stocked Standard ● ●

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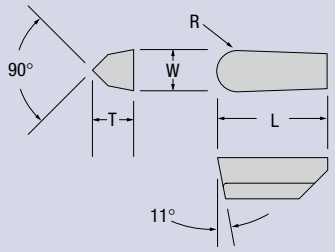
WG-Style, Full Nose Grooving Inserts



Shape: Groover	Part Number ISO	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3 GEM-19	Part Number ANSI	Dimensions (millimeters) W	L	T	R
	WG-4094	●	○	●	○	○	○	WG-4094	0.094	0.500	0.187	Full
	WG-4125	●	●	●	○	○	○	WG-4125	0.125	0.500	0.187	Full
	WG-4156	●	●	●	○	○	○	WG-4156	0.156	0.500	0.187	Full
	WG-4187	●	●	●	○	○	○	WG-4187	0.187	0.500	0.187	Full
	WG-6218	●	●	●	○	○	○	WG-6218	0.218	0.750	0.250	Full
	WG-6250	●	●	●	○	○	○	WG-6250	0.250	0.750	0.250	Full
	WG-6281	●	○	○	○	○	○	WG-6281	0.281	0.750	0.250	Full
	WG-8312	●	○	●	○	○	○	WG-8312	0.312	1.000	0.337	Full
	WG-8344	○	○	○	○	○	○	WG-8344	0.344	1.000	0.337	Full
	WG-8375	●	○	○	○	○	○	WG-8375	0.375	1.000	0.337	Full

Ceramic Classification

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3

Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC | Al_2O_3

Page GP 04 – grade description

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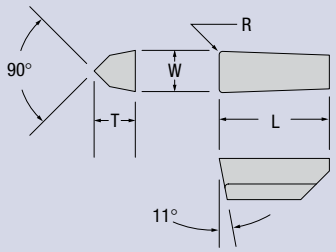
○ ○ Stocked or Available Upon Request

WG-Style, Flat Nose Grooving Inserts



Shape: Groover	Part Number ISO	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3 GEM-19	Part Number ANSI	Dimensions (millimeters) W	L	T	R
	WG-4094-1	●	○	●	○	○	○	WG-4094-1	0.094	0.500	0.187	0.015
	WG-4094-2	○	○	○	○	○	○	WG-4094-2	0.094	0.500	0.187	0.031
	WG-4125-1	●	○	●	○	○	○	WG-4125-1	0.125	0.500	0.187	0.015
	WG-4125-2	●	○	●	○	●	○	WG-4125-2	0.125	0.500	0.187	0.031
	WG-4156-1	●	○	●	○	○	○	WG-4156-1	0.156	0.500	0.187	0.015
	WG-4156-2	●	○	●	○	○	○	WG-4156-2	0.156	0.500	0.187	0.031
	WG-4156-3	●	○	●	○	○	○	WG-4156-3	0.156	0.500	0.187	0.046
	WG-4187-1	●	○	●	○	○	○	WG-4187-1	0.187	0.500	0.187	0.015
	WG-4187-2	●	○	●	○	●	○	WG-4187-2	0.187	0.500	0.187	0.031
	WG-6218-1	●	○	●	○	○	○	WG-6218-1	0.218	0.750	0.250	0.015
	WG-6218-2	●	○	●	○	○	○	WG-6218-2	0.218	0.750	0.250	0.031
	WG-6250-1	●	●	●	○	○	○	WG-6250-1	0.250	0.750	0.250	0.015
	WG-6250-2	●	●	●	○	●	○	WG-6250-2	0.250	0.750	0.250	0.031
	WG-6250-3	●	●	●	○	○	○	WG-6250-3	0.250	0.750	0.250	0.046
	WG-6250-4	●	○	●	○	○	○	WG-6250-4	0.250	0.750	0.250	0.062
	WG-6281-1	●	○	○	○	○	○	WG-6281-1	0.281	0.750	0.250	0.015
	WG-6281-2	○	○	○	○	○	○	WG-6281-2	0.281	0.750	0.250	0.031
	WG-6281-3	○	○	○	○	○	○	WG-6281-3	0.281	0.750	0.250	0.046
	WG-8312-1	●	○	●	○	○	○	WG-8312-1	0.312	1.000	0.337	0.015
	WG-8312-2	●	○	●	○	○	○	WG-8312-2	0.312	1.000	0.337	0.031
	WG-8312-3	●	○	●	○	○	○	WG-8312-3	0.312	1.000	0.337	0.046
	WG-8312-4	○	○	○	○	○	○	WG-8312-4	0.312	1.000	0.337	0.062
	WG-8344-1	○	○	○	○	○	○	WG-8344-1	0.344	1.000	0.337	0.015
	WG-8344-2	○	○	○	○	○	○	WG-8344-2	0.344	1.000	0.337	0.031
	WG-8344-3	○	○	○	○	○	○	WG-8344-3	0.344	1.000	0.337	0.046
	WG-8344-4	○	○	○	○	○	○	WG-8344-4	0.344	1.000	0.337	0.062
	WG-8375-1	○	○	○	○	○	○	WG-8375-1	0.375	1.000	0.337	0.015
	WG-8375-2	●	○	●	○	●	○	WG-8375-2	0.375	1.000	0.337	0.031
	WG-8375-3	○	○	○	○	○	○	WG-8375-3	0.375	1.000	0.337	0.046
	WG-8375-4	●	○	○	○	○	○	WG-8375-4	0.375	1.000	0.337	0.062

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

WG-300	WG-600	WG-700	XSYTIN-1	GSN100	GEM-19
Whisker			Phase Toughened	Si_3N_4	Al_2O_3

Page GP 04 – grade description

Stocked or Available Upon Request ○ ○

Stocked Standard ● ●

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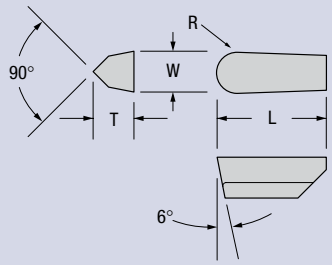
WGC Full Nose Grooving Inserts



Shape: Groover	Part Number ISO	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ANSI	Dimensions (millimeters) W	L	T	R
	WGC-4094	❍	❍	❍	❍	❍	❍	❍	WGC-4094	0.094	0.500	0.187	Full
	WGC-4125	❍	❍	❍	❍	❍	❍	❍	WGC-4125	0.125	0.500	0.187	Full
	WGC-4156	❍	❍	❍	❍	❍	❍	❍	WGC-4156	0.156	0.500	0.187	Full
	WGC-4187	❍	❍	❍	❍	❍	❍	❍	WGC-4187	0.187	0.500	0.187	Full
	WGC-6218	❍	❍	❍	❍	❍	❍	❍	WGC-6218	0.218	0.750	0.250	Full
	WGC-6250	❍	❍	❍	❍	❍	●	❍	WGC-6250	0.250	0.750	0.250	Full
	WGC-6281	❍	❍	❍	❍	❍	❍	❍	WGC-6281	0.281	0.750	0.250	Full
	WGC-8312	❍	❍	❍	❍	❍	❍	❍	WGC-8312	0.312	1.000	0.337	Full
	WGC-8344	❍	❍	❍	❍	❍	❍	❍	WGC-8344	0.344	1.000	0.337	Full
	WGC-8375	❍	❍	❍	❍	❍	❍	❍	WGC-8375	0.375	1.000	0.337	Full

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19

Page GP 04 – grade description

* WGC style inserts come standard with a “T1A” edge prep (.002”-.004” x 20° and .0005”-.001” hone).

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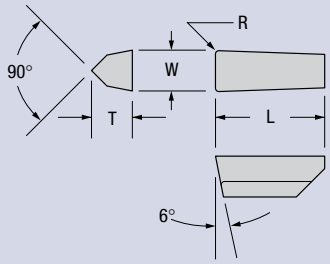
● ● Stocked Standard

❍ ❍ Stocked or Available Upon Request

WGC Flat Nose Grooving Inserts



Shape: Groover	Part Number ISO	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ANSI	Dimensions (millimeters) W	L	T	R
	WGC-4094-1	❍	❍	❍	❍	❍	❍	❍	WGC-4094-1	0.094	0.500	0.187	0.015
	WGC-4094-2	❍	❍	❍	❍	❍	❍	❍	WGC-4094-2	0.094	0.500	0.187	0.031
	WGC-4125-1	❍	❍	❍	❍	❍	●	❍	WGC-4125-1	0.125	0.500	0.187	0.015
	WGC-4125-2	❍	❍	❍	❍	❍	❍	❍	WGC-4125-2	0.125	0.500	0.187	0.031
	WGC-4156-1	❍	❍	❍	❍	❍	❍	❍	WGC-4156-1	0.156	0.500	0.187	0.015
	WGC-4156-2	❍	❍	❍	❍	❍	❍	❍	WGC-4156-2	0.156	0.500	0.187	0.031
	WGC-4187-1	❍	❍	❍	❍	❍	❍	❍	WGC-4187-1	0.187	0.500	0.187	0.015
	WGC-4187-2	❍	❍	❍	❍	❍	❍	❍	WGC-4187-2	0.187	0.500	0.187	0.031
	WGC-6218-1	❍	❍	❍	❍	❍	❍	❍	WGC-6218-1	0.218	0.750	0.250	0.015
	WGC-6218-2	❍	❍	❍	❍	❍	❍	❍	WGC-6218-2	0.218	0.750	0.250	0.031
	WGC-6250-1	❍	❍	❍	❍	❍	❍	❍	WGC-6250-1	0.250	0.750	0.250	0.015
	WGC-6250-2	❍	❍	❍	❍	❍	❍	❍	WGC-6250-2	0.250	0.750	0.250	0.031
	WGC-6250-3	❍	❍	❍	❍	❍	❍	❍	WGC-6250-3	0.250	0.750	0.250	0.046
	WGC-6281-1	❍	❍	❍	❍	❍	❍	❍	WGC-6281-1	0.281	0.750	0.250	0.015
	WGC-6281-2	❍	❍	❍	❍	❍	❍	❍	WGC-6281-2	0.281	0.750	0.250	0.031
	WGC-6281-3	❍	❍	❍	❍	❍	❍	❍	WGC-6281-3	0.281	0.750	0.250	0.046
	WGC-8312-1	❍	❍	❍	❍	❍	❍	❍	WGC-8312-1	0.312	1.000	0.337	0.015
	WGC-8312-2	❍	❍	❍	❍	❍	❍	❍	WGC-8312-2	0.312	1.000	0.337	0.031
	WGC-8312-3	❍	❍	❍	❍	❍	❍	❍	WGC-8312-3	0.312	1.000	0.337	0.046
	WGC-8312-4	❍	❍	❍	❍	❍	❍	❍	WGC-8312-4	0.312	1.000	0.337	0.062
	WGC-8344-1	❍	❍	❍	❍	❍	❍	❍	WGC-8344-1	0.344	1.000	0.337	0.015
	WGC-8344-2	❍	❍	❍	❍	❍	❍	❍	WGC-8344-2	0.344	1.000	0.337	0.031
	WGC-8344-3	❍	❍	❍	❍	❍	❍	❍	WGC-8344-3	0.344	1.000	0.337	0.046
	WGC-8344-4	❍	❍	❍	❍	❍	❍	❍	WGC-8344-4	0.344	1.000	0.337	0.062
	WGC-8375-1	❍	❍	❍	❍	❍	❍	❍	WGC-8375-1	0.375	1.000	0.337	0.015
	WGC-8375-2	❍	❍	❍	❍	❍	❍	❍	WGC-8375-2	0.375	1.000	0.337	0.031
	WGC-8375-3	❍	❍	❍	❍	❍	❍	❍	WGC-8375-3	0.375	1.000	0.337	0.046
	WGC-8375-4	❍	❍	❍	❍	❍	❍	❍	WGC-8375-4	0.375	1.000	0.337	0.062

Ceramic Classification

Whisker Ceramic	Phase Toughened	Silicon Nitride	Alumina TiC	Al_2O_3

Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19

Page GP 04 – grade description

* WGC style inserts come standard with a "T1A" edge prep (.002"-.004" x 20° and .0005"-.001" hone).

Stocked or Available Upon Request ❍ ❍

Stocked Standard ● ●

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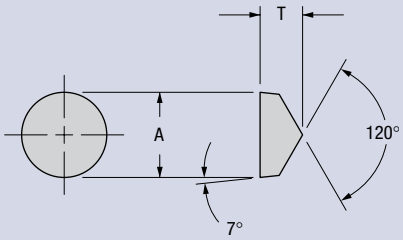
Round: Positive V-Bottom Inserts (RCGN-V)

Carbide



Shape: Round V-Bottom	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A	Dimensions (inches) T
	RCGN-2V	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RCGX-060400	0.250	0.187
	RCGX-102	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	RCGX-060600	0.250	0.250
	RCGN-3V	○	○	○	○	●	●	○	○	○	○	●	●	○	○	●	RCGX-090700	0.375	0.312
	RCGN-4V	○	○	○	○	●	●	○	○	○	○	●	●	○	○	●	RCGX-120700	0.500	0.312

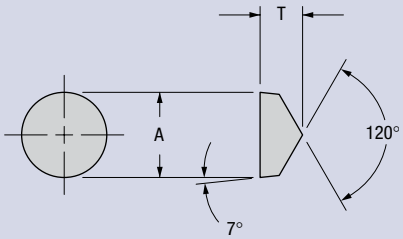
Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Steel P15 GA5025 | Steel P25 GA5035 | Steel P25 GA5125 | Steel P35 GA5036 | Stainless Steel M15 GA5026 | Stainless Steel M15 G-925 | Stainless Steel M15 G-920 | Stainless Steel M20 GA5023 | Stainless Steel M35 G-915 | Cast Iron K15 GA5023 | High-Temp Alloys S GA5026 | High-Temp Alloys S G-925 | High-Temp Alloys S G-920 | High-Temp Alloys S G-915 | High-Temp Alloys S G-20M

Round: Positive V-Bottom Inserts (RCGN-V)

Ceramic



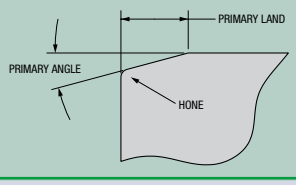
Shape: Round V-Bottom	Part Number ANSI	Edge Prep*	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep*	Dimensions (inches) A	Dimensions (inches) T
	RCGN-2V	T1	●	●	●	●	○		○	RCGX-060400	T1	0.250	0.187
		T2A	●	○	○	○	○	●	○		T2A	0.250	0.187
	RCGN-3V	T1	●	●	●	●	●		○	RCGX-090700	T1	0.375	0.312
		T1A	○	○	○	○	○	○	○		T1A	0.375	0.312
		T2A	●	○	○	○	○	●	○		T2A	0.375	0.312
	RCGN-4V	T1	●	●	●	●	●		○	RCGX-120700	T1	0.500	0.312
		T1A	●	●	●	○	○	○	○		T1A	0.500	0.312
		T2	●	○	●	○	○		○		T2	0.500	0.312
		T2A	●	●	●	○	○	●	○		T2A	0.500	0.312

Ceramic Classification

Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC | Al_2O_3

WG-300 | WG-600 | WG-700 | XSYTIN-1 | GSN100 | GEM-7 | GEM-19
Whisker | Phase Toughened | Si_3N_4 | Al_2O_3-TiC | Al_2O_3

Additional Edge Preps



Page GP 04 – grade description

* If edge prep is not shown, call Greenleaf technical service for assistance.

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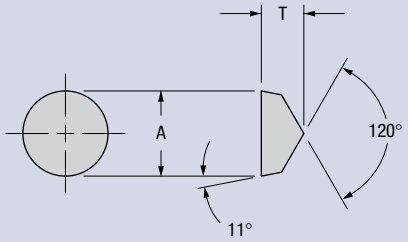
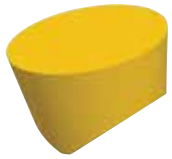
● ● Stocked Standard | ○ ○ Stocked or Available Upon Request | Not Recommended

Round: Positive V-Bottom Inserts (RPGN-V)

Carbide



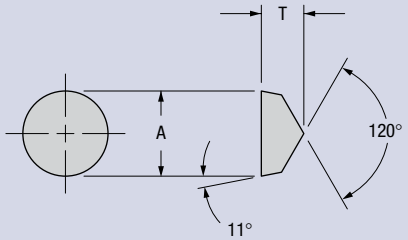
Shape: Round V-Bottom	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A	Dimensions (inches) T
	RPGN-2V	●	❍	❍	❍	●	●	●	❍	❍	❍	●	●	●	❍	●	RPGX-060400	0.250	0.187
	RPGN-3V	●	❍	❍	❍	●	●	●	❍	❍	❍	●	●	●	❍	●	RPGX-090700	0.375	0.312
	RPGN-4V	❍	❍	❍	❍	●	●	●	❍	❍	❍	●	●	●	❍	●	RPGX-120700	0.500	0.312

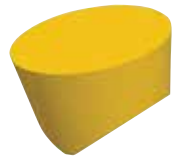
Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Round: Positive V-Bottom Inserts (RPGN-V)

Ceramic



Shape: Round V-Bottom	Part Number ANSI	Edge Prep*	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3–TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep*	Dimensions (inches) A	Dimensions (inches) T
	RPGN-2V	T1	●	●	●	●	❍		❍	RPGX-060400	T1	0.250	0.187
		T2	❍	❍	❍	❍	●		❍		T2	0.250	0.187
		T2A	●	❍	●	❍	❍	❍	❍		T2A	0.250	0.187
	RPGN-3V	T1	●	●	●	●	❍		❍	RPGX-090700	T1	0.375	0.312
		T1A	❍	❍	❍	❍	●		❍		T1A	0.375	0.312
		T2	❍	❍	❍	❍	●		❍		T2	0.375	0.312
	RPGN-4V	T1	●	❍	●	●	❍		❍	RPGX-120700	T1	0.500	0.312
		T2	❍	❍	❍	❍	●		❍		T2	0.500	0.312

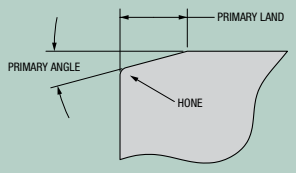
Ceramic Classification

Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC | Al_2O_3

WG-300 | WG-600 | WG-700 | XSYTIN-1 | GSN100 | GEM-7 | GEM-19

Whisker | Phase Toughened | Si_3N_4 | Al_2O_3–TiC | Al_2O_3

Additional Edge Preps



Page GP 04 – grade description

* If edge prep is not shown, call Greenleaf technical service for assistance.

Not Recommended | Stocked or Available Upon Request | Stocked Standard

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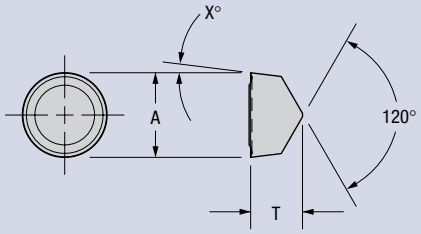
Round Inserts (RCGR-V/RPGR-V)

Positive Chipform V-Bottom
Carbide



Shape: Round V-Bottom	Part Number ANSI	Steel P15 GA5025	Steel P25 GA5035	Steel P25 GA5125	Steel P35 GA5036	Stainless Steel M15 GA5026	Stainless Steel M15 G-925	Stainless Steel M15 G-920	Stainless Steel M20 GA5023	Stainless Steel M35 G-915	Cast Iron K15 GA5023	High-Temp Alloys S GA5026	High-Temp Alloys S G-925	High-Temp Alloys S G-920	High-Temp Alloys S G-915	High-Temp Alloys S G-20M	Part Number ISO	Dimensions (inches) A	T	X
	RCGR-2V-TF					❍	❍	❍				❍	❍	❍		●	RCGR-060400V-TF	0.250	0.187	7°
	RCGR-3V-TF					❍	❍	●				❍	❍	●		❍	RCGR-090700V-TF	0.375	0.312	7°
	RCGR-4V-TF					❍	❍	❍				❍	❍	❍		❍	RCGR-120700V-TF	0.500	0.312	7°
	RPGR-2V-TF					❍	●	❍				❍	●	❍		●	RPGX-060400V-TF	0.250	0.187	11°
	RPGR-3V-TF					●	●	●				●	●	●		●	RPGX-090700V-TF	0.375	0.312	11°
	RPGR-4V-TF					●	●	●				●	●	●		❍	RPGX-120700V-TF	0.500	0.312	11°

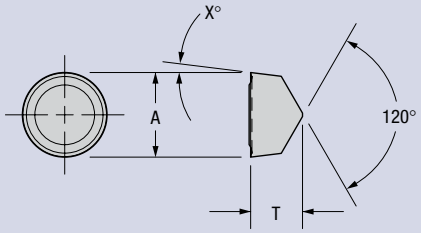
Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Steel P15 GA5025 | Steel P25 GA5035 | Steel P25 GA5125 | Steel P35 GA5036 | Stainless Steel M15 GA5026 | Stainless Steel M15 G-925 | Stainless Steel M15 G-920 | Stainless Steel M20 GA5023 | Stainless Steel M35 G-915 | Cast Iron K15 GA5023 | High-Temp Alloys S GA5026 | High-Temp Alloys S G-925 | High-Temp Alloys S G-920 | High-Temp Alloys S G-915 | High-Temp Alloys S G-20M

Round Inserts

Positive Chipform V-Bottom
Ceramic



Shape: Round V-Bottom	Part Number ANSI	Edge Prep *	Whisker WG-300	Whisker WG-600	Whisker WG-700	Phase Toughened XSYTIN-1	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep *	Dimensions (millimeters) A	T	X
	RCGR-2V-GF1	A	❍	❍	❍	❍				RCGR-060400V-GF1	A	0.250	0.187	7°
	RCGR-3V-GF1	A	❍	❍	❍	❍				RCGR-090700V-GF1	A	0.375	0.312	7°
	RCGR-4V-GF1	A	❍	●	❍	❍				RCGR-120700V-GF1	A	0.500	0.312	7°
	RPGR-2V-GF1	A	❍	❍	❍	❍				RPGR-060400V-GF1	A	0.250	0.187	11°
	RPGR-3V-GF1	A	❍	❍	❍	❍				RPGR-090700V-GF1	A	0.375	0.312	11°

Ceramic Classification

Whisker Ceramic | Phase Toughened | Silicon Nitride | Alumina TiC | Al_2O_3

Whisker WG-300 | WG-600 | WG-700 | Phase Toughened XSYTIN-1 | Si_3N_4 GSN100 | Al_2O_3-TiC GEM-7 | Al_2O_3 GEM-19

Page GP 04 – grade description

* If edge prep is not shown, call Greenleaf technical service for assistance.

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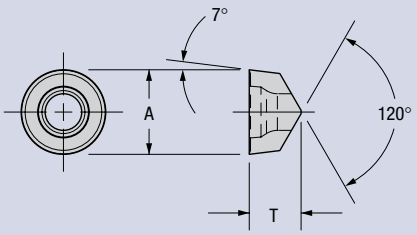
Round Inserts (RCGT-V)

Positive Chipform V-Bottom
Carbide



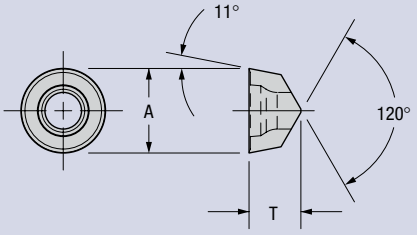
Shape: Round V-Bottom	Part Number ANSI	Steel P15	Steel P25	Steel P25	Steel P35	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M20	Stainless Steel M35	Cast Iron K15	High-Temp Alloys S				Part Number ISO	Dimensions (inches) A I.C.	T
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-915	G-20M			
	RCGT-2V-TF					❍	❍	❍				❍	❍	❍		●	RCGT-060400V-TF	0.250	0.187
	RCGT-3V-TF					❍	●	❍				❍	●	❍		❍	RCGT-090700V-TF	0.375	0.312
	RCGT-4V-TF					❍	●	❍				❍	●	❍		●	RCGT-120700V-TF	0.500	0.312

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Round Inserts (RPGT-V)

Positive Chipform V-Bottom
Carbide



Shape: Round V-Bottom	Part Number ANSI	Steel P15	Steel P25	Steel P25	Steel P35	Stainless Steel M15	Stainless Steel M15	Stainless Steel M15	Stainless Steel M20	Stainless Steel M35	Cast Iron K15	High-Temp Alloys S				Part Number ISO	Dimensions (inches) A I.C.	T
		GA5025	GA5035	GA5125	GA5036	GA5026	G-925	G-920	GA5023	G-915	GA5023	GA5026	G-925	G-920	G-915	G-20M			
	RPGT-2V-TF					❍	●	●				❍	●	●		❍	RPGT-060400V-TF	0.250	0.187
	RPGT-3V-TF					●	❍	❍				●	❍	❍		●	RPGT-090700V-TF	0.375	0.312
	RPGT-4V-TF					❍	❍	❍				❍	❍	❍		❍	RPGT-120700V-TF	0.500	0.312

Carbide Coatings

MT-CVD Coated | PVD Coated | Uncoated

Not Recommended | Stocked or Available Upon Request | Stocked Standard

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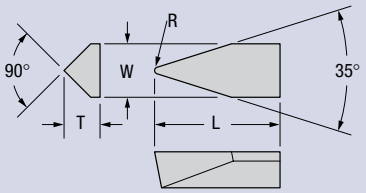
35° V-Bottom Inserts (VPG-V)



Shape: 35° V-Bottom	Part Number ISO	Edge Prep*	Whisker WG-300	Whisker WG-600	Whisker WG-700	Si_3N_4 GSN100	Al_2O_3–TiC GEM-7	Al_2O_3 GEM-19	Part Number ANSI	Edge Prep*	Dimensions (millimeters) W	L	T	R
	VPG-33.542V	A	❍	❍	❍	❍	❍	❍	VPG-33.542V	A	0.375	0.875	0.250	0.031
	VPG-33.543V	A	●	❍	❍	❍	❍	❍	VPG-33.543V	A	0.375	0.875	0.250	0.046

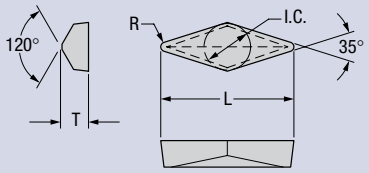
Whisker Ceramic | Silicon Nitride | Alumina TiC | Al_2O_3

WG-300 | WG-600 | WG-700 | GSN100 | GEM-7 | GEM-19

Whisker | Si_3N_4 | Al_2O_3–TiC | Al_2O_3

* If edge prep is not shown, call Greenleaf technical service for assistance.

35° V-Bottom Inserts (VCGN-V)



Shape: 35° V-Bottom	Part Number ISO	Edge Prep*	Whisker WG-300	Whisker WG-600	Whisker WG-700	Si_3N_4 GSN100	Al_2O_3–TiC GEM-7	Al_2O_3 GEM-19	Part Number ANSI	Edge Prep*	Dimensions (millimeters) I.C.	L	T	R
	VCGN-2.532V	A	●	❍	❍	❍	❍	❍	VCGN-2.532V	A	0.312	0.892	0.187	0.031
	VCGN-2.533V	A	●	❍	❍	❍	❍	❍	VCGN-2.533V	A	0.312	0.819	0.187	0.047
		T1	●	❍	❍	❍		❍		T1	0.312	0.819	0.187	0.047

Whisker Ceramic | Silicon Nitride | Alumina TiC | Al_2O_3

WG-300 | WG-600 | WG-700 | GSN100 | GEM-7 | GEM-19

Whisker | Si_3N_4 | Al_2O_3–TiC | Al_2O_3

* If edge prep is not shown, call Greenleaf technical service for assistance.

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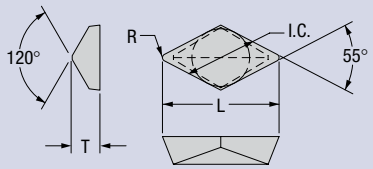
55° V-Bottom Inserts



Shape: 55° V-Bottom	Part Number ANSI	Edge Prep*	Whisker WG-300	Whisker WG-600	Whisker WG-700	Si_3N_4 GSN100	Al_2O_3-TiC GEM-7	Al_2O_3 GEM-19	Part Number ISO	Edge Prep*	Dimensions (millimeters) I.C.	L	T	R
	DPGN-442V	A	●	❍	❍	❍	❍	❍	DPGN-442V	A	0.500	1.010	0.250	0.031
	DPGN-443V	A	❍	❍	❍	❍	❍	❍	DPGN-443V	A	0.500	0.973	0.250	0.047

Whisker Ceramic — Silicon Nitride — Alumina TiC — Al_2O_3

Whisker: WG-300, WG-600, WG-700 | Si_3N_4: GSN100 | Al_2O_3-TiC: GEM-7 | Al_2O_3: GEM-19

* If edge prep is not shown, call Greenleaf technical service for assistance.

Stocked or Available Upon Request ❍ ❍

Stocked Standard ● ●

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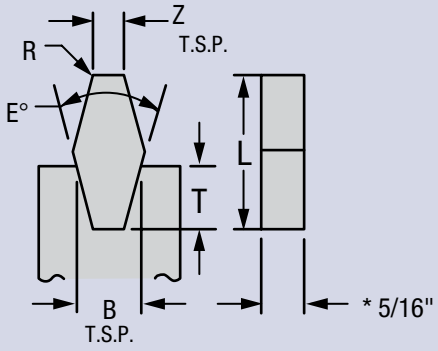
Pulley and Poly Grooving Inserts

When ordering or requesting quotations, you should provide a part print and a sketch with dimensions as indicated in the following format:

Insert Style	B	E°	L
R_1	R_2	T	Z

* Recommended – other specifications available upon request.

A



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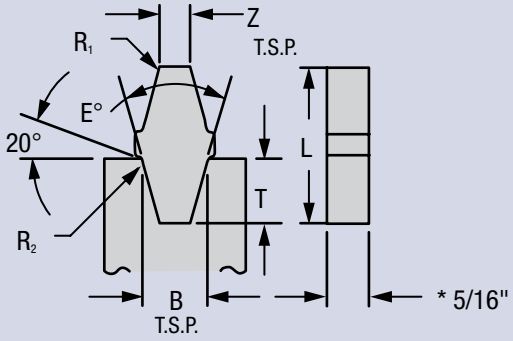

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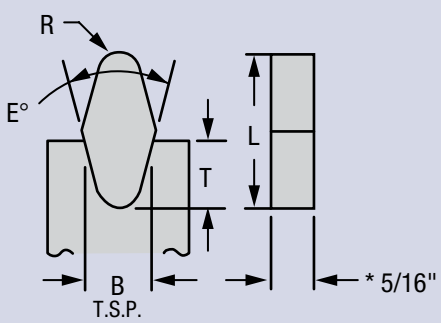

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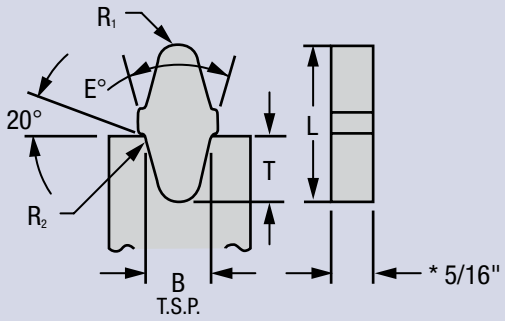

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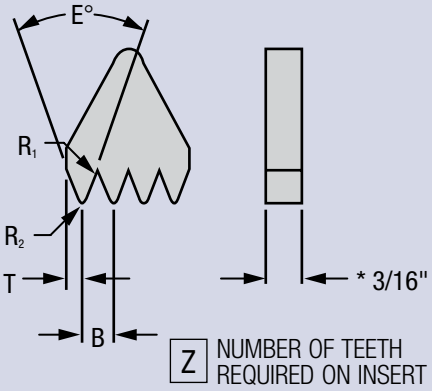

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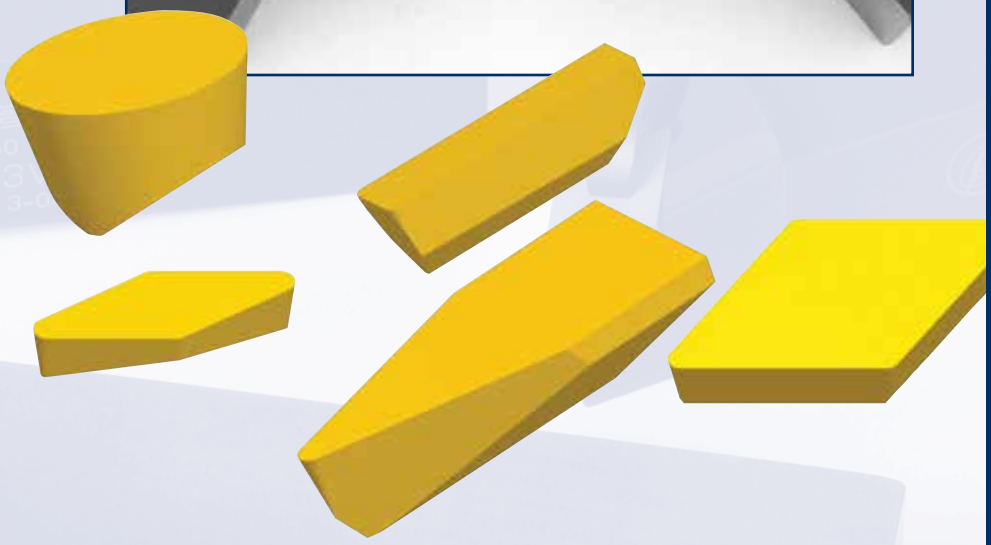
Grooving, Profiling and Cut-Off Toolholders and Bars

The Greenleaf Advanced Tooling System for grooving, profiling and cut off provides every specific application with unsurpassed support to ensure the longest tool life and highest material-removal rates with both carbide and ceramic inserts.

Utilizing 4140 alloyed steel at 42-44 RC, these qualified toolholders are offered in both milled nest and replaceable nest designs to provide further options in your tooling requirements.



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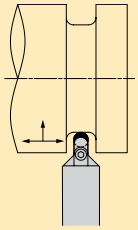
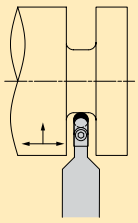
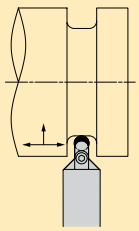
V-Bottom Round Toolholders



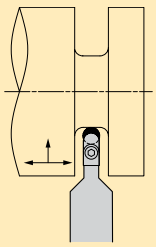
CRDPN-VS
Replaceable Nest
Shallow D.O.C.
page: GP 24



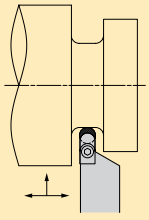
CRDPN-V
Replaceable Nest
Deep D.O.C.
page: GP 24



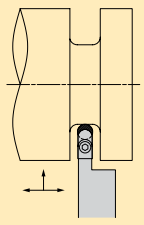
CRDPN-VMS
Milled Nest
Shallow D.O.C.
page: GP 25



CRDPN-VM
Milled Nest
Deep D.O.C.
page: GP 25

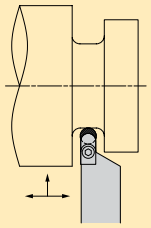


O.D.
Replaceable Nest
Shallow D.O.C.
page: GP 26

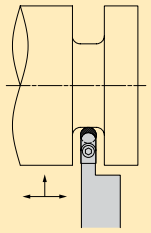


O.D.
Replaceable Nest
Deep D.O.C.
page: GP 26

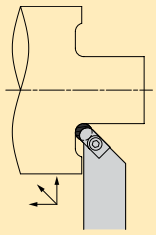
V-Bottom Round Toolholders *continued*



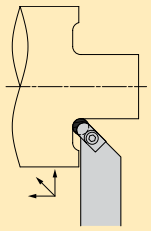
O.D.
Milled Nest
Shallow D.O.C.
page: GP 27



O.D.
Milled Nest
Deep D.O.C.
page: GP 27

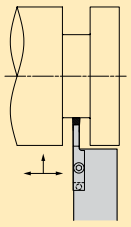


CRGPR-V
CRGPL-V
45°
Replaceable Nest
page: GP 28

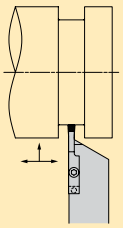


CRGPR-VM
CRGPL-VM
45°
Milled Nest
page: GP 28

Single-Ended Groovers

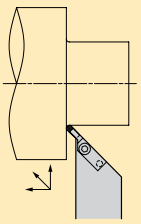


Deep D.O.C.
page: GP 29-30

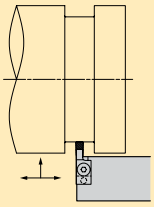


Shallow D.O.C.
page: GP 31-32

Single-Ended Groovers *continued*

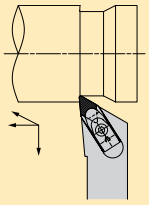


45° G/P
Toolholder
page: GP 33

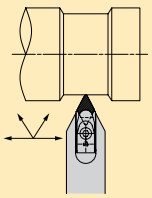


90° G/P
Toolholder
page: GP 34-35

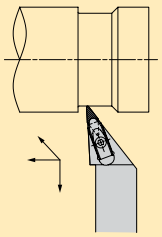
55° and 35° V-Bottom



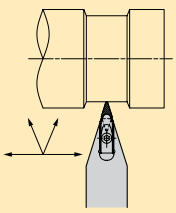
CDJOR-V
CDJOL-V
Double Ended
55° Diamond
page: GP 36



CDPON-V
Double Ended
55° Diamond
page: GP 36



CVJOR-V
CVJOL-V
Double Ended
35° Diamond
page: GP 37



CVVON-V
Double Ended
35° Diamond
page: GP 37

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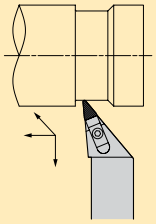
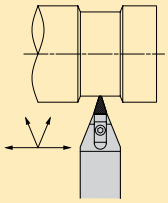
55° and 35° V-Bottom *continued*

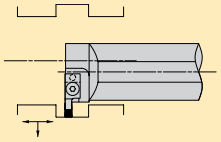


VJOR-V
VJOL-V
Single Ended
35° Diamond
page: GP 38

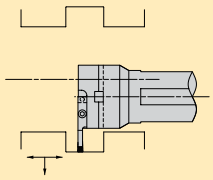


VVON-V
Single Ended
35° Diamond
page: GP 38

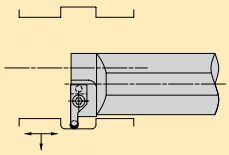
Grooving, Profiling and Cut-Off Bars



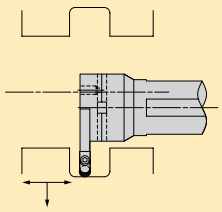
Cut-Off
Grooving Bar
page: GP 39



Cut-Off
Grooving
Support Blade
For Single-Ended,
V-Bottom Inserts
page: GP 40

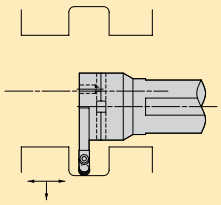


Profiling Bar
Round V-Bottom Insert
Milled Nest
page: GP 41

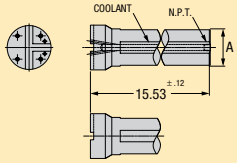


Profiling
Support Blade
Round V-Bottom Insert
Milled Nest
page: GP 42

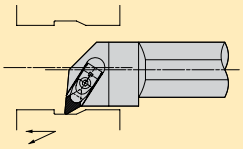
Grooving, Profiling and Cut-Off Bars *continued*



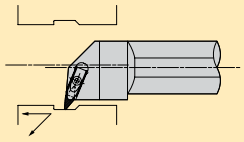
Profiling
Support Blade
Round V-Bottom Insert
Replaceable Nest
page: GP 43



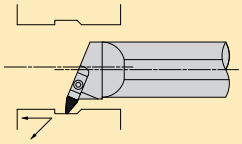
Shank
Options
For Bolt-On
Support Blades
page: GP 44



Profiling Bar
Double Ended
55° Diamond
page: GP 45



Profiling Bar
Double Ended
35° Diamond
page: GP 45



Profiling Bar
Single Ended
35° Diamond
page: GP 46

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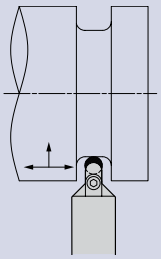
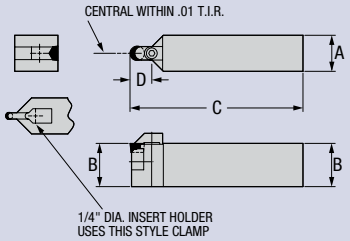
CRDPN-VS Toolholder

Round V-Bottom Insert; Replaceable Nest
Shallow D.O.C. (D) Series





Part Number	Gage Insert	Stock	D.O.C. D	Dimensions (inches) A	B	C	Standard Components Nest	Nest Screw	Clamp	Clamp Screw	*Tune-Up Kit Includes All Standard Components
CRDPN-162VS	** RPGN-2V	●	0.375	1.000	1.000	6	410631	#3-48 x 3/8 B.H.C.S	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00524
CRDPN-202VS		❍	0.375	1.250	1.250	6	410631	#3-48 x 3/8 B.H.C.S	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00524
CRDPN-242VS		❍	0.375	1.500	1.500	8	410631	#3-48 x 3/8 B.H.C.S	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00524
CRDPN-163VS	** RPGN-3V	●	0.562	1.000	1.000	6	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
CRDPN-203VS		❍	0.562	1.250	1.250	6	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
CRDPN-243VS		❍	0.562	1.500	1.500	8	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
CRDPN-164VS	** RPGN-4V	❍	0.750	1.000	1.000	6	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526
CRDPN-204VS		❍	0.750	1.250	1.250	6	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526
CRDPN-244VS		❍	0.750	1.500	1.500	8	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526

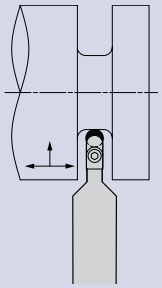
***** Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

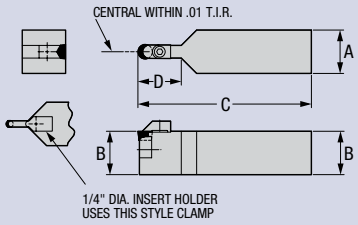
****** RCGN can be used in place of RPGN.

See page GP 14 for ceramic and carbide inserts.

CRDPN-V Toolholder

Round V-Bottom Insert; Replaceable Nest Deep
D.O.C. (D) Series





Part Number	Gage Insert	Stock	D.O.C. D	Dimensions (inches) A	B	C	Standard Components Nest	Nest Screw	Clamp	Clamp Screw	*Tune-Up Kit Includes All Standard Components
CRDPN-162V	** RPGN-2V	●	0.750	1.000	1.000	6	410631	#3-48 x 3/8 B.H.C.S.	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00524
CRDPN-202V		●	0.750	1.250	1.250	6	410631	#3-48 x 3/8 B.H.C.S.	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00524
CRDPN-242V		●	0.750	1.500	1.500	8	410631	#3-48 x 3/8 B.H.C.S.	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00524
CRDPN-163V	** RPGN-3V	●	1.125	1.000	1.000	6	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
CRDPN-203V		●	1.125	1.250	1.250	6	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
CRDPN-243V		●	1.125	1.500	1.500	8	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
CRDPN-164V	** RPGN-4V	●	1.500	1.000	1.000	6	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526
CRDPN-204V		●	1.500	1.250	1.250	6	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526
CRDPN-244V		●	1.500	1.500	1.500	8	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526

***** Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

****** RCGN can be used in place of RPGN.

See page GP 14 for ceramic and carbide inserts.

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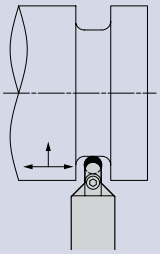
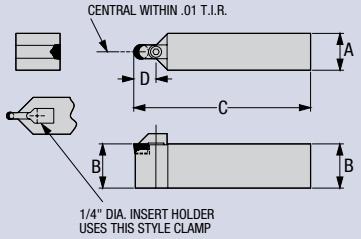
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

CRDPN-VMS Toolholder

Round V-Bottom Insert; Milled Nest
Shallow D.O.C. (D) Series





Part Number	Gage Insert	Stock	D.O.C. D	Dimensions (inches) A	B	C	Standard Components Clamp	Clamp Screw	*Tune-Up Kit Includes All Standard Components	Optional Component Insert Screw
CRDPN-162VMS	** RPGN-2V	❍	0.375	1.000	1.000	6	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00803	PT-542T
CRDPN-202VMS		❍	0.375	1.250	1.250	6	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00803	PT-542T
CRDPN-242VMS		❍	0.375	1.500	1.500	8	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00803	PT-542T
CRDPN-163VMS	** RPGN-3V	❍	0.562	1.000	1.000	6	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRDPN-203VMS		❍	0.562	1.250	1.250	6	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRDPN-243VMS		❍	0.562	1.500	1.500	8	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRDPN-164VMS	** RPGN-4V	❍	0.750	1.000	1.000	6	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
CRDPN-204VMS		❍	0.750	1.250	1.250	6	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
CRDPN-244VMS		❍	0.750	1.500	1.500	8	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

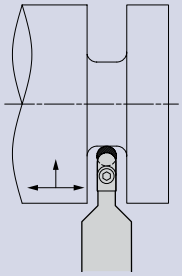
See page GP 14 for ceramic and carbide inserts.

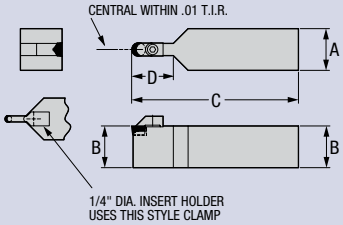
** RCGN can be used in place of RPGN.

NOTE: Use carbide inserts RCGT and RPGT with optional insert screw for finishing.

CRDPN-VM Toolholder

Round V-Bottom Insert; Milled Nest
Deep D.O.C. (D) Series





Part Number	Gage Insert	Stock	D.O.C. D	Dimensions (inches) A	B	C	Standard Components Clamp	Clamp Screw	*Tune-Up Kit Includes All Standard Components	Optional Component Insert Screw
CRDPN-162VM	** RPGN-2V	❍	0.750	1.000	1.000	6	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00803	PT-542T
CRDPN-202VM		❍	0.750	1.250	1.250	6	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00803	PT-542T
CRDPN-242VM		❍	0.750	1.500	1.500	8	411910-250VRC	1/4-20 x 3/4 B.H.C.S.	TK-00803	PT-542T
CRDPN-163VM	** RPGN-3V	❍	1.125	1.000	1.000	6	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRDPN-203VM		❍	1.125	1.250	1.250	6	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRDPN-243VM		●	1.125	1.500	1.500	8	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRDPN-164VM	** RPGN-4V	❍	1.500	1.000	1.000	6	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
CRDPN-204VM		❍	1.500	1.250	1.250	6	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
CRDPN-244VM		❍	1.500	1.500	1.500	8	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 14 for ceramic and carbide inserts.

** RCGN can be used in place of RPGN.

NOTE: Use carbide inserts RCGT and RPGT with optional insert screw for finishing.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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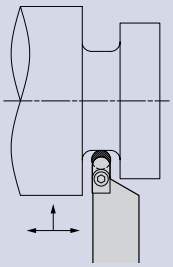
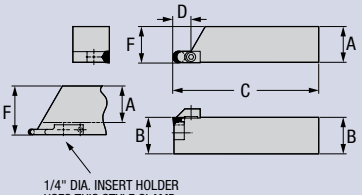
O.D. Grooving/Profiling Toolholder

Round V-Bottom Insert; Replaceable Nest
Shallow D.O.C. (D) Series



Right-Hand Toolholder Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)				Standard Components				*Tune-Up Kit Includes All Std. Components
Right	Left	Insert	R	L	D	A	B	C	F	Nest	Nest Screw	Clamp	Clamp Screw	
415419-2VRS	–	** RPGN-2V	●		0.375	1.000	1.000	6	1.500	410631	#3-48 x 3/8 B.H.C.S.	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00590
–	415420-2VRS			●	0.375	1.000	1.000	6	1.500	410631	#3-48 x 3/8 B.H.C.S.	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00591
415421-2VRS	–		●		0.375	1.250	1.250	6	1.750	410631	#3-48 x 3/8 B.H.C.S.	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00590
–	415422-2VRS			●	0.375	1.250	1.250	6	1.750	410631	#3-48 x 3/8 B.H.C.S.	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00591
415423-2VRS	–		●		0.375	1.500	1.500	8	2.000	410631	#3-48 x 3/8 B.H.C.S.	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00590
–	415424-2VRS			●	0.375	1.500	1.500	8	2.000	410631	#3-48 x 3/8 B.H.C.S.	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00591
415427-3VRS	415428-3VRS	** RPGN-3V	❍	●	0.562	1.000	1.000	6	1.000	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
415429-3VRS	415430-3VRS		●	●	0.562	1.250	1.250	6	1.250	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
415431-3VRS	415432-3VRS		●	❍	0.562	1.500	1.500	8	1.500	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
415435-4VRS	415436-4VRS	** RPGN-4V	❍	●	0.750	1.000	1.000	6	1.000	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526
415437-4VRS	415438-4VRS		●	●	0.750	1.250	1.250	6	1.250	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526
415439-4VRS	415440-4VRS		●	●	0.750	1.500	1.500	8	1.500	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526

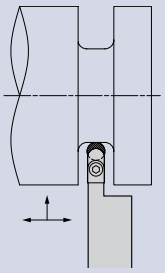
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 14 for ceramic and carbide inserts.

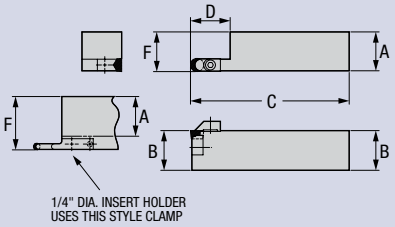
** RCGN can be used in place of RPGN.

O.D. Grooving/Profiling Toolholder

Round, V-Bottom Insert; Replaceable Nest
Deep D.O.C. (D) Series



Right-Hand Toolholder Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)				Standard Components				*Tune-Up Kit Includes All Std. Components
Right	Left	Insert	R	L	D	A	B	C	F	Nest	Nest Screw	Clamp	Clamp Screw	
411149-2VRS	–	** RPGN-2V	●		0.750	1.000	1.000	6	1.500	410631	#3-48 x 3/8 B.H.C.S.	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00590
–	411150-2VRS			●	0.750	1.000	1.000	6	1.500	410631	#3-48 x 3/8 B.H.C.S.	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00591
411151-2VRS	–		●		0.750	1.250	1.250	6	1.750	410631	#3-48 x 3/8 B.H.C.S.	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00590
–	411956-2VRS			●	0.750	1.250	1.250	6	1.750	410631	#3-48 x 3/8 B.H.C.S.	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00591
411957-2VRS	–		●		0.750	1.500	1.500	8	2.000	410631	#3-48 x 3/8 B.H.C.S.	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00590
–	411958-2VRS			●	0.750	1.500	1.500	8	2.000	410631	#3-48 x 3/8 B.H.C.S.	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00591
411157-3VRS	411158-3VRS	** RPGN-3V	●	●	1.125	1.000	1.000	6	1.000	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
411159-3VRS	411160-3VRS		●	●	1.125	1.250	1.250	6	1.250	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
411161-3VRS	411162-3VRS		●	●	1.125	1.500	1.500	8	1.500	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
411165-4VRS	411166-4VRS	** RPGN-4V	●	●	1.500	1.000	1.000	6	1.000	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526
411167-4VRS	411168-4VRS		●	●	1.500	1.250	1.250	6	1.250	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526
411169-4VRS	411170-4VRS		●	●	1.500	1.500	1.500	8	1.500	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 14 for ceramic and carbide inserts.

** RCGN can be used in place of RPGN.

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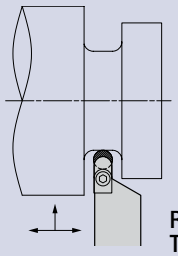
● ● Stocked Standard

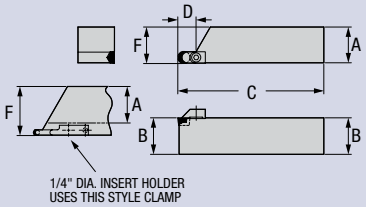
❍ ❍ 10 Business Days or Less

O.D. Grooving/Profiling Toolholder

Round, V-Bottom Insert; Milled Nest
Shallow D.O.C. (D) Series



Right-Hand Toolholder Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)				Standard Components		*Tune-Up Kit Includes All Standard Components	Optional Component
Right	Left	Insert	R	L	D	A	B	C	F	Clamp	Clamp Screw		Insert Screw
421450-2VMRS	–	** RPGN-2V	●		0.375	1.000	1.000	6	1.500	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00765	PT-542T
–	421451-2VMRS			❍	0.375	1.000	1.000	6	1.500	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00799	PT-542T
421452-2VMRS	–		❍		0.375	1.250	1.250	6	1.750	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00765	PT-542T
–	421453-2VMRS			●	0.375	1.250	1.250	6	1.750	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00799	PT-542T
421454-2VMRS	–		❍		0.375	1.500	1.500	8	2.000	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00765	PT-542T
–	421455-2VMRS			❍	0.375	1.500	1.500	8	2.000	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00799	PT-542T
421458-3VMRS	421459-3VMRS	** RPGN-3V	❍	❍	0.562	1.000	1.000	6	1.000	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
421460-3VMRS	421461-3VMRS		❍	❍	0.562	1.250	1.250	6	1.250	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
421462-3VMRS	421463-3VMRS		●	❍	0.562	1.500	1.500	8	1.500	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
421466-4VMRS	421467-4VMRS	** RPGN-4V	❍	❍	0.750	1.000	1.000	6	1.000	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
421468-4VMRS	421469-4VMRS		❍	❍	0.750	1.250	1.250	6	1.250	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
421470-4VMRS	421471-4VMRS		●	●	0.750	1.500	1.500	8	1.500	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

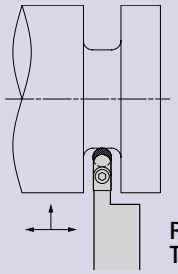
See page GP 14 for ceramic and carbide inserts.

** RCGN can be used in place of RPGN.

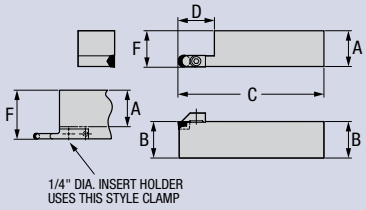
NOTE: Use carbide inserts RCGT and RPGT with optional insert screw for finishing.

O.D. Grooving/Profiling Toolholder

Round, V-Bottom Insert; Milled Nest
Deep D.O.C. (D) Series



Right-Hand Toolholder Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)				Standard Components		*Tune-Up Kit Includes All Standard Components	Optional Component
Right	Left	Insert	R	L	D	A	B	C	F	Clamp	Clamp Screw		Insert Screw
421498-2VMRS	–	** RPGN-2V	●		0.750	1.000	1.000	6	1.500	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00765	PT-542T
–	421499-2VMRS			❍	0.750	1.000	1.000	6	1.500	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00799	PT-542T
421500-2VMRS	–		●		0.750	1.250	1.250	6	1.750	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00765	PT-542T
–	421501-2VMRS			❍	0.750	1.250	1.250	6	1.750	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00799	PT-542T
421502-2VMRS	–		●		0.750	1.500	1.500	8	2.000	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00765	PT-542T
–	421503-2VMRS			❍	0.750	1.500	1.500	8	2.000	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00799	PT-542T
421504-3VMRS	421505-3VMRS	** RPGN-3V	●	❍	1.125	1.000	1.000	6	1.000	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
421506-3VMRS	421507-3VMRS		●	●	1.125	1.250	1.250	6	1.250	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
421508-3VMRS	421509-3VMRS		❍	❍	1.125	1.500	1.500	8	1.500	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
421510-4VMRS	421511-4VMRS	** RPGN-4V	❍	❍	1.500	1.000	1.000	6	1.000	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
421512-4VMRS	421513-4VMRS		●	●	1.500	1.250	1.250	6	1.250	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
421514-4VMRS	421515-4VMRS		❍	❍	1.500	1.500	1.500	8	1.500	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 14 for ceramic and carbide inserts.

** RCGN can be used in place of RPGN.

NOTE: Use carbide inserts RCGT and RPGT with optional insert screw for finishing.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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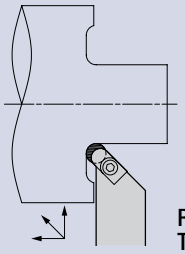
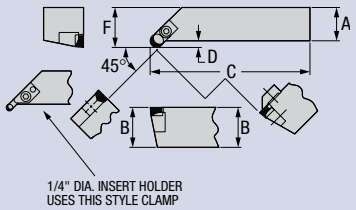
CRGPR-V/CRGPL-V

45˚ Grooving/Profiling Toolholder
Round V-Bottom Insert; Replaceable Nest



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)				Standard Components				*Tune-Up Kit Includes All Std. Components
Right	Left	Insert	R	L	D	A	B	C	F	Nest	Nest Screw	Clamp	Clamp Screw	
CRGPR-162V	–	** RPGN-2V	❍		0.250	1.000	1.000	6	1.250	411108	#3-48 x 3/8 B.H.C.S.	412131-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00530
–	CRGPL-162V			❍	0.250	1.000	1.000	6	1.250	411108	#3-48 x 3/8 B.H.C.S.	412132-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00527
CRGPR-202V	–		●		0.250	1.250	1.250	6	1.500	411108	#3-48 x 3/8 B.H.C.S.	412131-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00530
–	CRGPL-202V			●	0.250	1.250	1.250	6	1.500	411108	#3-48 x 3/8 B.H.C.S.	412132-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00527
CRGPR-242V	–		●		0.250	1.500	1.500	8	1.750	411108	#3-48 x 3/8 B.H.C.S.	412131-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00530
–	CRGPL-242V			❍	0.250	1.500	1.500	8	1.750	411108	#3-48 x 3/8 B.H.C.S.	412132-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00527
CRGPR-163V	CRGPL-163V	** RPGN-3V	❍	●	0.250	1.000	1.000	6	1.250	414009	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00528
CRGPR-203V	CRGPL-203V		●	●	0.250	1.250	1.250	6	1.500	414009	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00528
CRGPR-243V	CRGPL-243V		●	●	0.250	1.500	1.500	8	1.750	414009	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00528
CRGPR-164V	CRGPL-164V	** RPGN-4V	❍	❍	0.250	1.000	1.000	6	1.250	414008	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00529
CRGPR-204V	CRGPL-204V		●	●	0.250	1.250	1.250	6	1.500	414008	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00529
CRGPR-244V	CRGPL-244V		●	●	0.250	1.500	1.500	8	1.750	414008	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00529

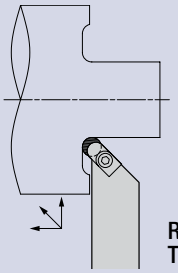
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 14 for ceramic and carbide inserts.

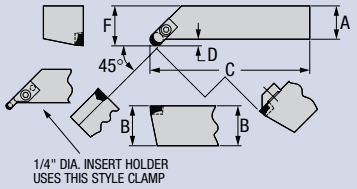
** RCGN can be used in place of RPGN.

CRGPR-VM/CRGPL-VM

45˚ Grooving/Profiling Toolholder
Round V-Bottom Insert; Milled Nest



Right-Hand
Toolholder Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)				Standard Components		*Tune-Up Kit Includes All Standard Components	Optional Component
Right	Left	Insert	R	L	D	A	B	C	F	Clamp	Clamp Screw		Insert Screw
CRGPR-162VM	–	** RPGN-2V	●		0.250	1.000	1.000	6	1.250	412131-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00795	PT-542T
–	CRGPL-162VM			❍	0.250	1.000	1.000	6	1.250	412132-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00836	PT-542T
CRGPR-202VM	–		❍		0.250	1.250	1.250	6	1.500	412131-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00795	PT-542T
–	CRGPL-202VM			❍	0.250	1.250	1.250	6	1.500	412132-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00836	PT-542T
CRGPR-242VM	–		❍		0.250	1.500	1.500	8	1.750	412131-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00795	PT-542T
–	CRGPL-242VM			❍	0.250	1.500	1.500	8	1.750	412132-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00836	PT-542T
CRGPR-163VM	CRGPL-163VM	** RPGN-3V	❍	❍	0.250	1.000	1.000	6	1.250	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRGPR-203VM	CRGPL-203VM		❍	❍	0.250	1.250	1.250	6	1.500	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRGPR-243VM	CRGPL-243VM		❍	❍	0.250	1.500	1.500	8	1.750	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
CRGPR-164VM	CRGPL-164VM	** RPGN-4V	❍	❍	0.250	1.000	1.000	6	1.250	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
CRGPR-204VM	CRGPL-204VM		❍	❍	0.250	1.250	1.250	6	1.500	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
CRGPR-244VM	CRGPL-244VM		❍	❍	0.250	1.500	1.500	8	1.750	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 14 for ceramic and carbide inserts.

** RCGN can be used in place of RPGN.

NOTE: Use carbide inserts RCGT and RPGT with optional insert screw for finishing.

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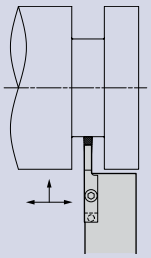
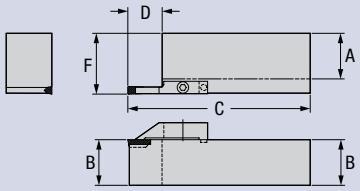
Grooving/Profiling/ Cut-Off Toolholder

Deep D.O.C. Series





Right-Hand Toolholder Shown

Part Number			Stock		D.O.C.	Dimensions (inches)				Standard Components		Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left	Groove Width	R	L	D	A	B	C	F	Insert	Clamp		Insert	Clamp
427635-094VGS	–	0.094	●		0.750	1.000	1.000	6	1.500		427651-094GC	TK-00881		429524-094GC
–	427636-094VGS	0.094		❍	0.750	1.000	1.000	6	1.500	WGC-4094	427652-094GC	TK-00882	COS-4094-0	429525-094GC
427637-094VGS	–	0.094	❍		0.750	1.250	1.250	6	1.750		427651-094GC	TK-00881		429524-094GC
–	427638-094VGS	0.094		❍	0.750	1.250	1.250	6	1.750	WG-4094	427652-094GC	TK-00882	COS-4094-4L	429525-094GC
427639-094VGS	–	0.094	❍		0.750	1.500	1.500	8	2.000		427651-094GC	TK-00881		429524-094GC
–	427640-094VGS	0.094		❍	0.750	1.500	1.500	8	2.000		427652-094GC	TK-00882	COS-4094-4R	429525-094GC
411173-125VGS	–	0.125	●		0.750	1.000	1.000	6	1.500		411966-125GC	TK-00592		429512-125GC
–	411961-125VGS	0.125		●	0.750	1.000	1.000	6	1.500	WGC-4125	411967-125GC	TK-00596	GTS-4125	429513-125GC
411250-125VGS	–	0.125	●		0.750	1.250	1.250	6	1.750	WG-4125	411966-125GC	TK-00592	COS-4125-0	429512-125GC
–	411251-125VGS	0.125		●	0.750	1.250	1.250	6	1.750	GTS-4125-1	411967-125GC	TK-00596	COS-4125-4L	429513-125GC
411962-125VGS	–	0.125	❍		0.750	1.500	1.500	8	2.000	GTS-4125-2	411966-125GC	TK-00592	COS-4125-4R	429512-125GC
–	411963-125VGS	0.125		❍	0.750	1.500	1.500	8	2.000		411967-125GC	TK-00596		429513-125GC
411964-156VGS	–	0.156	●		0.750	1.000	1.000	6	1.500		411968-156GC	TK-00580		436373-156GC
–	411965-156VGS	0.156		●	0.750	1.000	1.000	6	1.500	WGC-4156	411969-156GC	TK-00597		436374-156GC
411256-156VGS	–	0.156	●		0.750	1.250	1.250	6	1.750		411968-156GC	TK-00580	GTS-4156	436373-156GC
–	411257-156VGS	0.156		●	0.750	1.250	1.250	6	1.750	WG-4156	411969-156GC	TK-00597		436374-156GC
411258-156VGS	–	0.156	❍		0.750	1.500	1.500	8	2.000		411968-156GC	TK-00580		436373-156GC
–	411259-156VGS	0.156		❍	0.750	1.500	1.500	8	2.000		411969-156GC	TK-00597		436374-156GC
411970-187VGS	–	0.187	●		0.750	1.000	1.000	6	1.500	WGC-4187	411977-187GC	TK-00581		429518-187GC
–	411178-187VGS	0.187		●	0.750	1.000	1.000	6	1.500	WG-4187	411978-187GC	TK-00593	GTS-4187	429519-187GC
411262-187VGS	–	0.187	●		0.750	1.250	1.250	6	1.750		411977-187GC	TK-00581	COS-4187-0	429518-187GC
–	411263-187VGS	0.187		●	0.750	1.250	1.250	6	1.750	GTS-4187-1	411978-187GC	TK-00593	COS-4187-4L	429519-187GC
411971-187VGS	–	0.187	●		0.750	1.500	1.500	8	2.000	GTS-4187-2	411977-187GC	TK-00581	COS-4187-4R	429518-187GC
–	411972-187VGS	0.187		❍	0.750	1.500	1.500	8	2.000		411978-187GC	TK-00593		429519-187GC
411179-218VGS	–	0.218	●		1.125	1.000	1.000	6	1.500		411979-218GC	TK-00582	–	–
–	411180-218VGS	0.218		❍	1.125	1.000	1.000	6	1.500	WGC-6218	411130-218GC	TK-00583	–	–
411268-218VGS	–	0.218	❍		1.125	1.250	1.250	6	1.750		411979-218GC	TK-00582	–	–
–	411269-218VGS	0.218		●	1.125	1.250	1.250	6	1.750	WG-6218	411130-218GC	TK-00583	–	–
411270-218VGS	–	0.218	❍		1.125	1.500	1.500	8	2.000		411979-218GC	TK-00582	–	–
–	411271-218VGS	0.218		❍	1.125	1.500	1.500	8	2.000		411130-218GC	TK-00583	–	–
411973-250VGS	–	0.250	●		1.125	1.000	1.000	6	1.500	WGC-6250	411980-250GC	TK-00617	–	–
–	411974-250VGS	0.250		●	1.125	1.000	1.000	6	1.500	WG-6250	411981-250GC	TK-00598	–	–
411975-250VGS	–	0.250	●		1.125	1.250	1.250	6	1.750		411980-250GC	TK-00617	–	–
–	411275-250VGS	0.250		●	1.125	1.250	1.250	6	1.750	GTS-6250	411981-250GC	TK-00598	–	–
411276-250VGS	–	0.250	●		1.125	1.500	1.500	8	2.000	GTS-6250-1	411980-250GC	TK-00617	–	–
–	411277-250VGS	0.250		●	1.125	1.500	1.500	8	2.000	GTS-6250-2	411981-250GC	TK-00598	–	–
411183-281VGS	–	0.281	❍		1.125	1.000	1.000	6	1.500		411133-281GC	TK-00584	–	–
–	411184-281VGS	0.281		❍	1.125	1.000	1.000	6	1.500	WGC-6281	411134-281GC	TK-00585	–	–
411280-281VGS	–	0.281	❍		1.125	1.250	1.250	6	1.750		411133-281GC	TK-00584	–	–
–	411281-281VGS	0.281		❍	1.125	1.250	1.250	6	1.750	WG-6281	411134-281GC	TK-00585	–	–
411282-281VGS	–	0.281	❍		1.125	1.500	1.500	8	2.000		411133-281GC	TK-00584	–	–
–	411283-281VGS	0.281		❍	1.125	1.500	1.500	8	2.000		411134-281GC	TK-00585	–	–

* All toolholders include standard clamp and 1/4-20 x 1 SHCS.

Continued on next page.

GTS is Greenleaf's groove/turn system insert with chip control. Page GP 09.
COS is Greenleaf's cut-off system insert. Page GP 08.
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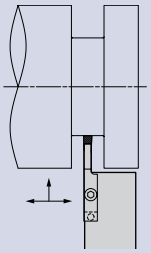
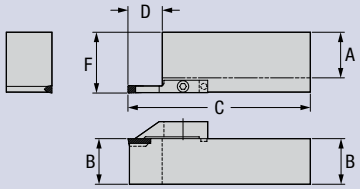
Grooving/Profiling Toolholder

Deep D.O.C. Series (Continued)





Right-Hand Toolholder Shown

Part Number		Groove Width	Stock		D.O.C.	Dimensions (inches)				Standard Components		Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left		R	L	D	A	B	C	F	Insert	Clamp		Insert	Clamp
411982-312VGS	–	0.312	❍		1.500	1.000	1.000	6	1.500		411985-312GC	TK-00586	–	–
–	411186-312VGS	0.312		❍	1.500	1.000	1.000	6	1.500	WGC-8312	411136-312GC	TK-00587	–	–
411286-312VGS	–	0.312	❍		1.500	1.250	1.250	6	1.750		411985-312GC	TK-00586	–	–
–	411287-312VGS	0.312		●	1.500	1.250	1.250	6	1.750	WG-8312	411136-312GC	TK-00587	–	–
411288-312VGS	–	0.312	❍		1.500	1.500	1.500	8	2.000		411985-312GC	TK-00586	–	–
–	411289-312VGS	0.312		❍	1.500	1.500	1.500	8	2.000		411136-312GC	TK-00587	–	–
411187-344VGS	–	0.344	❍		1.500	1.000	1.000	6	1.500		411137-344GC	TK-00594	–	–
–	411188-344VGS	0.344		❍	1.500	1.000	1.000	6	1.500	WGC-8344	411138-344GC	TK-00588	–	–
411292-344VGS	–	0.344	●		1.500	1.250	1.250	6	1.750		411137-344GC	TK-00594	–	–
–	411293-344VGS	0.344		❍	1.500	1.250	1.250	6	1.750	WG-8344	411138-344GC	TK-00588	–	–
411294-344VGS	–	0.344	❍		1.500	1.500	1.500	8	2.000		411137-344GC	TK-00594	–	–
–	411295-344VGS	0.344		❍	1.500	1.500	1.500	8	2.000		411138-344GC	TK-00588	–	–
411189-375VGS	–	0.375	❍		1.500	1.000	1.000	6	1.500		411986-375GC	TK-00595	–	–
–	411190-375VGS	0.375		❍	1.500	1.000	1.000	6	1.500		411987-375GC	TK-00589	–	–
411983-375VGS	–	0.375	●		1.500	1.250	1.250	6	1.750	WGC-8375	411986-375GC	TK-00595	–	–
–	411984-375VGS	0.375		●	1.500	1.250	1.250	6	1.750		411987-375GC	TK-00589	–	–
411300-375VGS	–	0.375	❍		1.500	1.500	1.500	8	2.000	WG-8375	411986-375GC	TK-00595	–	–
–	411301-375VGS	0.375		❍	1.500	1.500	1.500	8	2.000		411987-375GC	TK-00589	–	–

* All toolholders include standard clamp and 1/4-20 x 1 SHCS.

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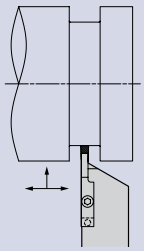
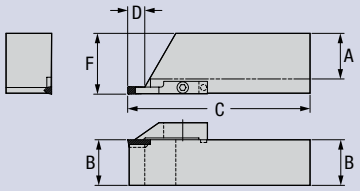
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

Grooving/Profiling/ Cut-Off Toolholder

Shallow D.O.C. Series





Right-Hand Toolholder Shown

Part Number		Groove Width	Stock		D.O.C.	Dimensions (inches)				Standard Components		Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left		R	L	D	A	B	C	F	Insert	Clamp		Insert	Clamp
427641-094VGS	–	0.094	●		0.375	1.000	1.000	6	1.500		427651-094GC	TK-00881		429524-094GC
–	427642-094VGS	0.094		●	0.375	1.000	1.000	6	1.500		427652-094GC	TK-00882	COS-4094-0	429525-094GC
427643-094VGS	–	0.094	❍		0.375	1.250	1.250	6	1.750	WG-4094	427651-094GC	TK-00881		429524-094GC
–	427644-094VGS	0.094		❍	0.375	1.250	1.250	6	1.750	WGC-4094	427652-094GC	TK-00882	COS-4094-4L	429525-094GC
427645-094VGS	–	0.094	❍		0.375	1.500	1.500	8	2.000		427651-094GC	TK-00881	COS-4094-4R	429524-094GC
–	427646-094VGS	0.094		❍	0.375	1.500	1.500	8	2.000		427652-094GC	TK-00882		429525-094GC
415316-125VGS	–	0.125	●		0.375	1.000	1.000	6	1.500		411966-125GC	TK-00592		429512-125GC
–	415317-125VGS	0.125		●	0.375	1.000	1.000	6	1.500	GTS-4125-1	411967-125GC	TK-00596	GTS-4125	429513-125GC
415318-125VGS	–	0.125	●		0.375	1.250	1.250	6	1.750	GTS-4125-2	411966-125GC	TK-00592	COS-4125-0	429512-125GC
–	415319-125VGS	0.125		●	0.375	1.250	1.250	6	1.750	WG-4125	411967-125GC	TK-00596	COS-4125-4L	429513-125GC
415320-125VGS	–	0.125	❍		0.375	1.500	1.500	8	2.000	WGC-4125	411966-125GC	TK-00592	COS-4125-4R	429512-125GC
–	415321-125VGS	0.125		❍	0.375	1.500	1.500	8	2.000		411967-125GC	TK-00596		429513-125GC
415324-156VGS	–	0.156	❍		0.375	1.000	1.000	6	1.500		411968-156GC	TK-00580		436373-156GC
–	415325-156VGS	0.156		❍	0.375	1.000	1.000	6	1.500	WG-4156	411969-156GC	TK-00597		436374-156GC
415326-156VGS	–	0.156	●		0.375	1.250	1.250	6	1.750		411968-156GC	TK-00580	GTS-4156	436373-156GC
–	415327-156VGS	0.156		❍	0.375	1.250	1.250	6	1.750	WGC-4156	411969-156GC	TK-00597		436374-156GC
415328-156VGS	–	0.156	❍		0.375	1.500	1.500	8	2.000		411968-156GC	TK-00580		436373-156GC
–	415329-156VGS	0.156		❍	0.375	1.500	1.500	8	2.000		411969-156GC	TK-00597		436374-156GC
415332-187VGS	–	0.187	●		0.375	1.000	1.000	6	1.500		411977-187GC	TK-00581		429518-187GC
–	415333-187VGS	0.187		●	0.375	1.000	1.000	6	1.500	GTS-4187-1	411978-187GC	TK-00593	GTS-4187	429519-187GC
415334-187VGS	–	0.187	❍		0.375	1.250	1.250	6	1.750	GTS-4187-2	411977-187GC	TK-00581	COS-4187-0	429518-187GC
–	415335-187VGS	0.187		●	0.375	1.250	1.250	6	1.750	WG-4187	411978-187GC	TK-00593	COS-4187-4L	429519-187GC
415336-187VGS	–	0.187	❍		0.375	1.500	1.500	8	2.000	WGC-4187	411977-187GC	TK-00581	COS-4187-4R	429518-187GC
–	415337-187VGS	0.187		❍	0.375	1.500	1.500	8	2.000		411978-187GC	TK-00593		429519-187GC
415340-218VGS	–	0.218	❍		0.562	1.000	1.000	6	1.500		411979-218GC	TK-00582	–	–
–	415341-218VGS	0.218		❍	0.562	1.000	1.000	6	1.500	WG-6218	411130-218GC	TK-00583	–	–
415342-218VGS	–	0.218	❍		0.562	1.250	1.250	6	1.750		411979-218GC	TK-00582	–	–
–	415343-218VGS	0.218		❍	0.562	1.250	1.250	6	1.750	WGC-6218	411130-218GC	TK-00583	–	–
415344-218VGS	–	0.218	❍		0.562	1.500	1.500	8	2.000		411979-218GC	TK-00582	–	–
–	415345-218VGS	0.218		❍	0.562	1.500	1.500	8	2.000		411130-218GC	TK-00583	–	–
415348-250VGS	–	0.250	●		0.562	1.000	1.000	6	1.500		411980-250GC	TK-00617	–	–
–	415349-250VGS	0.250		●	0.562	1.000	1.000	6	1.500	GTS-6250	411981-250GC	TK-00598	–	–
415350-250VGS	–	0.250	●		0.562	1.250	1.250	6	1.750	GTS-6250-1	411980-250GC	TK-00617	–	–
–	415351-250VGS	0.250		●	0.562	1.250	1.250	6	1.750	GTS-6250-2	411981-250GC	TK-00598	–	–
415352-250VGS	–	0.250	❍		0.562	1.500	1.500	8	2.000	WG-6250	411980-250GC	TK-00617	–	–
–	415353-250VGS	0.250		❍	0.562	1.500	1.500	8	2.000	WGC-6250	411981-250GC	TK-00598	–	–
415356-281VGS	–	0.281	❍		0.562	1.000	1.000	6	1.500		411133-281GC	TK-00584	–	–
–	415357-281VGS	0.281		❍	0.562	1.000	1.000	6	1.500	WG-6281	411134-281GC	TK-00585	–	–
415358-281VGS	–	0.281	❍		0.562	1.250	1.250	6	1.750		411133-281GC	TK-00584	–	–
–	415359-281VGS	0.281		❍	0.562	1.250	1.250	6	1.750	WGC-6281	411134-281GC	TK-00585	–	–
415360-281VGS	–	0.281	❍		0.562	1.500	1.500	8	2.000		411133-281GC	TK-00584	–	–
–	415361-281VGS	0.281		❍	0.562	1.500	1.500	8	2.000		411134-281GC	TK-00585	–	–

* All toolholders include standard clamp and 1/4-20 x 1 SHCS.

Continued on next page.

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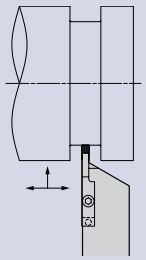
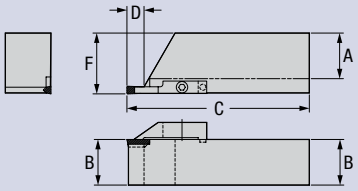
Grooving/Profiling Cut-Off Toolholder

Shallow D.O.C. Series (Continued)



Right-Hand
Toolholder Shown



Part Number		Groove Width	Stock		D.O.C.	Dimensions (inches)				Standard Components		Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left		R	L	D	A	B	C	F	Insert	Clamp		Insert	Clamp
415364-312VGS	–	0.312	❍		0.750	1.000	1.000	6	1.500		411985-312GC	TK-00586	–	–
–	415365-312VGS	0.312		❍	0.750	1.000	1.000	6	1.500	WG-8312	411136-312GC	TK-00587	–	–
415366-312VGS	–	0.312	❍		0.750	1.250	1.250	6	1.750		411985-312GC	TK-00586	–	–
–	415367-312VGS	0.312		❍	0.750	1.250	1.250	6	1.750	WGC-8312	411136-312GC	TK-00587	–	–
415368-312VGS	–	0.312	❍		0.750	1.500	1.500	8	2.000		411985-312GC	TK-00586	–	–
–	415369-312VGS	0.312		❍	0.750	1.500	1.500	8	2.000		411136-312GC	TK-00587	–	–
415372-344VGS	–	0.344	❍		0.750	1.000	1.000	6	1.500		411137-344GC	TK-00594	–	–
–	415373-344VGS	0.344		❍	0.750	1.000	1.000	6	1.500		411138-344GC	TK-00588	–	–
415374-344VGS	–	0.344	❍		0.750	1.250	1.250	6	1.750	WG-8344	411137-344GC	TK-00594	–	–
–	415375-344VGS	0.344		❍	0.750	1.250	1.250	6	1.750		411138-344GC	TK-00588	–	–
415376-344VGS	–	0.344	❍		0.750	1.500	1.500	8	2.000	WGC-8344	411137-344GC	TK-00594	–	–
–	415377-344VGS	0.344		❍	0.750	1.500	1.500	8	2.000		411138-344GC	TK-00588	–	–
415380-375VGS	–	0.375	❍		0.750	1.000	1.000	6	1.500		411986-375GC	TK-00595	–	–
–	415381-375VGS	0.375		❍	0.750	1.000	1.000	6	1.500		411987-375GC	TK-00589	–	–
415382-375VGS	–	0.375	❍		0.750	1.250	1.250	6	1.750	WG-8375	411986-375GC	TK-00595	–	–
–	415383-375VGS	0.375		❍	0.750	1.250	1.250	6	1.750		411987-375GC	TK-00589	–	–
415384-375VGS	–	0.375	❍		0.750	1.500	1.500	8	2.000		411986-375GC	TK-00595	–	–
–	415385-375VGS	0.375		❍	0.750	1.500	1.500	8	2.000		411987-375GC	TK-00589	–	–

* All toolholders include standard clamp and 1/4-20 x 1 SHCS.

GTS is Greenleaf's groove/turn system insert with chip control. Page GP 09.
COS is Greenleaf's cut-off system insert. Page GP 08.
WG is Greenleaf flat-top groover with an 11° nose clearance. Pages GP 10 and GP 11.
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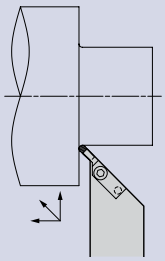
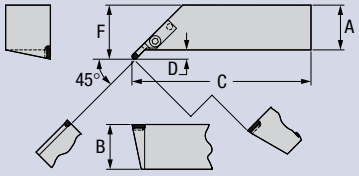
❍ ❍ 10 Business Days or Less

45° Grooving/Profiling Toolholder



Right-Hand Toolholder Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)				Standard Components	Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left	Insert	R	L	D	A	B	C	F	Clamp		Insert	Clamp
		GTS-4125-1			0.313	1.000	1.000	6.020	1.332				
		GTS-4125-2			0.313	1.000	1.000	6.013	1.325				
415293-45VGS	–	WG-4125			0.313	1.000	1.000	6.000	1.312	415305-GC	TK-00618		429514-GC
–	415294-45VGS	WG-4125-1			0.313	1.000	1.000	6.020	1.332	415306-GC	TK-00709	GTS-4125	429515-GC
		WG-4125-2	●		0.313	1.000	1.000	6.013	1.325				
		WG-4156		●	0.313	1.000	1.000	6.005	1.317				
		WG-4156-1			0.313	1.000	1.000	6.031	1.343				
		WG-4156-2			0.313	1.000	1.000	6.024	1.336				
		GTS-4125-1			0.313	1.250	1.250	6.020	1.582				
		GTS-4125-2			0.313	1.250	1.250	6.013	1.575				
415295-45VGS	–	WG-4125			0.313	1.250	1.250	6.000	1.562	415305-GC	TK-00618		429514-GC
–	415296-45VGS	WG-4125-1			0.313	1.250	1.250	6.020	1.582	415306-GC	TK-00709	GTS-4125	429515-GC
		WG-4125-2	●		0.313	1.250	1.250	6.013	1.575				
		WG-4156		●	0.313	1.250	1.250	6.005	1.567				
		WG-4156-1			0.313	1.250	1.250	6.031	1.593				
		WG-4156-2			0.313	1.250	1.250	6.024	1.586				
		GTS-4125-1			0.313	1.500	1.500	8.020	1.832				
		GTS-4125-2			0.313	1.500	1.500	8.013	1.825				
415297-45VGS	–	WG-4125			0.313	1.500	1.500	8.000	1.812	415305-GC	TK-00618		429514-GC
–	415298-45VGS	WG-4125-1			0.313	1.500	1.500	8.020	1.832	415306-GC	TK-00709	GTS-4125	429515-GC
		WG-4125-2	❍		0.313	1.500	1.500	8.013	1.825				
		WG-4156		❍	0.313	1.500	1.500	8.005	1.817				
		WG-4156-1			0.313	1.500	1.500	8.031	1.843				
		WG-4156-2			0.313	1.500	1.500	8.024	1.836				
		GTS-4187-1			0.313	1.000	1.000	6.033	1.345				
415299-45VGS	–	GTS-4187-2			0.313	1.000	1.000	6.026	1.338	415307-GC	TK-00619	GTS-4187	429520-GC
–	415300-45VGS	WG-4187			0.313	1.000	1.000	6.000	1.312	415308-GC	TK-00708		429521-GC
		WG-4187-1	❍		0.313	1.000	1.000	6.033	1.345				
		WG-4187-2		❍	0.313	1.000	1.000	6.026	1.338				
		GTS-4187-1			0.313	1.250	1.250	6.033	1.595				
415301-45VGS	–	GTS-4187-2			0.313	1.250	1.250	6.026	1.588	415307-GC	TK-00619	GTS-4187	429520-GC
–	415302-45VGS	WG-4187			0.313	1.250	1.250	6.000	1.562	415308-GC	TK-00708		429521-GC
		WG-4187-1	❍		0.313	1.250	1.250	6.033	1.595				
		WG-4187-2		❍	0.313	1.250	1.250	6.026	1.588				
		GTS-4187-1			0.313	1.500	1.500	8.033	1.845				
415303-45VGS	–	GTS-4187-2			0.313	1.500	1.500	8.026	1.838	415307-GC	TK-00619	GTS-4187	429520-GC
–	415304-45VGS	WG-4187			0.313	1.500	1.500	8.000	1.812	415308-GC	TK-00708		429521-GC
		WG-4187-1	❍		0.313	1.500	1.500	8.033	1.845				
		WG-4187-2		❍	0.313	1.500	1.500	8.026	1.838				

* All toolholders include standard clamp and 1/4-20 x 1 SHCS.

GTS is Greenleaf's groove/turn system insert with chip control. Page GP 09.
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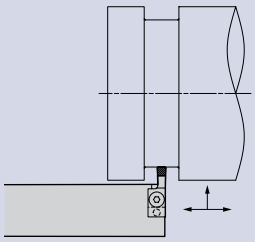
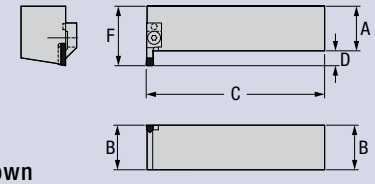
90° Grooving/Profiling Toolholder





Right-Hand Toolholder Shown

Part Number		Groove Width	Stock		D.O.C.	Dimensions (inches)				Standard Components		Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left		R	L	D	A	B	C	F	Insert	Clamp		Insert	Clamp
411693-125VGS	–	0.125	●		0.375	1.000	1.000	6	1.375		411765-125GC	TK-00599		429516-125GC
–	411694-125VGS	0.125		●	0.375	1.000	1.000	6	1.375	GTS-4125-1	411766-125GC	TK-00600	GTS-4125	429517-125GC
411695-125VGS	–	0.125	❍		0.375	1.250	1.250	6	1.625	GTS-4125-2	411765-125GC	TK-00599	COS-4125-0	429516-125GC
–	411696-125VGS	0.125		❍	0.375	1.250	1.250	6	1.625	WG-4125	411766-125GC	TK-00600	COS-4125-4R	429517-125GC
411697-125VGS	–	0.125	❍		0.375	1.500	1.500	8	1.875	WGC-4125	411765-125GC	TK-00599	COS-4125-4L	429516-125GC
–	411698-125VGS	0.125		❍	0.375	1.500	1.500	8	1.875		411766-125GC	TK-00600		429517-125GC
411701-156VGS	–	0.156	❍		0.375	1.000	1.000	6	1.375		411767-156GC	TK-00601	–	–
–	411702-156VGS	0.156		❍	0.375	1.000	1.000	6	1.375	WG-4156	411768-156GC	TK-00602	–	–
411703-156VGS	–	0.156	❍		0.375	1.250	1.250	6	1.625		411767-156GC	TK-00601	–	–
–	411704-156VGS	0.156		❍	0.375	1.250	1.250	6	1.625	WGC-4156	411768-156GC	TK-00602	–	–
411705-156VGS	–	0.156	❍		0.375	1.500	1.500	8	1.875		411767-156GC	TK-00601	–	–
–	411706-156VGS	0.156		❍	0.375	1.500	1.500	8	1.875		411768-156GC	TK-00602	–	–
411709-187VGS	–	0.187	❍		0.375	1.000	1.000	6	1.375		411769-187GC	TK-00603		429522-187GC
–	411710-187VGS	0.187		❍	0.375	1.000	1.000	6	1.375	GTS-4187-1	411770-187GC	TK-00604	GTS-4187	429523-187GC
411711-187VGS	–	0.187	❍		0.375	1.250	1.250	6	1.625	GTS-4187-2	411769-187GC	TK-00603	COS-4187-0	429522-187GC
–	411712-187VGS	0.187		❍	0.375	1.250	1.250	6	1.625	WG-4187	411770-187GC	TK-00604	COS-4187-4R	429523-187GC
411713-187VGS	–	0.187	❍		0.375	1.500	1.500	8	1.875	WGC-4187	411769-187GC	TK-00603	COS-4187-4L	429522-187GC
–	411714-187VGS	0.187		❍	0.375	1.500	1.500	8	1.875		411770-187GC	TK-00604		429523-187GC
411717-218VGS	–	0.218	❍		0.500	1.000	1.000	6	1.500		411771-218GC	TK-00605	–	–
–	411718-218VGS	0.218		❍	0.500	1.000	1.000	6	1.500	WG-6218	411772-218GC	TK-00606	–	–
411719-218VGS	–	0.218	❍		0.500	1.250	1.250	6	1.750		411771-218GC	TK-00605	–	–
–	411720-218VGS	0.218		❍	0.500	1.250	1.250	6	1.750	WGC-6218	411772-218GC	TK-00606	–	–
411721-218VGS	–	0.218	❍		0.500	1.500	1.500	8	2.000		411771-218GC	TK-00605	–	–
–	411722-218VGS	0.218		❍	0.500	1.500	1.500	8	2.000		411772-218GC	TK-00606	–	–
411725-250VGS	–	0.250	❍		0.500	1.000	1.000	6	1.500		411773-250GC	TK-00608	–	–
–	411726-250VGS	0.250		❍	0.500	1.000	1.000	6	1.500	GTS-6250	411774-250GC	TK-00607	–	–
411727-250VGS	–	0.250	●		0.500	1.250	1.250	6	1.750	GTS-6250-1	411773-250GC	TK-00608	–	–
–	411728-250VGS	0.250		●	0.500	1.250	1.250	6	1.750	GTS-6250-2	411774-250GC	TK-00607	–	–
411729-250VGS	–	0.250	❍		0.500	1.500	1.500	8	2.000	WG-6250	411773-250GC	TK-00608	–	–
–	411730-250VGS	0.250		❍	0.500	1.500	1.500	8	2.000	WGC-6250	411774-250GC	TK-00607	–	–
411733-281VGS	–	0.281	❍		0.500	1.000	1.000	6	1.500		411775-281GC	TK-00609	–	–
–	411734-281VGS	0.281		❍	0.500	1.000	1.000	6	1.500	WG-6281	411776-281GC	TK-00610	–	–
411735-281VGS	–	0.281	❍		0.500	1.250	1.250	6	1.750		411775-281GC	TK-00609	–	–
–	411736-281VGS	0.281		❍	0.500	1.250	1.250	6	1.750	WGC-6281	411776-281GC	TK-00610	–	–
411737-281VGS	–	0.281	❍		0.500	1.500	1.500	8	2.000		411775-281GC	TK-00609	–	–
–	411738-281VGS	0.281		❍	0.500	1.500	1.500	8	2.000		411776-281GC	TK-00610	–	–
411743-312VGS	–	0.312	❍		0.625	1.250	1.250	6	1.875		411777-312GC	TK-00611	–	–
–	411744-312VGS	0.312		❍	0.625	1.250	1.250	6	1.875	WG-8312	411778-312GC	TK-00612	–	–
411745-312VGS	–	0.312	❍		0.625	1.500	1.500	8	2.125	WGC-8312	411777-312GC	TK-00611	–	–
–	411746-312VGS	0.312		❍	0.625	1.500	1.500	8	2.125		411778-312GC	TK-00612	–	–

* All toolholders include standard clamp and 1/4-20 x 3/4 BHCS.

Continued on next page.

GTS is Greenleaf's groove/turn system insert with chip control. Page GP 09.
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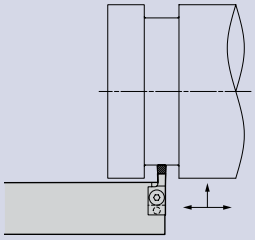
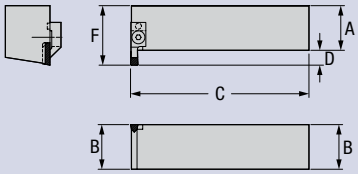
90° Grooving/Profiling Toolholder

(Continued)





Right-Hand Toolholder Shown

Part Number		Groove Width	Stock		D.O.C.	Dimensions (inches)				Standard Components		Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left		R	L	D	A	B	C	F	Insert	Clamp		Insert	Clamp
411751-344VGS	–	0.344	❍		0.625	1.250	1.250	6	1.875		411779-344GC	TK-00613	–	–
–	**411752-344VGS**	0.344		❍	0.625	1.250	1.250	6	1.875	WG-8344	411780-344GC	TK-00614	–	–
411753-344VGS	–	0.344	❍		0.625	1.500	1.500	8	2.125	WGC-8344	411779-344GC	TK-00613	–	–
–	**411754-344VGS**	0.344		❍	0.625	1.500	1.500	8	2.125		411780-344GC	TK-00614	–	–
411759-375VGS	–	0.375	❍		0.625	1.250	1.250	6	1.875		411781-375GC	TK-00615	–	–
–	**411760-375VGS**	0.375		❍	0.625	1.250	1.250	6	1.875	WG-8375	411782-375GC	TK-00616	–	–
411761-375VGS	–	0.375	❍		0.625	1.500	1.500	8	2.125	WGC-8375	411781-375GC	TK-00615	–	–
–	**411762-375VGS**	0.375		❍	0.625	1.500	1.500	8	2.125		411782-375GC	TK-00616	–	–

* All toolholders include standard clamp and 1/4-20 x 3/4 BHCS.

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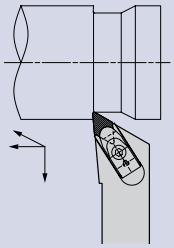
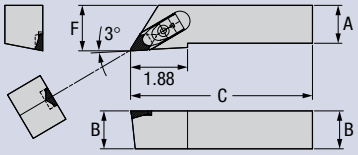
CDJOR-V/CDJOL-V

Double Ended
55° Diamond



Right-Hand
Toolholder Shown



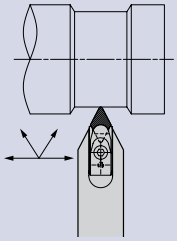
Part Number		Gage	Stock		Dimensions (inches)				Standard Components				*Tune-Up Kit Includes All Std. Components
Right	Left	Insert	R	L	A	B	C	F	Back-up Plate	Plate Screw	Clamp	Clamp Screw	
CDJOR-164V	CDJOL-164V	DPGN-443V	❍	❍	1.000	1.000	6	1.250	418101	#6-32 x 3/8 S.H.C.S.	418100	1/4-20 x 1 S.H.C.S.	TK-00754
CDJOR-204V	CDJOL-204V	DPGN-443V	❍	❍	1.250	1.250	6	1.500	418101	#6-32 x 3/8 S.H.C.S.	418100	1/4-20 x 1 S.H.C.S.	TK-00754
CDJOR-244V	CDJOL-244V	DPGN-443V	❍	❍	1.500	1.500	8	2.000	418101	#6-32 x 3/8 S.H.C.S.	418100	1/4-20 x 1 S.H.C.S.	TK-00754

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

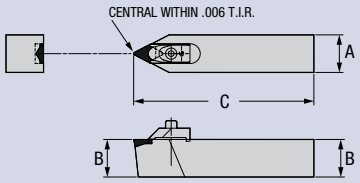
See page GP 19 for inserts.

CDPON-V

Double Ended
55° Diamond



Neutral
Toolholder Shown



Part Number	Gage	Stock	Dimensions (inches)			Standard Components				*Tune-Up Kit Includes All Std. Components
	Insert		A	B	C	Back-up Plate	Plate Screw	Clamp	Clamp Screw	
CDPON-164V	DPGN-443V	❍	1.000	1.000	6	418101	#6-32 x 3/8 S.H.C.S.	418100	1/4-20 x 1 S.H.C.S.	TK-00754
CDPON-204V	DPGN-443V	❍	1.250	1.250	6	418101	#6-32 x 3/8 S.H.C.S.	418100	1/4-20 x 1 S.H.C.S.	TK-00754
CDPON-244V	DPGN-443V	❍	1.500	1.500	8	418101	#6-32 x 3/8 S.H.C.S.	418100	1/4-20 x 1 S.H.C.S.	TK-00754

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 19 for inserts.

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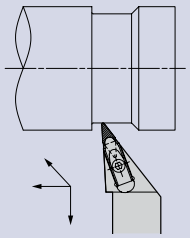
● ● Stocked Standard

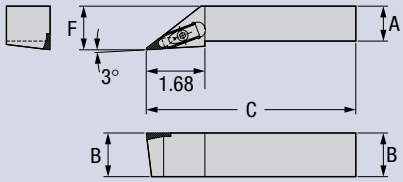
❍ ❍ 10 Business Days or Less

CVJOR-V/CVJOL-V

Double Ended
35° Diamond



Right-Hand
Toolholder Shown



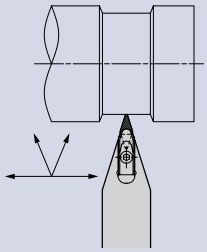
Part Number		Gage	Stock		Dimensions (inches)				Standard Components				*Tune-Up Kit Includes All Std. Components
Right	Left	Insert	R	L	A	B	C	F	Back-up Plate	Plate Screw	Clamp	Clamp Screw	
CVJOR-122.5VC	CVJOL-122.5VC	VCGN-2.532V	❍	❍	0.750	0.750	5	1.000	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.	TK-00756
CVJOR-162.5V	CVJOL-162.5V	VCGN-2.532V	●	●	1.000	1.000	6	1.250	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.	TK-00756
CVJOR-202.5V	CVJOL-202.5V	VCGN-2.532V	●	❍	1.250	1.250	6	1.500	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.	TK-00756
CVJOR-242.5V	CVJOL-242.5V	VCGN-2.532V	❍	❍	1.500	1.500	8	2.000	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.	TK-00756

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

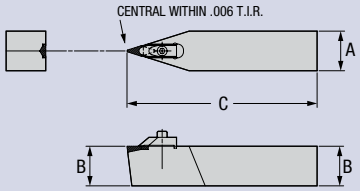
See page GP 18 for inserts.

CVVON-V

Double Ended
35° Diamond



Neutral
Toolholder Shown



Part Number	Gage	Stock	Dimensions (inches)			Standard Components				*Tune-Up Kit Includes All Std. Components
	Insert		A	B	C	Back-up Plate	Plate Screw	Clamp	Clamp Screw	
CVVON-122.5VC	VCGN-2.532V	❍	0.750	0.750	5	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.	TK-00756
CVVON-162.5V	VCGN-2.532V	❍	1.000	1.000	6	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.	TK-00756
CVVON-202.5V	VCGN-2.532V	❍	1.250	1.250	6	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.	TK-00756
CVVON-242.5V	VCGN-2.532V	❍	1.500	1.500	8	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.	TK-00756

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 18 for inserts.

10 Business Days or Less ❍ ❍

Stocked Standard ● ●

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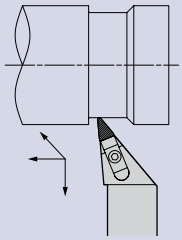
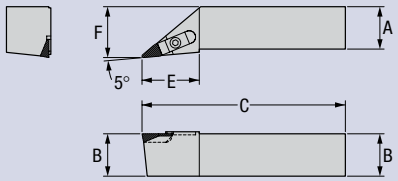
VJOR-V/VJOL-V

Single Ended
35° Diamond



Right-Hand
Toolholder Shown



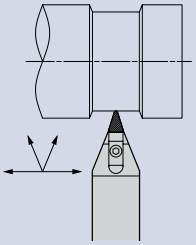
Part Number		Gage	Stock		Dimensions (inches)					Standard Components		*Tune-Up Kit Includes All Standard Components
Right	Left	Insert	R	L	A	B	C	E	F	Clamp	Clamp Screw	
VJOR-164V	VJOL-164V	VPG-33.543V	❍	❍	1.000	1.000	6	1.688	1.250	3386	#10-32 x 5/8 S.H.C.S.	TK-00578
VJOR-204V	VJOL-204V	VPG-33.543V	❍	❍	1.250	1.250	6	1.688	1.500	3386	#10-32 x 5/8 S.H.C.S.	TK-00578
VJOR-244V	VJOL-244V	VPG-33.543V	❍	❍	1.500	1.500	8	1.688	2.000	3386	#10-32 x 5/8 S.H.C.S.	TK-00578

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

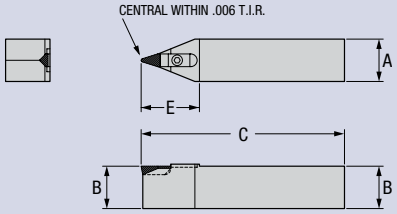
See page GP 18 for inserts.

VVON-V

Single Ended
35° Diamond



Neutral
Toolholder Shown



Part Number	Gage	Stock	Dimensions (inches)				Standard Components		*Tune-Up Kit Includes All Standard Components
	Insert		A	B	C	E	Clamp	Clamp Screw	
VVON-164V	VPG-33.543V	❍	1.000	1.000	6	1.719	3386	#10-32 x 5/8 S.H.C.S.	TK-00578
VVON-204V	VPG-33.543V	❍	1.250	1.250	6	1.719	3386	#10-32 x 5/8 S.H.C.S.	TK-00578
VVON-244V	VPG-33.543V	❍	1.500	1.500	8	1.719	3386	#10-32 x 5/8 S.H.C.S.	TK-00578

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

See page GP 18 for inserts.

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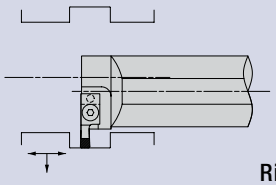
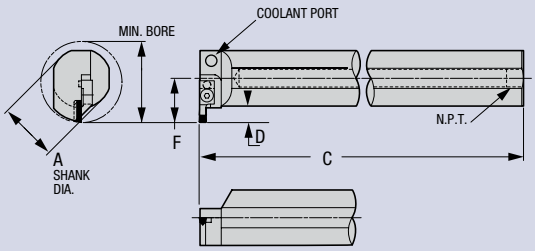
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

Cut-Off Grooving Bar





Right-Hand
Grooving Bar Shown

Part Number		Groove Width	Stock		D.O.C.	Min. Bore	Dimensions (inches)			Standard Components		Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left		R	L	D		A	C	F	Insert	Clamp		Insert	Clamp
512074-125VGS	–	0.125	❍		0.375	2.500	2.000	16.000	1.375	GTS-4125-1	411765-125GC	TK-00599	GTS-4125	429516-125GC
–	512075-125VGS	0.125		❍	0.375	2.500	2.000	16.000	1.375	GTS-4125-2	411766-125GC	TK-00600	COS-4125-0	429517-125GC
										WG-4125			COS-4125-4R	
										WGC-4125			COS-4125-4L	
512086-156VGS	–	0.156	❍		0.375	2.500	2.000	16.000	1.375	WG-4156	411767-156GC	TK-00601	–	–
–	512087-156VGS	0.156		❍	0.375	2.500	2.000	16.000	1.375	WGC-4156	411768-156GC	TK-00602	–	–
512098-187VGS	–	0.187	❍		0.375	2.500	2.000	16.000	1.375	GTS-4187-1	411769-187GC	TK-00603	GTS-4187	429522-187GC
–	512099-187VGS	0.187		❍	0.375	2.500	2.000	16.000	1.375	GTS-4187-2	411770-187GC	TK-00604	COS-4187-0	429523-187GC
										WG-4187			COS-4187-4R	
										WGC-4187			COS-4187-4L	
512106-218VGS	–	0.218	❍		0.500	2.750	2.000	16.000	1.500	WG-6218	411771-218GC	TK-00605	–	–
–	512107-218VGS	0.218		❍	0.500	2.750	2.000	16.000	1.500	WGC-6218	411772-218GC	TK-00606	–	–
512116-250VGS	–	0.250	●		0.500	2.750	2.000	16.000	1.500	GTS-6250	411773-250GC	TK-00608	–	–
–	512117-250VGS	0.250		●	0.500	2.750	2.000	16.000	1.500	GTS-6250-1	411774-250GC	TK-00607	–	–
										GTS-6250-2				
										WG-6250				
										WGC-6250				
512126-281VGS	–	0.281	❍		0.500	2.750	2.000	16.000	1.500	WG-6281	411775-281GC	TK-00609	–	–
–	512127-281VGS	0.281		❍	0.500	2.750	2.000	16.000	1.500	WGC-6281	411776-281GC	TK-00610	–	–
512132-312VGS	–	0.312	❍		0.625	3.000	2.000	16.000	1.625	WG-8312	411777-312GC	TK-00611	–	–
–	512133-312VGS	0.312		❍	0.625	3.000	2.000	16.000	1.625	WGC-8312	411778-312GC	TK-00612	–	–
512138-344VGS	–	0.344	❍		0.625	3.000	2.000	16.000	1.625	WG-8344	411779-344GC	TK-00613	–	–
–	512139-344VGS	0.344		❍	0.625	3.000	2.000	16.000	1.625	WGC-8344	411780-344GC	TK-00614	–	–
512144-375VGS	–	0.375	❍		0.625	3.000	2.000	16.000	1.625	WG-8375	411781-375GC	TK-00615	–	–
–	512145-375VGS	0.375		❍	0.625	3.000	2.000	16.000	1.625	WGC-8375	411782-375GC	TK-00616	–	–

* All toolholders include standard clamp and 1/4-20 x 3/4 BHCS.

GTS is Greenleaf's groove/turn system insert with chip control. Page GP 09.
COS is Greenleaf's cut-off system insert. Page GP 08.
WG is Greenleaf flat-top groover with an 11° nose clearance. Pages GP 10 and GP 11.
WGC is Greenleaf's flat-top groover with a 6° nose clearance. Pages GP 12 and GP 13.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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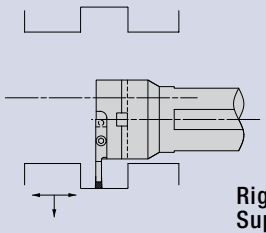
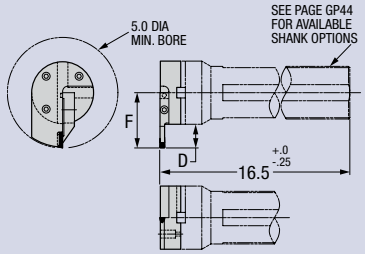
Cut-Off Grooving Support Blade

For Single Ended V-Bottom Inserts



Right-Hand
Support Blade Shown



Part Number		Groove Width	Stock		D.O.C.	Dimensions (inches)	Standard Components		Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Right	Left		R	L	D	F	Insert	Clamp		Insert	Clamp
511309-125VGB	–	0.125	❍		0.750	2.250	GTS-4125-1	411967-125GC	TK-00596	GTS-4125	429513-125GC
–	512228-125VGB	0.125		❍	0.750	2.250	GTS-4125-2	411966-125GC	TK-00592	COS-4125-0	429512-125GC
							WG-4125			COS-4125-4R	
							WGC-4125			COS-4125-4L	
511311-156VGB	–	0.156	❍		0.750	2.250	WG-4156	411969-156GC	TK-00597	–	–
–	511312-156VGB	0.156		❍	0.750	2.250	WGC-4156	411968-156GC	TK-00580	–	–
511313-187VGB	–	0.187	❍		0.750	2.250	GTS-4187-1	411978-187GC	TK-00593	GTS-4187	429519-187GC
–	511314-187VGB	0.187		❍	0.750	2.250	GTS-4187-2	411977-187GC	TK-00581	COS-4187-0	429518-187GC
							WG-4187			COS-4187-4R	
							WGC-4187			COS-4187-4L	
511315-218VGB	–	0.218	❍		1.125	2.625	WG-6218	411130-218GC	TK-00583	–	–
–	512229-218VGB	0.218		❍	1.125	2.625	WGC-6218	411979-218GC	TK-00582	–	–
512230-250VGB	–	0.250	❍		1.125	2.625	GTS-6250	411981-250GC	TK-00598	–	–
–	511318-250VGB	0.250		❍	1.125	2.625	GTS-6250-1	411980-250GC	TK-00617	–	–
							GTS-6250-2				
							WG-6250				
							WGC-6250				
511319-281VGB	–	0.281	❍		1.125	2.625	WG-6281	411134-281GC	TK-00585	–	–
–	511320-281VGB	0.281		❍	1.125	2.625	WGC-6281	411133-281GC	TK-00584	–	–
511321-312-VGB	–	0.312	❍		1.500	3.000	WG-8312	411136-312GC	TK-00587	–	–
–	511322-312VGB	0.312		❍	1.500	3.000	WGC-8312	411985-312GC	TK-00586	–	–
511323-344VGB	–	0.344	❍		1.500	3.000	WG-8344	411138-344GC	TK-00588	–	–
–	511324-344VGB	0.344		❍	1.500	3.000	WGC-8344	411137-344GC	TK-00594	–	–
511325-375VGB	–	0.375	❍		1.500	3.000	WG-8375	411987-375GC	TK-00589	–	–
–	511326-375VGB	0.375		❍	1.500	3.000	WGC-8375	411986-375GC	TK-00595	–	–

* See page GP 44 for available shank options
All toolholders include standard clamp and 1/4-20 x 1 SHCS.

GTS is Greenleaf's groove/turn system insert with chip control. Page GP 09.
COS is Greenleaf's cut-off system insert. Page GP 08.
WG is Greenleaf flat-top groover with an 11° nose clearance. Pages GP 10 and GP 11.
WGC is Greenleaf's flat-top groover with a 6° nose clearance. Pages GP 12 and GP 13.

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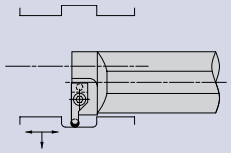
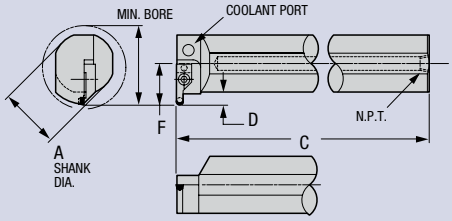
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

Profiling Bar

Round V-Bottom Insert
Milled Nest





Right-Hand
Profiling Bar Shown

Part Number		Gage–Option 1		Gage–Option 2		Stock		D.O.C.	Dimensions (inches)			Standard Components		*Tune-Up Kit Includes All Std. Components	Optional Component
Right	Left	Insert	Min. Bore	Insert	Min. Bore	R	L	D	A	C	F	Clamp	Clamp Screw		Insert Screw
519700-2VMRB	–	RPGN-2V	1.500	RCGN-2V	3.500	❍		3/8	1.000	12.00	0.875	412131-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00795	PT-542T
–	519701-2VMRB	RPGN-2V	1.500	RCGN-2V	3.500		❍	3/8	1.000	12.00	0.875	412132-250GC	1/4-20 x 3/4 S.H.C.S.	TK-00836	PT-542T
519702-2VMRB	–	RPGN-2V	1.750	RCGN-2V	3.500	❍		3/8	1.250	13.75	1.000	412131-250GC	1/4-20 x 1 S.H.C.S.	TK-00798	PT-542T
–	519703-2VMRB	RPGN-2V	1.750	RCGN-2V	3.500		❍	3/8	1.250	13.75	1.000	412132-250GC	1/4-20 x 1 S.H.C.S.	TK-00848	PT-542T
519704-2VMRB	–	RPGN-2V	2.000	RCGN-2V	3.500	❍		3/8	1.500	13.75	1.125	412131-250GC	1/4-20 x 1 S.H.C.S.	TK-00798	PT-542T
–	519705-2VMRB	RPGN-2V	2.000	RCGN-2V	3.500		❍	3/8	1.500	13.75	1.125	412132-250GC	1/4-20 x 1 S.H.C.S.	TK-00848	PT-542T
519706-2VMRB	–	RPGN-2V	2.500	RCGN-2V	3.500	●		3/8	2.000	16.00	1.375	412131-250GC	1/4-20 x 1 S.H.C.S.	TK-00798	PT-542T
–	519707-2VMRB	RPGN-2V	2.500	RCGN-2V	3.500		❍	3/8	2.000	16.00	1.375	412132-250GC	1/4-20 x 1 S.H.C.S.	TK-00848	PT-542T
519708-3VMRB	519709-3VMRB	RPGN-3V	2.250	RCGN-3V	4.500	❍	❍	1/2	1.250	13.75	1.125	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
519710-3VMRB	519711-3VMRB	RPGN-3V	2.500	RCGN-3V	4.500	❍	❍	1/2	1.500	13.75	1.250	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
519712-3VMRB	519713-3VMRB	RPGN-3V	2.750	RCGN-3V	4.500	❍	❍	1/2	2.000	16.00	1.500	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
519714-4VMRB	519715-4VMRB	RPGN-4V	2.250	RCGN-4V	4.500	❍	❍	5/8	1.250	13.75	1.250	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
519716-4VMRB	519717-4VMRB	RPGN-4V	2.500	RCGN-4V	4.500	❍	❍	5/8	1.500	13.75	1.375	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
519718-4VMRB	519719-4VMRB	RPGN-4V	2.750	RCGN-4V	4.500	❍	❍	5/8	2.000	16.00	1.625	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the profiling bar.

See page GP 14 for ceramic and carbide inserts.

NOTE: Use carbide inserts RCGT and RPGT with optional insert screw for finishing.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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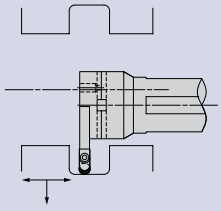
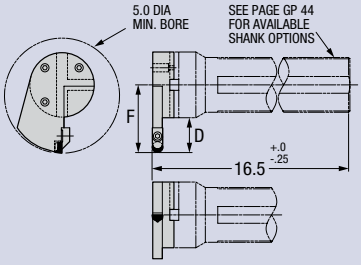
Profiling Support Blade

Round V-Bottom Insert
Milled Nest





Right-Hand Profiling Bar Shown

Part Number		Gage	Stock		D.O.C.	Dimensions (inches)	Standard Components		*Tune-Up Kit Includes All Standard Components	Optional Component
Right	Left	Insert	R	L	D	F	Clamp	Clamp Screw		Insert Screw
519740-2VMRB	–	** RPGN-2V	❍		0.750	2.375	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00799	PT-542T
–	**519741-2VMRB**	** RPGN-2V		❍	0.750	2.375	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00765	PT-542T
519742-3VMRB	–	** RPGN-3V	❍		1.125	2.750	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
–	**519743-3VMRB**	** RPGN-3V		❍	1.125	2.750	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
519744-4VMRB	–	** RPGN-4V	❍		1.500	3.125	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018
–	**519745-4VMRB**	** RPGN-4V		❍	1.500	3.125	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

** RCGN can be used in place of RPGN.

NOTE: Use carbide inserts RCGT and RPGT with optional insert screw for finishing.

See page GP 14 for ceramic and carbide inserts.

See page GP 44 for available shank options.

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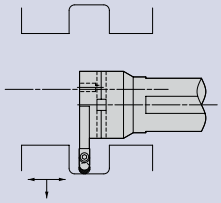
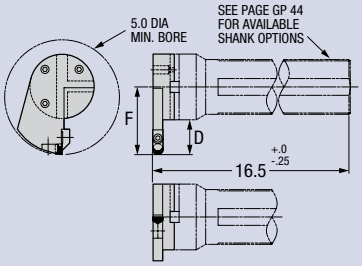
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

Profiling Support Blade

Round V-Bottom Insert
Replaceable Nest





Right-Hand
Profiling Bar Shown

Part Number		Gage	Stock		D.O.C.	Dimensions (inches)	Standard Components				*Tune-Up Kit Includes All Standard Components
Right	Left	Insert	R	L	D	F	Nest	Nest Screw	Clamp	Clamp Screw	
512227-2VRB	–	** RPGN-2V	❍		0.750	2.375	411108	#3-48 x 3/8 B.H.C.S.	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00685
–	**511287-2VRB**	** RPGN-2V		❍	0.750	2.375	411108	#3-48 x 3/8 B.H.C.S.	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00683
511288-3VRB	–	** RPGN-3V	❍		1.125	2.750	414009	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00528
–	**511289-3VRB**	** RPGN-3V		●	1.125	2.750	414009	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00528
511290-4VRB	–	** RPGN-4V	❍		1.500	3.125	414008	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00529
–	**511291-4VRB**	** RPGN-4V		❍	1.500	3.125	414008	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00529

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

** RCGN can be used in place of RPGN.

See page GP 14 for ceramic and carbide inserts.

See page GP 44 for available shank options.

10 Business Days or Less ❍ ❍

Stocked Standard ● ●

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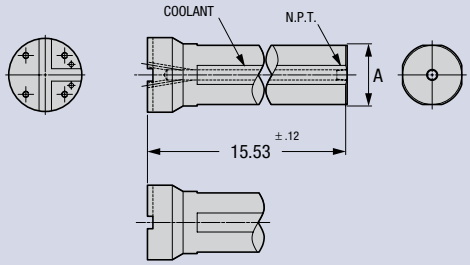
Shank Options

For Bolt-On Support Blades

Part Number		Stock
Shank No.	A	
511296	2.000	●
511297	2.250	❍
511292	2.500	❍
511298	3.000	❍



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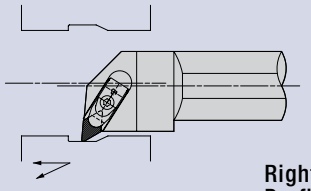
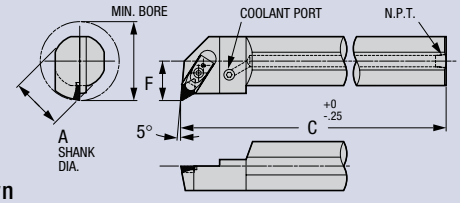
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

Profiling Bar

Double Ended
55° Diamond





Right-Hand
Profiling Bar Shown

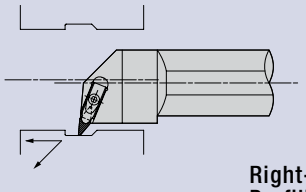
Part Number		Gage	Stock			Dimensions (inches)			Standard Components					*Tune-Up Kit Includes All Std. Components
Right	Left	Insert	R	L	Min. Bore	A	C	F	Back-up Plate	Plate Screw	Clamp	Clamp Screw		
518560-32-55VR	518561-32-55VL	DPGN-443V	❍	❍	2-3/4	2.000	16	1.500	418101	#6-32 x 3/8 S.H.C.S.	418100	1/4-20 x 1 S.H.C.S.		TK-00754
518562-40-55VR	518563-40-55VL	DPGN-443V	❍	❍	3-1/4	2.500	16	2.000	418101	#6-32 x 3/8 S.H.C.S.	418100	1/4-20 x 1 S.H.C.S.		TK-00754

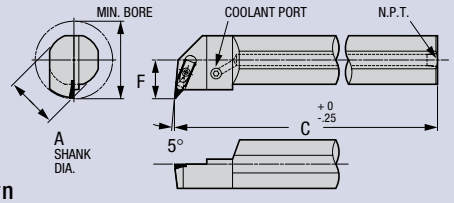
* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the profiling bar.

See page GP 19 for inserts.

Profiling Bar

Double Ended
35° Diamond





Right-Hand
Profiling Bar Shown

Part Number		Gage	Stock			Dimensions (inches)			Standard Components					*Tune-Up Kit Includes All Std. Components
Right	Left	Insert	R	L	Min. Bore	A	C	F	Back-up Plate	Plate Screw	Clamp	Clamp Screw		
518554-24-35VR	518555-24-35VL	VCGN-2.532V	❍	❍	2	1.500	14	1.000	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.		TK-00756
518556-32-35VR	518557-32-35VL	VCGN-2.532V	❍	❍	2-3/4	2.000	16	1.500	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.		TK-00756
518558-40-35VR	518559-40-35VL	VCGN-2.532V	❍	❍	3-1/4	2.500	16	2.000	418525	#4-40 x 1/4 S.H.C.S.	418524	#10-32 x 3/4 S.H.C.S.		TK-00756

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the profiling bar.

See page GP 18 for inserts.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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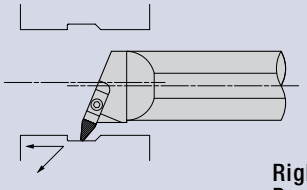
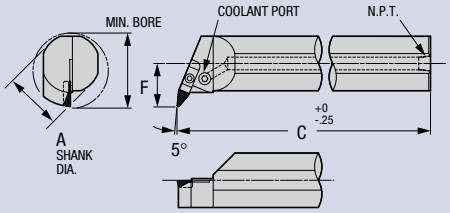
Profiling Bar

Single Ended
35° Diamond





Right-Hand
Profiling Bar Shown

Part Number		Gage	Stock			Dimensions (inches)			Standard Components		*Tune-Up Kit Includes All Standard Components
Right	Left	Insert	R	L	Min. Bore	A	C	F	Clamp	Clamp Screw	
511339-B244VR	511340-B244VL	VPG-33.543V	❍	❍	2	1.500	14	1.000	3386	#10-32 x 5/8 S.H.C.S.	TK-00578
511343-B324VR	511344-B324VL	VPG-33.543V	❍	❍	2-3/4	2.000	16	1.500	3386	#10-32 x 5/8 S.H.C.S.	TK-00578
511347-B404VR	511348-B404VL	VPG-33.543V	❍	❍	3-1/4	2.500	16	2.000	3386	#10-32 x 5/8 S.H.C.S.	TK-00578

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the profiling bar.

See page GP 18 for inserts.

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● ● Stocked Standard

❍ ❍ 10 Business Days or Less

Grooving, Profiling and Cut-Off Support Blades

The Greenleaf Advanced Tooling System for grooving, profiling and cut off is further expanded to a support blade system that couples qualified shanks and qualified support blades to increase the application range of each toolholder or bar. Each Greenleaf tool has the option to utilize 248 support blade combinations of cut-off, V-bottom round profilers, and grooving inserts to meet your cut-off, grooving, profiling and face-grooving application needs.

Quick-change shanks such as CAPTO or KM, as well as straight shank holders and bars, are all part of this tooling system. Call Greenleaf to design your unique right- or left-hand support blade.

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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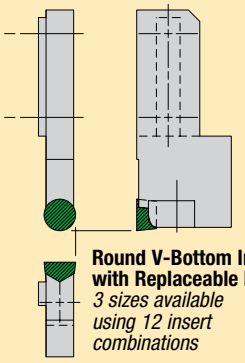
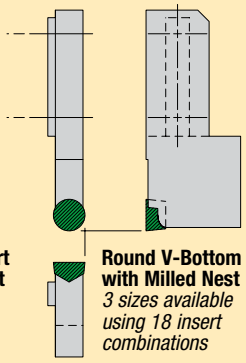


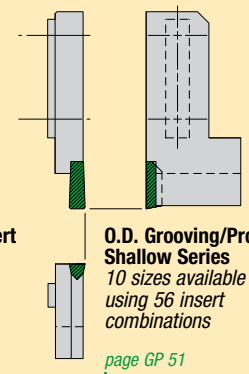
Round V-Bottom Insert with Replaceable Nest
3 sizes available using 12 insert combinations

page GP 50



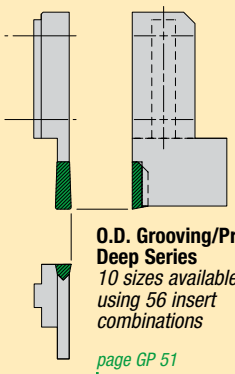
Round V-Bottom Insert with Milled Nest
3 sizes available using 18 insert combinations

page GP 50



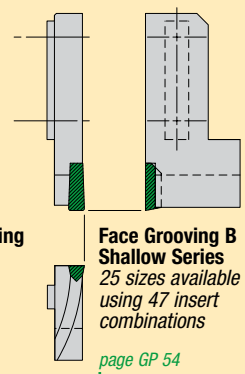
O.D. Grooving/Profiling Shallow Series
10 sizes available using 56 insert combinations

page GP 51



O.D. Grooving/Profiling Deep Series
10 sizes available using 56 insert combinations

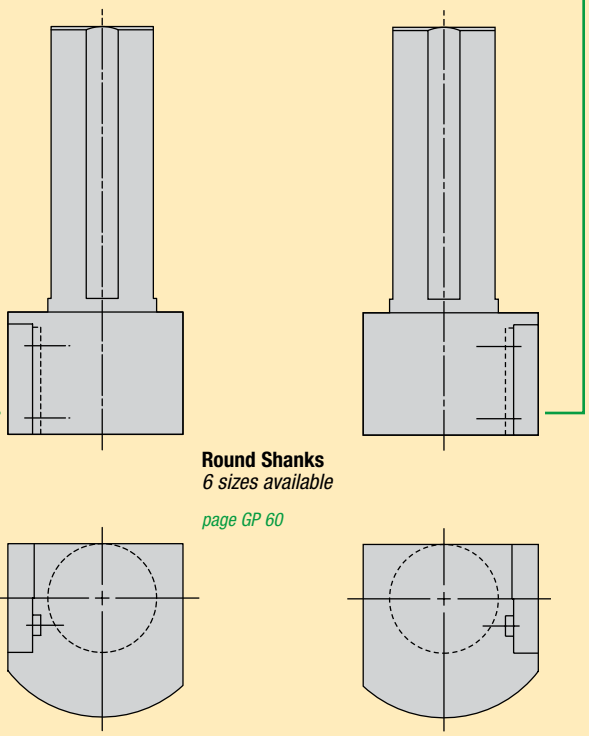
page GP 51



Face Grooving B Shallow Series
25 sizes available using 47 insert combinations

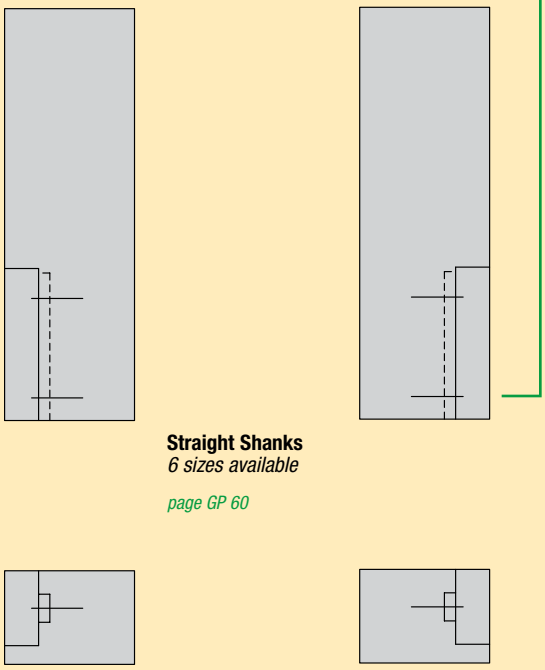
page GP 54

RIGHT HAND



Round Shanks
6 sizes available

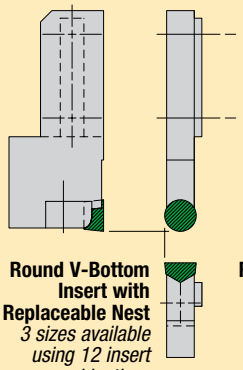
page GP 60



Straight Shanks
6 sizes available

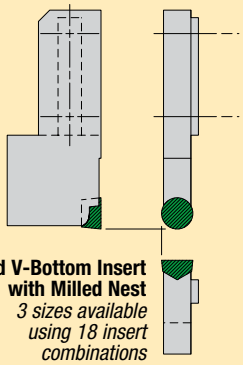
page GP 60

LEFT HAND



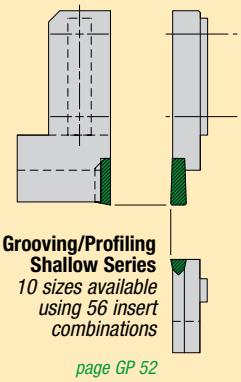
Round V-Bottom Insert with Replaceable Nest
3 sizes available using 12 insert combinations

page GP 50



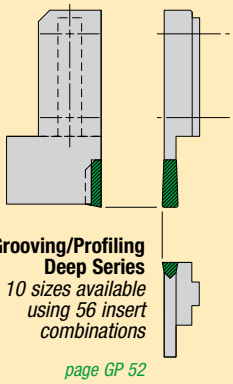
Round V-Bottom Insert with Milled Nest
3 sizes available using 18 insert combinations

page GP 50



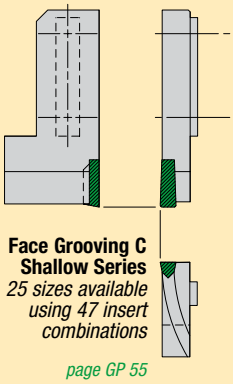
O.D. Grooving/Profiling Shallow Series
10 sizes available using 56 insert combinations

page GP 52



O.D. Grooving/Profiling Deep Series
10 sizes available using 56 insert combinations

page GP 52



Face Grooving C Shallow Series
25 sizes available using 47 insert combinations

page GP 55

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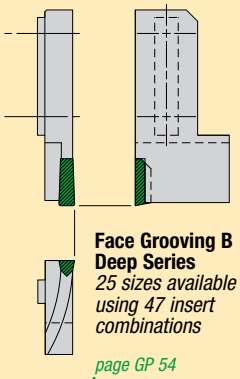
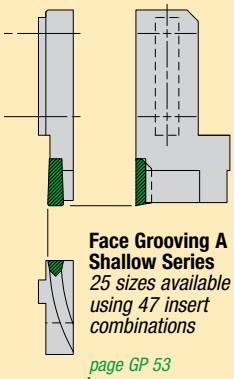


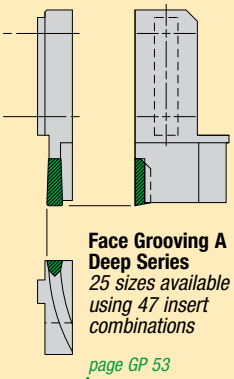
Face Grooving B Deep Series
25 sizes available using 47 insert combinations

page GP 54



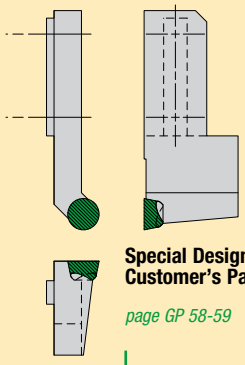
Face Grooving A Shallow Series
25 sizes available using 47 insert combinations

page GP 53



Face Grooving A Deep Series
25 sizes available using 47 insert combinations

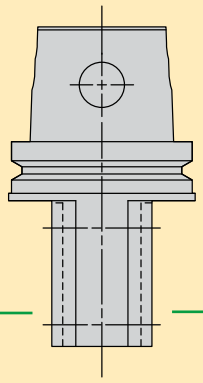
page GP 53

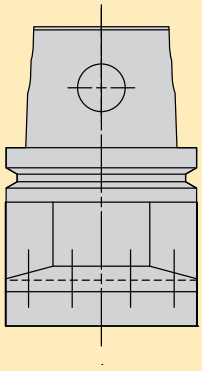


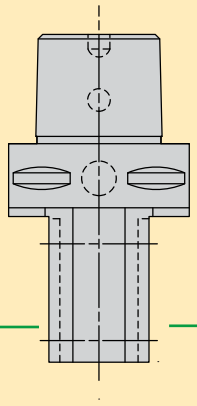
Special Designs to Fit Customer's Parts

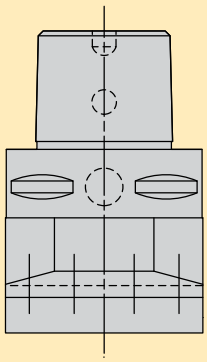
page GP 58-59

RIGHT HAND



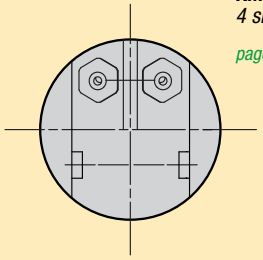


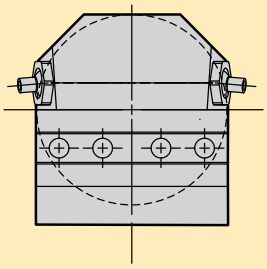




KM Tool Shanks
4 sizes available

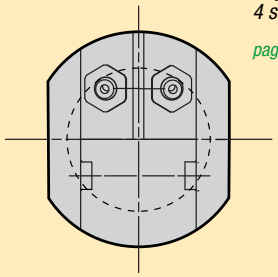
page GP 61

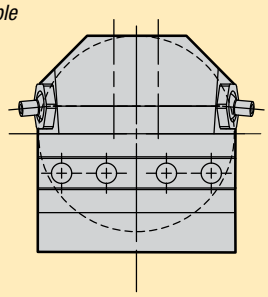




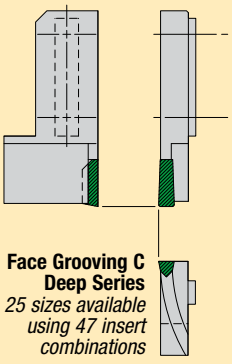
Capto Tool Shanks
4 sizes available

page GP 62



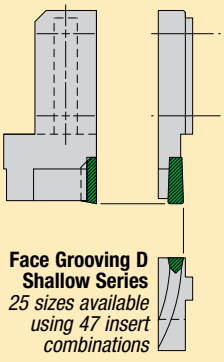


LEFT HAND



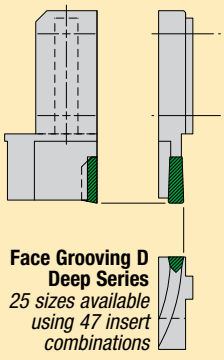
Face Grooving C Deep Series
25 sizes available using 47 insert combinations

page GP 55



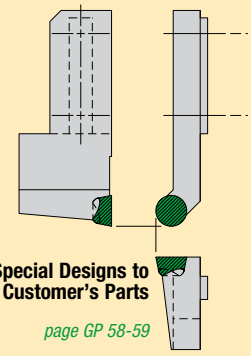
Face Grooving D Shallow Series
25 sizes available using 47 insert combinations

page GP 56



Face Grooving D Deep Series
25 sizes available using 47 insert combinations

page GP 56



Special Designs to Fit Customer's Parts

page GP 58-59

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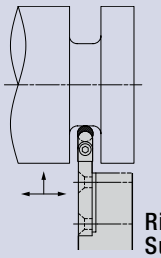
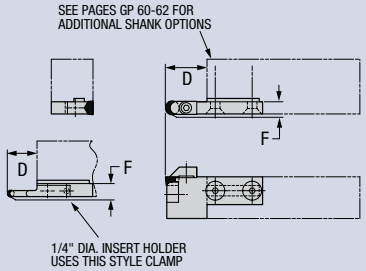
O.D. Grooving/Profiling Support Blade

Round V-Bottom Insert
Replaceable Nest



Right-Hand
Support Blade Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)	Standard Components				*Tune-Up Kit Includes All Std. Components
Right	Left	Insert	R	L	D	F	Nest	Nest Screw	Clamp	Clamp Screw	
411959-2VR	–	** RPGN-2V	●		0.750	0.469	410631	#3-48 x 3/8 B.H.C.S.	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00590
–	411960-2VR	** RPGN-2V		●	0.750	0.469	410631	#3-48 x 3/8 B.H.C.S.	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00591
411011-3VR	411012-3VR	** RPGN-3V	●	●	1.125	0.469	413970	#6-32 x 1/2 B.H.C.S.	308063	#10-32 x 1/2 S.H.C.S.	TK-00525
411009-4VR	411010-4VR	** RPGN-4V	●	●	1.500	0.469	414007	#10-32 x 5/8 B.H.C.S.	308136	1/4-20 x 5/8 S.H.C.S.	TK-00526

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

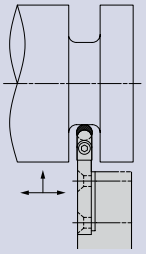
See page GP 14 for ceramic and carbide inserts.

** RCGN can be used in place of RPGN.

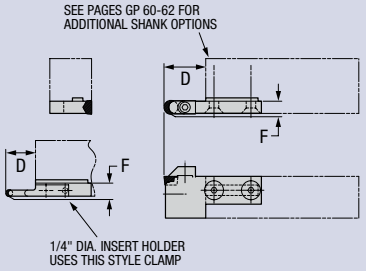
See pages GP 60-62 for additional shank options.

O.D. Grooving/Profiling Support Blade

Round V-Bottom Insert
Milled Nest



Right-Hand
Support Blade Shown



Part Number		Gage	Stock		D.O.C.	Dimensions (inches)	Standard Components		*Tune-Up Kit Includes All Standard Components	Optional Component
Right	Left	Insert	R	L	D	F	Clamp	Clamp Screw		Insert Screw
421534-2VMR	–	** RPGN-2V	❍		0.750	0.469	411905-250VRC	1/4-20 x 1 S.H.C.S.	TK-00765	PT-542T
–	421535-2VMR	** RPGN-2V		❍	0.750	0.469	411906-250VRC	1/4-20 x 1 S.H.C.S.	TK-00799	PT-542T
421536-3VMR	421537-3VMR	** RPGN-3V	❍	❍	1.125	0.469	308063	#10-32 x 1/2 S.H.C.S.	TK-00764	PT-545T
421538-4VMR	421539-4VMR	** RPGN-4V	●	❍	1.500	0.469	308136	1/4-20 x 3/4 S.H.C.S.	TK-00763	CO-5018

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

See page GP 14 for ceramic and carbide inserts.

** RCGN can be used in place of RPGN.

See pages GP 60-62 for additional shank options.

NOTE: Use carbide inserts RCGT and RPGT with optional insert screw for finishing.

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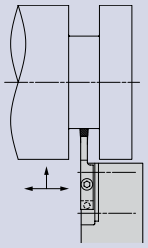
● ● Stocked Standard

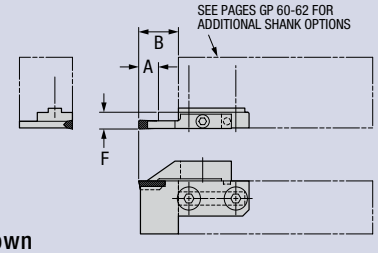
❍ ❍ 10 Business Days or Less

O.D. Grooving/Profiling/ Cut-Off Support Blade

Right Hand



Right-Hand
Support Blade Shown



Part Number		Groove Width	Stock		Dimensions (inches)			Standard Components		*Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
Shallow Series	Deep Series		Shallow	Deep	A	B	F	Insert	Clamp		Insert	Clamp
427647-094VG		0.094	❍		0.38	–	0.469	WG-4094	427651-094GC	TK-00881	COS-4094-0	429524-094GC
	427648-094VG			❍	–	0.75	0.469	WGC-4094	427651-094GC	TK-00881	COS-4094-4L	429524-094GC
											COS-4094-4R	
421109-125VG		0.125	●		0.38	–	0.469	GTS-4125-1	411966-125GC	TK-00592	GTS-4125	429512-125GC
	411988-125VG			●	–	0.75	0.469	GTS-4125-2	411966-125GC	TK-00592	COS-4125-0	429512-125GC
								WG-4125			COS-4125-4R	
								WGC-4125			COS-4125-4L	
421110-156VG		0.156	❍		0.38	–	0.469	WG-4156		TK-00580		
	411066-156VG			●	–	0.75	0.469	WGC-4156	411968-156GC	TK-00580	–	–
421111-187VG		0.187	❍		0.38	–	0.469	GTS-4187-1	411977-187GC	TK-00581	GTS-4187	429518-187GC
	411068-187VG			●	–	0.75	0.469	GTS-4187-2	411977-187GC	TK-00581	COS-4187-0	429518-187GC
								WG-4187			COS-4187-4R	
								WGC-4187			COS-4187-4L	
421112-218VG		0.218	❍		0.56	–	0.469	WG-6218	411979-218GC	TK-00582		
	411081-218VG			❍	–	1.13	0.469	WGC-6218	411979-218GC	TK-00582	–	–
421113-250VG		0.250	●		0.56	–	0.469	WG-6250	411980-250GC	TK-00617		
	411992-250VG			●	–	1.13	0.469	WGC-6250	411980-250GC	TK-00617	–	–
								GTS-6250				
								GTS-6250-1				
								GTS-6250-2				
421114-281VG		0.281	❍		0.56	–	0.469	WG-6281	411133-281GC	TK-00584		
	411085-281VG			❍	–	1.13	0.469	WGC-6281	411133-281GC	TK-00584	–	–
421115-312VG		0.312	❍		0.75	–	0.469	WG-8312	411985-312GC	TK-00586		
	411087-312VG			❍	–	1.50	0.469	WGC-8312	411985-312GC	TK-00586	–	–
421116-344VG		0.344	❍		0.75	–	0.469	WG-8344	411137-344GC	TK-00594		
	411089-344VG			❍	–	1.50	0.469	WGC-8344	411137-344GC	TK-00594	–	–
421117-375VG		0.375	❍		0.75	–	0.469	WG-8375	411986-375GC	TK-00595		
	411994-375VG			●	–	1.50	0.469	WGC-8375	411986-375GC	TK-00595	–	–

***** Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

All support blades include Standard Clamp and 1/4-20 x 1 SHCS.

GTS is Greenleaf's groove/turn system insert with chip control. Page GP 09.
COS is Greenleaf's cut-off system insert. Page GP 08.
WG is Greenleaf flat-top groover with an 11° nose clearance. Pages GP 10 and GP 11.
WGC is Greenleaf's flat-top groover with a 6° nose clearance. Pages GP 12 and GP 13.

See pages GP 60-62 for additional shank options.

10 Business Days or Less ❍ ❍

Stocked Standard ● ●

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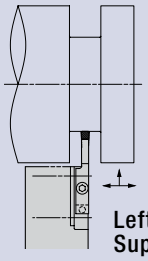
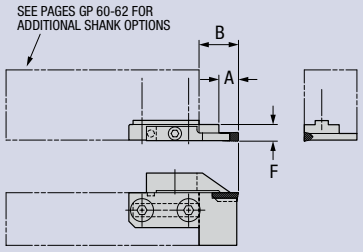
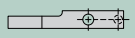
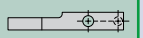
O.D. Grooving/Profiling/ Cut-Off Support Blade

Left Hand



Left-Hand
Support Blade Shown



Part Number		Groove Width	Stock		Dimensions (inches)			Standard Components		*Tune-Up Kit Includes Standard Clamp and *Clamp Screw	Optional Components	
								Insert	 Clamp		Insert	 Clamp
Shallow Series	Deep Series		Shallow	Deep	A	B	F					
427649-094VG			❍		0.38	–	0.469	WG-4094	427652-094GC	TK-00882	COS-4094-0	429525-094GC
	427650-094VG	0.094		❍	–	0.75	0.469	WGC-4094	427652-094GC	TK-00882	COS-4094-4L	429525-094GC
											COS-4094-4R	
421100-125VG			●		0.38	–	0.469	GTS-4125-1	411967-125GC	TK-00596	GTS-4125	429513-125GC
	411989-125VG	0.125		●	–	0.75	0.469	GTS-4125-2	411967-125GC	TK-00596	COS-4125-0	429513-125GC
								WG-4125			COS-4125-4R	
								WGC-4125			COS-4125-4L	
421101-156VG			❍		0.38	–	0.469	WG-4156	411969-156GC	TK-00597		
	411990-156VG	0.156		❍	–	0.75	0.469	WGC-4156	411969-156GC	TK-00597	–	–
421102-187VG			❍		0.38	–	0.469	GTS-4187-1	411978-187GC	TK-00593	GTS-4187	429519-187GC
	411991-187VG	0.187		●	–	0.75	0.469	GTS-4187-2	411978-187GC	TK-00593	COS-4187-0	429519-187GC
								WG-4187			COS-4187-4R	
								WGC-4187			COS-4187-4L	
421103-218VG			❍		0.56	–	0.469	WG-6218	411130-218GC	TK-00583		
	411082-218VG	0.218		●	–	1.13	0.469	WGC-6218	411130-218GC	TK-00583	–	–
421104-250VG			●		0.56	–	0.469	WG-6250	411981-250GC	TK-00598		
	411993-250VG	0.250		●	–	1.13	0.469	WGC-6250	411981-250GC	TK-00598	–	–
								GTS-6250				
								GTS-6250-1				
								GTS-6250-2				
421105-281VG			❍		0.56	–	0.469	WG-6281	411134-281GC	TK-00585		
	411086-281VG	0.281		❍	–	1.13	0.469	WGC-6281	411134-281GC	TK-00585	–	–
421106-312VG			❍		0.75	–	0.469	WG-8312	411136-312GC	TK-00587		
	411088-312VG	0.312		❍	–	1.50	0.469	WGC-8312	411136-312GC	TK-00587	–	–
421107-344VG			❍		0.75	–	0.469	WG-8344	411138-344GC	TK-00588		
	411090-344VG	0.344		❍	–	1.50	0.469	WGC-8344	411138-344GC	TK-00588	–	–
421108-375VG			❍		0.75	–	0.469	WG-8375	411987-375GC	TK-00589		
	411122-375VG	0.375		●	–	1.50	0.469	WGC-8375	411987-375GC	TK-00589	–	–

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

All support blades include Standard Clamp and 1/4-20 x 1 SHCS.

GTS is Greenleaf's groove/turn system insert with chip control. Page GP 09.
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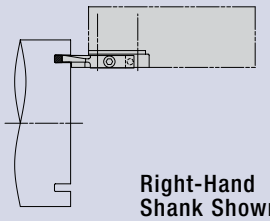
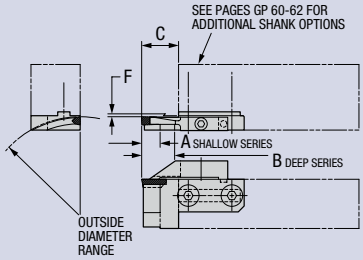
Face Grooving Support Blade A



Right-Hand Shank Shown



Part Number		Gage	Stock		Outside Diameter Range	Dimensions (inches)				Standard Components		*Tune-Up Kit Includes All Standard Components
Shallow Series	Deep Series	Insert	Shallow	Deep		A	B	C	F	Clamp	Clamp Screw	
421218-125S-030	421243-125L-030	WG-4125	❍	❍	3.00 / 3.50	0.38	0.63	0.750	0.031	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421219-125S-035	421244-125L-035	WG-4125	❍	❍	3.50 / 4.25	0.38	0.63	0.750	0.031	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421220-125S-0425	421245-125L-0425	WG-4125	❍	❍	4.25 / 5.50	0.38	0.63	0.750	0.031	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421221-125S-055	421246-125L-055	WG-4125	❍	❍	5.50 / 7.50	0.38	0.63	0.750	0.031	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421222-125S-075	421247-125L-075	WG-4125	❍	❍	7.50 / 12.50	0.38	0.63	0.750	0.031	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421223-125S-125	421248-125L-125	WG-4125	❍	❍	12.50 / 40.00	0.38	0.63	0.750	0.031	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421224-187S-030	421249-187L-030	WG-4187	❍	❍	3.00 / 3.50	0.38	0.63	0.750	0.031	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421225-187S-035	421250-187L-035	WG-4187	❍	❍	3.50 / 4.25	0.38	0.63	0.750	0.031	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421226-187S-0425	421251-187L-0425	WG-4187	❍	❍	4.25 / 5.50	0.38	0.63	0.750	0.031	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421227-187S-055	421252-187L-055	WG-4187	❍	❍	5.50 / 7.50	0.38	0.63	0.750	0.031	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421228-187S-075	421253-187L-075	WG-4187	❍	❍	7.50 / 12.50	0.38	0.63	0.750	0.031	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421229-187S-125	421254-187L-125	WG-4187	❍	❍	12.50 / 40.00	0.38	0.63	0.750	0.031	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421230-250S-030	421255-250L-030	WG-6250	❍	❍	3.00 / 4.25	0.56	1.00	1.125	0.031	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421231-250S-0425	421256-250L-0425	WG-6250	❍	❍	4.25 / 6.00	0.56	1.00	1.125	0.031	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421232-250S-060	421257-250L-060	WG-6250	❍	❍	6.00 / 8.50	0.56	1.00	1.125	0.031	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421233-250S-085	421258-250L-085	WG-6250	❍	❍	8.50 / 15.50	0.56	1.00	1.125	0.031	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421234-250S-155	421259-250L-155	WG-6250	❍	❍	15.50 / 40.00	0.56	1.00	1.125	0.031	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421235-312S-030	421260-312L-030	WG-8312	❍	❍	3.00 / 5.00	0.75	1.31	1.500	0.031	421326-312GC	1/4-20 x 1 S.H.C.S.	TK-00823
421236-312S-050	421261-312L-050	WG-8312	❍	❍	5.00 / 9.00	0.75	1.31	1.500	0.031	421326-312GC	1/4-20 x 1 S.H.C.S.	TK-00823
421237-312S-090	421262-312L-090	WG-8312	❍	❍	9.00 / 19.00	0.75	1.31	1.500	0.031	421326-312GC	1/4-20 x 1 S.H.C.S.	TK-00823
421238-312S-190	421263-312L-190	WG-8312	❍	❍	19.00 and up	0.75	1.31	1.500	0.031	421326-312GC	1/4-20 x 1 S.H.C.S.	TK-00823
421239-375S-030	421264-375L-030	WG-8375	❍	❍	3.00 / 5.00	0.75	1.31	1.500	0.031	421327-375GC	1/4-20 x 1 S.H.C.S.	TK-00839
421240-375S-050	421265-375L-050	WG-8375	❍	❍	5.00 / 9.00	0.75	1.31	1.500	0.031	421327-375GC	1/4-20 x 1 S.H.C.S.	TK-00839
421241-375S-090	421266-375L-090	WG-8375	❍	❍	9.00 / 19.00	0.75	1.31	1.500	0.031	421327-375GC	1/4-20 x 1 S.H.C.S.	TK-00839
421242-375S-190	421267-375L-190	WG-8375	❍	❍	19.00 and up	0.75	1.31	1.500	0.031	421327-375GC	1/4-20 x 1 S.H.C.S.	TK-00839

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

See pages GP 10 and GP 11 for inserts.

See pages GP 60-62 for additional shank options.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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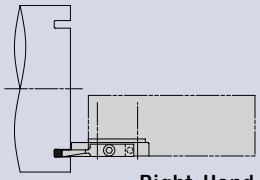
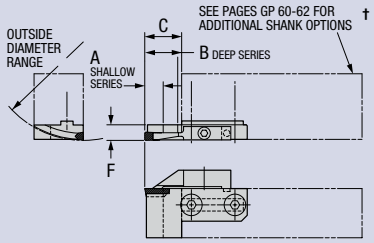
Face Grooving Support Blade B



Right-Hand Shank Shown



Part Number		Gage	Stock		Outside Diameter Range	Dimensions (inches)				Standard Components		*Tune-Up Kit Includes All Standard Components
Shallow Series	Deep Series	Insert	Shallow	Deep		A	B	C	F	Clamp	Clamp Screw	
421118-125S-030	421143-125L-030	WG-4125	❍	❍	3.00 / 3.50	0.38	0.63	0.750	0.469	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421119-125S-035	421144-125L-035	WG-4125	❍	❍	3.50 / 4.25	0.38	0.63	0.750	0.469	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421120-125S-0425	421145-125L-0425	WG-4125	❍	❍	4.25 / 5.50	0.38	0.63	0.750	0.469	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421121-125S-055	421146-125L-055	WG-4125	❍	❍	5.50 / 7.50	0.38	0.63	0.750	0.469	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421122-125S-075	421147-125L-075	WG-4125	❍	❍	7.50 / 12.50	0.38	0.63	0.750	0.469	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421123-125S-125	421148-125L-125	WG-4125	❍	❍	12.50 / 40.00	0.38	0.63	0.750	0.469	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421124-187S-030	421149-187L-030	WG-4187	❍	❍	3.00 / 3.50	0.38	0.63	0.750	0.469	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421125-187S-035	421150-187L-035	WG-4187	❍	❍	3.50 / 4.25	0.38	0.63	0.750	0.469	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421126-187S-0425	421151-187L-0425	WG-4187	❍	❍	4.25 / 5.50	0.38	0.63	0.750	0.469	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421127-187S-055	421152-187L-055	WG-4187	❍	❍	5.50 / 7.50	0.38	0.63	0.750	0.469	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421128-187S-075	421153-187L-075	WG-4187	❍	❍	7.50 / 12.50	0.38	0.63	0.750	0.469	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421129-187S-125	421154-187L-125	WG-4187	❍	❍	12.50 / 40.00	0.38	0.63	0.750	0.469	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421130-250S-030	421155-250L-030	WG-6250	❍	❍	3.00 / 4.25	0.56	1.00	1.125	0.469	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421131-250S-0425	421156-250L-0425	WG-6250	❍	❍	4.25 / 6.00	0.56	1.00	1.125	0.469	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421132-250S-060	421157-250L-060	WG-6250	❍	❍	6.00 / 8.50	0.56	1.00	1.125	0.469	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421133-250S-085	421158-250L-085	WG-6250	❍	❍	8.50 / 15.50	0.56	1.00	1.125	0.469	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421134-250S-155	421159-250L-155	WG-6250	❍	❍	15.50 / 40.00	0.56	1.00	1.125	0.469	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421135-312S-030	421160-312L-030	WG-8312	❍	❍	3.00 / 5.00	0.75	1.31	1.500	0.469	421321-312GC	1/4-20 x 1 S.H.C.S.	TK-00849
421136-312S-050	421161-312L-050	WG-8312	❍	❍	5.00 / 9.00	0.75	1.31	1.500	0.469	421321-312GC	1/4-20 x 1 S.H.C.S.	TK-00849
421137-312S-090	421162-312L-090	WG-8312	❍	❍	9.00 / 19.00	0.75	1.31	1.500	0.469	421321-312GC	1/4-20 x 1 S.H.C.S.	TK-00849
421138-312S-190	421163-312L-190	WG-8312	❍	❍	19.00 and up	0.75	1.31	1.500	0.469	421321-312GC	1/4-20 x 1 S.H.C.S.	TK-00849
421139-375S-030	421164-375L-030	WG-8375	❍	❍	3.00 / 5.00	0.75	1.31	1.500	0.469	421322-375GC	1/4-20 x 1 S.H.C.S.	TK-00797
421140-375S-050	421165-375L-050	WG-8375	❍	❍	5.00 / 9.00	0.75	1.31	1.500	0.469	421322-375GC	1/4-20 x 1 S.H.C.S.	TK-00797
421141-375S-090	421166-375L-090	WG-8375	❍	❍	9.00 / 19.00	0.75	1.31	1.500	0.469	421322-375GC	1/4-20 x 1 S.H.C.S.	TK-00797
421142-375S-190	421167-375L-190	WG-8375	❍	❍	19.00 and up	0.75	1.31	1.500	0.469	421322-375GC	1/4-20 x 1 S.H.C.S.	TK-00797

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See page GP 10 and GP 11 for inserts.

See pages GP 60-62 for additional shank options.

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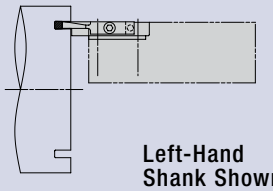
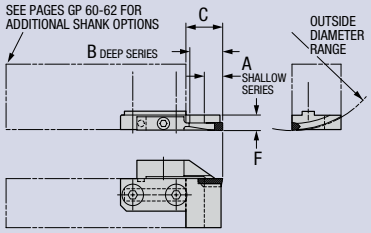
● ● Stocked Standard

❍ ❍ 10 Business Days or Less

Face Grooving Support Blade C



Left-Hand Shank Shown



Part Number		Gage	Stock		Outside Diameter Range	Dimensions (inches)				Standard Components		*Tune-Up Kit Includes All Standard Components
Shallow Series	Deep Series	Insert	Shallow	Deep		A	B	C	F	Clamp	Clamp Screw	
421168-125S-030	421193-125L-030	WG-4125	❍	❍	3.00 / 3.50	0.38	0.63	0.750	0.469	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421169-125S-035	421194-125L-035	WG-4125	❍	❍	3.50 / 4.25	0.38	0.63	0.750	0.469	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421170-125S-0425	421195-125L-0425	WG-4125	❍	❍	4.25 / 5.50	0.38	0.63	0.750	0.469	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421171-125S-055	421196-125L-055	WG-4125	❍	❍	5.50 / 7.50	0.38	0.63	0.750	0.469	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421172-125S-075	421197-125L-075	WG-4125	❍	❍	7.50 / 12.50	0.38	0.63	0.750	0.469	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421173-125S-125	421198-125L-125	WG-4125	❍	❍	12.50 / 40.00	0.38	0.63	0.750	0.469	421323-125GC	1/4-20 x 1 S.H.C.S.	TK-00801
421174-187S-030	421199-187L-030	WG-4187	❍	❍	3.00 / 3.50	0.38	0.63	0.750	0.469	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421175-187S-035	421200-187L-035	WG-4187	❍	❍	3.50 / 4.25	0.38	0.63	0.750	0.469	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421176-187S-0425	421201-187L-0425	WG-4187	❍	❍	4.25 / 5.50	0.38	0.63	0.750	0.469	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421177-187S-055	421202-187L-055	WG-4187	❍	❍	5.50 / 7.50	0.38	0.63	0.750	0.469	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421178-187S-075	421203-187L-075	WG-4187	❍	❍	7.50 / 12.50	0.38	0.63	0.750	0.469	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421179-187S-125	421204-187L-125	WG-4187	❍	❍	12.50 / 40.00	0.38	0.63	0.750	0.469	421324-187GC	1/4-20 x 1 S.H.C.S.	TK-00762
421180-250S-030	421205-250L-030	WG-6250	❍	❍	3.00 / 4.25	0.56	1.00	1.125	0.469	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421181-250S-0425	421206-250L-0425	WG-6250	❍	❍	4.25 / 6.00	0.56	1.00	1.125	0.469	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421182-250S-060	421207-250L-060	WG-6250	❍	❍	6.00 / 8.50	0.56	1.00	1.125	0.469	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421183-250S-085	421208-250L-085	WG-6250	❍	❍	8.50 / 15.50	0.56	1.00	1.125	0.469	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421184-250S-155	421209-250L-155	WG-6250	❍	❍	15.50 / 40.00	0.56	1.00	1.125	0.469	421325-250GC	1/4-20 x 1 S.H.C.S.	TK-00808
421185-312S-030	421210-312L-030	WG-8312	❍	❍	3.00 / 5.00	0.75	1.31	1.500	0.469	421326-312GC	1/4-20 x 1 S.H.C.S.	TK-00823
421186-312S-050	421211-312L-050	WG-8312	❍	❍	5.00 / 9.00	0.75	1.31	1.500	0.469	421326-312GC	1/4-20 x 1 S.H.C.S.	TK-00823
421187-312S-090	421212-312L-090	WG-8312	❍	❍	9.00 / 19.00	0.75	1.31	1.500	0.469	421326-312GC	1/4-20 x 1 S.H.C.S.	TK-00823
421188-312S-190	421213-312L-190	WG-8312	❍	❍	19.00 and up	0.75	1.31	1.500	0.469	421326-312GC	1/4-20 x 1 S.H.C.S.	TK-00823
421189-375S-030	421214-375L-030	WG-8375	❍	❍	3.00 / 5.00	0.75	1.31	1.500	0.469	421327-375GC	1/4-20 x 1 S.H.C.S.	TK-00839
421190-375S-050	421215-375L-050	WG-8375	❍	❍	5.00 / 9.00	0.75	1.31	1.500	0.469	421327-375GC	1/4-20 x 1 S.H.C.S.	TK-00839
421191-375S-090	421216-375L-090	WG-8375	❍	❍	9.00 / 19.00	0.75	1.31	1.500	0.469	421327-375GC	1/4-20 x 1 S.H.C.S.	TK-00839
421192-375S-190	421217-375L-190	WG-8375	❍	❍	19.00 and up	0.75	1.31	1.500	0.469	421327-375GC	1/4-20 x 1 S.H.C.S.	TK-00839

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

See page GP 10 and GP 11 for inserts.

See pages GP 60-62 for additional shank options.

10 Business Days or Less ❍ ❍ Stocked Standard ● ●

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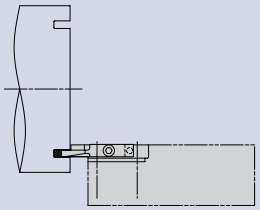
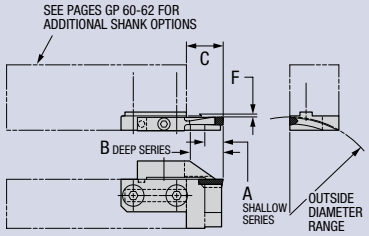
Face Grooving Support Blade D



Left-Hand Shank Shown



Part Number		Gage	Stock		Outside Diameter Range	Dimensions (inches)				Standard Components		*Tune-Up Kit Includes All Standard Components
Shallow Series	Deep Series	Insert	Shallow	Deep		A	B	C	F	Clamp	Clamp Screw	
421268-125S-030	421293-125L-030	WG-4125	❍	❍	3.00 / 3.50	0.38	0.63	0.750	0.031	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421269-125S-035	421294-125L-035	WG-4125	❍	❍	3.50 / 4.25	0.38	0.63	0.750	0.031	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421270-125S-0425	421295-125L-0425	WG-4125	❍	❍	4.25 / 5.50	0.38	0.63	0.750	0.031	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421271-125S-055	421296-125L-055	WG-4125	❍	❍	5.50 / 7.50	0.38	0.63	0.750	0.031	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421272-125S-075	421297-125L-075	WG-4125	❍	❍	7.50 / 12.50	0.38	0.63	0.750	0.031	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421273-125S-125	421298-125L-125	WG-4125	❍	❍	12.50 / 40.00	0.38	0.63	0.750	0.031	421318-125GC	1/4-20 x 1 S.H.C.S.	TK-00800
421274-187S-030	421299-187L-030	WG-4187	❍	❍	3.00 / 3.50	0.38	0.63	0.750	0.031	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421275-187S-035	421300-187L-035	WG-4187	❍	❍	3.50 / 4.25	0.38	0.63	0.750	0.031	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421276-187S-0425	421301-187L-0425	WG-4187	❍	❍	4.25 / 5.50	0.38	0.63	0.750	0.031	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421277-187S-055	421302-187L-055	WG-4187	❍	❍	5.50 / 7.50	0.38	0.63	0.750	0.031	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421278-187S-075	421303-187L-075	WG-4187	●	❍	7.50 / 12.50	0.38	0.63	0.750	0.031	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421279-187S-125	421304-187L-125	WG-4187	❍	❍	12.50 / 40.00	0.38	0.63	0.750	0.031	421319-187GC	1/4-20 x 1 S.H.C.S.	TK-00794
421280-250S-030	421305-250L-030	WG-6250	❍	❍	3.00 / 4.25	0.56	1.00	1.125	0.031	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421281-250S-0425	421306-250L-0425	WG-6250	❍	❍	4.25 / 6.00	0.56	1.00	1.125	0.031	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421282-250S-060	421307-250L-060	WG-6250	❍	❍	6.00 / 8.50	0.56	1.00	1.125	0.031	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421283-250S-085	421308-250L-085	WG-6250	❍	❍	8.50 / 15.50	0.56	1.00	1.125	0.031	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421284-250S-155	421309-250L-155	WG-6250	❍	❍	15.50 / 40.00	0.56	1.00	1.125	0.031	421320-250GC	1/4-20 x 1 S.H.C.S.	TK-00802
421285-312S-030	421310-312L-030	WG-8312	❍	❍	3.00 / 5.00	0.75	1.31	1.500	0.031	421321-312GC	1/4-20 x 1 S.H.C.S.	TK-00849
421286-312S-050	421311-312L-050	WG-8312	❍	❍	5.00 / 9.00	0.75	1.31	1.500	0.031	421321-312GC	1/4-20 x 1 S.H.C.S.	TK-00849
421287-312S-090	421312-312L-090	WG-8312	❍	❍	9.00 / 19.00	0.75	1.31	1.500	0.031	421321-312GC	1/4-20 x 1 S.H.C.S.	TK-00849
421288-312S-190	421313-312L-190	WG-8312	❍	❍	19.00 and up	0.75	1.31	1.500	0.031	421321-312GC	1/4-20 x 1 S.H.C.S.	TK-00849
421289-375S-030	421314-375L-030	WG-8375	❍	❍	3.00 / 5.00	0.75	1.31	1.500	0.031	421322-375GC	1/4-20 x 1 S.H.C.S.	TK-00797
421290-375S-050	421315-375L-050	WG-8375	❍	❍	5.00 / 9.00	0.75	1.31	1.500	0.031	421322-375GC	1/4-20 x 1 S.H.C.S.	TK-00797
421291-375S-090	421316-375L-090	WG-8375	❍	❍	9.00 / 19.00	0.75	1.31	1.500	0.031	421322-375GC	1/4-20 x 1 S.H.C.S.	TK-00797
421292-375S-190	421317-375L-190	WG-8375	❍	❍	19.00 and up	0.75	1.31	1.500	0.031	421322-375GC	1/4-20 x 1 S.H.C.S.	TK-00797

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the support blade.

See page GP 10 and GP 11 for inserts.

See pages GP 60-62 for additional shank options.

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Face Grooving Tools - Ordering Instructions

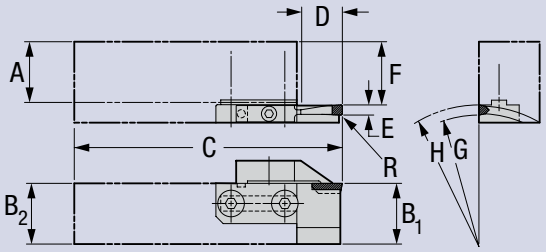
Face grooving tools must be matched to a specific radius and are, therefore, manufactured to order for your particular application.

We offer tools either with integral support blades (SFG) or with separate replaceable blades (AFG). Four combinations are available relative to hand of tool and hand of radius.

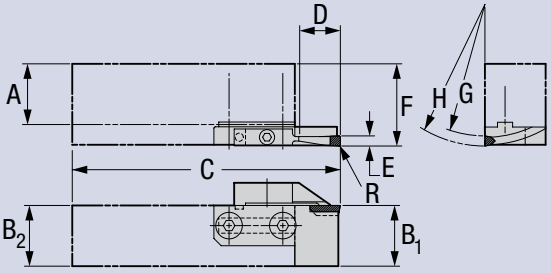
When ordering replaceable blade styles, we suggest the purchase of additional back-up blades at time of original order.

For your convenience in ordering or request for quotation, we have published sample blank engineering data forms. You must provide *ALL* of the dimensional data listed to ensure the correct tool being manufactured.

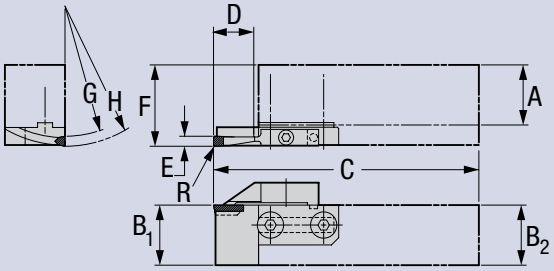
Note: *Tools will be quoted either with radius relieved blades or angular relieved blades, according to groove diameter. Radius relieved blades are illustrated.*



AFGVLL



AFGVLR



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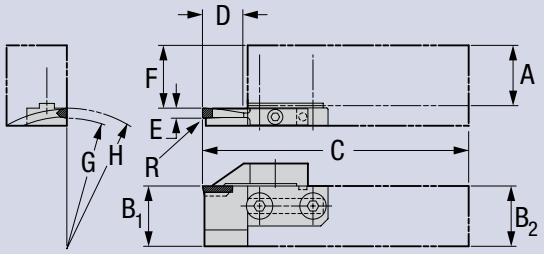

AFGVRR

AFGV_ _	A	C	F
Drawing #	B_1	D (depth of cut)	G (radius)
R (radius)	B_2	E	H (radius)

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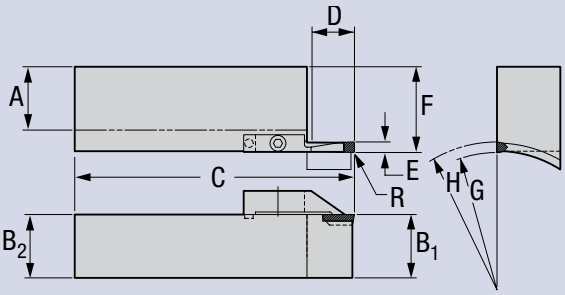
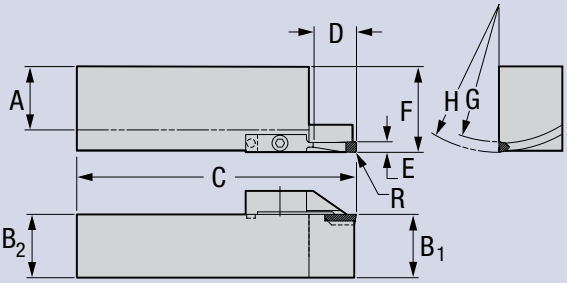
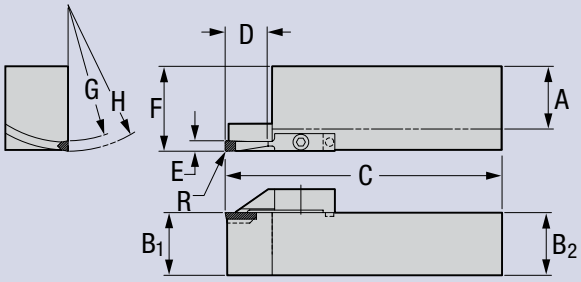


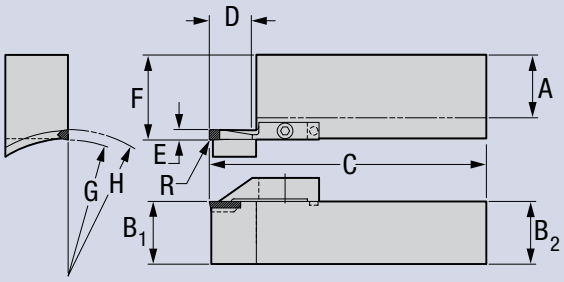
SFGVLL



SFGVLR



SFGVRL



SFGVRR

SFGV_ _	A	C	F
Drawing #	B_1	D (depth of cut)	G (radius)
R (radius)	B_2	E	H (radius)

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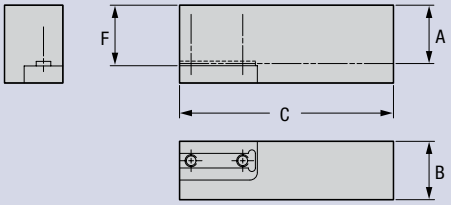
Straight Shank Holder

For Support Blades

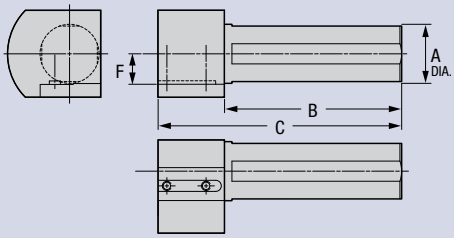


Part Number		Stock		Dimensions (inches)				Standard Component	*Tune-Up Kit Includes All Standard Components
Right	Left	R	L	A	B	C	F	Mounting Screw	
411055	411056	●	●	1.00	1.00	4.50	1.031	5/16-18 x 1 F.H.C.S.	TK-00579
411059	411449	●	●	1.25	1.25	5.50	1.281	5/16-18 x 1 F.H.C.S.	TK-00579
411015	411016	●	●	1.50	1.50	7.50	1.531	5/16-18 x 1 F.H.C.S.	TK-00579

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

Round Shank Holder

For Support Blades



Part Number		Stock		Dimensions (inches)				Standard Component	*Tune-Up Kit Includes All Standard Components
Right	Left	R	L	A	B	C	F	Mounting Screw	
519600	519601	❍	❍	1.50	6.0	8.25	1.031	5/16-18 X 1 F.H.C.S.	TK-00579
519602	519603	●	❍	2.00	6.0	8.25	1.281	5/16-18 X 1 F.H.C.S.	TK-00579
519604	519605	❍	❍	2.50	6.0	8.25	1.531	5/16-18 X 1 F.H.C.S.	TK-00579

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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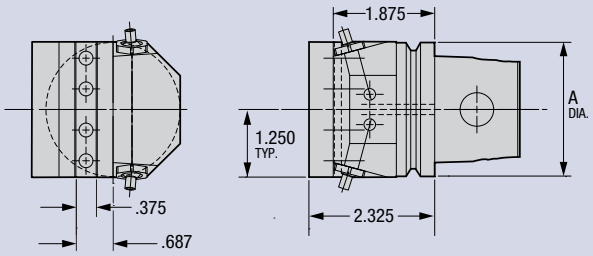
KM Shank

Face Mount



Part Number † Face Mount	Stock	Dimensions (inches) A	Standard Component Mounting Screw	*Tune-Up Kit Includes All Standard Components
SBH-KM50-F	❍	1.969	5/16-18 X 1 F.H.C.S.	TK-00579
SBH-KM63-F	❍	2.480	5/16-18 X 1 F.H.C.S.	TK-00579

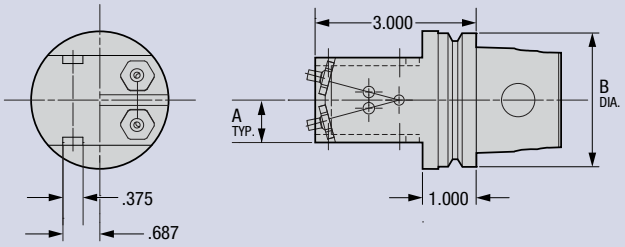
High-pressure coolant – 1,500 PSI Max (100 bar)

***** Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

† These tools based on KM63UT shank.

KM Shank

Side Mount



Part Number † Side Mount	Stock	Dimensions (inches) A	 B	Standard Component Mounting Screw	*Tune-Up Kit Includes All Standard Components
SBH-KM50-S	❍	0.687	1.969	5/16-18 X 1 F.H.C.S.	TK-00579
SBH-KM63-S	❍	0.790	2.480	5/16-18 X 1 F.H.C.S.	TK-00579

High-pressure coolant – 1,500 PSI Max (100 bar)

***** Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

† These tools based on KM63UT shank.

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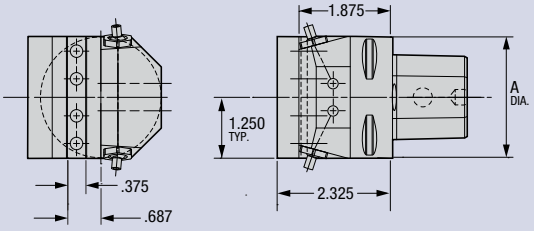
Capto Shank

Face Mount



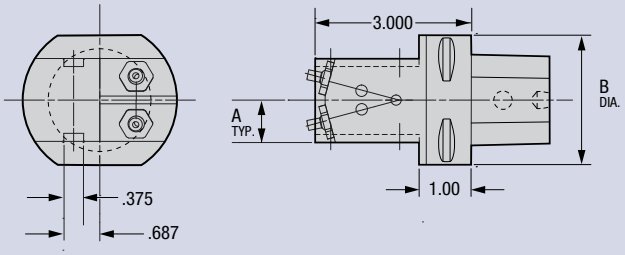
Part Number Face Mount	Stock	Dimensions (inches) A	Standard Component Mounting Screw	*Tune-Up Kit Includes All Standard Components
SBH-C5-F	❍	1.969	5/16-18 X 1 F.H.C.S.	TK-00579
SBH-C6-F	❍	2.480	5/16-18 X 1 F.H.C.S.	TK-00579

High-pressure coolant – 1,500 PSI Max (100 bar)

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

Capto Shank

Side Mount



Part Number Side Mount	Stock	Dimensions (inches) A	 B	Standard Component Mounting Screw	*Tune-Up Kit Includes All Standard Components
SBH-C5-S	❍	0.687	1.969	5/16-18 X 1 F.H.C.S.	TK-00579
SBH-C6-S	●	0.790	2.480	5/16-18 X 1 F.H.C.S.	TK-00579

High-pressure coolant – 1,500 PSI Max (100 bar)

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the toolholder.

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API RING GROOVE MACHINING

Ring Max™ Inserts ..... *RM 03-08*
Ring Max™ II ..... *RM 09-22*
Ring Max™ III ..... *RM 23-33*
Ring Max™ Cartridges ..... *RM 34-36*
Ring Max™ STX ..... *RM 37-44*

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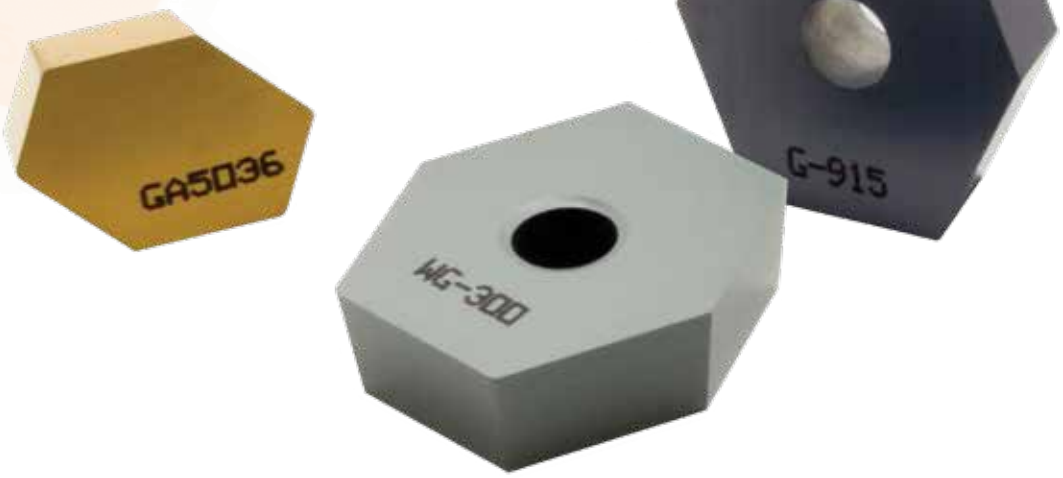
Ring Max™ Grooving Inserts

Utilizing the latest cutting tool technology and coatings, there is a Greenleaf high-performance insert grade for every ring groove need:

- WG-300® whisker-reinforced ceramics for Inconel 625 clad overlay
- Carbide grade G-915 for stainless steel
- Carbide grade GA5036 for alloy steel



Greenleaf Corporation is continually upgrading its products.
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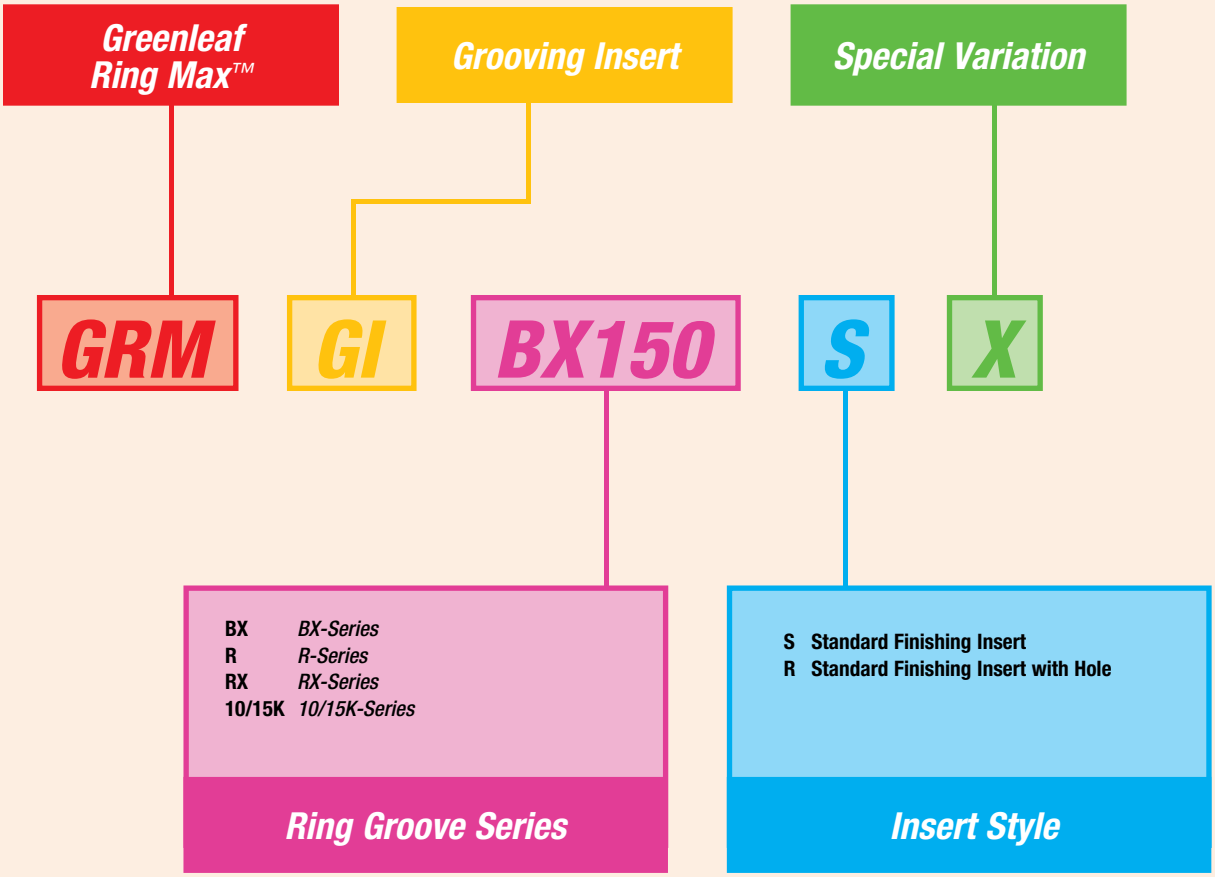
Ring Max™ Grooving Insert Identification System



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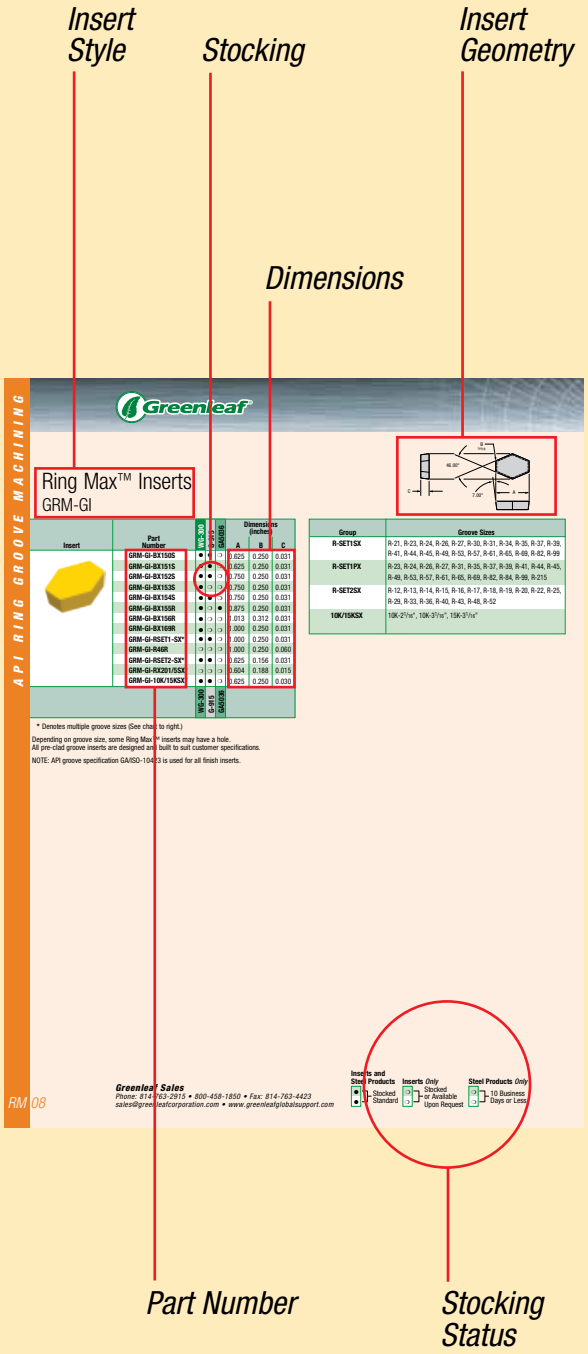
Ring Max™ Grooving Insert Reference Guide



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CARBIDE

COATED

GA5036 A high-performance MT-CVD coated grade for milling steels at high speed. GA5036 should be used when milling forged and cast steels and selected ductile irons. GA5036 has a unique combination of toughness and heat resistance making it suitable for heavy- and light-duty milling at high cutting speeds.

G-915 Multi-layer PVD-coated grade, excellent for milling and turning high-temp alloys, stainless steel, and low-carbon steels. The multi-layer PVD coating adds heat and abrasion resistance to the tough, shock-resistant substrate. G-915 should be run at moderate speeds and moderate to high feeds in milling and interrupted turning applications.

CERAMIC

WG-300® Whisker-reinforced ceramic with excellent wear and shock resistance at high surface speeds. WG-300 is very effective at machining nickel- and cobalt-based super alloys, and other hard materials at metal removal rates up to 10 times higher than carbide.

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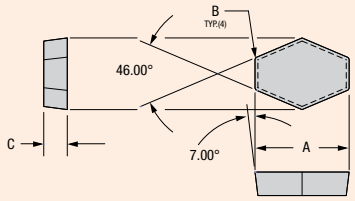
Ring Max™ Inserts
GRM-GI



Insert	Part Number	WG-300	G-915	GA5036	Dimensions (inches) A	B	C
	GRM-GI-BX150S	●	●	❍	0.625	0.250	0.031
	GRM-GI-BX151S	●	●	❍	0.625	0.250	0.031
	GRM-GI-BX152S	●	●	❍	0.750	0.250	0.031
	GRM-GI-BX153S	●	❍	❍	0.750	0.250	0.031
	GRM-GI-BX154S	●	●	❍	0.750	0.250	0.031
	GRM-GI-BX155R	●	❍	●	0.875	0.250	0.031
	GRM-GI-BX156R	●	❍	❍	1.013	0.312	0.031
	GRM-GI-BX169R	●	❍	❍	1.000	0.250	0.031
	GRM-GI-RSET1-SX*	●	●	❍	1.000	0.250	0.031
	GRM-GI-R46R	❍	❍	❍	1.000	0.250	0.060
	GRM-GI-RSET2-SX*	●	❍	❍	0.625	0.156	0.031
	GRM-GI-RX201/5SX*	❍	❍	❍	0.604	0.188	0.015
	GRM-GI-10K/15KSX*	●	❍	❍	0.625	0.250	0.030
		WG-300	G-915	GA5036			

Group	Groove Sizes
R-SET1SX	R-21, R-23, R-24, R-26, R-27, R-30, R-31, R-34, R-35, R-37, R-39, R-41, R-44, R-45, R-49, R-53, R-57, R-61, R-65, R-69, R-82, R-84, R-99
R-SET2SX	R-12, R-13, R-14, R-15, R-16, R-17, R-18, R-19, R-20, R-22, R-25, R-29, R-33, R-36, R-40, R-43, R-48, R-52
10K/15KSX	10K-2 1/16", 10K-3 1/16", 15K-3 1/16"

* Denotes multiple groove sizes (See chart to right.)

NOTE: Depending on groove size, some Ring Max™ inserts may have a hole.
All pre-clad groove inserts are designed and built to suit customer specifications.

NOTE: API groove specification GA/ISO-10423 is used for all finish inserts.

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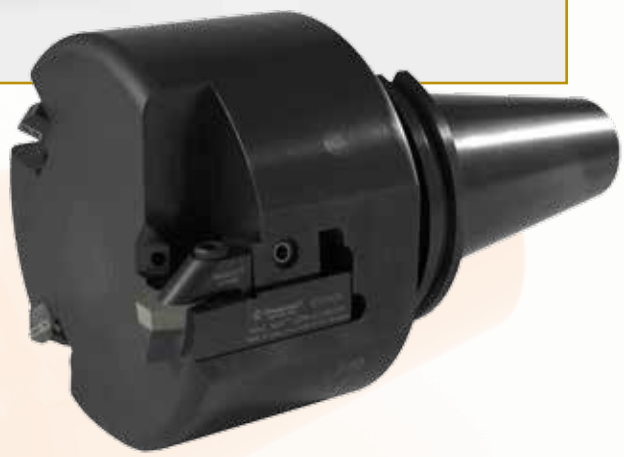
Ring Max™ II Ring Groove Tooling

The Ring Max™ II cutters are designed to use fewer components for even greater dimensional accuracy and repeatability from groove to groove. Their unique design ensures accurate seating and secure locking of the insert cartridge into the cutter body.

Standard features and benefits include:

- Roughing and finishing of BX, R and RX API ring grooves in Inconel 625 clad overlay in less than one minute
- Adjustable and replaceable cartridge design for easy maintenance
- Machining the groove and chamfers in one operation
- Availability for grooving in stainless and alloy steel



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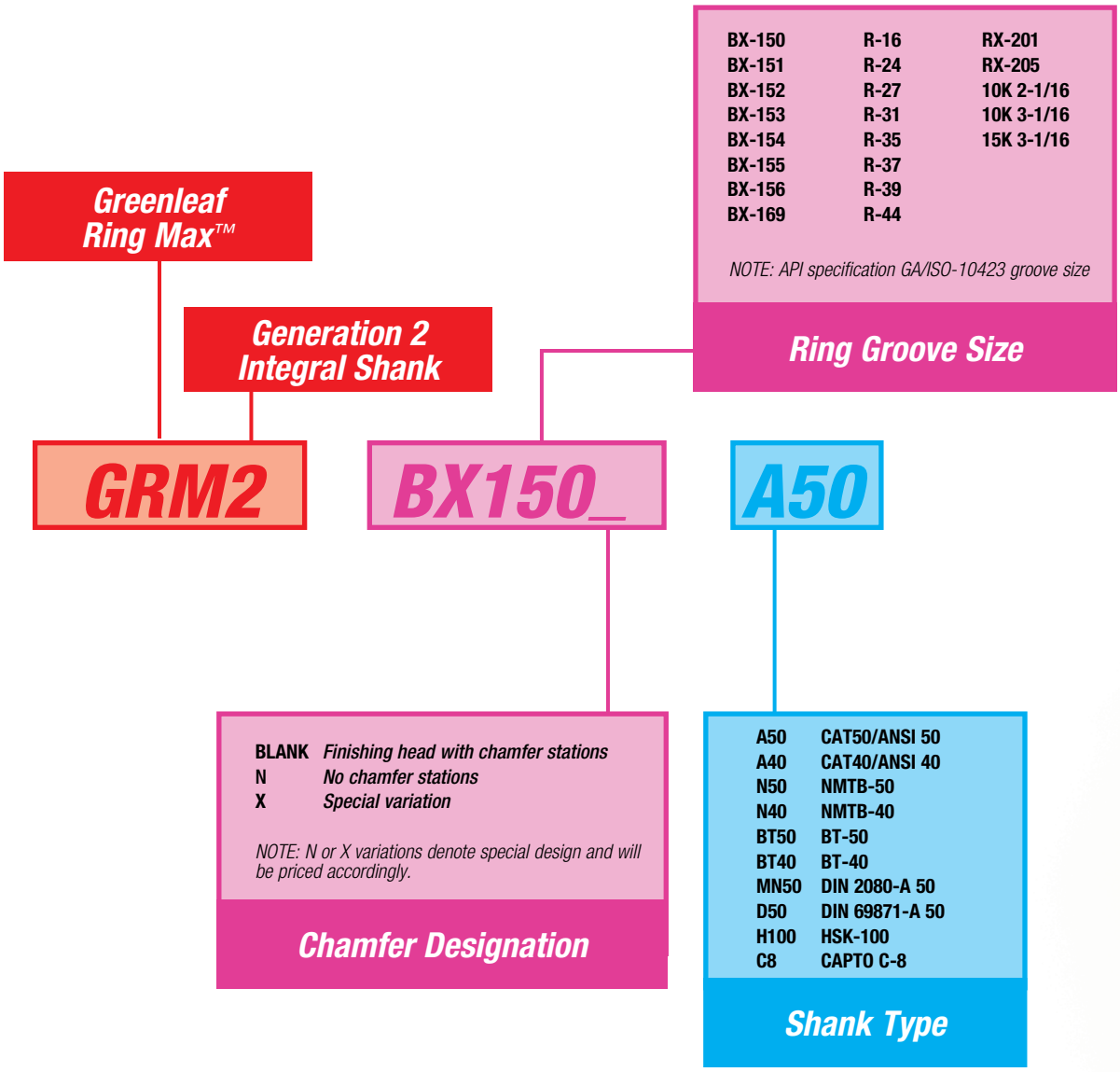
Ring Max™ II – Finishing Head Identification System



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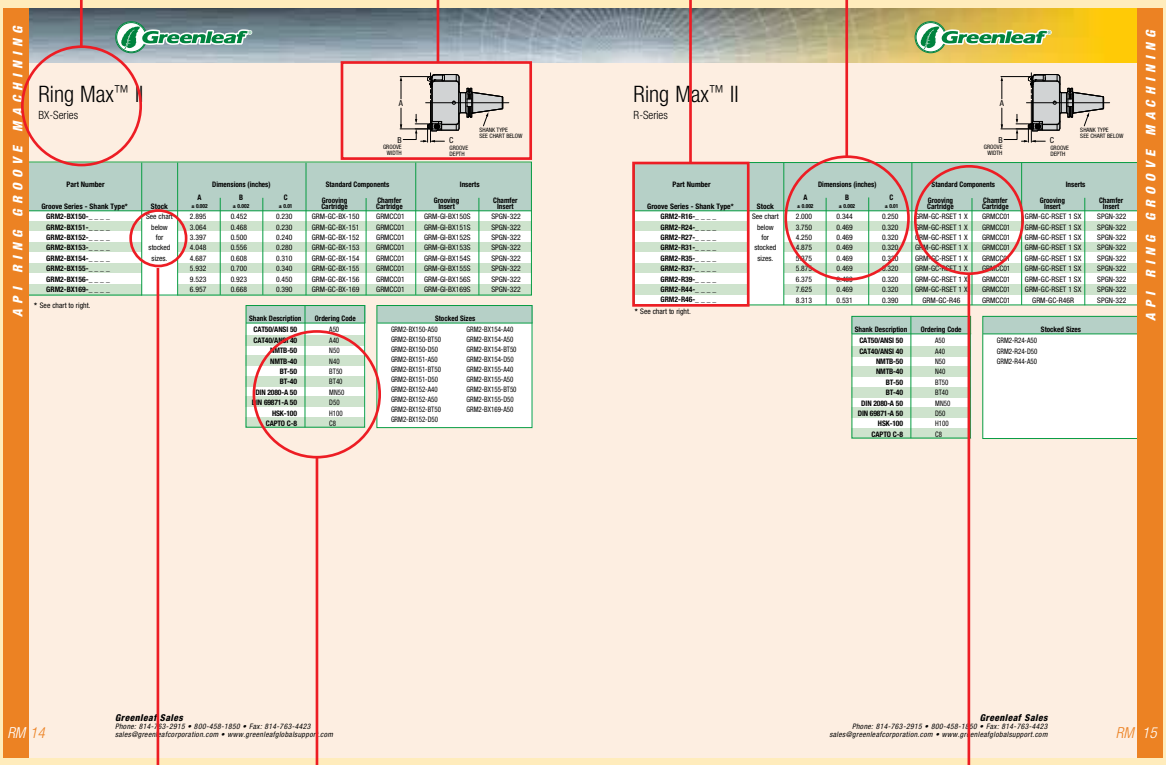
Ring Max™ II – Ring Groove Tooling Usage Reference Guide

Tooling Style

Tooling Geometry

Part Number

Dimensions



Ring Max™ II
BX-Series

Part Number Groove Series - Shank Type*	Stock	Dimensions (inches) A ±.002	B ±.002	C ±.01	Standard Components Grooving Cartridge	Chamfer Cartridge	Inserts Grooving Insert	Chamfer Insert
GRM2-BX150-____	See chart below for stocked sizes.	2.895	0.452	0.230	GRM-GC-BX-150	GRMCC01	GRM-GI-BX150S	SPGN-322
GRM2-BX151-____		3.064	0.468	0.230	GRM-GC-BX-151	GRMCC01	GRM-GI-BX151S	SPGN-322
GRM2-BX152-____		3.397	0.500	0.240	GRM-GC-BX-152	GRMCC01	GRM-GI-BX152S	SPGN-322
GRM2-BX153-____		4.048	0.556	0.280	GRM-GC-BX-153	GRMCC01	GRM-GI-BX153S	SPGN-322
GRM2-BX154-____		4.687	0.608	0.310	GRM-GC-BX-154	GRMCC01	GRM-GI-BX154S	SPGN-322
GRM2-BX155-____		5.932	0.700	0.340	GRM-GC-BX-155	GRMCC01	GRM-GI-BX155S	SPGN-322
GRM2-BX156-____		9.523	0.923	0.450	GRM-GC-BX-156	GRMCC01	GRM-GI-BX156S	SPGN-322
GRM2-BX169-____		6.957	0.668	0.390	GRM-GC-BX-169	GRMCC01	GRM-GI-BX169S	SPGN-322

* See chart to right.

Shank Description	Ordering Code
CAT50/ANSI 50	A50
CAT40/ANSI 40	A40
NMTB-50	N50
NMTB-40	N40
BT-50	BT50
BT-40	BT40
DIN 2080-A 50	MN50
DIN 69871-A 50	D50
HSK-100	H100
CAPTO C-8	C8

Stocked Sizes	
GRM2-BX150-A50	GRM2-BX154-A40
GRM2-BX150-BT50	GRM2-BX154-A50
GRM2-BX150-D50	GRM2-BX154-BT50
GRM2-BX151-A50	GRM2-BX154-D50
GRM2-BX151-BT50	GRM2-BX155-A40
GRM2-BX151-D50	GRM2-BX155-A50
GRM2-BX152-A40	GRM2-BX155-BT50
GRM2-BX152-A50	GRM2-BX155-D50
GRM2-BX152-BT50	GRM2-BX169-A50
GRM2-BX152-D50	

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Ring Max™ II
R-Series

Part Number Groove Series - Shank Type*	Stock	Dimensions (inches) A ±.002	B ±.002	C ±.01	Standard Components Grooving Cartridge	Chamfer Cartridge	Inserts Grooving Insert	Chamfer Insert
GRM2-R16-____	See chart below for stocked sizes.	2.000	0.344	0.250	GRM-GC-RSET 1 X	GRMCC01	GRM-GC-RSET 1 SX	SPGN-322
GRM2-R24-____		3.750	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GC-RSET 1 SX	SPGN-322
GRM2-R27-____		4.250	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GC-RSET 1 SX	SPGN-322
GRM2-R31-____		4.875	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GC-RSET 1 SX	SPGN-322
GRM2-R35-____		5.375	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GC-RSET 1 SX	SPGN-322
GRM2-R37-____		5.875	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GC-RSET 1 SX	SPGN-322
GRM2-R39-____		6.375	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GC-RSET 1 SX	SPGN-322
GRM2-R44-____		7.625	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GC-RSET 1 SX	SPGN-322
GRM2-R46-____		8.313	0.531	0.390	GRM-GC-R46	GRMCC01	GRM-GC-R46R	SPGN-322

* See chart to right.

Shank Description	Ordering Code
CAT50/ANSI 50	A50
CAT40/ANSI 40	A40
NMTB-50	N50
NMTB-40	N40
BT-50	BT50
BT-40	BT40
DIN 2080-A 50	MN50
DIN 69871-A 50	D50
HSK-100	H100
CAPTO C-8	C8

Stocked Sizes
GRM2-R24-A50
GRM2-R24-D50
GRM2-R44-A50

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Stocking Information

Shank Options

Standard Components

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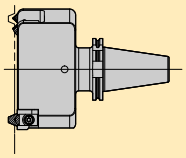
Ring Groove Tooling



Ring Max™ II
BX Series
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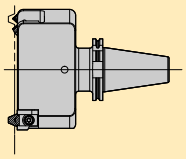
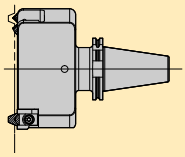


Ring Max™ II
R Series
page: RM 15



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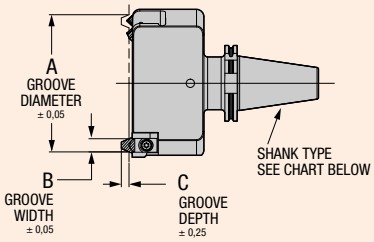
Ring Max™ II

BX Series



Part Number Groove Series - Shank Type*	Stock	Dimensions (inches) A	 B	 C	Standard Components Grooving Cartridge	 Chamfer Cartridge	Inserts Grooving Insert	 Chamfer Insert
GRM2-BX150-_ _ _ _	See chart	2.895	0.452	0.230	GRM-GC-BX-150	GRMCC01	GRM-GI-BX150S	SPGN-322
GRM2-BX151-_ _ _ _	below	3.064	0.468	0.230	GRM-GC-BX-151	GRMCC01	GRM-GI-BX151S	SPGN-322
GRM2-BX152-_ _ _ _	for	3.397	0.500	0.240	GRM-GC-BX-152	GRMCC01	GRM-GI-BX152S	SPGN-322
GRM2-BX153-_ _ _ _	stocked	4.048	0.556	0.280	GRM-GC-BX-153	GRMCC01	GRM-GI-BX153S	SPGN-322
GRM2-BX154-_ _ _ _	sizes.	4.687	0.608	0.310	GRM-GC-BX-154	GRMCC01	GRM-GI-BX154S	SPGN-322
GRM2-BX155-_ _ _ _		5.932	0.700	0.340	GRM-GC-BX-155	GRMCC01	GRM-GI-BX155R	SPGN-322
GRM2-BX156-_ _ _ _		9.523	0.923	0.450	GRM-GC-BX-156	GRMCC01	GRM-GI-BX156R	SPGN-322
GRM2-BX169-_ _ _ _		6.957	0.668	0.390	GRM-GC-BX-169	GRMCC01	GRM-GI-BX169R	SPGN-322

***** See chart to right.

Shank Description	Ordering Code
CAT50/ANSI 50	A50
CAT40/ANSI 40	A40
NMTB-50	N50
NMTB-40	N40
BT-50	BT50
BT-40	BT40
DIN 2080-A 50	MN50
DIN 69871-A 50	D50
HSK-100	H100
CAPTO C-8	C8

Stocked Sizes	
GRM2-BX150-A50	GRM2-BX154-A40
GRM2-BX150-BT50	GRM2-BX154-A50
GRM2-BX150-D50	GRM2-BX154-BT50
GRM2-BX151-A50	GRM2-BX154-D50
GRM2-BX151-BT50	GRM2-BX155-A40
GRM2-BX151-D50	GRM2-BX155-A50
GRM2-BX152-A40	GRM2-BX155-BT50
GRM2-BX152-A50	GRM2-BX155-D50
GRM2-BX152-BT50	GRM2-BX156-A50
GRM2-BX152-D50	GRM2-BX169-A50

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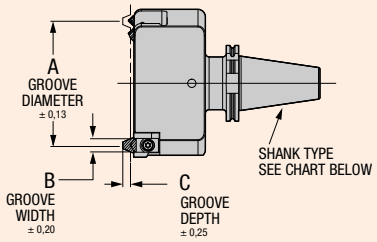
Ring Max™ II

R Series



Part Number		Dimensions (inches)			Standard Components		Inserts	
Groove Series - Shank Type*	Stock	A	B	C	Grooving Cartridge	Chamfer Cartridge	Grooving Insert	Chamfer Insert
GRM2-R16-_ _ _ _	See chart	2.000	0.344	0.250	GRM-GC-RSET 2 AX	GRMCC01	GRM-GI-RSET 2 SX	SPGN-322
GRM2-R24-_ _ _ _	below	3.750	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
GRM2-R27-_ _ _ _	for	4.250	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
GRM2-R31-_ _ _ _	stocked	4.875	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
GRM2-R35-_ _ _ _	sizes.	5.375	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
GRM2-R37-_ _ _ _		5.875	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
GRM2-R39-_ _ _ _		6.375	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
GRM2-R44-_ _ _ _		7.625	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
GRM2-R46-_ _ _ _		8.313	0.531	0.390	GRM-GC-R46	GRMCC01	GRM-GI-R46R	SPGN-322

* See chart to right.

Shank Description	Ordering Code
CAT50/ANSI 50	A50
CAT40/ANSI 40	A40
NMTB-50	N50
NMTB-40	N40
BT-50	BT50
BT-40	BT40
DIN 2080-A 50	MN50
DIN 69871-A 50	D50
HSK-100	H100
CAPTO C-8	C8

Stocked Sizes
GRM2-R24-A50
GRM2-R24-D50
GRM2-R24N-A50
GRM2-R24N-D50

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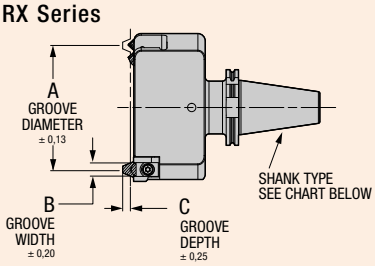
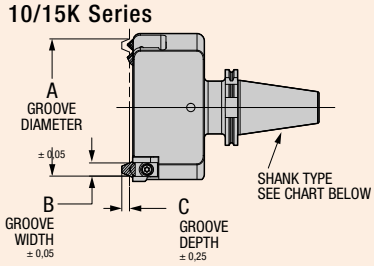
Ring Max™ II

RX Series
10K and 15K Series

RX Series



10/15K Series



Part Number		Dimensions (inches)			Standard Components		Inserts	
Groove Series - Shank Type*	Stock	A	B	C	Grooving Cartridge	Chamfer Cartridge	Grooving Insert	Chamfer Insert
GRM2-RX201N-_ _ _ _	See chart	1.813	0.219	0.160	GRM-GCRX201/5-X	N/A	GRM-GI-RX201/5SX	N/A
GRM2-RX205N-_ _ _ _	below	2.250	0.219	0.160	GRM-GCRX201/5-X	N/A	GRM-GI-RX201/5SX	N/A
GRM2-10K2-_ _ _ _	for	4.623	0.377	0.258	GRM-GC10/15K-X	GRMCC01	GRM-GI-10/15KSX	SPGN-322
GRM2-10K3N-_ _ _ _	stocked	5.748	0.377	0.258	GRM-GC10/15K-X	N/A	GRM-GI-10/15KSX	N/A
GRM2-10K5-_ _ _ _	sizes.	8.748	0.377	0.258	GRM-GC10/15K-X	GRMCC01	GRM-GI-10/15KSX	SPGN-322
GRM2-15K3-_ _ _ _		6.623	0.377	0.258	GRM-GC10/15K-X	GRMCC01	GRM-GI-10/15KSX	SPGN-322

* See chart to right.

Shank Description	Ordering Code
CAT50/ANSI 50	A50
CAT40/ANSI 40	A40
NMTB-50	N50
NMTB-40	N40
BT-50	BT50
BT-40	BT40
DIN 2080-A 50	MN50
DIN 69871-A 50	D50
HSK-100	H100
CAPTO C-8	C8

Stocked Sizes

Ring Max™ II RX and 10/15K Series are not standard stocked items.

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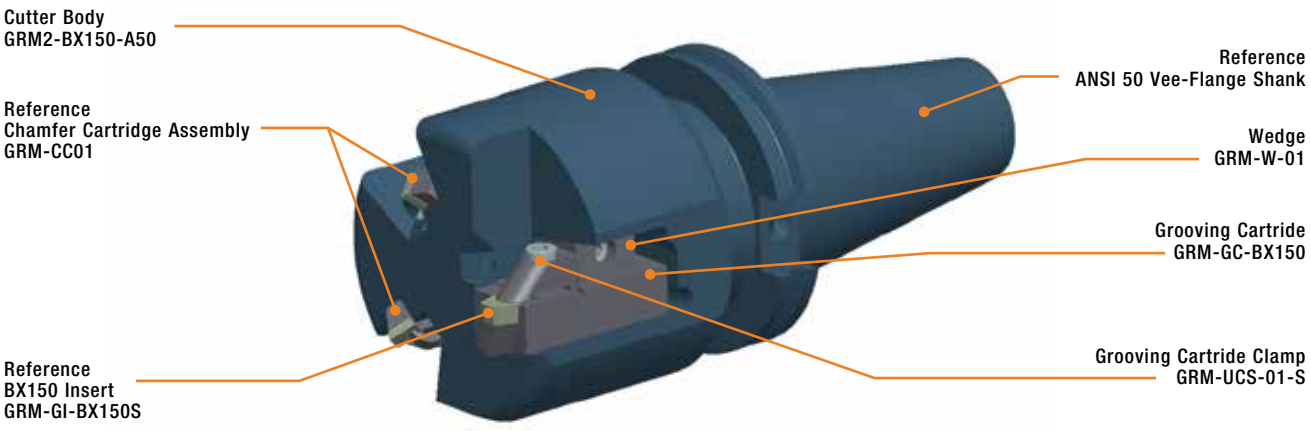
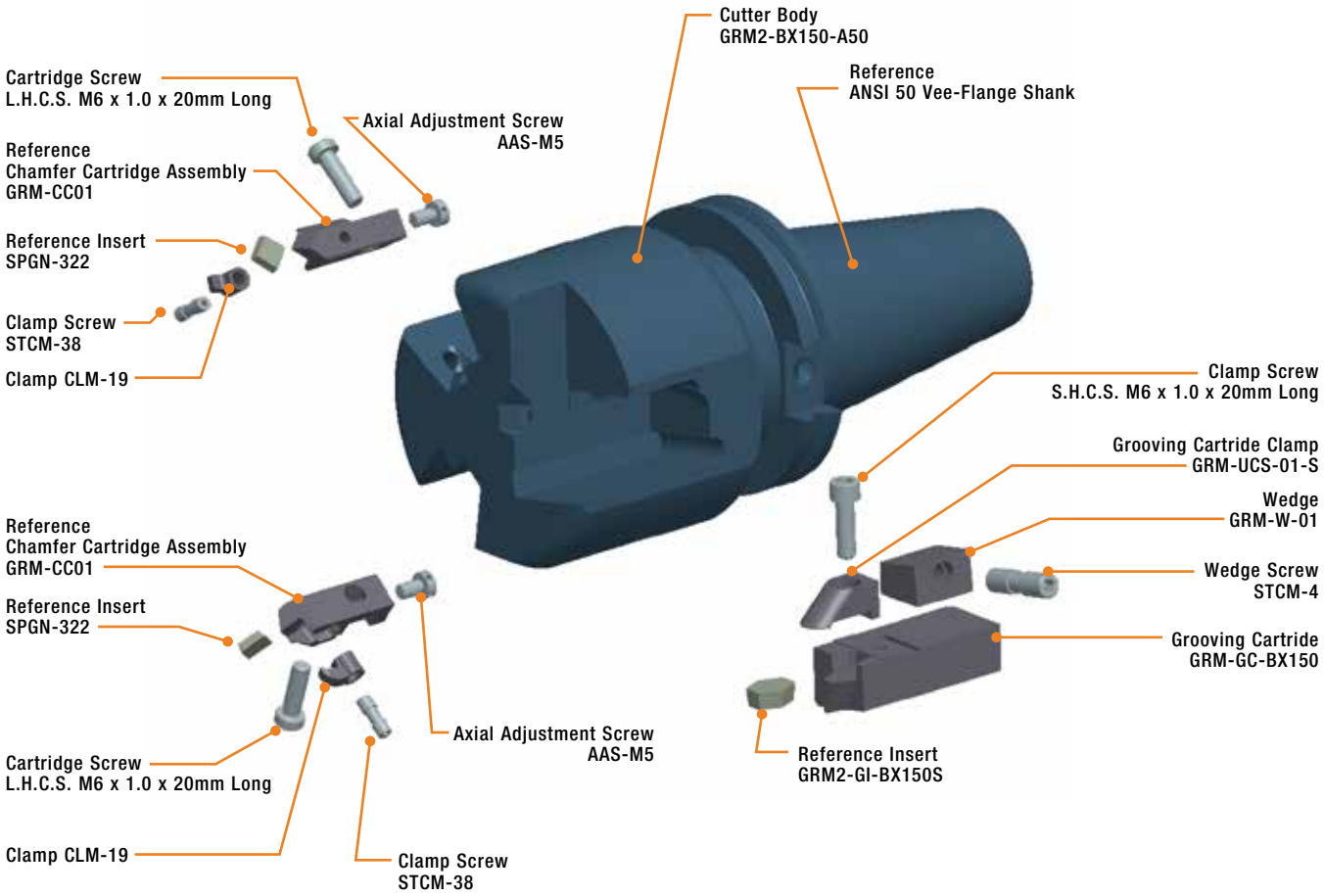
Ring Max™ II – Assembled & Exploded Views Reference Guide





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engineering@ greenleafcorporation.com
via **FAX**
814-763-4040

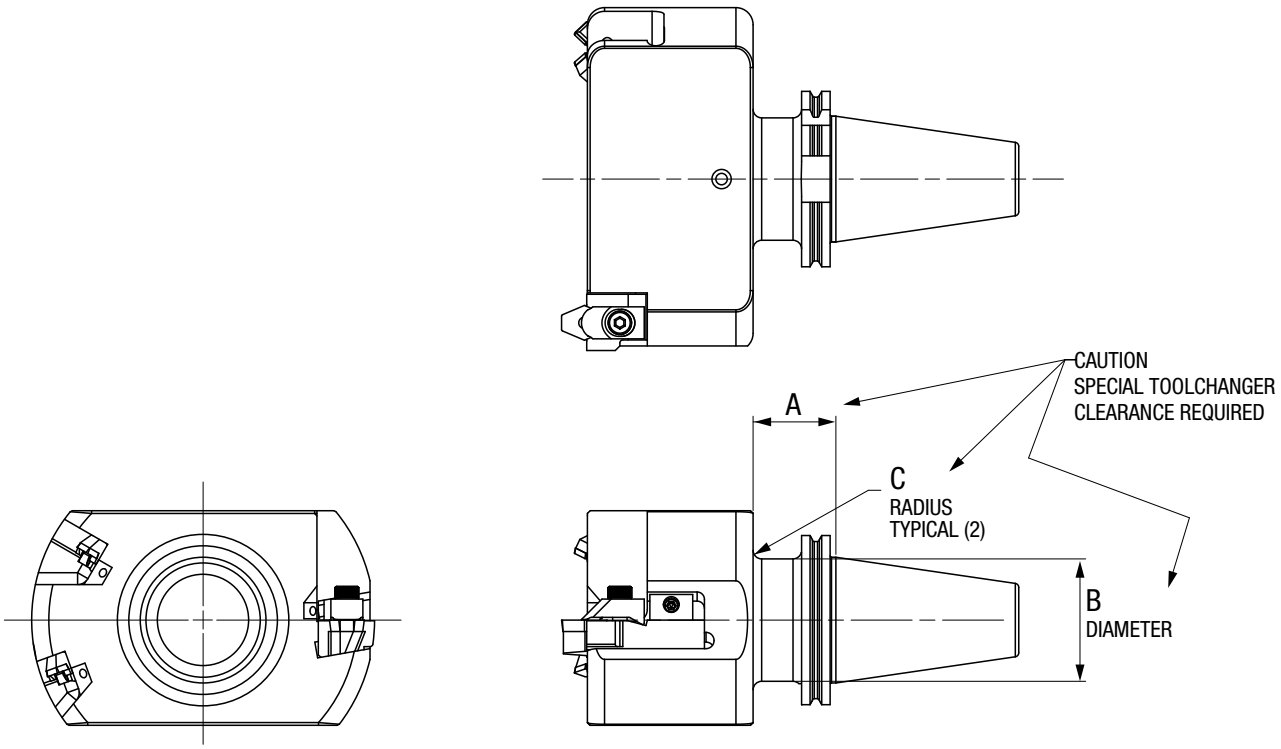
Special Toolchanger Clearance Request Form

Part Information:

Reference Groove Number: _____ Reference Shank Size: _____

A distance: _____ B diameter: _____ C radius: _____

Additional comments: _____



Company _____ Customer Number _____

Attention _____ Customer Inquiry Number _____

Street _____ Ship to City _____ Country _____

City _____ State _____ Zip Code _____ Send Copy to _____

Phone _____ FAX _____ _____

Email _____ Sales Rep _____ Date Received _____ Due Date _____

FOR FAST QUOTE, complete form and send
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via **FAX**
814-763-4040

Pre-Clad Head Quote Request Form

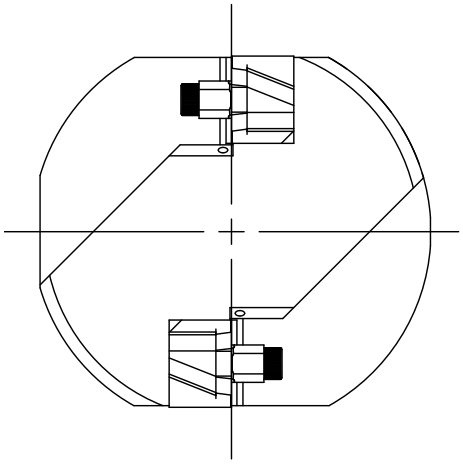
Part Information:

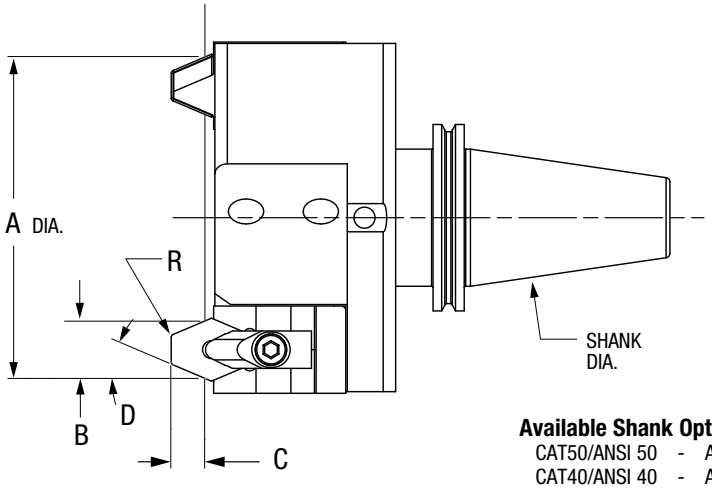
Part Name: _____

Clad Material: _____ Insert Grade: _____

Quote quantities: Heads: _____ Cartiridges: _____ Inserts: _____

Additional comments: _____





Available Shank Options:

CAT50/ANSI 50	-	A50
CAT40/ANSI 40	-	A40
NMTB-50	-	N50
NMTB-40	-	N40
BT-50	-	BT50
BT-40	-	BT40
DIN 2080-A 50	-	MN50
DIN 69871-A 50	-	D50
HSK-100	-	H100
CAPTO C-8	-	C8

Dimensions *(Please provide required tolerances.)*					Shank
A ±_____	B ±_____	C ±_____	D ±_____	R ±_____	

Company _____ **Customer Number** _____

Attention _____ **Customer Inquiry Number** _____

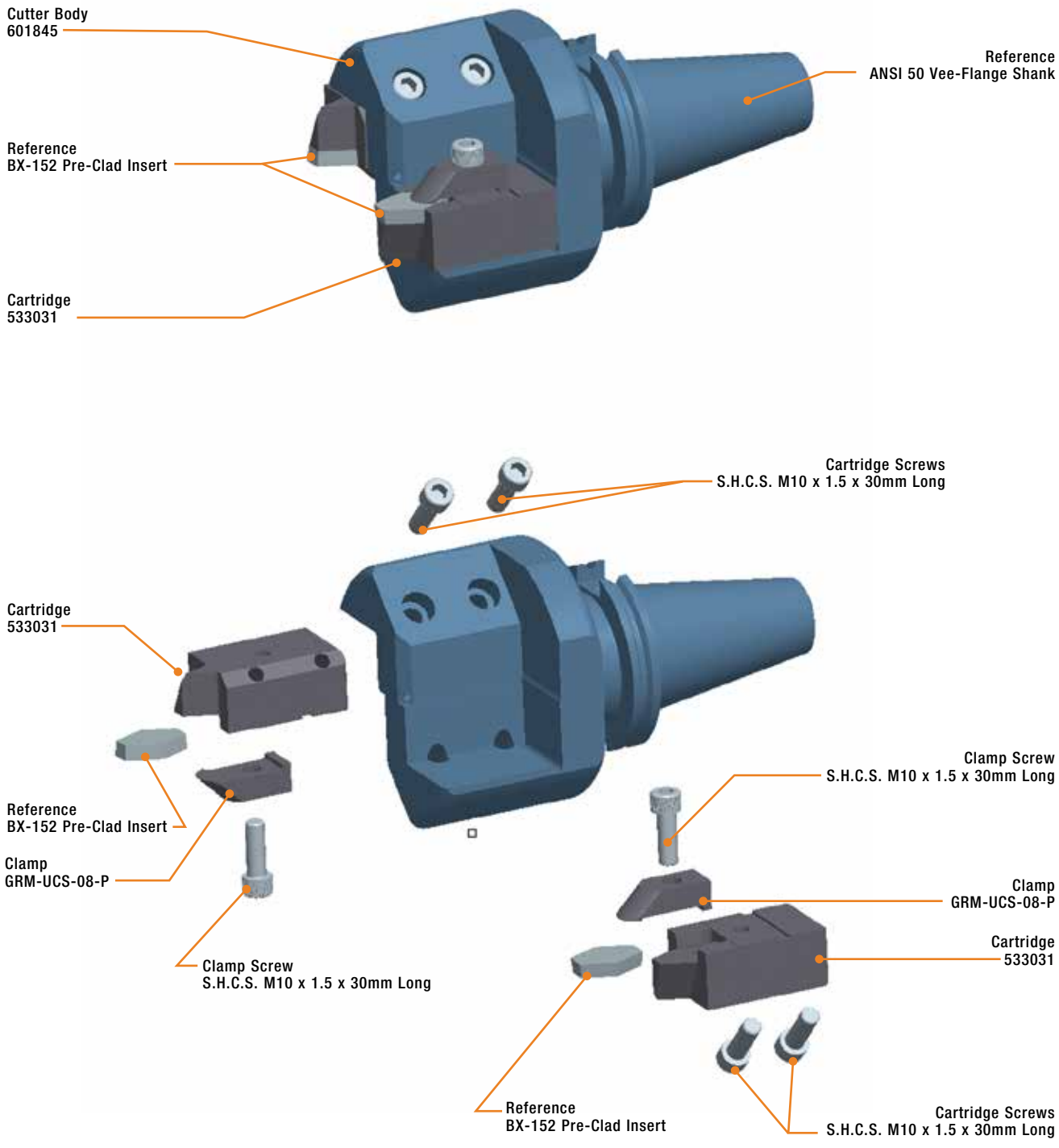
Street _____ **Ship to City** _____ **Country** _____

City _____ **State** _____ **Zip Code** _____ **Send Copy to** _____

Phone _____ **FAX** _____ _____

Email _____ **Sales Rep** _____ **Date Received** _____ **Quote Due Date** _____

Ring Max™ BX-152 Pre-Clad – Assembled & Exploded Views Reference Guide



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Ring Max™ – Machining Methods Reference Guide

Method One

Use these instructions for setting gage points and establishing target ring groove depths using an optical comparator.

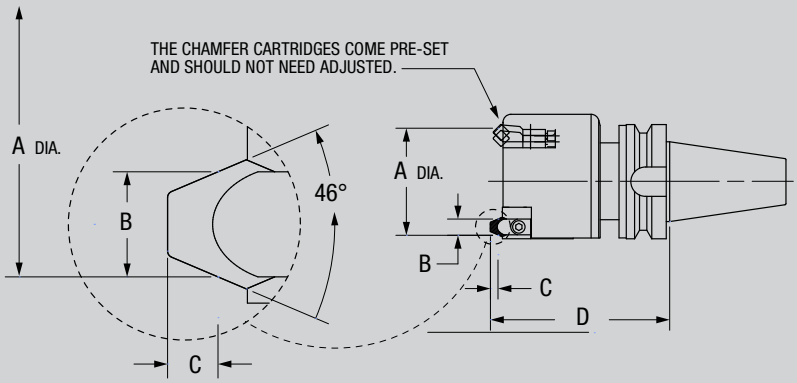
Step One:

Using an optical comparator, find and set the gage points at the groove's A diameter at mid-tolerance. The groove's B dimension will be within the allowable tolerance range.

Step Two:

Once the gage points in Step One have been determined, measure and record the tool's Z length and the actual measured C dimension over the insert nose.

NOTE: The measured C dimension is the target machining depth and will be within the groove's allowable part tolerance.



Example for BX-152

A		B	C		Z
Part print dimension and tolerance	Target this diameter for gage points	Part print dimension and tolerance	Part print dimension and tolerance	Measure and target this depth for programming	Measure and use this depth for programming
3.395 + 0.004 – 0.000	3.397	0.498 + 0.004 – 0.000	0.23 + 0.020 – 0.000		

Method Two

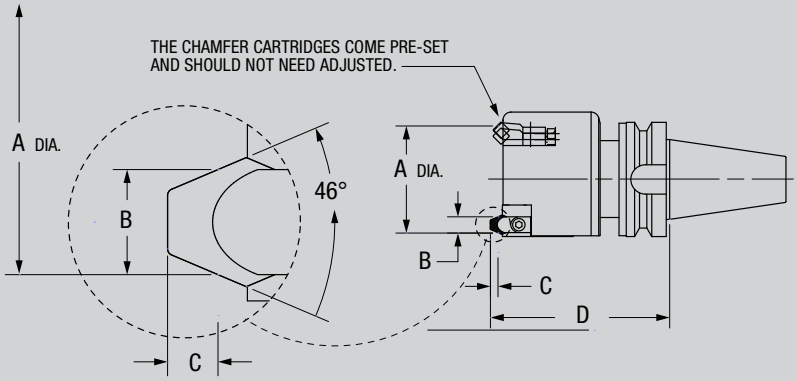
This method is used to machine ring grooves in a rough and finish pass.

Step One:

Machine the groove but reduce the groove depth to leave stock for the finish pass.

Step Two:

Measure the groove's A diameter and use the chart below to determine the additional D depth necessary to bring the A diameter into mid-tolerance.



If the A groove diameter is undersize by:	Increase the groove depth D by:
0.0010	0.0012
0.0020	0.0023
0.0030	0.0035
0.0040	0.0047
0.0050	0.0059
0.0060	0.0071
0.0070	0.0082
0.0080	0.0094
0.0090	0.0106
0.0100	0.0118
0.0110	0.0130
0.0120	0.0141

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Ring Max™ III Ring Groove Tooling

The Ring Max™ III is a high-precision, two-piece modular system for shop versatility. This system offers many head and shank configurations, including adaptability to Greenleaf's Excelerator® face mills. The Ring Max™ III line delivers the ultimate economical and flexible solution for any shop machining multiple API ring groove sizes.

Standard features and benefits include:

- Roughing and finishing of BX, R and RX API ring grooves in Inconel 625 clad overlay in less than one minute
- Adjustable and replaceable cartridge design for easy maintenance
- Machining the groove and chamfers in one operation
- Availability for grooving in stainless and alloy steel

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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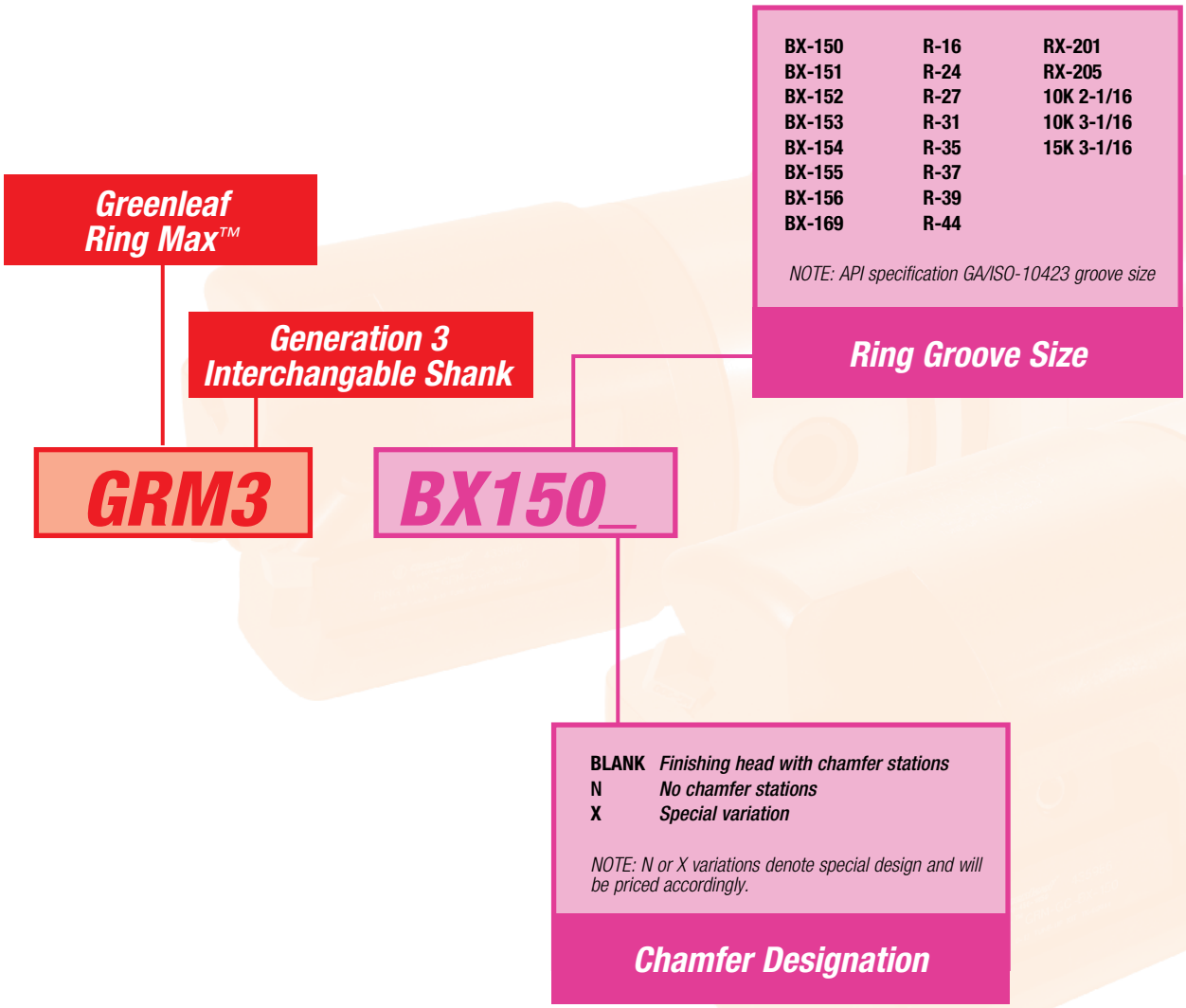
Ring Max™ III – Finishing Head Identification System



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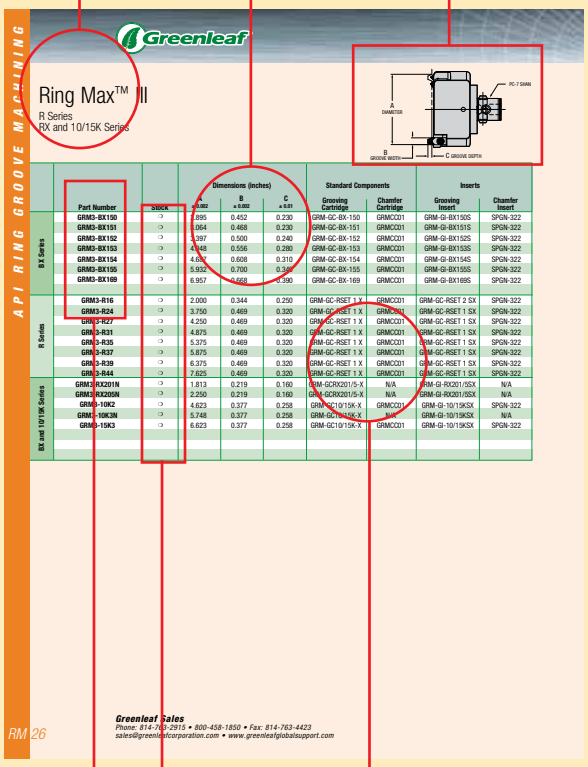
Ring Max™ III – Ring Groove Tooling Usage Reference Guide

Tooling Style

Tooling Geometry

Dimensions



Stocking Program

Part Number

Standard Components

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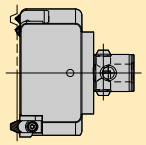
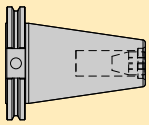
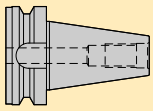
Ring Groove Tooling

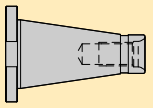


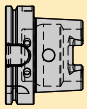
Ring Max™ III
BX Series
R Series
RX Series
10/15K Series
page: RM 28

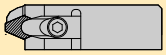


Ring Max™
Shank Options
page: RM 29

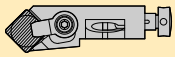








Ring Max™
Grooving Cartridge
page: RM 35



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Chamfer Cartridge
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Reference

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Models
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Ring Max™ III Pre-Clad
Models
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Pre-Clad Head
Quote Request Form
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Machining Methods
Reference Guide
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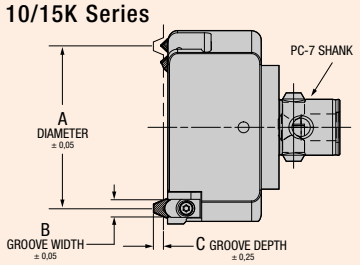
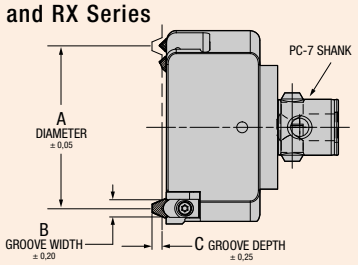
Ring Max™ III

BX Series
R Series
RX and 10/15K Series

BX and 10/15K Series



R and RX Series



	Part Number	Stock	Dimensions (inches) A	B	C	Standard Components Grooving Cartridge	Chamfer Cartridge	Inserts Grooving Insert	Chamfer Insert
BX Series	GRM3-BX150	❍	2.895	0.452	0.230	GRM-GC-BX-150	GRMCC01	GRM-GI-BX150S	SPGN-322
	GRM3-BX151	❍	3.064	0.468	0.230	GRM-GC-BX-151	GRMCC01	GRM-GI-BX151S	SPGN-322
	GRM3-BX152	●	3.397	0.500	0.240	GRM-GC-BX-152	GRMCC01	GRM-GI-BX152S	SPGN-322
	GRM3-BX153	❍	4.048	0.556	0.280	GRM-GC-BX-153	GRMCC01	GRM-GI-BX153S	SPGN-322
	GRM3-BX154	●	4.687	0.608	0.310	GRM-GC-BX-154	GRMCC01	GRM-GI-BX154S	SPGN-322
	GRM3-BX155	●	5.932	0.700	0.340	GRM-GC-BX-155	GRMCC01	GRM-GI-BX155R	SPGN-322
	GRM3-BX169	❍	6.957	0.668	0.390	GRM-GC-BX-169	GRMCC01	GRM-GI-BX169R	SPGN-322
R Series	GRM3-R16	❍	2.000	0.344	0.250	GRM-GC-RSET 2 AX	GRMCC01	GRM-GI-RSET 2 SX	SPGN-322
	GRM3-R24	●	3.750	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
	GRM3-R27	❍	4.250	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
	GRM3-R31	❍	4.875	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
	GRM3-R35	❍	5.375	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
	GRM3-R37	❍	5.875	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
	GRM3-R39	❍	6.375	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
	GRM3-R44	❍	7.625	0.469	0.320	GRM-GC-RSET 1 X	GRMCC01	GRM-GI-RSET 1 SX	SPGN-322
RX and 10/15K Series	GRM3-RX201N	❍	1.813	0.219	0.160	GRM-GCRX201/5-X	N/A	GRM-GI-RX201/5SX	N/A
	GRM3-RX205N	❍	2.250	0.219	0.160	GRM-GCRX201/5-X	N/A	GRM-GI-RX201/5SX	N/A
	GRM3-10K2	❍	4.623	0.377	0.258	GRM-GC10/15K-X	GRMCC01	GRM-GI-10/15KSX	SPGN-322
	GRM3-10K3N	❍	5.748	0.377	0.258	GRM-GC10/15K-X	N/A	GRM-GI-10/15KSX	N/A
	GRM3-15K3	❍	6.623	0.377	0.258	GRM-GC10/15K-X	GRMCC01	GRM-GI-10/15KSX	SPGN-322

NOTE: Due to blank availability, special designs may need to be a two-piece weld construction or no quote.

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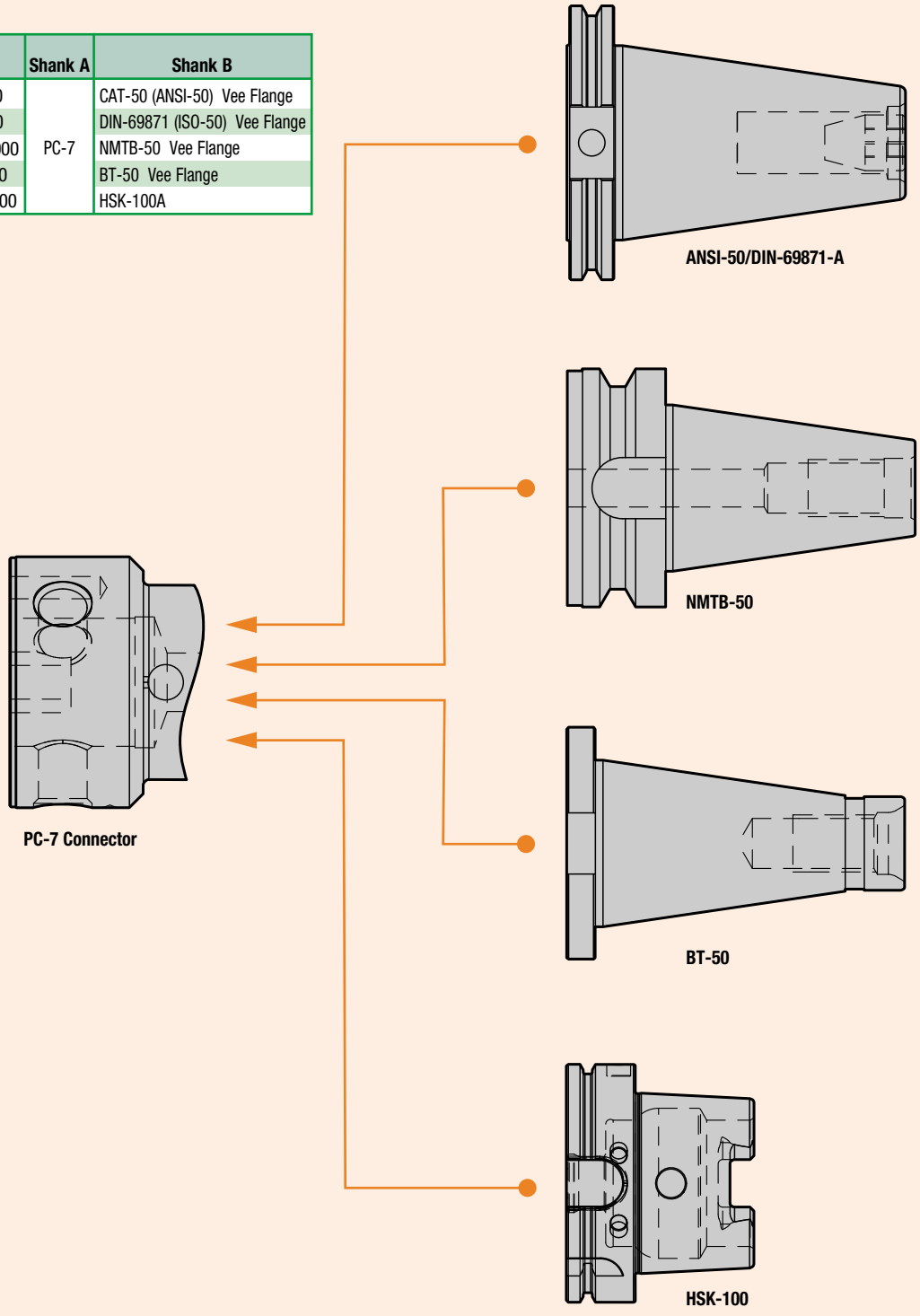
Ring Max™ III

Shank Options

Adapter Designation	Shank A	Shank B
04-GRMA50-000	PC-7	CAT-50 (ANSI-50) Vee Flange
04-GRMD50-000		DIN-69871 (ISO-50) Vee Flange
04-GRMNMTB50-000		NMTB-50 Vee Flange
04-GRMBT50-000		BT-50 Vee Flange
04-GRMHSK100-000		HSK-100A



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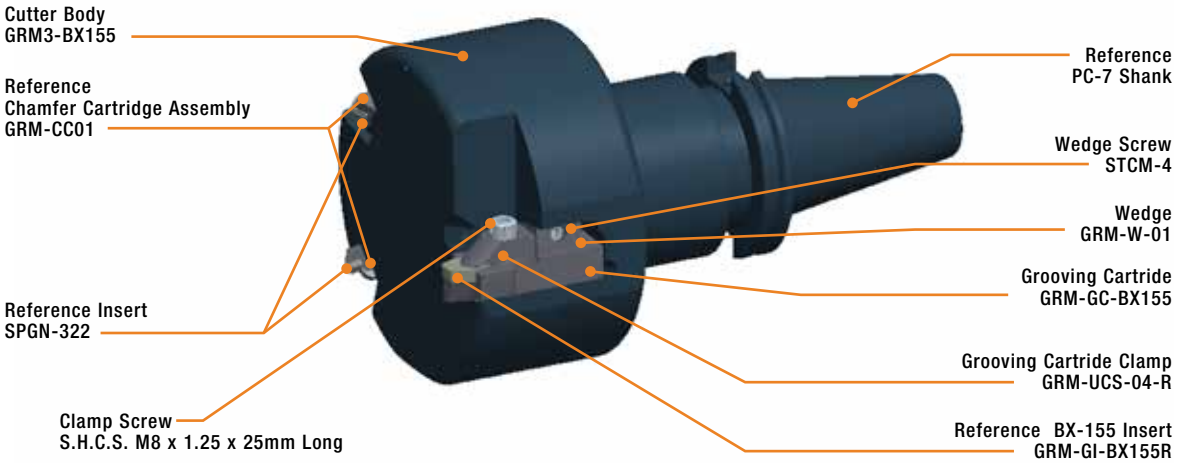
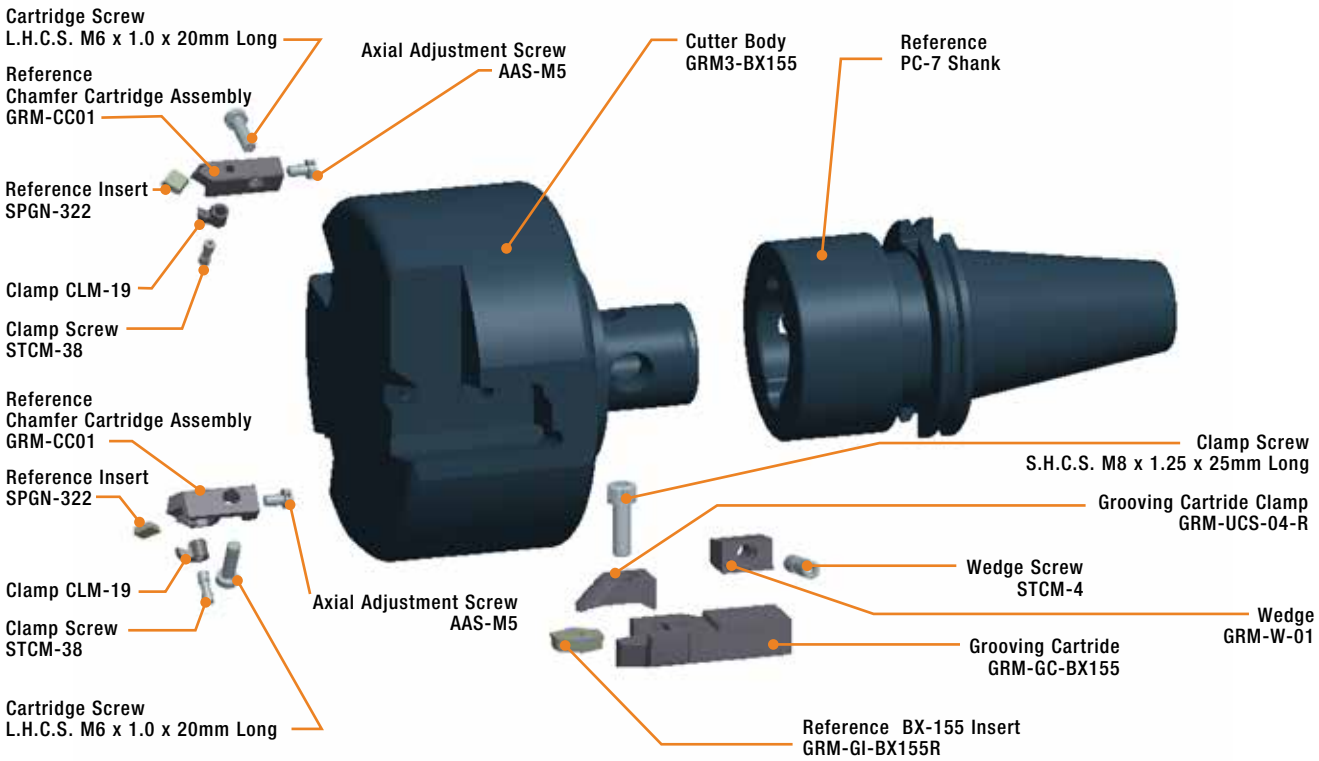
Ring Max™ GRM3-BX155 – Assembled and Exploded Views Reference Guide





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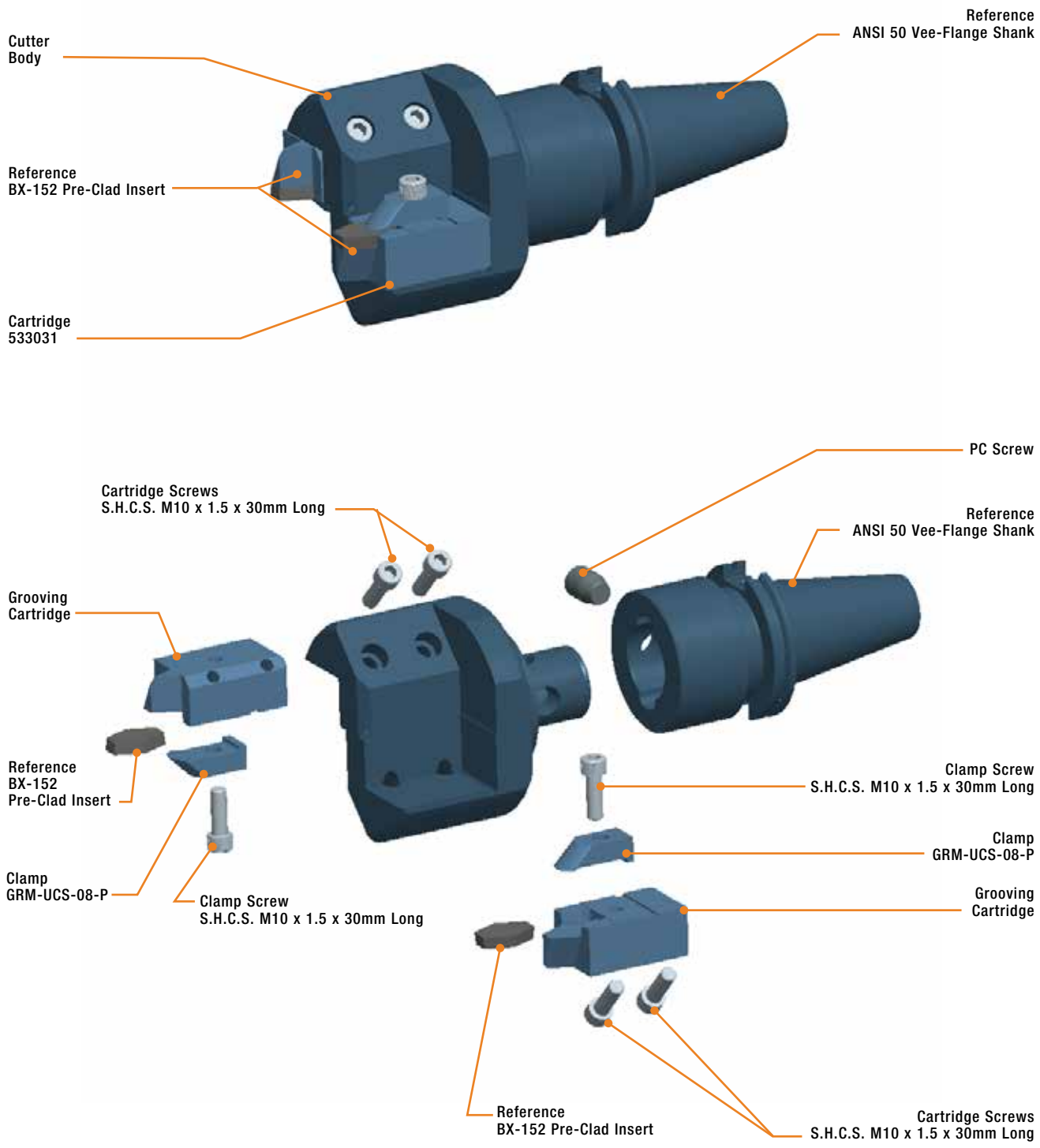
Ring Max™III Pre-Clad – Assembled and Exploded Views Reference Guide



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Pre-Clad Head Quote Request Form

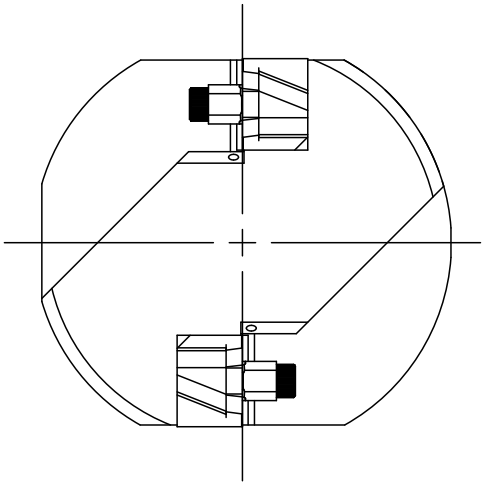
Part Information:

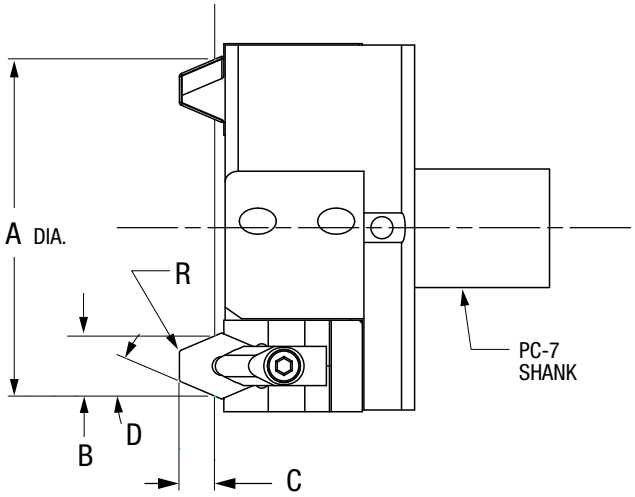
Part Name: _____

Clad Material: _____ Insert Grade: _____

Quote quantities: Heads: _____ Cartiridges: _____ Inserts: _____

Additional comments: _____





Dimensions *(Please provide required tolerances.)*				
A ±_____	B ±_____	C ±_____	D ±_____	R ±_____

Company _____ Customer Number _____

Attention _____ Rep Number _____

Street _____ Ship to City _____ Country _____

City _____ State _____ Zip Code _____ Send Copy to _____

Phone _____ FAX _____

Email _____ Sales Rep _____ Date Received _____ Quote Due Date _____

Ring Max™ – Machining Methods Reference Guide

Method One

Use these instructions for setting gage points and establishing target ring groove depths using an optical comparator.

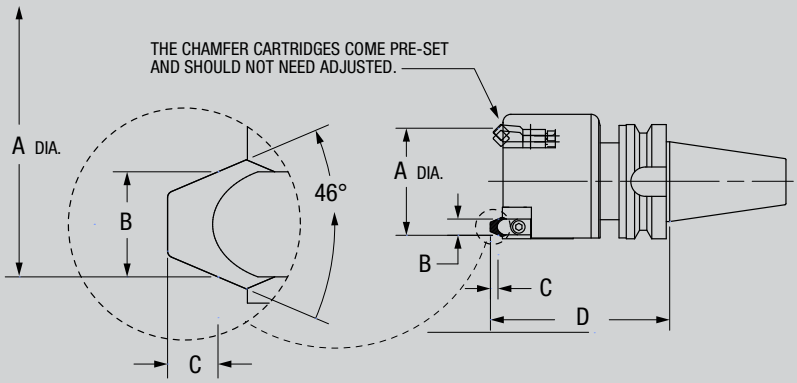
Step One:

Using an optical comparator, find and set the gage points at the groove's A diameter at mid-tolerance. The groove's B dimension will be within the allowable tolerance range.

Step Two:

Once the gage points in Step One have been determined, measure and record the tool's Z length and the actual measured C dimension over the insert nose.

NOTE: The measured C dimension is the target machining depth and will be within the groove's allowable part tolerance.



Example for BX-152

A		B	C		Z
Part print dimension and tolerance	Target this diameter for gage points	Part print dimension and tolerance	Part print dimension and tolerance	Measure and target this depth for programming	Measure and use this depth for programming
3.395 + 0.004 – 0.000	3.397	0.498 + 0.004 – 0.000	0.23 + 0.020 – 0.000		

Method Two

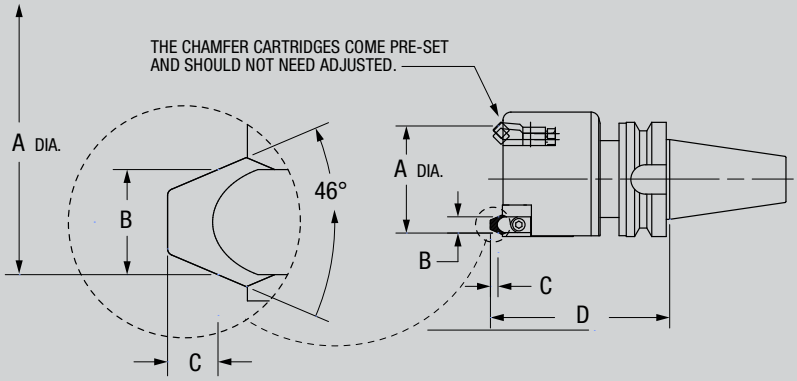
This method is used to machine ring grooves in a rough and finish pass.

Step One:

Machine the groove but reduce the groove depth to leave stock for the finish pass.

Step Two:

Measure the groove's A diameter and use the chart below to determine the additional D depth necessary to bring the A diameter into mid-tolerance.



If the A groove diameter is undersize by:	Increase the groove depth D by:
0.0010	0.0012
0.0020	0.0023
0.0030	0.0035
0.0040	0.0047
0.0050	0.0059
0.0060	0.0071
0.0070	0.0082
0.0080	0.0094
0.0090	0.0106
0.0100	0.0118
0.0110	0.0130
0.0120	0.0141

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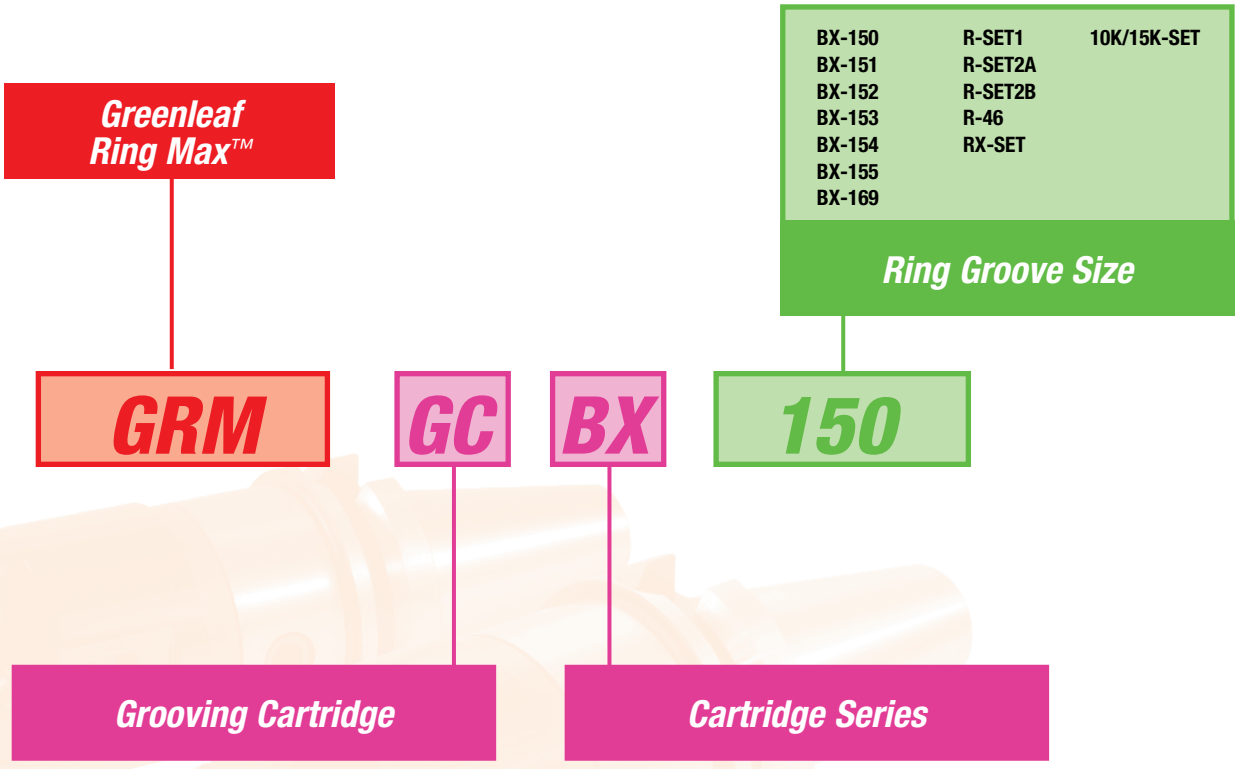
Ring Max™ – Grooving Cartridge Identification System



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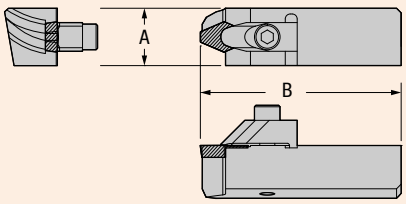
Ring Max™

Grooving Cartridge



Cartridge			Dimensions (inches)		Standard Components		Inserts
Groove Size	Part Number	Stock	A	B	Clamp	Clamp Screw	Purchased Seperately
BX-150	**GRM-GC-BX-150**	●	1.000	2.625	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX150S
BX-151	**GRM-GC-BX-151**	●	1.000	2.625	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX151S
BX-152	**GRM-GC-BX-152**	●	1.000	2.625	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX152S
BX-153	**GRM-GC-BX-153**	●	1.000	2.625	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX153S
BX-154	**GRM-GC-BX-154**	●	1.117	2.625	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX154S
BX-155	**GRM-GC-BX-155**	●	1.259	3.125	GRMUCS04R	M8-1.25 SHCS	GRM-GI-BX155R
BX-156	**GRM-GC-BX-156**	●	1.188	3.125	GRMUCS04R	M8-1.25 SHCS	GRM-GI-BX156R
BX-169	**GRM-GC-BX-169**	●	1.000	3.125	GRMUCS04R	M8-1.25 SHCS	GRM-GI-BX169R
R-SET1*	**GRM-GCRSET1-X**	●	1.000	3.125	GRMUCS03S	M6-1.0 SHCS	GRM-GI-RSET1SX
R-SET2A*	**GRM-GCRSET2A-X**	❍	0.750	2.625	GRMUCS05S	M5-0.8 SHCS	GRM-GI-RSET2SX
R-SET2B*	**GRM-GCRSET2B-X**	❍	1.000	2.625	GRMUCS03S	M5-0.8 SHCS	GRM-GI-RSET2SX
R-46	**GRM-GCR46**	❍	1.000	3.125	GRMUCS04R	M8-1.25 SHCS	GRM-GI-R46R
RX-SET*	**GRM-GCRX201/5-X**	❍	0.750	2.625	GRMUCS05S	M5-0.8 SHCS	GRM-GI-RX201/5SX
10/15K-SET*	**GRM-GC10/15-X**	❍	1.000	2.625	GRMUCS05S	M5-0.8 SHCS	GRM-GI-10/15KSX

***** Denotes multiple groove sizes (See chart below.)

Multiple-Groove Compatibility

Single cartridges can produce multiple grooves when used in the proper gage diameter Ring Max™ grooving head. Use this chart for compatibility.

Group	Groove Sizes
R-SET1	R-21, R-23, R-24, R-26, R-27, R-31, R-35, R-37, R-39, R-41, R-44, R-45, R-49, R-53, R-57, R-65, R-69, R-82, R-84
R-SET2A	R-12, R-13, R-14, R-15, R-16, R-17, R-18, R-19, R-20
R-SET2B	R-22, R-25, R-29, R-33, R-36, R-40, R-43, R-48, R-52
RX-SET	RX-201, RX-205
10/15K-SET	10K-2$^{1}/_{16}$", 10K-3$^{1}/_{16}$", 10K-5$^{1}/_{16}$", 15K-3$^{1}/_{16}$"

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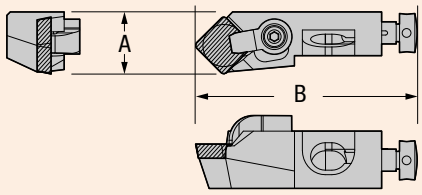
Ring Max™

Chamfer Cartridge



Cartridge	Stock	Dimensions (inches) A	Dimensions (inches) B	Standard Components Clamp	Standard Components Clamp Screw	Standard Components Adj. Screw	Inserts Purchased Seperately	Mounting Screw Supplied with Grooving Head
GRM-CC01	●	0.551	1.971	CLM-19	STCM-38	AAS-M5	SPGN-322	M6-1.0 LHCS

All Ring Max™ heads for generation 2 and 3 use the same chamfer cartridges.

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Ring Max™ STX – Lathe Tooling

The Ring Max™ STX system provides the same productivity gains as the Ring Max™ II and Ring Max™ III systems in a square shank tool. Whether you are machining a large diameter groove, or a standard BX, R, or RX groove, the Ring Max™ STX system is your solution for maximizing productivity in multiple API ring groove sizes.

Standard features and benefits include:

- Roughing and finishing of BX, R and RX API ring grooves in Inconel 625 clad overlay in less than one minute
- Utilization of the same clamping system and inserts as the Ring Max™ II and Ring Max III™ cutter systems.
- Available in common standard inch and metric shank sizes.
- Availability for grooving in stainless and alloy steel

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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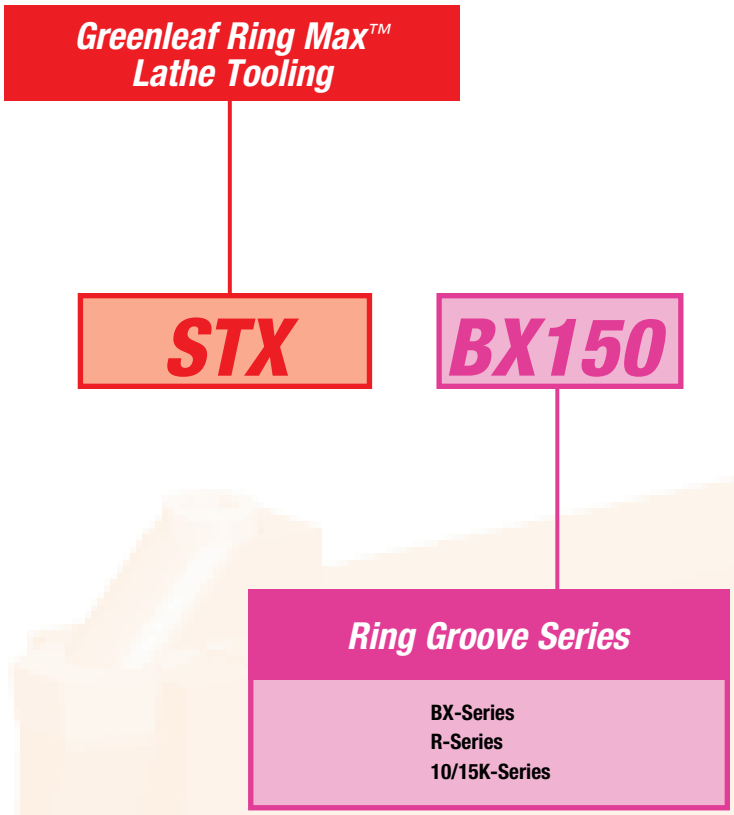
Ring Max™ STX – Lathe Tooling Identification System



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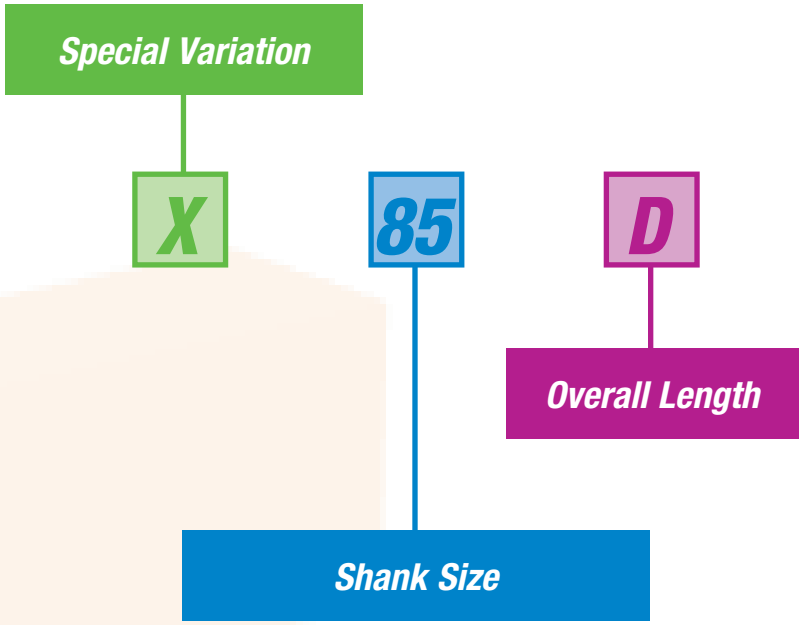

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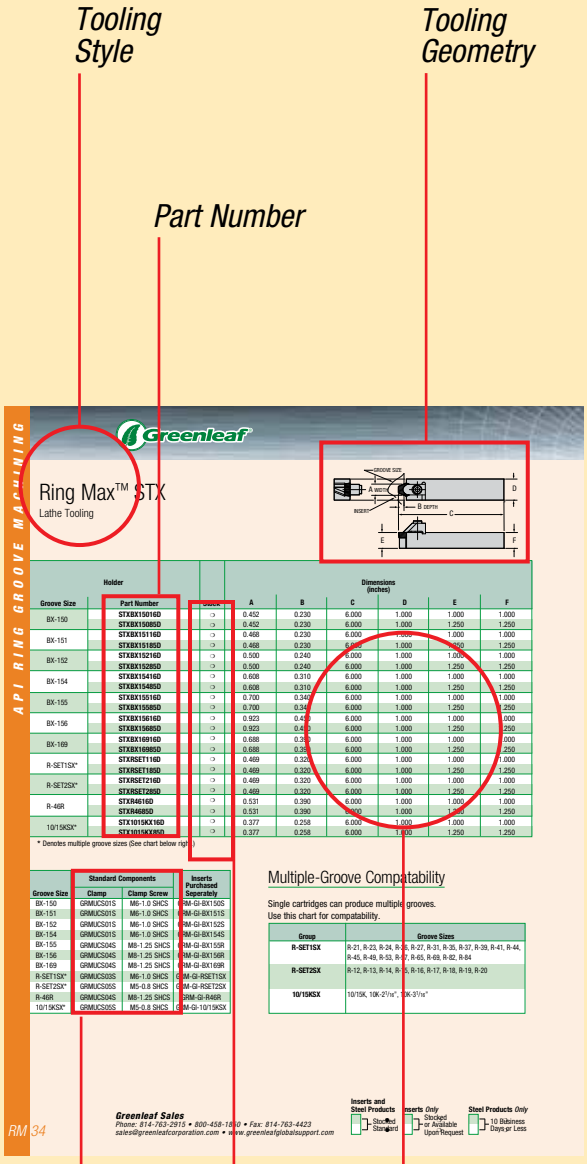
Ring Max™ STX – Lathe Tooling Usage Reference Guide



API RING GROOVE MACHINING

Greenleaf

Ring Max™ STX

Lathe Tooling

Groove Size	Holder Part Number	Stock	Dimensions (inches) A	B	C	D	E	F
BX-150	STXBX15016D	☐	0.452	0.230	6.000	1.000	1.000	1.000
	STXBX15085D	☐	0.452	0.230	6.000	1.000	1.250	1.250
BX-151	STXBX15116D	☐	0.468	0.230	6.000	1.000	1.000	1.000
	STXBX15185D	☐	0.468	0.230	6.000	1.000	1.250	1.250
BX-152	STXBX15216D	☐	0.500	0.240	6.000	1.000	1.000	1.000
	STXBX15285D	☐	0.500	0.240	6.000	1.000	1.250	1.250
BX-154	STXBX15416D	☐	0.608	0.310	6.000	1.000	1.000	1.000
	STXBX15485D	☐	0.608	0.310	6.000	1.000	1.250	1.250
BX-155	STXBX15516D	☐	0.700	0.340	6.000	1.000	1.000	1.000
	STXBX15585D	☐	0.700	0.340	6.000	1.000	1.250	1.250
BX-156	STXBX15616D	☐	0.923	0.400	6.000	1.000	1.000	1.000
	STXBX15685D	☐	0.923	0.400	6.000	1.000	1.250	1.250
BX-169	STXBX16916D	☐	0.688	0.310	6.000	1.000	1.000	1.000
	STXBX16985D	☐	0.688	0.310	6.000	1.000	1.250	1.250
R-SET1SX*	STXRSET116D	☐	0.469	0.320	6.000	1.000	1.000	1.000
	STXRSET185D	☐	0.469	0.320	6.000	1.000	1.250	1.250
R-SET2SX*	STXRSET216D	☐	0.469	0.320	6.000	1.000	1.000	1.000
	STXRSET285D	☐	0.469	0.320	6.000	1.000	1.250	1.250
R-46R	STXR4616D	☐	0.531	0.390	6.000	1.000	1.000	1.000
	STXR4685D	☐	0.531	0.390	6.000	1.000	1.000	1.250
10/15KSX*	STX1015KX16D	☐	0.377	0.258	6.000	1.000	1.000	1.000
	STX1015KX85D	☐	0.377	0.258	6.000	1.000	1.250	1.250

* Denotes multiple groove sizes (See chart below right.)

Groove Size	Standard Components Clamp	Clamp Screw	Inserts Purchased Seperately
BX-150	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX150S
BX-151	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX151S
BX-152	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX152S
BX-154	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX154S
BX-155	GRMUCS04S	M8-1.25 SHCS	GRM-GI-BX155R
BX-156	GRMUCS04S	M8-1.25 SHCS	GRM-GI-BX156R
BX-169	GRMUCS04S	M8-1.25 SHCS	GRM-GI-BX169R
R-SET1SX*	GRMUCS03S	M6-1.0 SHCS	GRM-GI-RSET1SX
R-SET2SX*	GRMUCS05S	M5-0.8 SHCS	GRM-GI-RSET2SX
R-46R	GRMUCS04S	M8-1.25 SHCS	GRM-GI-R46R
10/15KSX*	GRMUCS05S	M5-0.8 SHCS	GRM-GI-10/15KSX

Multiple-Groove Compatability

Single cartridges can produce multiple grooves.
Use this chart for compatability.

Group	Groove Sizes
R-SET1SX	R-21, R-23, R-24, R-26, R-27, R-31, R-35, R-37, R-39, R-41, R-44, R-45, R-49, R-53, R-7, R-65, R-69, R-82, R-84
R-SET2SX	R-12, R-13, R-14, R- 3, R-16, R-17, R-18, R-19, R-20
10/15KSX	10/15K, 10K-21/32", 10K-31/32"

RM 34

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Steel Products Only — 10 Bibiness Days or Less

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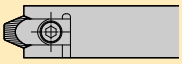
RING MAX™ Lathe Tooling



Ring Max™ STX
Lathe Tooling
page: RM 42

Reference

Ring Max™ STX
Models
page: RM 43

Lathe Tool
Quote Request Form
page: RM 44

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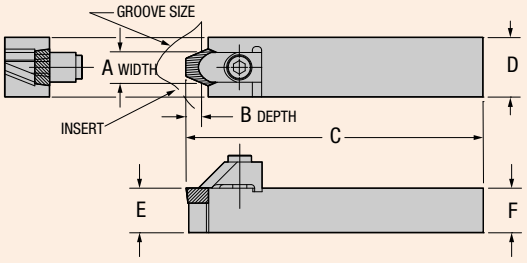
Ring Max™ STX

Lathe Tooling



Holder			Dimensions (inches)					
Groove Size	Part Number	Stock	A†	B†	C	D	E	F
BX-150	**STXBX15016D**	❍	0.452	0.230	6.000	1.000	1.000	1.000
	STXBX15085D	❍	0.452	0.230	6.000	1.000	1.250	1.250
BX-151	**STXBX15116D**	❍	0.468	0.230	6.000	1.000	1.000	1.000
	STXBX15185D	❍	0.468	0.230	6.000	1.000	1.250	1.250
BX-152	**STXBX15216D**	❍	0.500	0.240	6.000	1.000	1.000	1.000
	STXBX15285D	❍	0.500	0.240	6.000	1.000	1.250	1.250
BX-154	**STXBX15416D**	❍	0.608	0.310	6.000	1.000	1.000	1.000
	STXBX15485D	❍	0.608	0.310	6.000	1.000	1.250	1.250
BX-155	**STXBX15516D**	❍	0.700	0.340	6.000	1.000	1.000	1.000
	STXBX15585D	❍	0.700	0.340	6.000	1.000	1.250	1.250
BX-156	**STXBX15616D**	❍	0.923	0.450	6.000	1.000	1.000	1.000
	STXBX15685D	❍	0.923	0.450	6.000	1.000	1.250	1.250
BX-169	**STXBX16916D**	❍	0.688	0.390	6.000	1.000	1.000	1.000
	STXBX16985D	❍	0.688	0.390	6.000	1.000	1.250	1.250
R-SET1SX*	**STXRSET116D**	❍	0.469	0.320	6.000	1.000	1.000	1.000
	STXRSET185D	❍	0.469	0.320	6.000	1.000	1.250	1.250
R-SET2SX*	**STXRSET216D**	❍	0.469	0.320	6.000	1.000	1.000	1.000
	STXRSET285D	❍	0.469	0.320	6.000	1.000	1.250	1.250
R-46R	**STXR4616D**	❍	0.531	0.390	6.000	1.000	1.000	1.000
	STXR4685D	❍	0.531	0.390	6.000	1.000	1.250	1.250
10/15KSX*	**STX1015KX16D**	❍	0.377	0.258	6.000	1.000	1.000	1.000
	STX1015KX85D	❍	0.377	0.258	6.000	1.000	1.250	1.250

* Denotes multiple groove sizes (See chart below right.)

† Groove width and depth tolerances comply with API Standard 6A/ISO 10423.

	Standard Components		Inserts Purchased Seperately
Groove Size	Clamp	Clamp Screw	
BX-150	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX150S
BX-151	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX151S
BX-152	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX152S
BX-154	GRMUCS01S	M6-1.0 SHCS	GRM-GI-BX154S
BX-155	GRMUCS04R	M8-1.25 SHCS	GRM-GI-BX155R
BX-156	GRMUCS04R	M8-1.25 SHCS	GRM-GI-BX156R
BX-169	GRMUCS04R	M8-1.25 SHCS	GRM-GI-BX169R
R-SET1SX*	GRMUCS03S	M6-1.0 SHCS	GRM-GI-RSET1SX
R-SET2SX*	GRMUCS05S	M5-0.8 SHCS	GRM-GI-RSET2SX
R-46R	GRMUCS04R	M8-1.25 SHCS	GRM-GI-R46R
10/15KSX*	GRMUCS05S	M5-0.8 SHCS	GRM-GI-10/15KSX

Multiple-Groove Compatibility

Single cartridges can produce multiple grooves.
Use this chart for compatibility.

Group	Groove Sizes
R-SET1SX	R-21, R-23, R-24, R-26, R-27, R-31, R-35, R-37, R-39, R-41, R-44, R-45, R-49, R-53, R-57, R-65, R-69, R-82, R-84
R-SET2SX	R-12, R-13, R-14, R-15, R-16, R-17, R-18, R-19, R-20
10/15KSX	10/15K, 10K-2 1/16", 10K-3 1/16"

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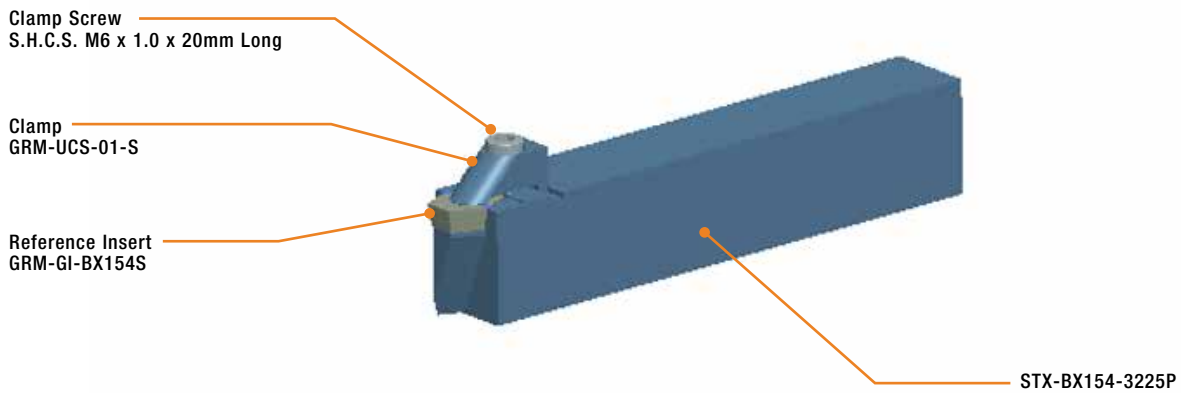
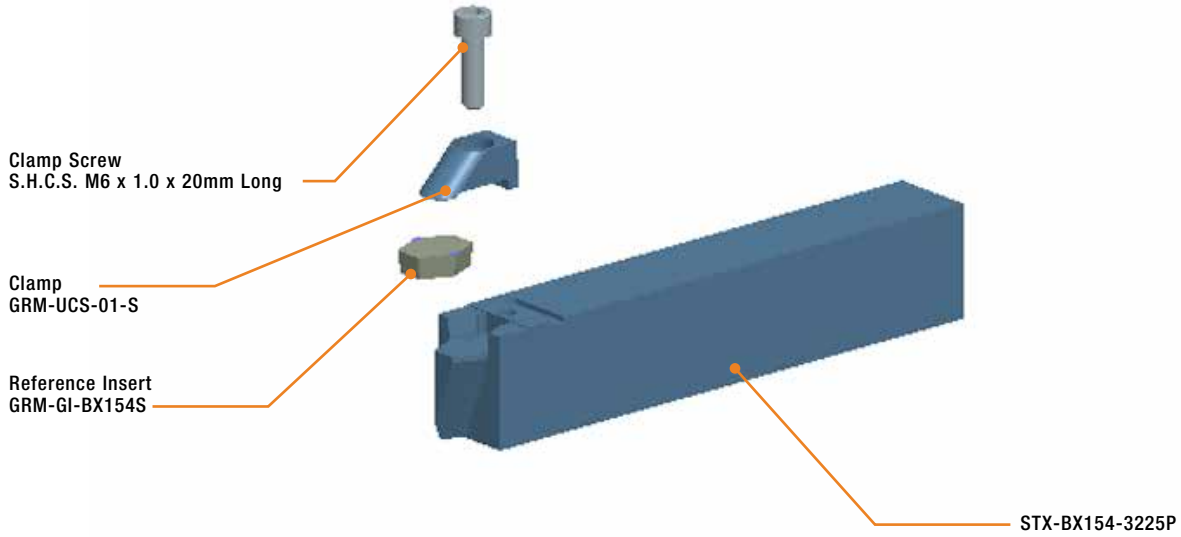
Inserts and Steel Products ● ● Stocked Standard

Inserts *Only* ❍ ❍ Stocked or Available Upon Request

Steel Products *Only* ❍ ❍ 10 Business Days or Less

Ring Max™ STX – Assembled and Exploded Views Reference Guide





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FOR FAST RESPONSE, complete form and send
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via **FAX**
814-763-4040

Lathe Tool Quote Request Form

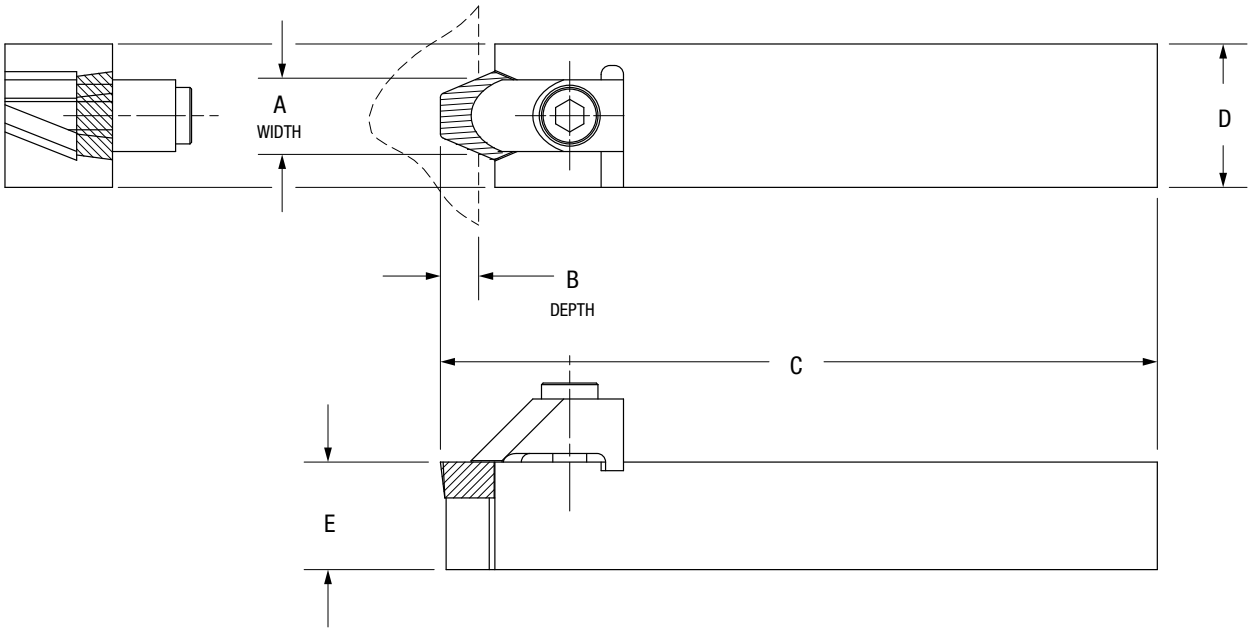
Part Information:

Part Name: _____

Clad Material: _____ Insert Grade: _____

Quote quantities: Heads: _____ Cartiridges: _____ Inserts: _____

Additional comments: _____



Dimensions *(Please provide required tolerances.)*				
A ±_____	B ±_____	C ±_____	D ±_____	E ±_____

Company _____ Customer Number _____

Attention _____ Rep Number _____

Street _____ Ship to City _____ Country _____

City _____ State _____ Zip Code _____ Send Copy to _____

Phone _____ FAX _____

Email _____ Sales Rep _____ Date Received _____ Quote Due Date _____

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Holemill™ Drilling System ..... ID 04
Technical Data ..... ID 05

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Indexable Drilling

The Holemill™ is an indexable drill utilizing Greenleaf's advanced coated-carbide grades for higher speeds, quieter cutting, longer tool life and reduced horsepower consumption. Inserts are positive squares (SPMT) for four indexes per insert. The Holemill is available in 1" to 3" diameters in 1/8" increments.

Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

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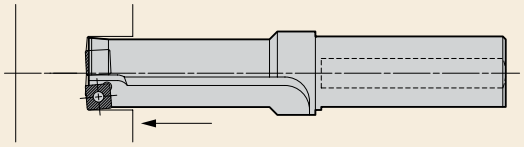
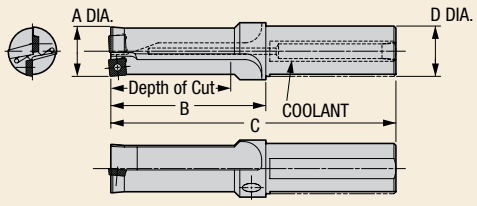
Holemill™ System



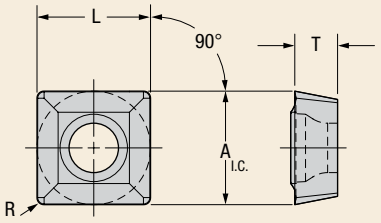


Part Number	Stock	Gage Insert Inboard	Qty	Insert Outboard	Qty	Dimensions (inches) A	Depth of Cut	B	C	D	Standard Components Insert Screw	* Tune-Up Kit Includes All Standard Components
HM3X-094	❍	SPMT-2.522-X2	1	SPMT-2.522-X2	1	0.937	3.000	4.130	8.00	1.25	PT-543-T	TK-00737
HM3X-100	❍	SPMT-2.522-X2	1	SPMT-2.522-X2	1	1.000	3.000	4.130	8.00	1.25	PT-543-T	TK-00737
HM3X-112	❍	SPMT-2.522-X2	1	SPMT-32.52-X2	1	1.125	3.375	4.380	8.25	1.25	PT-543-T & PT-559-T	TK-02619
HM3X-125	❍	SPMT-32.52-X2	1	SPMT-32.52-X2	1	1.250	3.750	4.880	8.75	1.25	PT-559-T	TK-00738
HM3X-138	❍	SPMT-432-X2	1	SPMT-32.52-X2	1	1.375	4.500	5.880	9.75	1.50	PT-588-T & PT-559-T	TK-00936
HM3X-150	❍	SPMT-432-X2	1	SPMT-432-X2	1	1.500	4.500	5.880	9.75	1.50	PT-588-T	TK-00739
HM3X-162	❍	SPMT-432-X2	1	SPMT-432-X2	1	1.625	5.250	6.630	10.50	1.50	PT-588-T	TK-00739
HM3X-175	❍	SPMT-432-X2	1	SPMT-432-X2	1	1.750	5.250	6.630	10.50	1.50	PT-588-T	TK-00739
HM3X-188	❍	SPMT-32.52-X2	1	SPMT-32.52-X2	2	1.875	6.000	7.580	11.50	2.00	PT-559-T	TK-00734
HM3X-200	❍	SPMT-32.52-X2	1	SPMT-432-X2	2	2.000	6.000	7.620	11.50	2.00	PT-588-T& PT-544-T	TK-01961
HM3X-225	❍	SPMT-32.52-X2	1	SPMT-432-X2	2	2.250	6.750	8.380	12.25	2.00	PT-588-T& PT-544-T	TK-01961
HM3X-238	❍	SPMT-432-X2	1	SPMT-432-X2	2	2.375	7.500	9.130	13.00	2.00	PT-588-T	TK-00751
HM3X-250	❍	SPMT-432-X2	1	SPMT-432-X2	2	2.500	7.500	9.130	13.00	2.00	PT-588-T	TK-00751
HM3X-275	❍	SPMT-32.52-X2	2	SPMT-432-X2	2	2.750	8.250	9.880	13.75	2.00	PT-588-T& PT-544-T	TK-02353
HM3X-288	❍	SPMT-432-X2	2	SPMT-432-X2	2	2.875	9.000	10.630	14.50	2.00	PT-588-T	TK-00752
HM3X-300	❍	SPMT-432-X2	2	SPMT-432-X2	2	3.000	9.000	10.630	14.50	2.00	PT-588-T	TK-00752

* Tune-Up Kits include one complete set of Standard Components to allow you to refurbish the Holemill.

Holemill™ Inserts

SPMT-X2



Inserts	Part Number ANSI	Insert Position	P G-935	M G-915	K G-915	S G-935	Part Number ISO	Dimensions (inches) A	L	T	R
SPMT	**SPMT-2.522-X2**	**Inboard**	●			●	**SPMT-070308-X2**	0.312	0.312	0.125	0.031
	SPMT-2.522-X2	**Outboard**	●	●	●	●	**SPMT-070308-X2**	0.312	0.312	0.125	0.031
	SPMT-32.52-X2	**Inboard**	●			●	**SPMT-09T308-X2**	0.375	0.375	0.156	0.031
	SPMT-32.52-X2	**Outboard**	●	●	●	●	**SPMT-09T308-X2**	0.375	0.375	0.156	0.031
	SPMT-432-X2	**Inboard**	●			●	**SPMT-120408-X2**	0.500	0.500	0.187	0.031
	SPMT-432-X2	**Outboard**	●	●	●	●	**SPMT-120408-X2**	0.500	0.500	0.187	0.031

P G-935 | M G-915 | K G-915 | S G-935

G-915 (PVD coated) Excellent for high-temp alloys, stainless steel, and low-carbon steels. Should be run at moderate speeds and moderate to high feeds.

G-935 (PVD coated) Multi-layer grade for steel milling and turning applications requiring additional resistance to mechanical and thermal shock. The multi-layered PVD coating increases the speed capability and wear resistance in tough milling and interrupted turning applications.

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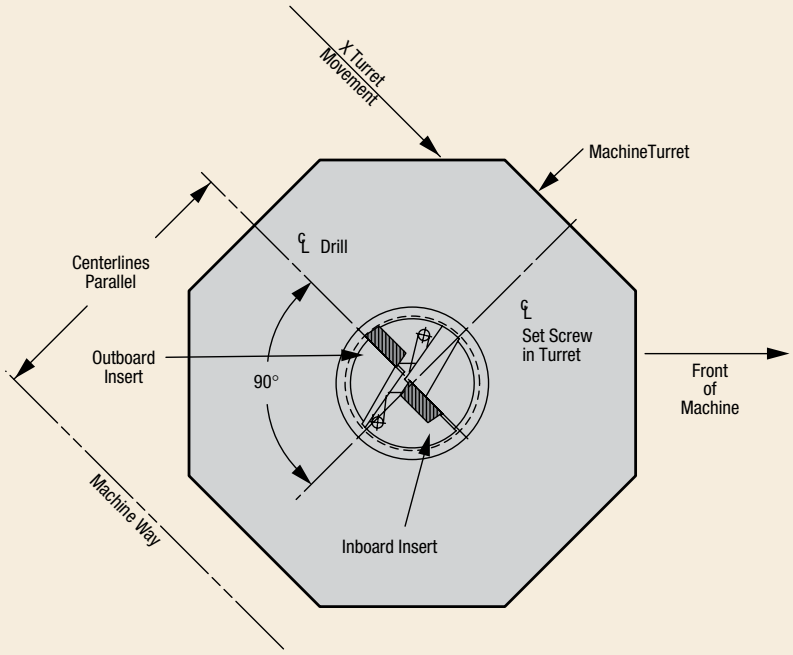
● Stocked Standard | ❍ Stocked or Available Upon Request | Not Recommended

Feed and Speed for Greenleaf Holemill™

Material	Hardness (Rc)	SFM	Feed Rate per Revolution (IPR)	
			1-1.75" Dia.	1.75-3" Dia.
Low Carbon Steel/ Free Machining	up to 25	450-1000	.004-.008	.005-.010
1010, 1018, 12L14				
High Carbon Steel	25-40	200-600	.004-.008	.005-.010
1080, 1541, Nitralloy, 52100				
Alloy Steel	15-30	400-900	.004-.008	.005-.010
4140, 4340, 6150, 8620				
Tool Steel	up to 30	250-600	.004-.008	.005-.010
A-6, D-2, P-20, H-13				
High-Temp Alloys	up to 45	90-225	.003-.005	.003-.005
Inconel, Hastelloy, Waspaloy, Stellite				
Stainless Steel	up to 32	250-550	.003-.007	.004-.008
304,316, 17-4 PH				

Greenleaf Holemill™ Operational Information

For best results in static drilling, set up the Greenleaf Holemill with the drill in the turret in an attitude that puts the inserts parallel to the ways of the machine with the inboard insert located toward the operator as shown.



Static Drilling

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Pictorial Index ..... TS 07
Inserts ..... TS 08-10
Toolholders ..... TS 11

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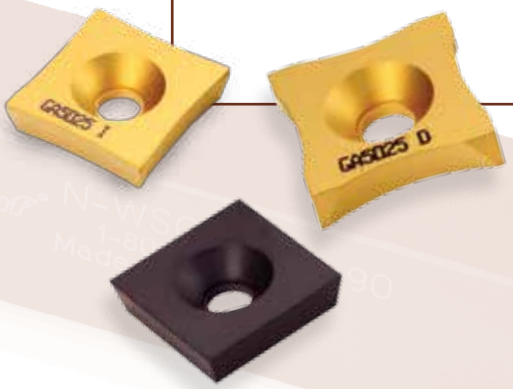
Tube Scarfing

Greenleaf's modern tube scarfing system using indexable inserts offers greatly increased productivity potential from decreased downtime, longer tool life, faster tool change time, decreased tool costs and elimination of regrinding problems. In addition, a superior seam can be expected since an accurate radius form is always available on each side of the insert.



Greenleaf Corporation is continually upgrading its products.
For the most current information, please visit our web site at:

www.greenleafglobalsupport.com

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CARBIDE

Greenleaf offers a comprehensive line of carbide inserts in grades ranging from sub-micron C-1 through C-8 classifications. An industry pioneer in coated carbide, Greenleaf offers a variety of uncoated, MT-CVD coated and PVD-coated grades. Carbide inserts are available in ANSI standard geometries.

COATED

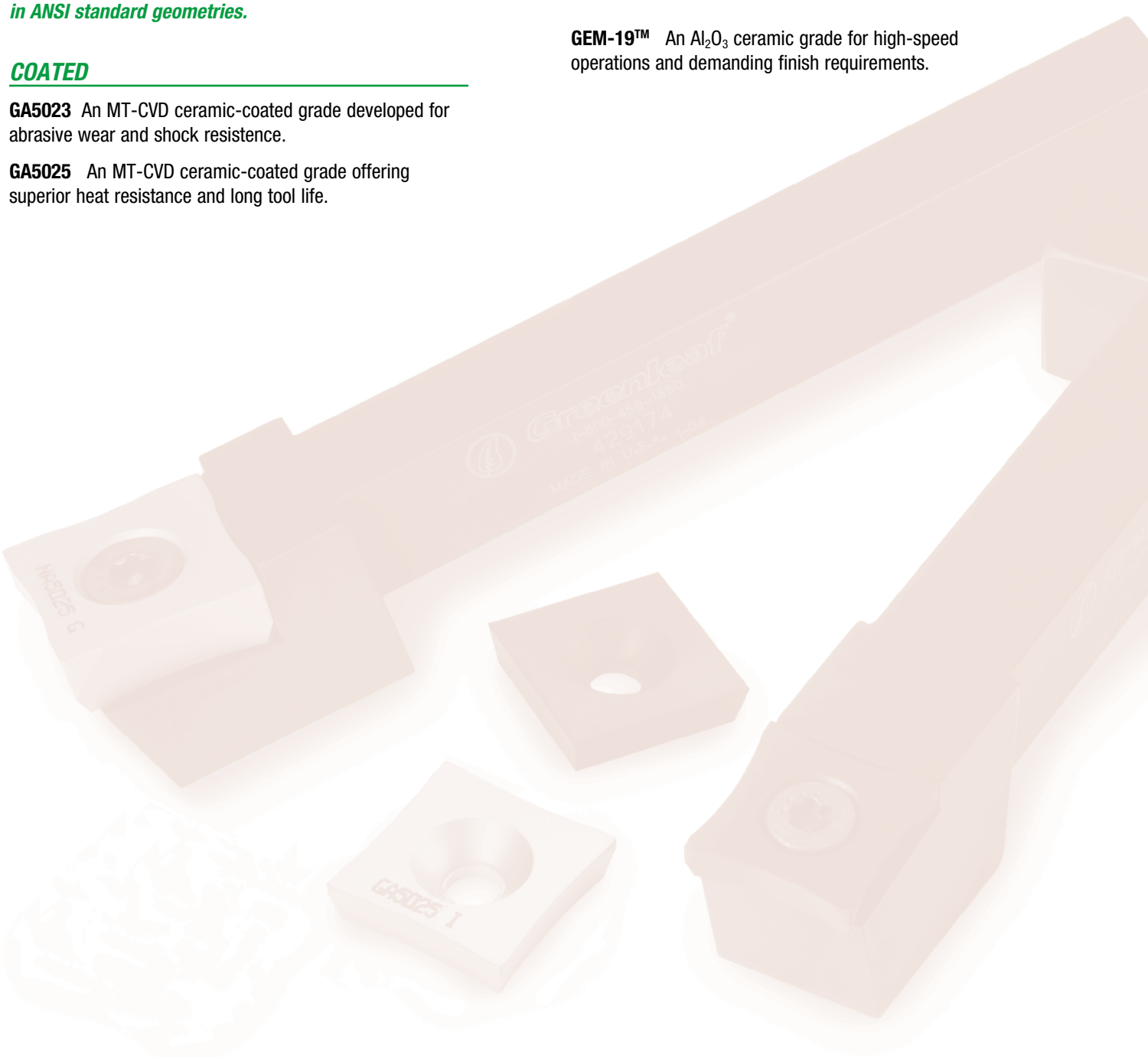
GA5023 An MT-CVD ceramic-coated grade developed for abrasive wear and shock resistence.

GA5025 An MT-CVD ceramic-coated grade offering superior heat resistance and long tool life.

CERAMIC

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts in ANSI standard and special geometries. One of the most prominent is:

GEM-19™ An Al_2O_3 ceramic grade for high-speed operations and demanding finish requirements.



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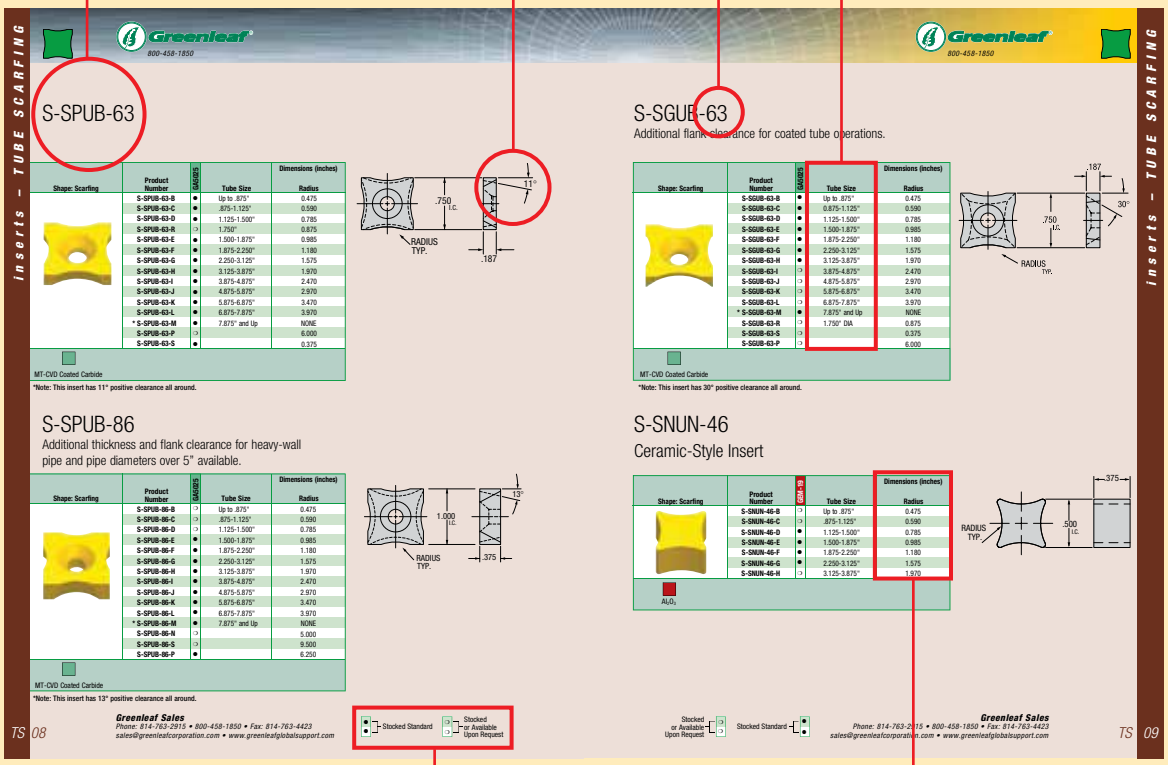
Greenleaf®

Flank Clearance

Insert Style

Insert IC and Thickness

Pipe Diameter



inserts – TUBE SCARFING

Greenleaf 800-458-1850

S-SPUB-63

Shape: Scarfing	Product Number	GAGES	Tube Size	Dimensions (inches) Radius
	S-SPUB-63-B	●	Up to .875"	0.475
	S-SPUB-63-C	●	.875-1.125"	0.590
	S-SPUB-63-D	●	1.125-1.500"	0.785
	S-SPUB-63-R	○	1.250"	0.875
	S-SPUB-63-E	●	1.500-1.875"	0.985
	S-SPUB-63-F	●	1.875-2.250"	1.180
	S-SPUB-63-G	●	2.250-3.125"	1.575
	S-SPUB-63-H	●	3.125-3.875"	1.970
	S-SPUB-63-I	●	3.875-4.875"	2.470
	S-SPUB-63-J	●	4.875-5.875"	2.970
	S-SPUB-63-K	●	5.875-6.875"	3.470
	S-SPUB-63-L	●	6.875-7.875"	3.970
	* S-SPUB-63-M	●	7.875" and Up	NONE
	S-SPUB-63-P	○		6.000
	S-SPUB-63-S	●		0.375

MT-CVD Coated Carbide

*Note: This insert has 11° positive clearance all around.

S-SGUB-63

Additional flank clearance for coated tube operations.

Shape: Scarfing	Product Number	GAGES	Tube Size	Dimensions (inches) Radius
	S-SGUB-63-B	●	Up to .875"	0.475
	S-SGUB-63-C	●	0.875-1.125"	0.590
	S-SGUB-63-D	●	1.125-1.500"	0.785
	S-SGUB-63-E	●	1.500-1.875"	0.985
	S-SGUB-63-F	●	1.875-2.250"	1.180
	S-SGUB-63-G	●	2.250-3.125"	1.575
	S-SGUB-63-H	●	3.125-3.875"	1.970
	S-SGUB-63-I	○	3.875-4.875"	2.470
	S-SGUB-63-J	○	4.875-5.875"	2.970
	S-SGUB-63-K	○	5.875-6.875"	3.470
	S-SGUB-63-L	○	6.875-7.875"	3.970
	* S-SGUB-63-M	●	7.875" and Up	NONE
	S-SGUB-63-R	○	1.750" DIA	0.875
	S-SGUB-63-S	○		0.375
	S-SGUB-63-P	○		6.000

MT-CVD Coated Carbide

*Note: This insert has 30° positive clearance all around.

S-SPUB-86

Additional thickness and flank clearance for heavy-wall pipe and pipe diameters over 5" available.

Shape: Scarfing	Product Number	GAGES	Tube Size	Dimensions (inches) Radius
	S-SPUB-86-B	○	Up to .875"	0.475
	S-SPUB-86-C	○	.875-1.125"	0.590
	S-SPUB-86-D	○	1.125-1.500"	0.785
	S-SPUB-86-E	●	1.500-1.875"	0.985
	S-SPUB-86-F	●	1.875-2.250"	1.180
	S-SPUB-86-G	●	2.250-3.125"	1.575
	S-SPUB-86-H	●	3.125-3.875"	1.970
	S-SPUB-86-I	●	3.875-4.875"	2.470
	S-SPUB-86-J	●	4.875-5.875"	2.970
	S-SPUB-86-K	●	5.875-6.875"	3.470
	S-SPUB-86-L	●	6.875-7.875"	3.970
	* S-SPUB-86-M	●	7.875" and Up	NONE
	S-SPUB-86-N	○		5.000
	S-SPUB-86-S	○		9.500
	S-SPUB-86-P	●		6.250

MT-CVD Coated Carbide

*Note: This insert has 13° positive clearance all around.

S-SNUN-46

Ceramic-Style Insert

Shape: Scarfing	Product Number	GAGES	Tube Size	Dimensions (inches) Radius
	S-SNUN-46-B	○	Up to .875"	0.475
	S-SNUN-46-C	○	.875-1.125"	0.590
	S-SNUN-46-D	●	1.125-1.500"	0.785
	S-SNUN-46-E	●	1.500-1.875"	0.985
	S-SNUN-46-F	●	1.875-2.250"	1.180
	S-SNUN-46-G	●	2.250-3.125"	1.575
	S-SNUN-46-H	○	3.125-3.875"	1.970

Al_2O_3

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Stocked Standard | Stocked or Available Upon Request

TS 08

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Stocked or Available Upon Request | Stocked Standard

TS 09

Stocking Status

Insert Radius

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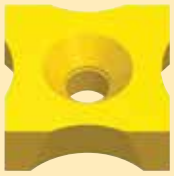
Inserts

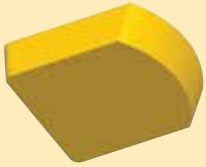
S-SPUB-63
page: TS 08



S-SPUB-86
page: TS 08

S-SGUB-63
page: TS 09

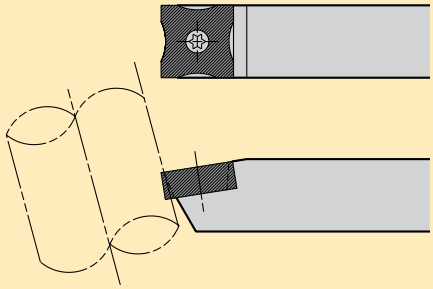
S-SNUN-46
page: TS 09



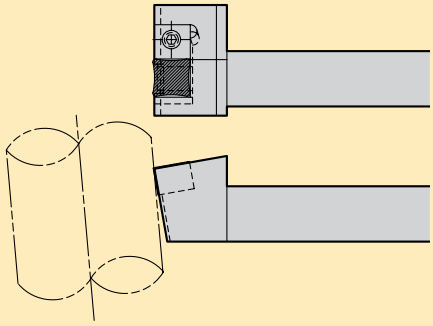
ID Scarfing Insert
page: TS 10

Toolholders

N-SSCPS
page: TS 11



N-WSCNN
page: TS 11



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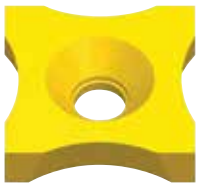
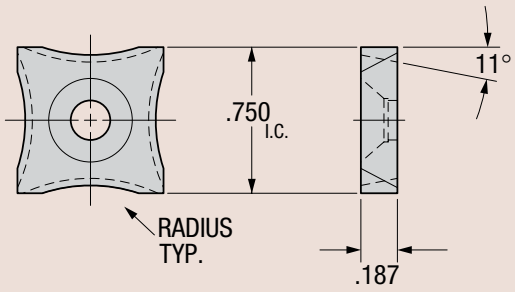
S-SPUB-63

Shape: Scarfing	Product Number	GA5023	GA5025	Tube Size	Dimensions (inches) Radius
	S-SPUB-63-B	○	●	Up to .875"	0.475
	S-SPUB-63-C	○	●	.875-1.125"	0.590
	S-SPUB-63-D	●	●	1.125-1.500"	0.785
	S-SPUB-63-R	○	○	1.750"	0.875
	S-SPUB-63-E	●	●	1.500-1.875"	0.985
	S-SPUB-63-F	●	●	1.875-2.250"	1.180
	S-SPUB-63-G	●	●	2.250-3.125"	1.575
	S-SPUB-63-H	●	●	3.125-3.875"	1.970
	S-SPUB-63-I	●	●	3.875-4.875"	2.470
	S-SPUB-63-J	●	●	4.875-5.875"	2.970
	S-SPUB-63-K	○	●	5.875-6.875"	3.470
	S-SPUB-63-L	○	●	6.875-7.875"	3.970
	* S-SPUB-63-M	●	●	7.875" and Up	NONE
	S-SPUB-63-P	○	○		6.000
	S-SPUB-63-S	○	●		0.375

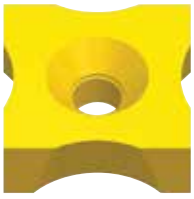
MT-CVD Coated Carbide

*Note: This insert has 11° positive clearance all around.



S-SPUB-86

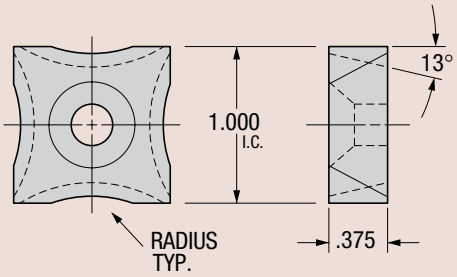
Additional thickness and flank clearance for heavy-wall pipe and pipe diameters over 5" available.

Shape: Scarfing	Product Number	GA5023	GA5025	Tube Size	Dimensions (inches) Radius
	S-SPUB-86-B	○	○	Up to .875"	0.475
	S-SPUB-86-C	○	○	.875-1.125"	0.590
	S-SPUB-86-D	○	○	1.125-1.500"	0.785
	S-SPUB-86-E	○	●	1.500-1.875"	0.985
	S-SPUB-86-F	○	●	1.875-2.250"	1.180
	S-SPUB-86-G	○	●	2.250-3.125"	1.575
	S-SPUB-86-H	○	●	3.125-3.875"	1.970
	S-SPUB-86-I	○	●	3.875-4.875"	2.470
	S-SPUB-86-J	○	●	4.875-5.875"	2.970
	S-SPUB-86-K	○	●	5.875-6.875"	3.470
	S-SPUB-86-L	○	●	6.875-7.875"	3.970
	* S-SPUB-86-M	○	●	7.875" and Up	NONE
	S-SPUB-86-N	○	○		5.000
	S-SPUB-86-S	○	○		9.500
	S-SPUB-86-P	○	●		6.250

*Note: This insert has 13° positive clearance all around.

MT-CVD Coated Carbide

*Note: This insert has 13° positive clearance all around.



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● ● Stocked Standard

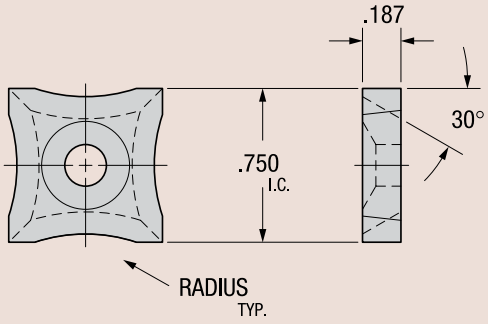
○ ○ Stocked or Available Upon Request

S-SGUB-63

Additional flank clearance for coated tube operations.

Shape: Scarfing	Product Number	GA5025	Tube Size	Dimensions (inches) Radius
	S-SGUB-63-B	●	Up to .875"	0.475
	S-SGUB-63-C	●	0.875-1.125"	0.590
	S-SGUB-63-D	●	1.125-1.500"	0.785
	S-SGUB-63-E	●	1.500-1.875"	0.985
	S-SGUB-63-F	●	1.875-2.250"	1.180
	S-SGUB-63-G	●	2.250-3.125"	1.575
	S-SGUB-63-H	●	3.125-3.875"	1.970
	S-SGUB-63-I	❍	3.875-4.875"	2.470
	S-SGUB-63-J	❍	4.875-5.875"	2.970
	S-SGUB-63-K	❍	5.875-6.875"	3.470
	S-SGUB-63-L	❍	6.875-7.875"	3.970
	* S-SGUB-63-M	●	7.875" and Up	NONE
	S-SGUB-63-R	❍	1.750" DIA	0.875
	S-SGUB-63-S	❍		0.375
	S-SGUB-63-P	❍		6.000

MT-CVD Coated Carbide



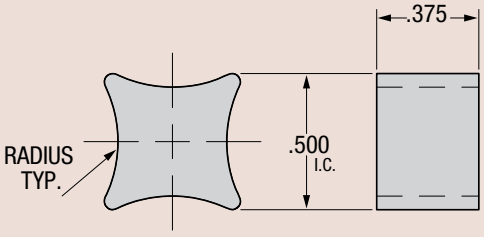
*Note: This insert has 30° positive clearance all around.

S-SNUN-46

Ceramic-Style Insert

Shape: Scarfing	Product Number	GEM-19	Tube Size	Dimensions (inches) Radius
	S-SNUN-46-B	❍	Up to .875"	0.475
	S-SNUN-46-C	❍	.875-1.125"	0.590
	S-SNUN-46-D	❍	1.125-1.500"	0.785
	S-SNUN-46-E	❍	1.500-1.875"	0.985
	S-SNUN-46-F	❍	1.875-2.250"	1.180
	S-SNUN-46-G	❍	2.250-3.125"	1.575
	S-SNUN-46-H	❍	3.125-3.875"	1.970

Al_2O_3



Stocked or Available Upon Request ❍ ❍

Stocked Standard ● ●

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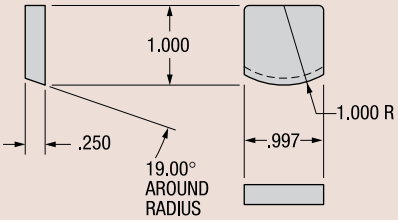
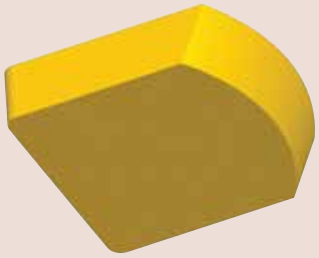
ID Scarfing Insert

Other sizes available upon request.





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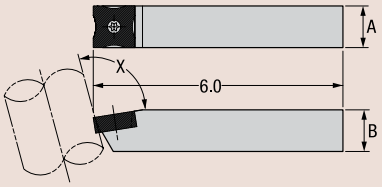
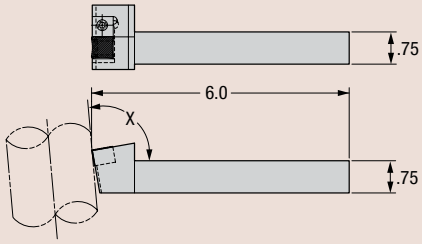
N-SSCPS



Product Number	Gage Insert	Stock	Angle X	Dimensions (inches) A	Dimensions (inches) B	Standard Component Insert Screw*	Tune-Up Kit Includes All Standard Components
N-SSCPS-12-90	S-SPUB-63	●	90°	0.75	0.75	10/32 x 1/2 IPFHCS	TK-00576
N-SSCPS-12-95	S-SPUB-63	❍	95°	0.75	0.75	10/32 x 1/2 IPFHCS	TK-00576
N-SSCPS-12-100	S-SPUB-63	●	100°	0.75	0.75	10/32 x 1/2 IPFHCS	TK-00576
N-SSCPS-12-105	S-SPUB-63	●	105°	0.75	0.75	10/32 x 1/2 IPFHCS	TK-00576
N-SSCPS-16-8-90	S-SPUB-86	❍	90°	1.00	1.00	1/4-20 x 3/4 IPFHCS	TK-00760
N-SSCPS-16-8-95	S-SPUB-86	❍	95°	1.00	1.00	1/4-20 x 3/4 IPFHCS	TK-00760
N-SSCPS-16-8-100	S-SPUB-86	❍	100°	1.00	1.00	1/4-20 x 3/4 IPFHCS	TK-00760
N-SSCPS-16-8-105	S-SPUB-86	●	105°	1.00	1.00	1/4-20 x 3/4 IPFHCS	TK-00760

N-WSCNN Ceramic Insert Holder

Product Number	Gage Insert	Stock	Angle X	Standard Components Wedge	Standard Components Wedge Screw	Tune-Up Kit Includes All Std. Components
N-WSCNN-12-90	S-SNUN-46	❍	90°	303996	38309	TK-00577
N-WSCNN-12-95	S-SNUN-46	❍	95°	303996	38309	TK-00577
N-WSCNN-12-100	S-SNUN-46	❍	100°	303996	38309	TK-00577
N-WSCNN-12-105	S-SNUN-46	❍	105°	303996	38309	TK-00577



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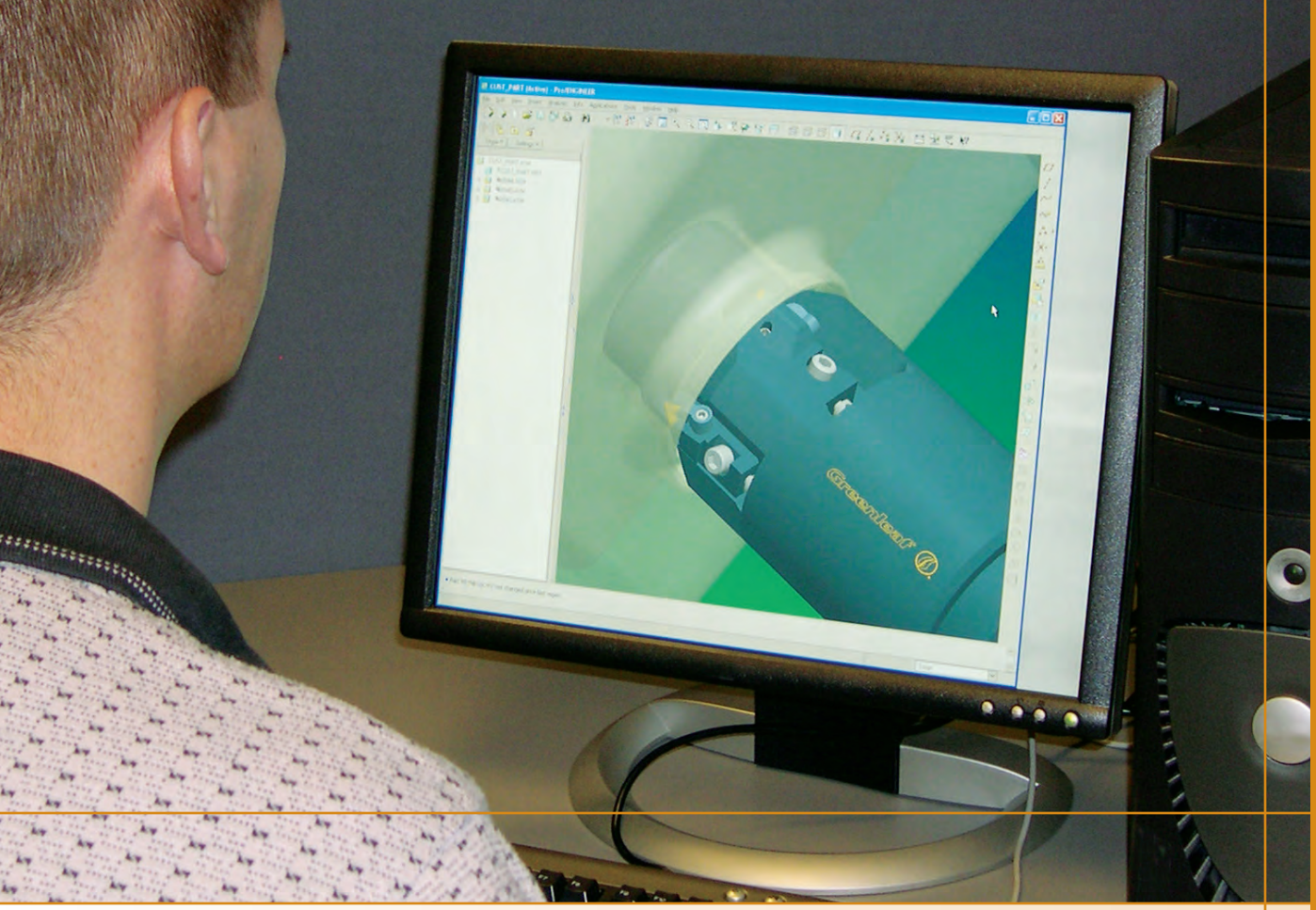


Aerospace Tools
Milling Cutters
Special Inserts
Special Designs/Layouts

Special Tool Design Information Checklist

Greenleaf®

Special Engineering

Greenleaf Corporation is a leading supplier of cutting-tool technology, specializing in the manufacture of high-performance tungsten carbide and ceramic inserts, as well as inventive tool-holding systems. Greenleaf continues to build on 60 years of innovation which centers on supplying customers with productive solutions to their metalcutting needs.

Today, Greenleaf Corporation is positioned to serve the evolving needs of companies in all major segments of the metalcutting industry including gas turbine, steel, medical, roll turning, automotive, machine tools and rail. Greenleaf's products are engineered to provide optimal performance against a wide range of materials under the most rigorous metalcutting conditions.

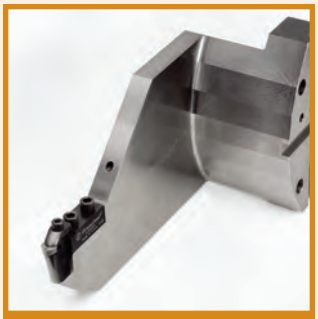
Special engineered or custom engineered products is a visible strength of the Greenleaf product line. Customers from around the world utilize the Greenleaf engineering services to address their specific, and often complex, requirements. For example, a cantilevered heavy metal head *(pictured at right)* was held to ± 0,012 inch tolerance for a VTL in the aerospace industry. Ask us to determine if we can assist you in your cutting tool special requirements.

In addition to specially engineered tooling systems and a comprehensive line of carbide inserts, Greenleaf offers high-quality ceramic and ceramic-composite materials which can be custom designed for specific machining applications.

From its headquarters in Saegertown, Pennsylvania, and a facility in North Carolina, Greenleaf maintains its commitment to pioneering breakthroughs in cutting-tool technology and to delivering ***Excel****erated* solutions for customers around the world.

Bar Peeler Cartridge

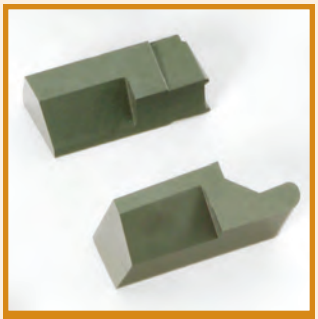
KM and Capto Shank



Heavy Metal Head

Keyslot

Quick Change Roll Tool



Race Track Groovers

Roll Turning

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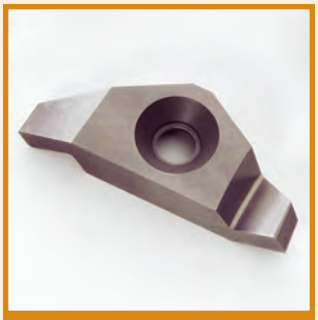
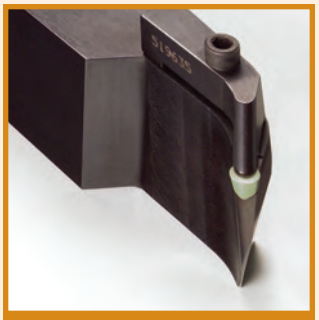
Dovetail Cutter



Heligroove Group

Hogmill

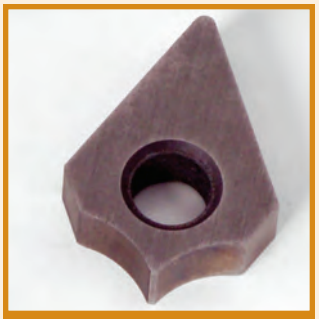


Hook Groove Holder

Long Shaft End Mill

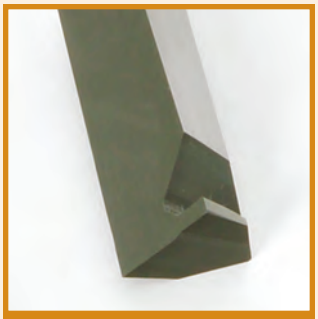
Plungeface Cutter

Pod Bore Head



Special Form Insert

Roll Lathe Tool

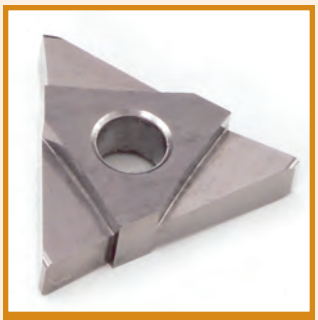


V-Bottom

Aero Grooving Tools

Roll Turning Tool

Heavy Turning



Tri-Thread Groover

Powerlock® Grooving Inserts

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Special Tool Design Information Checklist ✓

❑ Operation Information

Specify Operation: ❑ Milling ❑ Turning ❑ Boring ❑ Other: _____
Hand of Tool: ❑ Right Hand ❑ Left Hand ❑ Neutral

Specify size and style of mounting bore or shank: _____

❑ Machine Information

Type of Machine: _____ Horsepower or KW: _____
Condition: ❑ New ❑ Good ❑ Fair ❑ Poor

❑ Part Information:

Part Name: _____ Part End Use: _____

Part Material: _____ Hardness: _____ Condition: _____

❑ Furnish part drawing. *(Note areas to be machined and specify centerline of tool along with direction of feed and rotation.)*

❑ Furnish IGES or DXF file of part drawing if a tool layout is being requested.

❑ Furnish process sheets if available.

❑ Furnish digital photos of art or machine mounting if possible.

❑ Quote quantities: Tooling: _____ Inserts: _____

If parts are currently being machined, please complete this section:

❑ Furnish drawings, sketch or sample of existing tools.

❑ Describe problems with existing tools: _____

❑ Specify preferred insert style, grade, and edge prep: _____

Additional comments: _____

Company _____ **Customer Number** _____

Attention _____ **Customer Inquiry Number** _____

Street _____ **Ship to City** _____ **Country** _____

City _____ **State** _____ **Zip Code** _____ **Send Copy to** _____

Phone _____ **FAX** _____ _____

Email _____ **Sales Rep** _____ **Date Received** _____ **Quote Due Date** _____

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Carbide

Grade Descriptions ..... ATI 02-03
Feed and Speed Data ..... ATI 04-09
Chipform Application Range ..... ATI 10
Insert Grade Reference ..... ATI 12-13

Ceramic

Grade Descriptions ..... ATI 14
Feed and Speed Data ..... ATI 16-18
Edge Preparation and Application Guide ..... ATI 19
Insert Grade Reference ..... ATI 20-21

Formulas for Turning and Facing ..... ATI 22

Optional Clamps ..... ATI 23

Ceramic Productivity Manual ..... ATI 25-74

Greenleaf®

CARBIDE

Greenleaf offers a comprehensive line of carbide inserts in grades ranging from sub-micron C-1 through C-8 classifications. An industry pioneer in coated carbide, Greenleaf offers a variety of uncoated, MT-CVD coated and PVD-coated grades. Carbide inserts are available in ANSI standard geometries with multi-purpose chip-breakers for heavy roughing through finishing.

COATED – MT-CVD

GA5023 A high-speed performance grade for turning and milling cast iron. GA5023 features an advanced MT-CVD coating specifically developed for abrasive wear resistance. Application ranges from roughing to finishing on most cast iron materials including gray iron, ductile, nodular and other alloyed irons. The high wear and shock resistance of GA5023 allows machining at high speeds and a variety of feeds.

GA5025 A high-speed MT-CVD coated grade for turning, light roughing and finishing of carbon and alloy steels, as well as selected stainless steels.

GA5026 A high-speed grade developed for turning nickel- and cobalt-based super-alloys, stainless steels, and refractory metals. The advanced MT-CVD coating over a micro-grain substrate offers high wear resistance. GA5026 has exceptional resistance to the notching and deformation common to machining high strength materials. Apply at high speeds and light feeds in turning and selected milling applications.

GA5035 A high-performance MT-CVD coated grade for turning all types of steels, and selected stainless steels. GA5035 can be used in rough, semi-finish, and finish turning situations requiring resistance to heat deformation, thermal shock, and abrasion. GA5035 should be applied at high speeds and a range of feeds.

GA5036 A high-performance MT-CVD coated grade for milling steels at high speed. GA5036 should be used when milling forged and cast steels and selected ductile irons. GA5036 has a unique combination of toughness and heat resistance making it suitable for heavy and light duty milling at high cutting speeds.

GA5125 New high-performance MT-CVD coated carbide milling grade especially suited for manganese steel. GA5125 is also applicable on chrome-moly steel, tool steel and similar high alloy steels. GA5125 provides excellent resistance to abrasion, crater wear, thermal shock, deformation and edge build-up. GA5125 should be applied at high speeds with moderate feed rates.

COATED – PVD

G-910 PVD-coated grade for milling high-temp alloys, stainless steel, and low carbon steels. G-910 is a medium-speed grade and should be applied at moderate to high feed rates.

G-9120 PVD-coated grade for milling and turning steel castings and steel forgings. G-9120 is engineered to maximize productivity at moderate to heavy feed rates and depths of cut.

G-915 Multi-layer PVD-coated grade, excellent for cut off, milling and turning high-temp alloys, stainless steel, and low carbon steels. The multi-layer PVD coating adds heat and abrasion resistance to the tough, shock-resistant substrate. G-915 should be run at moderate speeds and moderate to high feeds in milling and interrupted turning applications.

G-920 PVD-coated grade for turning and milling high-strength materials such as high-temp alloys, titanium and stainless steel. G-920 is also an excellent grade for aluminum and refractory metals. This grade has the resistance to deformation and notching required for higher speeds than G-910.

G-9230 PVD-coated grade developed for medium to heavy machining of nickel alloys, cobolt alloys, titanium alloys, stainless steels and alloyed irons. G-9230 has superior wear resistance amd toughness and is excellent for cast and forged scale machining conditions.

G-925 Multi-layer PVD-coated grade specifically designed for machining abrasive and difficult-to-machine materials. Typical applications include high-temp alloys, titanium and other refractory metals, stainless steel, and many cast irons. G-925 exhibits excellent resistance to notching and deformation. Apply at moderate to high speeds and moderate feeds.

G-935 Multi-layer PVD-coated grade for steel milling and turning applications requiring additional resistance to mechanical and thermal shock. The multi-layered PVD coating increases the speed capability and wear resistance in tough milling and interrupted turning applications.

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UNCOATED

G-01 Developed for milling high-temp alloys, stainless steel, and low-carbon steels at low speeds and moderate to high feeds. Also can be used for turning in the same application range on severe interruption or old machinery.

G-01M A tough, sub-micron grade used for milling and roughing austenitic stainless steels, and stainless steel castings – even when rolling or casting skin is present. The edge strength of G-01M allows the use of sharp edges, high positive rakes, and intermittent cuts.

G-10 For roughing all cast irons under severe conditions, including broaching. The edge strength of G-10 makes it a good choice for roughing high-temp alloys with positive rakes and machining non-ferrous materials when toughness is of prime importance. Apply at moderate speeds and feeds.

G-02 An excellent general-purpose cast iron grade. G-02 can be applied to milling and turning cast iron at moderately high speeds and medium feeds. G-02 is also a good choice for machining aluminum with positive rakes, and light roughing of some high-temp alloys and stainless steels.

G-20M A sub-micron C-2 carbide grade suited for use in turning and milling titanium and nickel-based super-alloys. G-20M has the strength and edge wear characteristics to resist notching when turning high-strength materials.

G-23 A finishing grade for all cast irons and other short-chipping non-ferrous materials, such as brass and bronze. Apply at moderately high speeds and moderate feed rates.

G-40 Finish turning of cast iron and other hard-wearing materials at high speeds and light feeds in good conditions.

G-50 Heavy roughing grade for steel and steel castings under difficult conditions, and ferritic stainless steels in most applications. G-50 is tough enough to enable the use of positive rakes for turning.

G-53 Excellent general-purpose milling grade for steel and steel alloys at moderate speeds and feeds. Good combination of toughness and wear resistance for milling, or as an all-around grade for mixed production applications. G-53 is not recommended for continuous turning.

G-60 Heavy rough turning of steel, steel castings, and steel forgings. Apply G-60 at moderate speeds and heavy feed rates and depths of cut. More wear resistant than G-50, but lower in toughness.

G-74 Roughing or finishing grade for steel and steel castings. G-74 has higher shock resistance than G-70, and should be applied at high speeds and moderate to heavy feeds. Well suited for turning of steel rolls.

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Uncoated Carbide Grade Machining Recommendations for Turning

Type of Material	Hardness		Maximum Surface Speeds (ft/min)							
	Rc	BHN	G-60 G-53	G-50	G-02	G-10 G-23	G-20M	G-01M	G-40	G-74
Non-Alloy Carbon Steel:										
C < 0.25 %		110	612	391	N/A	N/A	N/A	N/A	N/A	663
C < 0.80 %	6	150	468	298	N/A	N/A	N/A	N/A	N/A	510
C < 1.40 %	33	310	374	238	N/A	N/A	N/A	N/A	N/A	408
Low-Alloy Steels:										
Annealed, Medium - High Carbon	12	180	391	247	N/A	N/A	N/A	N/A	N/A	425
Hardened	36	330	255	162	N/A	N/A	N/A	N/A	N/A	272
High-Alloy Steels:										
Annealed	16	200	238	153	N/A	N/A	N/A	N/A	N/A	255
Hardened	41	380	170	111	N/A	N/A	N/A	N/A	N/A	187
High-Alloy Tool Steel:										
Hardened	36	330	247	153	N/A	N/A	N/A	N/A	N/A	264
Cast Steel:										
Non-Alloy	6	150	468	298	N/A	N/A	N/A	N/A	N/A	510
Low-Alloy	16	200	374	238	N/A	N/A	N/A	N/A	N/A	408
High-Alloy	16	200	332	213	N/A	N/A	N/A	N/A	N/A	357
Stainless Steels:										
Ferritic, 400 Series	16	200	374	238	N/A	N/A	N/A	N/A	N/A	408
Austenitic, 300 Series	16	200	N/A	N/A	264	340	298	N/A	N/A	N/A
Gray, Perlitic Cast Irons:										
Low Tensile	12	180	N/A	N/A	383	510	425	300	700	N/A
High Tensile	26	260	N/A	N/A	170	213	196	150	350	N/A
Nodular / Malleable Irons:										
Short Chipping	6	150	578	374	N/A	N/A	N/A	N/A	N/A	629
Long Chipping	21	230	340	213	N/A	N/A	N/A	N/A	N/A	374
Aluminum Alloys:			N/A	N/A	1190	1530	1275	1000	1900	N/A
Brass, Copper, Bronze:			N/A	N/A	425	510	468	350	700	N/A
Hardened Steels (> 50 Rc):			N/A	N/A	N/A	N/A	N/A	N/A	50	43
Chilled, Hardened Irons (> 50 Rc):			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Titanium, Refractory Metals:			N/A	N/A	85	128	111	70	N/A	N/A
Nickel & Iron Based Superalloys:										
Inconels			N/A	N/A	68	N/A	85	60	N/A	N/A
Hastelloys			N/A	N/A	102	N/A	119	90	N/A	N/A
Waspaloys			N/A	N/A	68	N/A	85	60	N/A	N/A
Renes			N/A	N/A	51	N/A	68	40	N/A	N/A
Monels			N/A	N/A	51	N/A	68	40	N/A	N/A
Cobalt Based Superalloys:										
Stellites			N/A	N/A	43	N/A	51	40	N/A	N/A
Haynes Alloys			N/A	N/A	43	N/A	51	40	N/A	N/A

Finishing: 0.003 to 0.015 in/rev
General Purpose: 0.008 to 0.020 in/rev
Medium Roughing: 0.015 to 0.030 in/rev
Heavy Roughing: > 0.030 in/rev

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Uncoated Carbide Grade Machining Recommendations for Milling

Type of Material	Hardness		Maximum Surface Speeds (ft/min)							
	Rc	BHN	G-60 G-53	G-50	G-02	G-10 G-23	G-20M	G-01M	G-40	G-74
Non-Alloy Carbon Steel:										
C < 0.25 %		110	720	460	N/A	N/A	N/A	N/A	N/A	N/A
C < 0.80 %	6	150	550	350	N/A	N/A	N/A	N/A	N/A	N/A
C < 1.40 %	33	310	440	280	N/A	N/A	N/A	N/A	N/A	N/A
Low-Alloy Steels:										
Annealed, Medium - High Carbon	12	180	460	290	N/A	N/A	N/A	N/A	N/A	N/A
Hardened	36	330	300	190	N/A	N/A	N/A	N/A	N/A	N/A
High-Alloy Steels:										
Annealed	16	200	280	180	N/A	N/A	N/A	N/A	N/A	N/A
Hardened	41	380	200	130	N/A	N/A	N/A	N/A	N/A	N/A
High-Alloy Tool Steel:										
Hardened	36	330	290	180	N/A	N/A	N/A	N/A	N/A	N/A
Cast Steel:										
Non-Alloy	6	150	550	350	N/A	N/A	N/A	N/A	N/A	N/A
Low-Alloy	16	200	440	280	N/A	N/A	N/A	N/A	N/A	N/A
High-Alloy	16	200	390	250	N/A	N/A	N/A	N/A	N/A	N/A
Stainless Steels:										
Ferritic, 400 Series	16	200	440	280	N/A	N/A	N/A	N/A	N/A	N/A
Austenitic, 300 Series	16	200	N/A	N/A	310	400	350	N/A	N/A	N/A
Gray, Perlitic Cast Irons:										
Low Tensile	12	180	N/A	N/A	450	600	500	N/A	N/A	N/A
High Tensile	26	260	N/A	N/A	200	250	230	N/A	N/A	N/A
Nodular / Malleable Irons:										
Short Chipping	6	150	680	440	N/A	N/A	N/A	N/A	N/A	N/A
Long Chipping	21	230	400	250	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum Alloys:			N/A	N/A	1400	1800	1500	N/A	N/A	N/A
Brass, Copper, Bronze:			N/A	N/A	500	600	550	N/A	N/A	N/A
Hardened Steels (> 50 Rc):			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chilled, Hardened Irons (> 50 Rc):			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Titanium, Refractory Metals:			N/A	N/A	100	150	130	N/A	N/A	N/A
Nickel & Iron Based Superalloys:										
Inconels			N/A	N/A	80	N/A	100	N/A	N/A	N/A
Hastelloys			N/A	N/A	120	N/A	140	N/A	N/A	N/A
Waspaloys			N/A	N/A	80	N/A	100	N/A	N/A	N/A
Renes			N/A	N/A	60	N/A	80	N/A	N/A	N/A
Monels			N/A	N/A	60	N/A	80	N/A	N/A	N/A
Cobalt Based Superalloys:										
Stellites			N/A	N/A	50	N/A	60	N/A	N/A	N/A
Haynes Alloys			N/A	N/A	50	N/A	60	N/A	N/A	N/A

Feeds should be in the range of 0.003 in/tooth to 0.012 in/tooth.
Higher speeds require lower feeds, whereas, low speeds use higher feed rates.
A good general starting point for feed rate in milling is 0.004 in/tooth.

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MT-CVD Coated Carbide Grade Machining Recommendations for Turning

Type of Material	Hardness		Maximum Surface Speeds (ft/min)		
	Rc	BHN	GA5025 GA5035	GA5026	GA5023
Non-Alloy Carbon Steel					
C < 0.25 %		110	1105	N/A	N/A
C < 0.80 %	6	150	850	N/A	N/A
C < 1.40 %	33	310	680	N/A	N/A
Low-Alloy Steels					
Annealed, Medium - High Carbon	12	180	714	N/A	N/A
Hardened	36	330	459	N/A	N/A
High-Alloy Steels					
Annealed	16	200	425	N/A	N/A
Hardened	41	380	306	N/A	N/A
High-Alloy Tool Steel					
Hardened	36	330	442	N/A	N/A
Cast Steel					
Non-Alloy	6	150	850	N/A	N/A
Low-Alloy	16	200	680	N/A	N/A
High-Alloy	16	200	595	N/A	N/A
Stainless Steels					
Ferritic, 400 Series	16	200	N/A	N/A	638
Ferritic, 400 Series	32	310	600	N/A	N/A
Austenitic, 300 Series	16	200	N/A	450	425
Gray, Perlitic Cast Irons					
Low Tensile	12	180	N/A	600	808
High Tensile	26	260	N/A	350	289
Nodular / Malleable Irons					
Short Chipping	6	150	N/A	N/A	1165
Long Chipping	21	230	N/A	N/A	697
Aluminum Alloys			N/A	2000	N/A
Brass, Copper, Bronze			N/A	700	N/A
Hardened Steels (> 50 Rc)			N/A	N/A	N/A
Chilled, Hardened Irons (> 50 Rc)			N/A	N/A	N/A
Titanium, Refractory Metals			N/A	200	N/A
Nickel & Iron Based Superalloys					
Inconels			N/A	260	N/A
Hastelloys			N/A	340	N/A
Waspaloys			N/A	260	N/A
Renes			N/A	220	N/A
Monels			N/A	220	N/A
Cobalt Based Superalloys					
Stellites			N/A	180	N/A
Haynes Alloys			N/A	180	N

Finishing: 0.003 to 0.015 in/rev
General Purpose: 0.008 to 0.020 in/rev
Medium Roughing: 0.015 to 0.030 in/rev
Heavy Roughing: > 0.030 in/rev

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MT-CVD Coated Carbide Grade Machining Recommendations for Milling

Type of Material	Hardness		Maximum Surface Speeds (ft/min)			
	Rc	BHN	GA5036	GA5026	GA5023	GA5125
Non-Alloy Carbon Steel						
C < 0.25 %		110	1050	N/A	N/A	N/A
C < 0.80 %	6	150	850	N/A	N/A	N/A
C < 1.40 %	33	310	700	N/A	N/A	N/A
Low-Alloy Steels						
Medium - High Carbon, Annealed	12	180	700	N/A	N/A	N/A
Hardened	36	330	560	N/A	N/A	N/A
High-Alloy Steels						
Annealed	16	200	500	N/A	N/A	N/A
Hardened	41	380	400	N/A	N/A	N/A
Manganese Steel	20	230	N/A	N/A	N/A	500
High-Alloy Tool Steel						
Hardened	36	330	450	N/A	N/A	N/A
Cast Steel						
Non-Alloy	6	150	730	N/A	N/A	N/A
Low-Alloy	16	200	570	N/A	N/A	N/A
High-Alloy	16	200	500	N/A	N/A	N/A
Stainless Steels						
Ferritic, 400 Series	16	200	N/A	N/A	760	N/A
Ferritic, 400 Series	32	310	500	N/A	660	N/A
Austenitic, 300 Series	16	200	N/A	450	500	N/A
Gray, Perlitic Cast Irons						
Low Tensile	12	180	N/A	600	950	N/A
High Tensile	26	260	N/A	350	340	N/A
Nodular / Malleable Irons						
Short Chipping	6	150	N/A	N/A	1370	N/A
Long Chipping	21	230	N/A	N/A	820	N/A
Aluminum Alloys			N/A	1800	N/A	N/A
Brass, Copper, Bronze			N/A	700	N/A	N/A
Hardened Steels (> 50 Rc)			N/A	N/A	N/A	N/A
Chilled, Hardened Irons (> 50 Rc)			N/A	N/A	N/A	N/A
Titanium, Refractory Metals			N/A	200	N/A	N/A
Nickel & Iron Based Superalloys						
Inconels			N/A	130	N/A	N/A
Hastelloys			N/A	170	N/A	N/A
Waspaloys			N/A	130	N/A	N/A
Renes			N/A	110	N/A	N/A
Monels			N/A	110	N/A	N/A
Cobalt Based Superalloys						
Stellites			N/A	90	N/A	N/A
Haynes Alloys			N/A	90	N/A	N/A

Feeds should be in the range of 0.003 in/tooth to 0.012 in/tooth.

Higher speeds require lower feeds, whereas, low speeds use higher feed rates.

A good general starting point for feed rate in milling is 0.004 in/tooth.

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PVD-Coated Carbide Grade Machining Recommendations for Milling and Turning

Type of Material	Hardness		Maximum Surface Speeds (ft/min)				
	Rc	BHN	G-9120 G-935	G-9230 G-925	G-920	G-910	G-915
Non-Alloy Carbon Steel:							
C < 0.25 %		110	1500	N/A	N/A	650	820
C < 0.80 %	6	150	1200	N/A	N/A	500	630
C < 1.40 %	33	310	1000	N/A	N/A	400	500
Low-Alloy Steels:							
Medium - High Carbon, Annealed	12	180	900	N/A	N/A	425	530
Hardened	36	330	600	N/A	N/A	270	340
High-Alloy Steels:							
Annealed	16	200	600	N/A	N/A	255	320
Hardened	41	380	400	N/A	N/A	185	230
High-Alloy Tool Steel:							
Hardened	36	330	600	N/A	N/A	265	330
Cast Steel:							
Non-Alloy	6	150	1200	N/A	N/A	500	630
Low-Alloy	16	200	1000	N/A	N/A	400	500
High-Alloy	16	200	850	N/A	N/A	350	440
Stainless Steels:							
Ferritic, 400 Series	16	200	N/A	N/A	N/A	500	630
Ferritic, 400 Series	32	310	580	N/A	N/A	375	470
Austenitic, 300 Series	16	200	N/A	450	350	260	325
Gray, Perlitic Cast Irons:							
Low Tensile	12	180	1100	600	500	N/A	N/A
High Tensile	26	260	400	350	250	N/A	N/A
Nodular / Malleable Irons:							
Short Chipping	6	150	1500	N/A	N/A	N/A	N/A
Long Chipping	21	230	900	N/A	N/A	N/A	N/A
Aluminum Alloys:			850	1800	1500	N/A	N/A
Brass, Copper, Bronze:			650	700	550	N/A	N/A
Hardened Steels (> 50 Rc):			N/A	N/A	N/A	N/A	N/A
Chilled, Hardened Irons (> 50 Rc):			N/A	N/A	N/A	N/A	N/A
Titanium, Refractory Metals:			N/A	200	150	80	96
Nickel & Iron Based Superalloys:							
Inconels			N/A	130	100	70	84
Hastelloys			N/A	170	140	100	120
Waspaloys			N/A	130	100	70	84
Renes			N/A	110	80	50	60
Monels			N/A	110	80	50	60
Cobalt Based Superalloys:							
Stellites			N/A	90	60	50	60
Haynes Alloys			N/A	90	60	50	60

Milling

Feeds should be in the range of 0.003 in/tooth to 0.012 in/tooth.
Higher speeds require lower feeds, whereas, low speeds use higher feed rates.
A good general starting point for feed rate in milling is 0.004 in/tooth.

Turning

Finishing: 0.003 to 0.015 in/rev
General Purpose: 0.008 to 0.020 in/rev
Medium Roughing: 0.015 to 0.030 in/rev
Heavy Roughing: > 0.030 in/rev

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Suggested Cutting Speeds (SFM) for TurboForm® (TF) Inserts

Alloy	AMS#	Uncoated G-20M	PVD G-920 G-925	MT-CVD GA5026
A-286	5732	104	130	215
Astroloy		96	120	198
Custom 455 Stainless	5617	112	140	231
Greek Ascoloy	5616	200	250	413
Hastelloy B		144	180	297
Hastelloy C	5750	144	180	297
Hastelloy D		144	180	297
Hastelloy G		144	180	297
Hastelloy N	5771	144	180	297
Hastelloy S	5711	144	180	297
Hastelloy W	5755	104	130	215
Hastelloy X	5754	104	130	215
Haynes 188	5772	68	85	140
Haynes 25	5759	68	85	140
Haynes 263		68	85	140
IN-100	5397	48	60	99
Inconel 600	5665	112	140	231
Inconel 601	5715	112	140	231
Inconel 617		112	140	231
Inconel 625	5666	92	115	190
Inconel 702		92	115	190
Inconel 706	5702	92	115	190
Inconel 718	5662	80	100	165
Inconel 721		112	140	231
Inconel 722	5717	112	140	231
Inconel 751		92	115	190
Inconel X-750	5668	80	100	165
Incoloy 825		48	60	99
Incoloy 903		96	120	198
Incoloy 925		80	100	165
Monel 400		92	115	190
Monel 401		92	115	190
Monel 404		92	115	190
Monel 502		92	115	190
Monel K500		92	115	190
Monel R405		92	115	190
MP-35-N	5758	92	115	190
Nickel 200		92	115	190
Nickel 201		92	115	190
Nickel 205		92	115	190
Nickel 211		92	115	190
Nickel 220		92	115	190
Nimonic 75		92	115	190
Nimonic 80		92	115	190
Nimonic 90		92	115	190
Nimonic 95		92	115	190
Nimonic Alloy 901 Mod	5661	92	115	190

Alloy	AMS#	Uncoated G-20M	PVD G-920 G-925	MT-CVD GA5026
Nitralloy 230		96	120	198
Nitralloy N		96	120	198
Permanickel 300		96	120	198
Rene 41	5712	64	80	132
Rene 63		64	80	132
Rene 77		64	80	132
Rene 80		64	80	132
Rene 95		64	80	132
Stainless Steel 15-5PH	5659	92	115	190
Stainless Steel 17-4PH	5622	92	115	190
Udimet 500	5751	80	100	165
Udimet 630		68	85	140
Udimet 700		68	85	140
Udimet 710		68	85	140
Udimet M-252	5756	80	100	165
Waspaloy	5706	80	100	165

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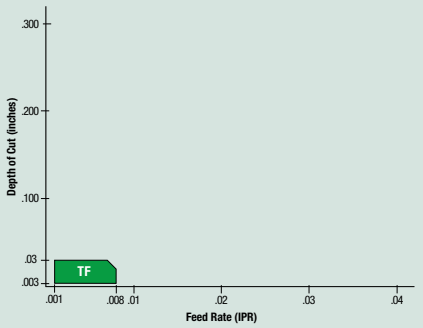
PRECISION FINISHING

TF

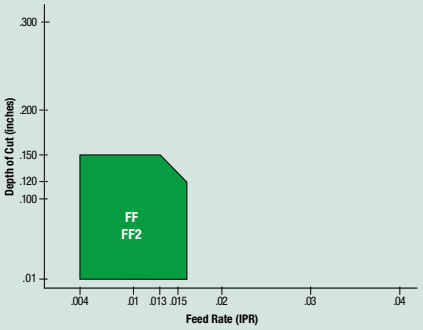
Precision ground chipbreaker for nickel alloys. Good for feeds up to 0.009"/rev and depths to 0.03".



FINISHING

FF and FF2

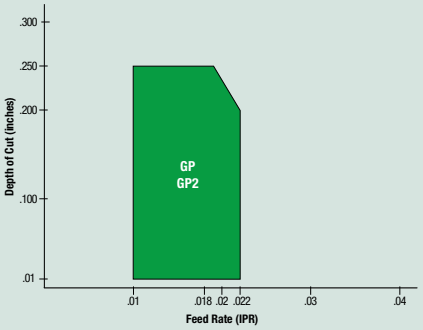
For finishing all types of material. Designed for feeds up to 0.0185"/rev and 0.15" depth of cut.



GENERAL PURPOSE

GP and GP2

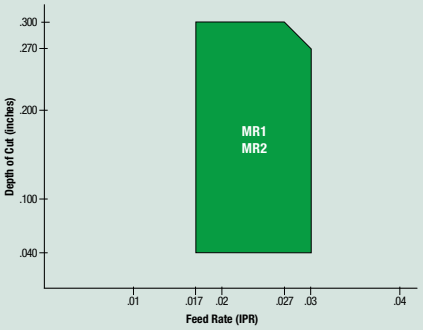
General purpose chipbreaker. Feed rates up to 0.02"/rev and 0.25" depth of cut.



MEDIUM ROUGHING

MR and MR2

Used for medium roughing of all material. Feeds up to 0.028"/rev and depths up to 0.30".

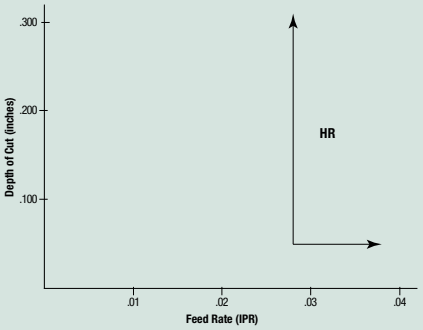


HEAVY ROUGHING

HR

Heavy roughing for all materials. Feeds above 0.023"/rev. One-sided chipbreaker for heaviest feeds (MM).

Example: CNMM 644 HR



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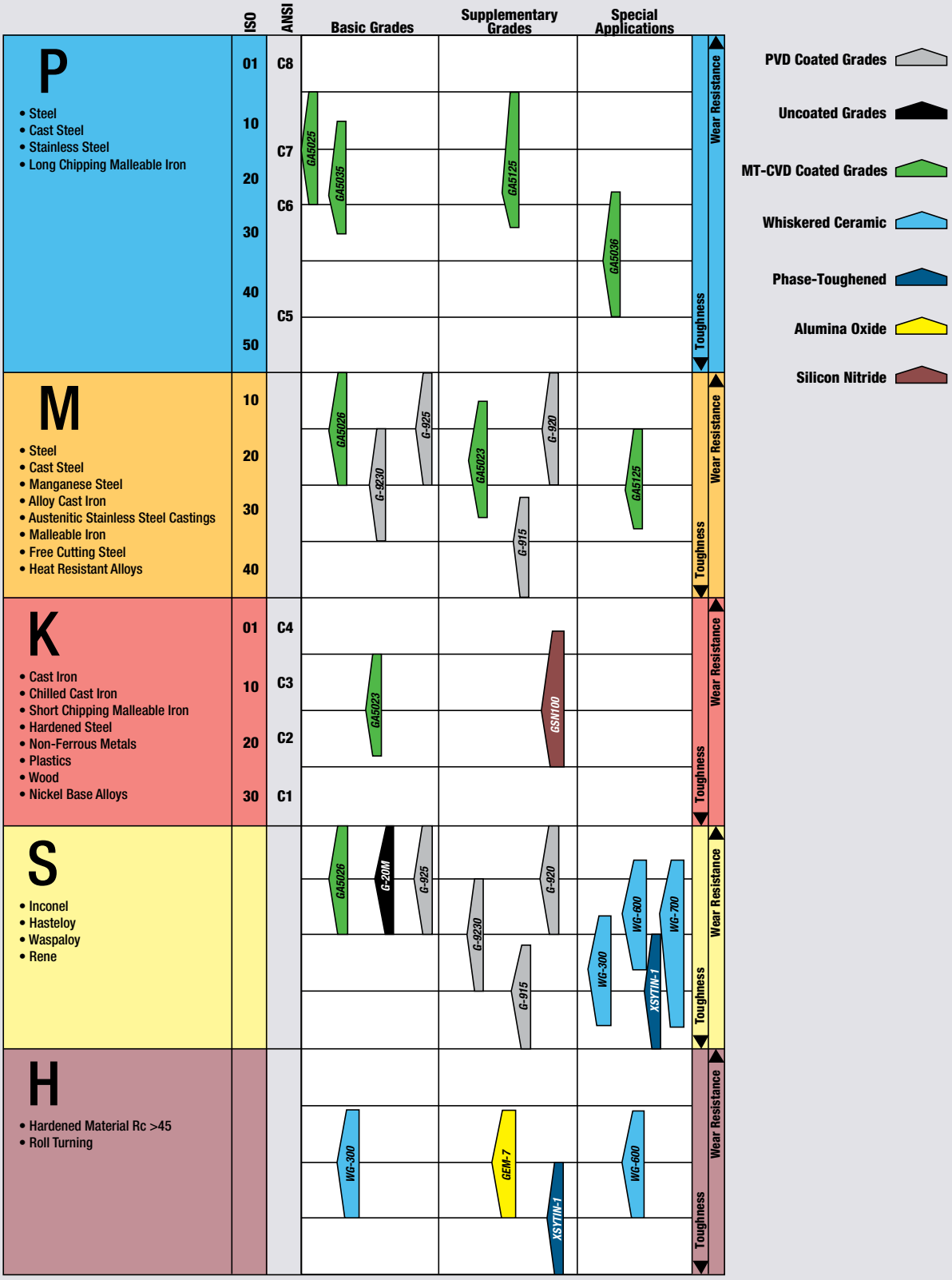
Insert Grade Reference for Turning, Grooving and Profiling



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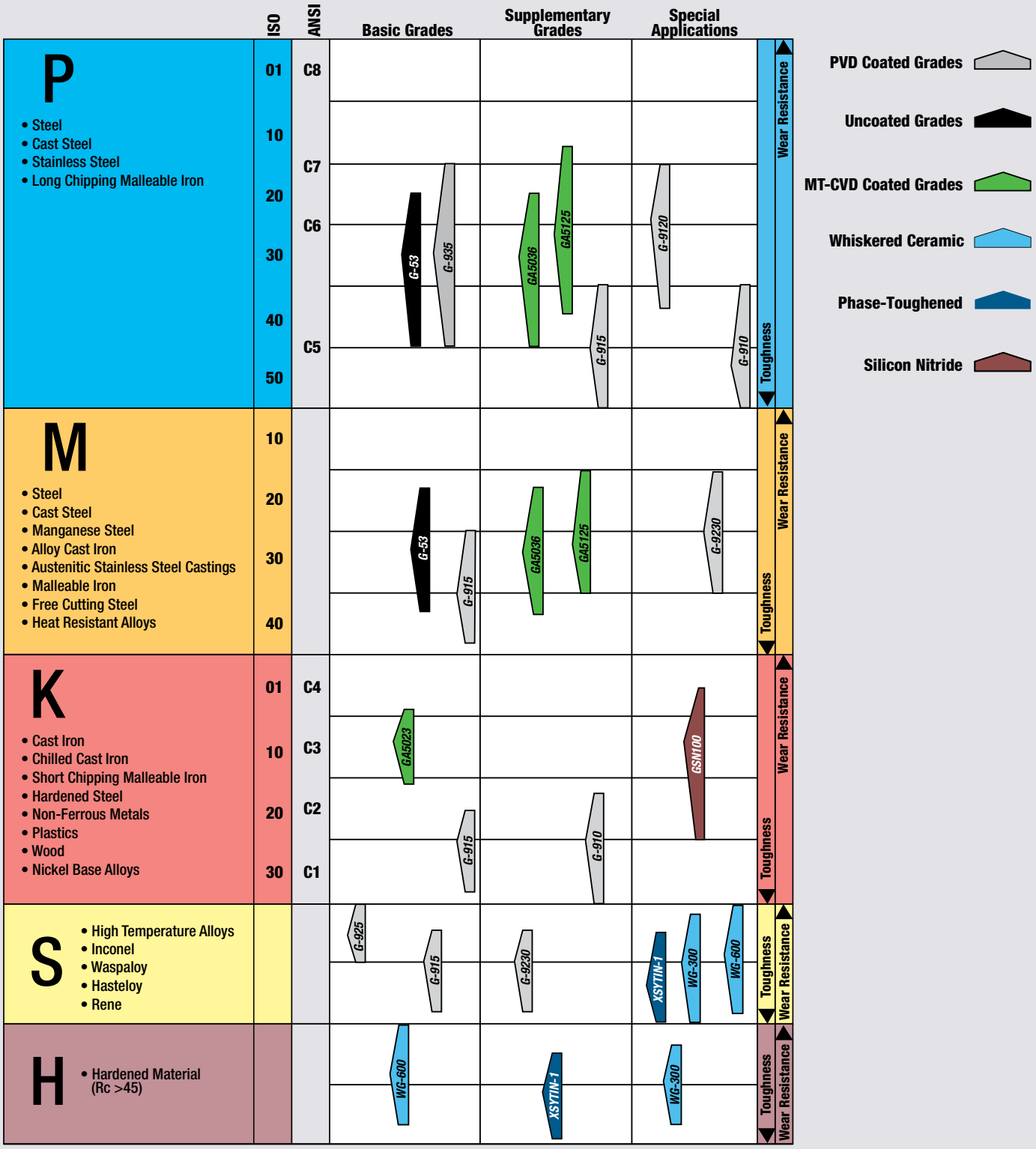
Insert Grade Reference for Milling



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CERAMIC

Greenleaf is the industry leader in the development and manufacture of ceramic and coated ceramic inserts in ANSI standard and special geometries. Some of the most prominent include:

WG-300® Whisker-reinforced ceramic with excellent wear and shock resistance at high surface speeds. WG-300 is very effective at machining nickel and cobalt based super-alloys, and other hard materials at metal removal rates up to 10 times higher than carbide.

WG-600® Coated whisker-reinforced ceramic offering longer tool life and better performance over uncoated ceramics due to outstanding thermal properties and shock-resistance at high cutting speeds. Application areas include rough and finish turning, as well as high-performance milling of high-strength alloys, hardened steels and select stainless steels.
U.S. Patent No. 6,447,896 B1.

WG-700™ New whisker-reinforced Al_2O_3 ceramic substrate featuring improved toughness and a unique high-speed coating. WG-700 is ideal for machining nickel- and cobalt-based super alloys and other difficult-to-machines materials. WG-700 exhibits high metal-removal rates with exceptional tool life. *U.S. Patent No. 6,447,896 B1.*

XSYTIN™-1 New phase-thoughened ceramic capable of extreme feed rates. XSYTIN™-1excels at machining a wide variety of materials including steels, cast and ductile irons, high-temperature alloys amd other challenging metals. XSYTIN™-1is ideal for use in interrupted cuts, scale, abrasive casting materials and milling.

GSN100™ New engineered blend of silicon nitride and proprietary toughening agents that redefines productivity in the machining of cast iron. GSN100 delivers outstanding tool life at high cutting speeds in turning, grooving and milling applications.

GEM-7™ Al_2O_3 + TiC composite ceramic with a high degree of predictability in roll turning and hard alloy (up to 65 R/c) machining.

GEM-19™ Cold pressed and sintered Al_2O_3 ceramic for economical roughing and finishing of cast iron grades application range on severe interruption or old machinery.

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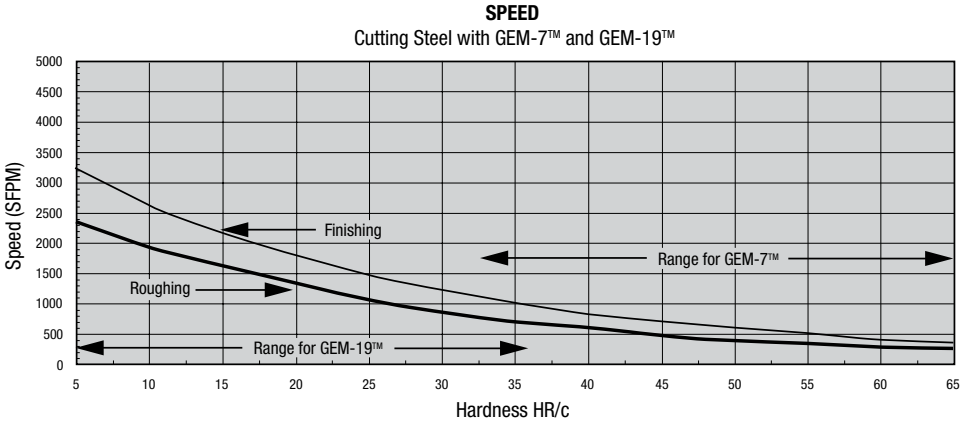
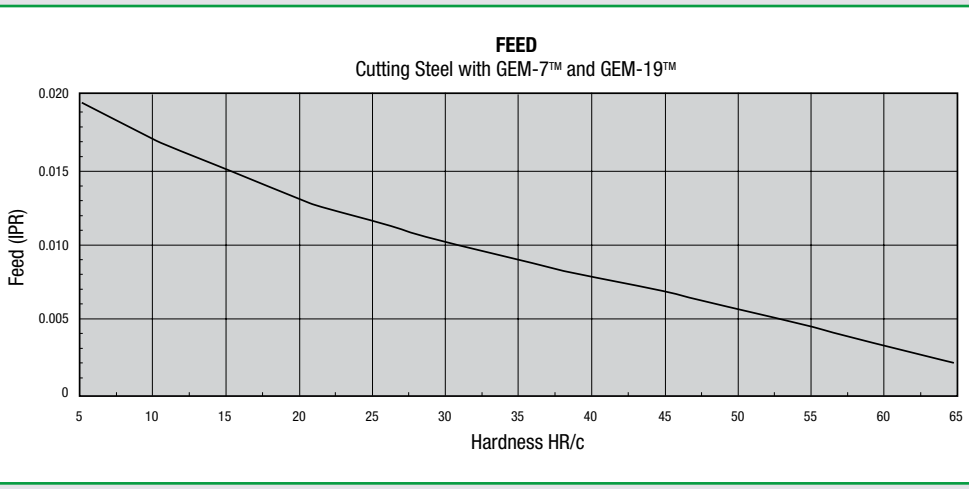
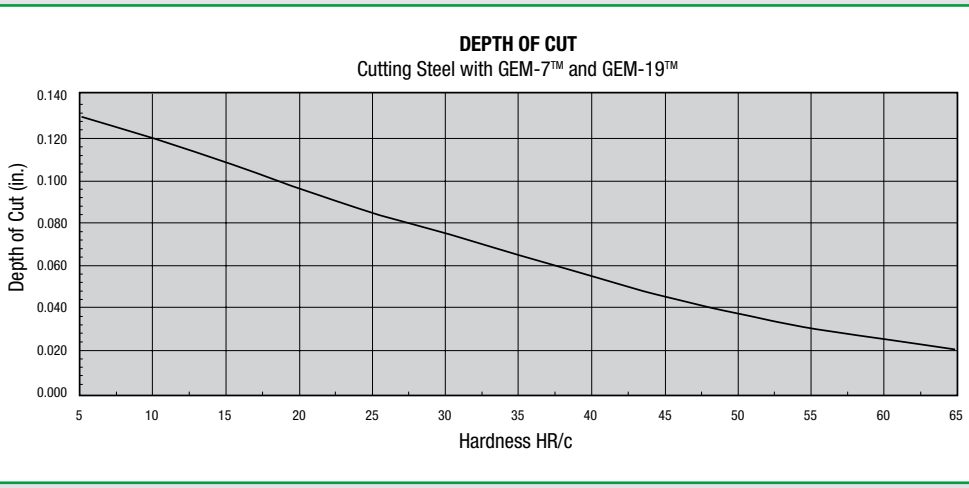
Cutting Steel with GEM-7™ and GEM-19™







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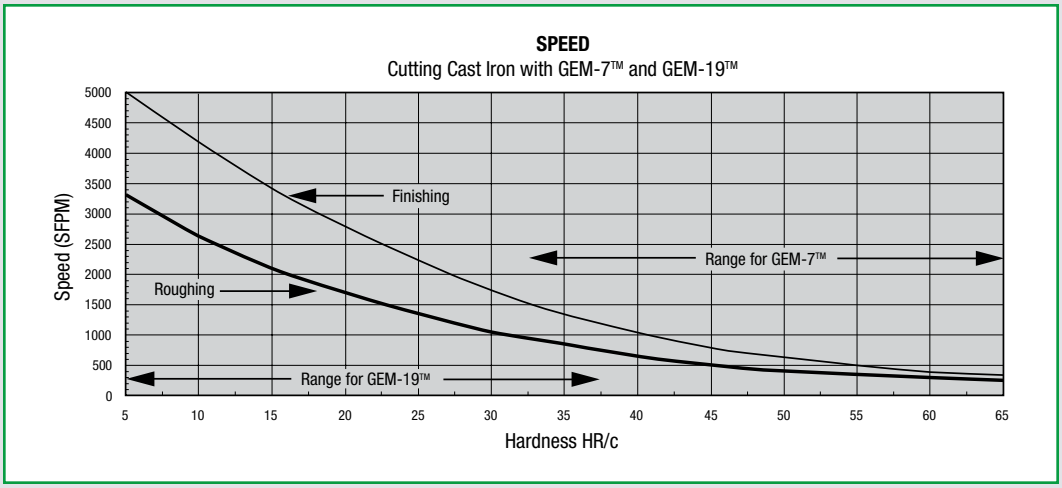
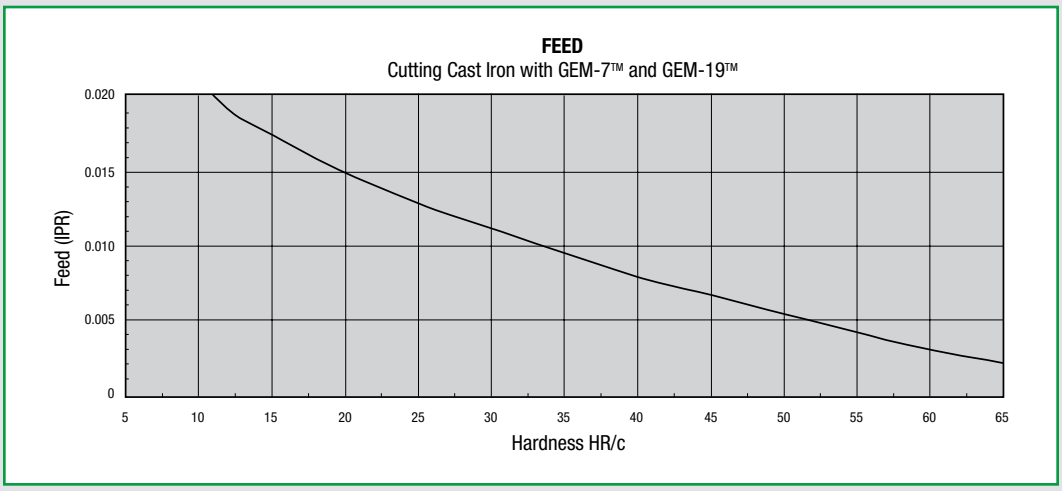
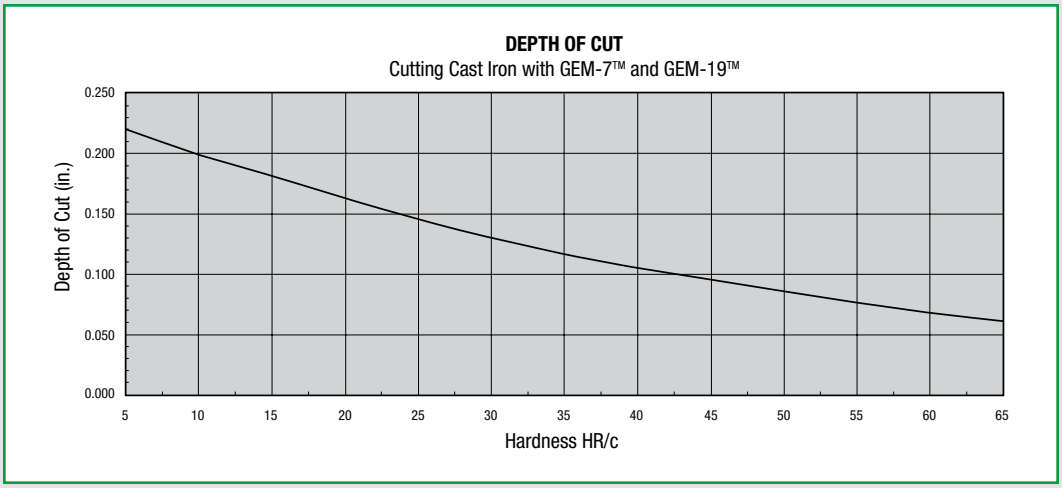
Cutting Cast Iron with GEM-7™ and GEM-19™







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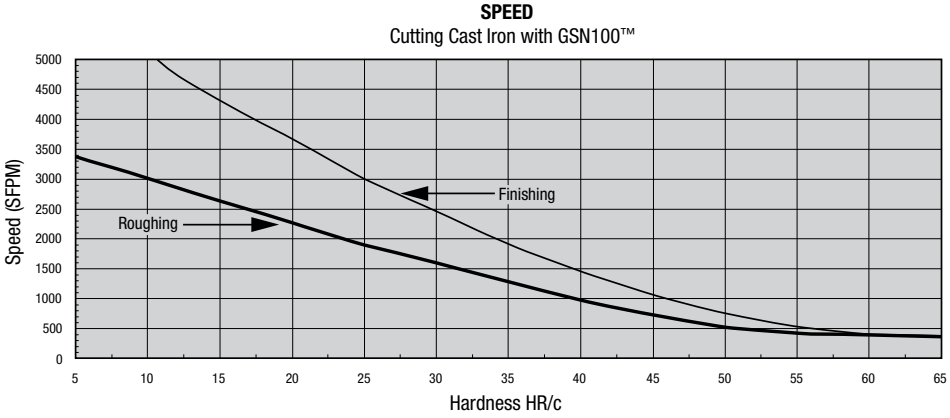
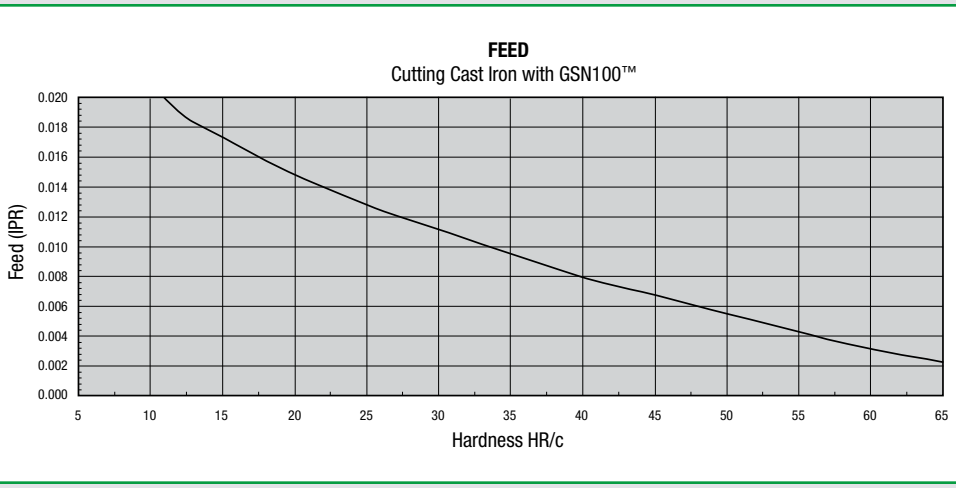
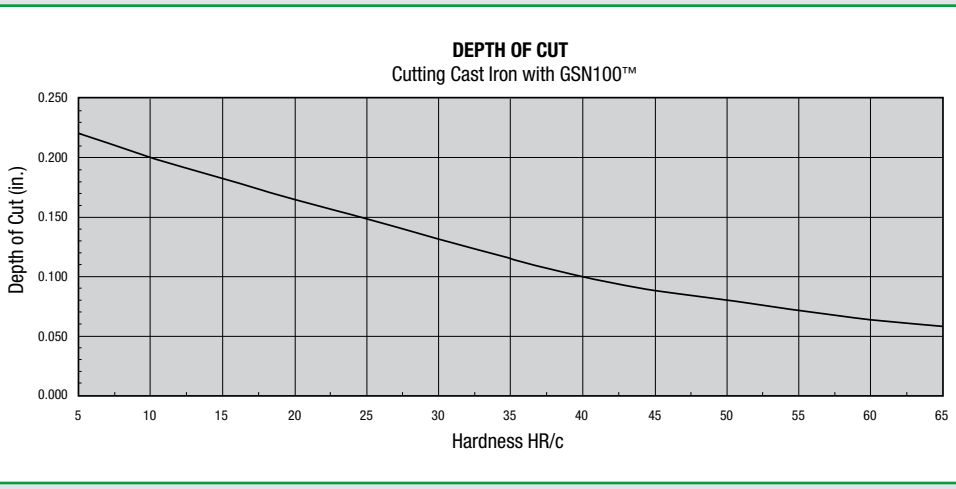
Cutting Cast Iron with GSN100™







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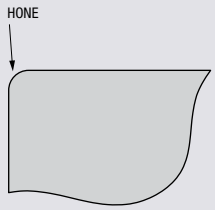
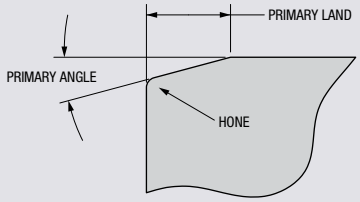
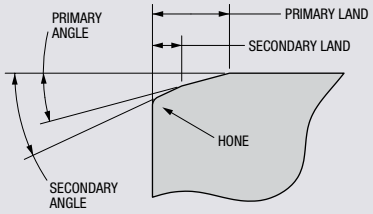
Edge Preparations and Application Guide



HONE



PRIMARY ANGLE



SECONDARY ANGLE

Edge Prep	Hone	Primary Land	Primary Angle	Secondary Land	Secondary Angle	Application
A	.0005 - .001" R.					For light finishing and grooving, also added to designated negative lands (i.e. T1, T2, T9).
B	.001 - .002" R.					Used in addition to heavy machining chamfers and designated negative lands (i.e. T4, T10).
T1		.002 - .004"	20°			General purpose for turning and light milling in clean high-temp. alloys and materials <50R/C.
T1A	.0005 - .001" R.	.002 - .004"	20°			Used where more protection is needed than T1 such as in scale and light interruptions, hard turning.
T2		.006 - .008"	20°			General purpose chamfer for light to medium feed rates, cast-iron machining.
T2A	.0005 - .001" R.	.006 - .008"	20°			Scale applications, light interruptions, weld overlays, finish turning and milling of hardened materials.
T3		.013 - .015"	30°			Used on smaller IC inserts as an alternative to T7.
T3A	.0005 - .001" R.	.013 - .015"	30°			Used on smaller IC inserts as an alternative to T7A.
T4B	.001 - .002" R.	.075"	10°	.006 - .008"	25°	Heavy machining <3/4"IC - Roll turning, 3V, 4V, CDH-22, CDH-33.
T5B	.001 - .002" R.	.060"	15°	.006 - .008"	30°	Heavy machining - alternative to T4B.
T7		.015 - .020"	20°			For use in similar applications as T2 - use in heavier feed areas.
T7A	.0005 - .001" R.	.015 - .020"	20°			For use in similar applications as T2A - use in heavier feed areas.
T9		.006 - .008"	30°			General purpose chamfer for medium to heavy feed rates, milling, cast-iron machining <5/8"IC.
T9A	.0005 - .001" R.	.006 - .008"	30°			For medium to heavy feed rates, milling, cast-iron machining for heavier interruptions <5/8"IC.
T10A	.0005 - .001" R.	.090 - .100"	15°	.006 - .008"	30°	Heavy machining, iron and steel roll turning >3/4"IC, CDH-43, CDH-53.
T10B	.001 - .002" R.	.090 - .100"	15°	.006 - .008"	30°	Heavy machining, iron and steel roll turning >3/4"IC, CDH-43, CDH-53.

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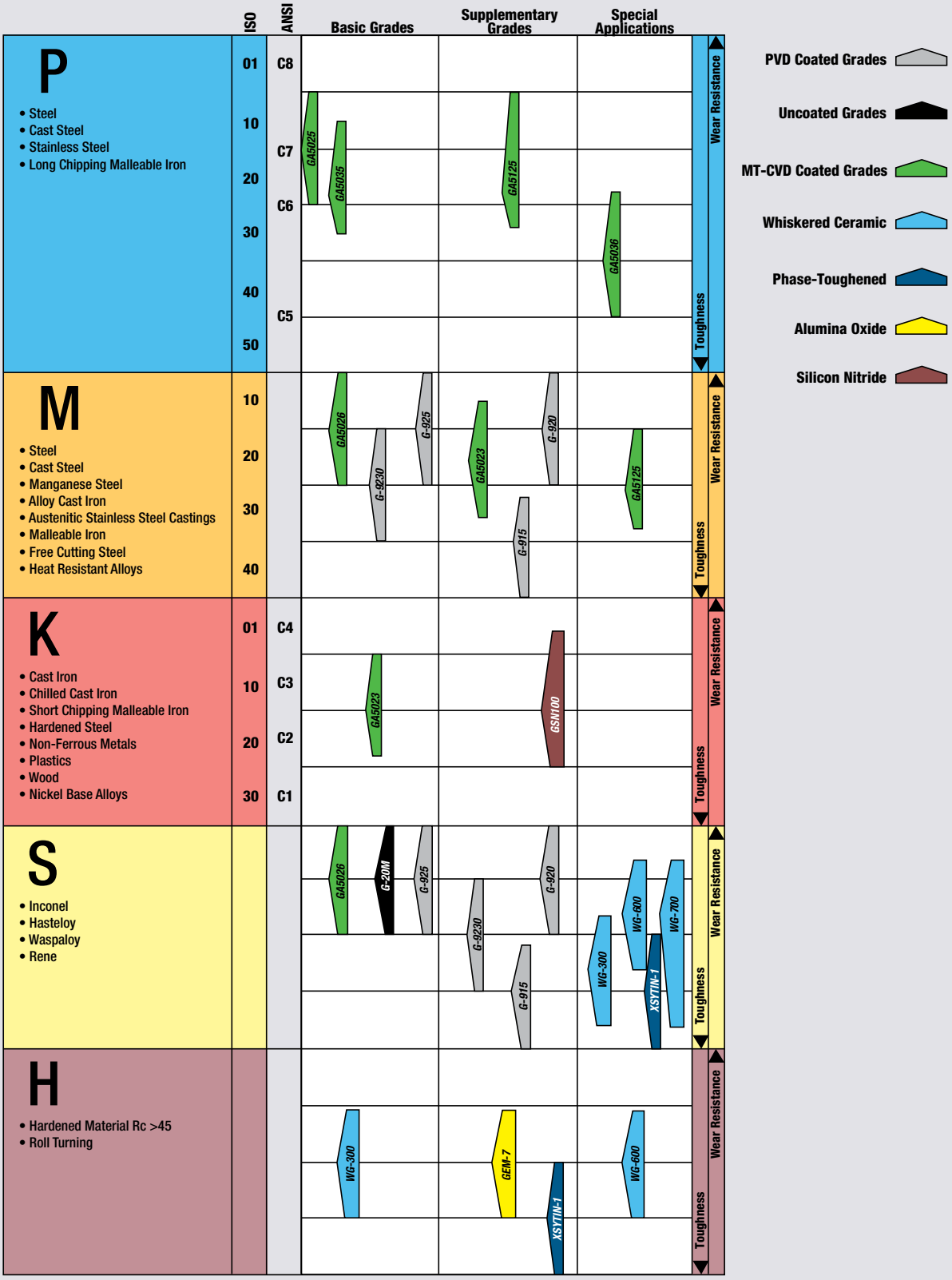

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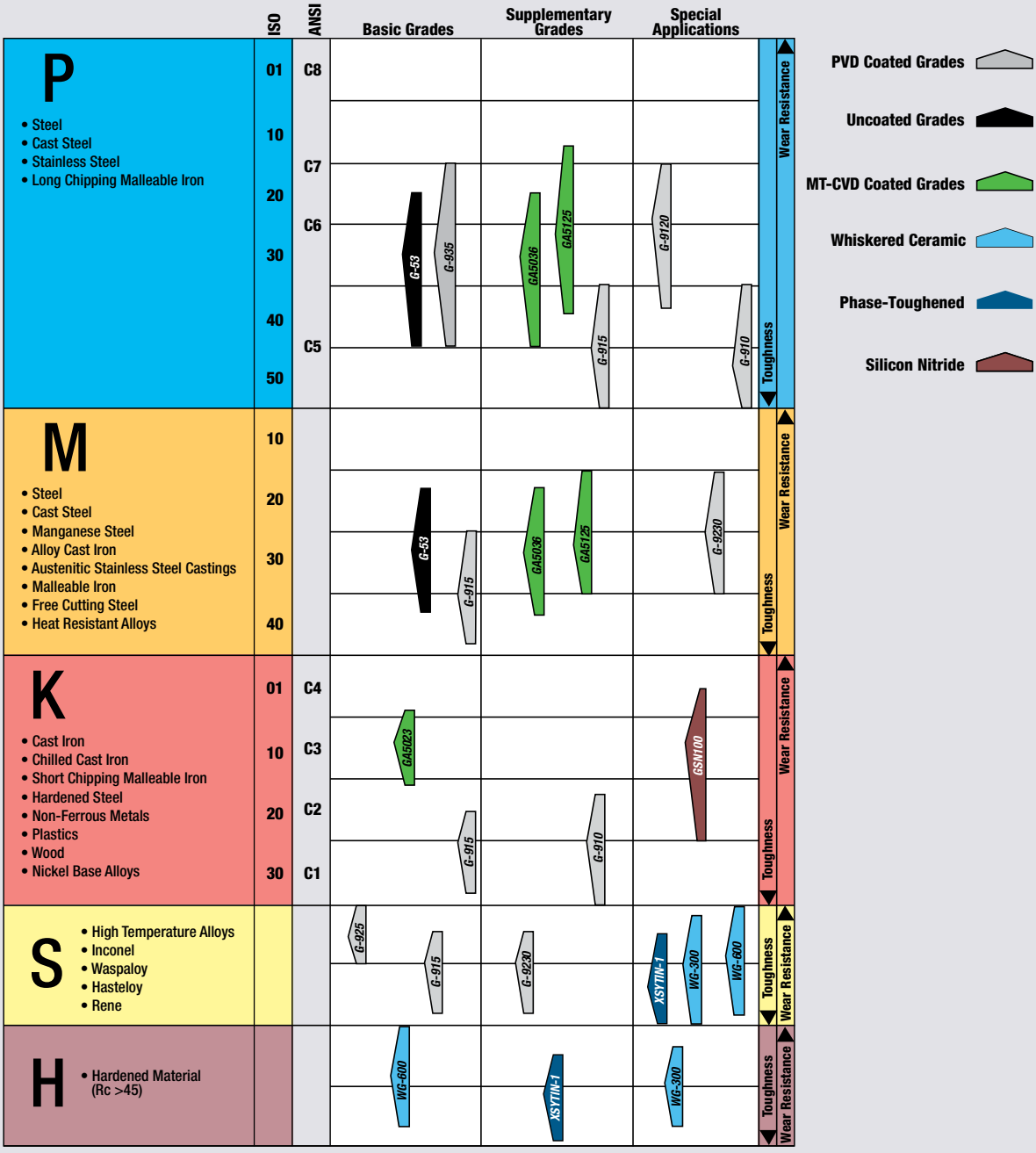
Insert Grade Reference for Milling



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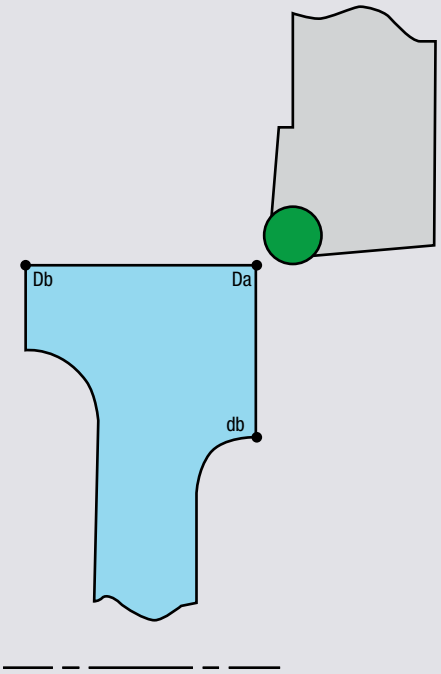
Formulas for Turning and Facing

Imperial



Turning

$$SFM = \frac{Dia. \times \pi \times RPM}{12} \qquad RPM = \frac{SFM \times 12}{Dia. \times \pi}$$

$$T = \frac{LOC}{IPR \times RPM} \qquad LOC\ Da\ to\ Db = \frac{SFM \times 12 \times IPR \times T}{Dia. \times \pi}$$

Facing

To calculate the time (T) for a facing operation from starting point (Da) to finishing point (db):

$$\textbf{Time}\ Da\ to\ db = \frac{\pi\ (Da^2 - db^2)}{48 \times SFM \times IPR}$$

To calculate the endpoint (db) for facing from starting point (Da) to finishing point (db):

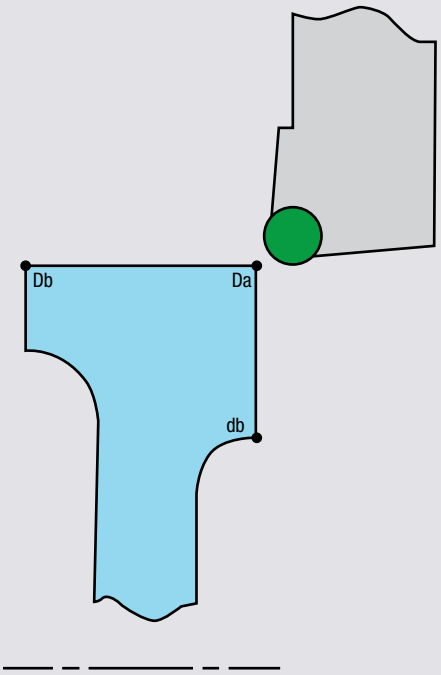
$$db = \sqrt{Da^2 - (15.279 \times T \times SFM \times IPR)}$$

If db is minus, you have passed center.

SFM = Surface Speed (feet/minute)
IPR = Feed Rate (inches/revolution)
LOC = Length of cut (inches)
T = Time (min.)
π = 3.1416
D = Large Diameter (inches)
d = Small Diameter (inches)
15.279 = $\frac{48}{\pi}$

Note: The constant speed capabilities of the lathe are assumed in the above facing calculations.

Metric



Turning

$$V = \frac{Dia. \times \pi \times RPM}{1000} \qquad RPM = \frac{V \times 1000}{Dia. \times \pi}$$

$$T = \frac{LOC}{S \times RPM} \qquad LOC\ Da\ to\ Db = \frac{V \times 1000 \times S \times T}{Dia. \times \pi}$$

Facing

To calculate the time (T) for a facing operation from starting point (Da) to finishing point (db):

$$\textbf{Time}\ Da\ to\ db = \frac{\pi\ (Da^2 - db^2)}{4000 \times V \times S}$$

To calculate the endpoint (db) for facing from starting point (Da) to finishing point (db):

$$db = \sqrt{Da^1 - (1273{,}2 \times T \times V \times S)}$$

If db is minus, you have passed center.

V = Surface Speed (meters/minute)
S = Feed Rate (mm/revolution)
LOC = Length of cut (mm)
T = Time (min.)
π = 3.1416
D = Large Diameter (mm)
d = Small Diameter (mm)
1273,2 = $\frac{4000}{\pi}$

Note: The constant speed capabilities of the lathe are assumed in the above facing calculations.

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Optional Clamps

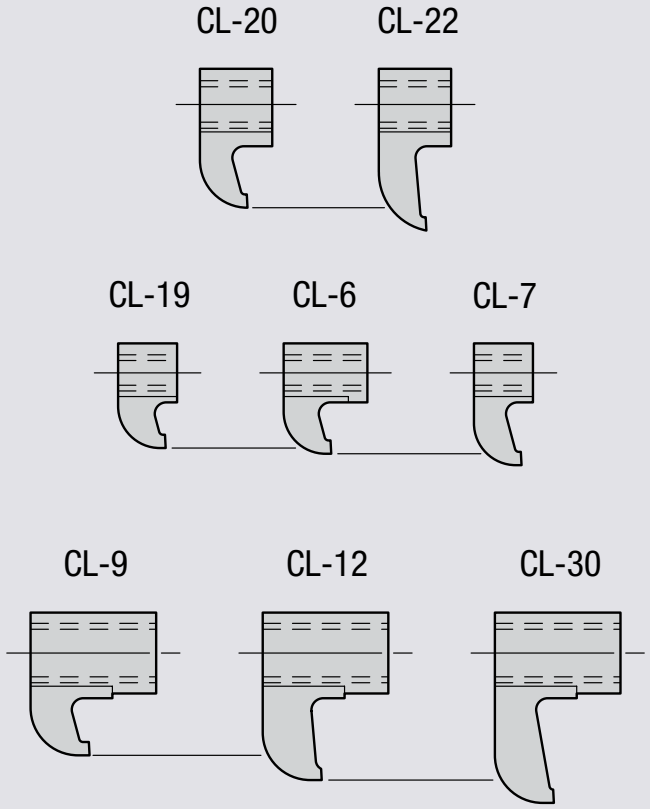
To give maximum flexibility and provide for maximum clamping advantage in any given cutting situation, there are alternative clamps available. The variation in these clamps is the reach. Barrel diameters are common.

A typical example of alternate clamp usage would be in holding an insert without a hole. In this case, the lock pin would be removed and the clamp substituted so that maximum top clamping capability may be applied.

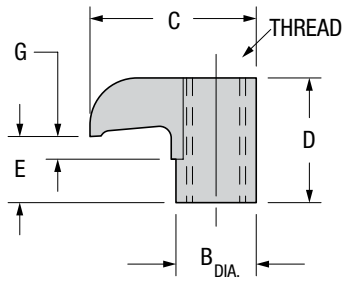
We have chosen as standard for each tool cataloged a clamp and differential screw combination for use with inserts with holes (pinlock). A longer reach clamp should be used when using top clamp alone. If conditions indicate, another combination would be advantageous. Please note as follows:

- Clamps CL-6, CL-7 and CL-19 are interchangeable. The difference is in the reach only.
- CL-9, CL-12 and CL-30 are all interchangeable, the difference being in the reach only.
- CL-20 and CL-22 are interchangeable, the difference being in the reach only.

Barrel diameters “B” and thread sizes are common. The reach “C”, height “D”, and “E” and “G” dimensions may be different. It is very important that sufficient clearance exist in the toolholder for the clamp to drop down far enough into the holder to attain clamping action on the insert.



Clamp Interchangeability



Order Number	B	C	D	E	G	Thread
CL-5	.280	.520	.350	.102	–	10-32
CL-6	.310	.580	.440	.187	.094	10-32
CL-7	.310	.640	.310	.062	–	10-32
CL-19	.310	.550	.310	.062	–	10-32
CL-9	.430	.750	.660	.344	.125	5/16-24
CL-12	.430	.880	.660	.344	.125	5/16-24
CL-30	.430	1.000	.660	.344	.125	5/16-24
CL-20	.375	.730	.380	.125	–	1/4-28
CL-22	.375	.850	.380	.125	–	1/4-28
CL-24	.491	1.000	.785	.453	.136	3/8-24

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Greenleaf Advanced Whisker-Reinforced Ceramics

Greenleaf advanced whisker-reinforced ceramic inserts exhibit excellent wear and shock resistance at high surface speeds. These insert grades are very effective at machining nickel- and cobalt-based super alloys and other hard materials at metal removal rates up to 10 times greater than carbide.

The Ceramic Productivity Manual will help you to machine more effectively with WG-300®, WG-600® and WG-700™. For additional technical support, contact a Greenleaf representative at 1-814-763-2915.

Greenleaf Corporation is continually upgrading its products.
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What is a Whisker-Reinforced Ceramic?

Greenleaf WG-300®, developed by Greenleaf Corporation, is the first commercially available ceramic composite using the technology of whisker reinforcement. It can operate up to 10 times the speed used for uncoated carbide tools.

Greenleaf WG-600® is the first commercially available coated, whisker-reinforced ceramic composite. Greenleaf WG-600 offers up to 30% speed improvement and up to 3 times tool life over uncoated ceramics.

Greenleaf WG-700™ is the newest whisker-reinforced ceramic substrate. Featuring improved toughness and a unique high-speed coating, WG-700 is ideal for machining nickel- and cobalt-based super alloys and other difficult-to-cut materials. WG-700 offers high metal removal rates with exceptional tool life.

The basic concept involves reinforcing a hard ceramic matrix with extremely strong, stiff, silicon-carbide crystals, commonly called whiskers.

These whiskers are grown under carefully controlled conditions and, due to their high purity and lack of grain boundaries, approach the theoretical maximum strength obtainable. This strength is calculated to be in the order of 1 million psi (6,900 MPa) tensile!

The super-strong whiskers are dispersed into a matrix of fine-grained aluminum oxide where they act much like glass filaments do in fiberglass, for example, by adding tensile strength and improving the fracture toughness of the brittle matrix.

The increase in the fracture toughness of the material is such that inserts are now offered without hones as a standard, making them suitable for finish cuts on most forged nickel-based alloys without “smearing.”

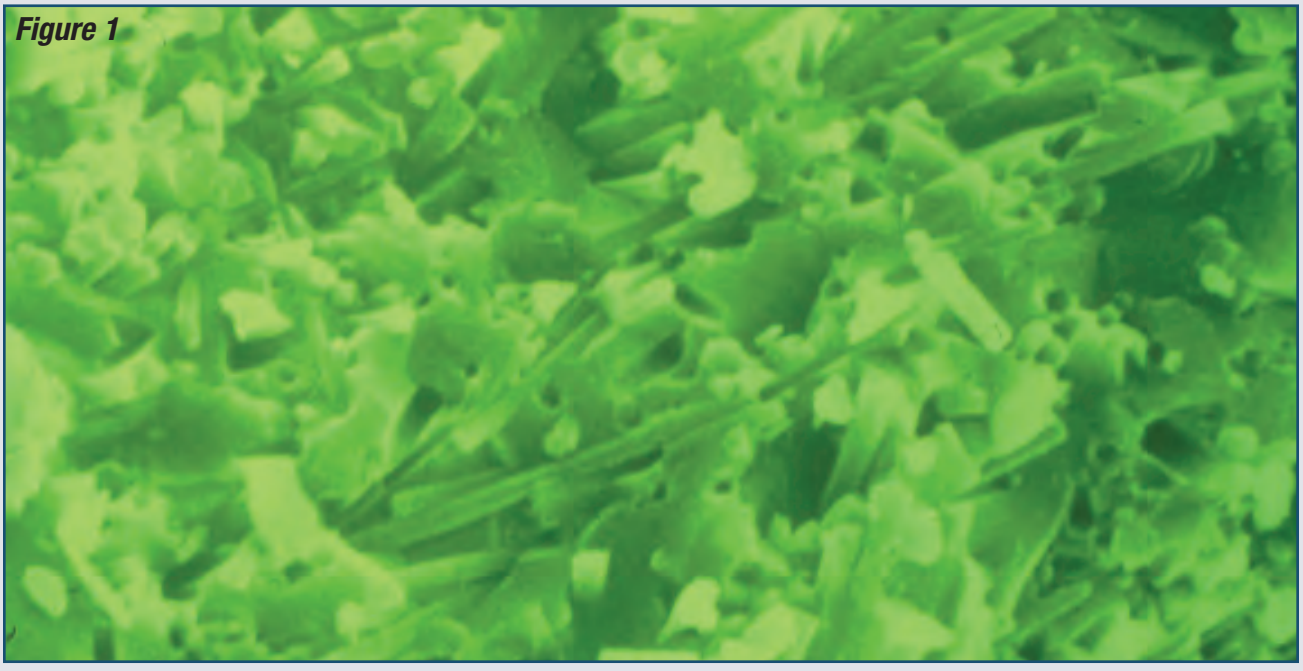
A properly manufactured whisker-reinforced ceramic has outstanding thermal and mechanical shock resistance. It can withstand intermittent cut applications, such as in milling, without breakage.

WG-300® Fracture Surface

The fracture toughness of a whisker-reinforced ceramic is enhanced by the phenomenon of whisker “pull-out.” A close examination of the fracture surface at 3000x will reveal not only a clear indication of the whiskers randomly dispersed throughout the matrix, but also the obvious hexagonal holes where whiskers have actually been pulled out in the fracture process. A large amount of energy is required to pull the whiskers out. This greatly enhances the fracture toughness and the high predictability of the inserts.

Greenleaf WG -300® will not fail by catastrophic breakage unless grossly misapplied, but will be gradually consumed in a predictable wear pattern. This wear pattern will be unlike the wear modes of carbide tools. It is the subject of a later paragraph in this section and should be studied and clearly understood for successful results.

Figure 1



SEM Photomicrograph 3000x

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Physical Properties

Physical properties are only a rough indicator of cutting tool performance.Ceramic cutting tools should always be evaluated in actual service where the synergisms of material properties and cutting-tool engineering can be clearly seen.

Particular note should be made that “Modulus of Rigidity” or “Transverse Rupture Strength” is expressed according to the accepted laboratory procedures for ceramics.

Here, a 2" *(50,8 mm)* long sample is broken by a four-point bend test. It is more common to refer to the 9/16" *(14,3 mm)* long three-point test in the case of carbide, and some manufacturers use this test also for ceramics. Naturally, the T.R.S. values for ceramic on the 2" *(50,8 mm)* sample are appreciably lower than they would be on a 9/16" *(14,3 mm)* test bar.

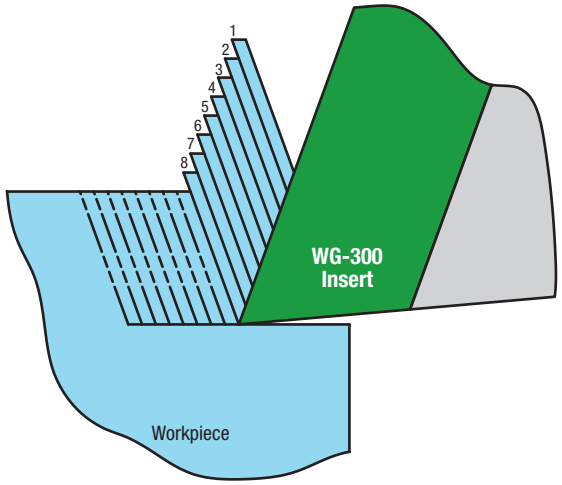
Figure 2 – Physical Properties

Microstructure	2 Phase Polycrystalline > 50% Alumina < 50% Silicon Carbide Whiskers
Density	= 3.74 g/cc
Melting Point	2040°C (3,700° F)
Hardness	≥ 94.4 RA
Modulus of Rigidity (E) / (4-Point Bend) } TRS = {	100,000 P.S.I.± 6,000 690 MPa ± 41
Young’s Modulus (E) **Modulus of Rigidity(G)**	= 57 X 10^6 P.S.I. = 23 X 10^6 P.S.I.
Poisson’s Ratio (M) $M = \frac{E}{2G} - 1$	= .23
Fracture Toughness *(Measures resistance of crack growth from stress)*	
Cemented Carbide	= 13.0
Hot Pressed Composite	= 3.8
WG Ceramics	= 10.0

How to Use the Properties of Greenleaf Advanced Ceramics

During the metal-removal operation, material is displaced ahead of the tool by being forced through a "shear zone" and subsequently sliding over the rake face of the tool as a chip. This action has been studied by numerous researchers including "Piispanen and Merchant," who demonstrated the mechanism of chip formation, likening it to the sideways slide of a deck of cards, caused by the rake face of the tool. *(Figure 3)*

Figure 3 – Deck-of-Cards Principle

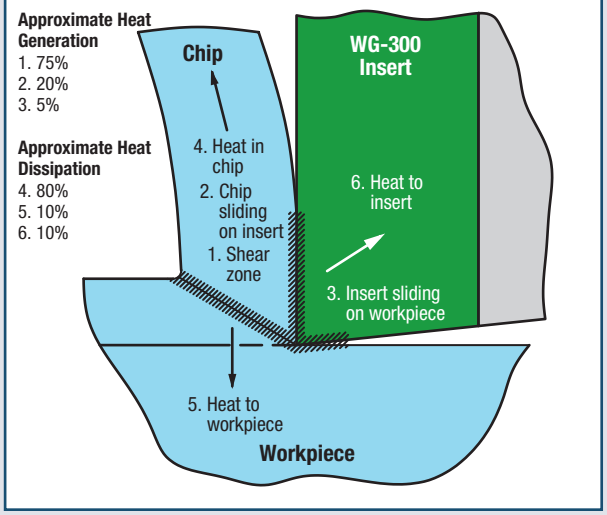


The chip is formed first by grain boundary distortion in front and below the shear plane, followed by grain boundary dislocation. This results in a chip that is always thicker than the layer of material being removed.

A large amount of shear stress is required to cause plastic deformation and shear to occur in the "shear zone," and this results in the generation of significant quantities of heat. In fact, as much as 75% of the heat generated during cutting is produced in this way. The other 25% comes from the sliding of the chip over the tool rake face and the contact of the flank of the tool with the workpiece. *(Figure 4)*

Most of the heat generated during metal cutting is dissipated by the chip carrying it away. As cutting speeds increase, the metal-cutting process becomes more adiabatic. In other words, the heat generated in the "shear zone" cannot be conducted away during the very short time in which the metal passes through this zone. We can benefit from the heat generation, temperature rise and softening effects in the "shear zone."

Figure 4 – Heat Dissipation in Ceramic Machining



The heat generated in the "shear zone" has been traditionally thought of as a negative factor since it is also associated with heat-related failure of cemented carbide cutting tools. This often leads to the need to slow down the cutting operation to a point where carbide inserts will give acceptable life.

Whisker-reinforced ceramics are able to withstand high temperatures while maintaining strength and hardness, and it has been shown that contrary to traditional methods of machining, we can, in fact, use the heat generated in the shear zone ahead of the tool to our advantage. There is an optimum speed outside the range of carbide tools where the heat generated lessens the cutting forces by softening the metal and aiding in the grain boundary dislocation.

This advantage can be very dramatic, sometimes moving the possible metal-cutting speeds from a few hundred feet per minute to thousands of feet per minute!

Such is the case with Greenleaf's whisker-reinforced ceramics when applied to most forged nickel-based alloys. Optimum speeds can be achieved with temperatures exceeding 1000° Celsius.

The excellent thermal shock resistance of whisker-reinforced ceramics results in a cutting material which can be used either dry, wet or even intermittently cooled without fear of catastrophic tool failure from thermal cracking.

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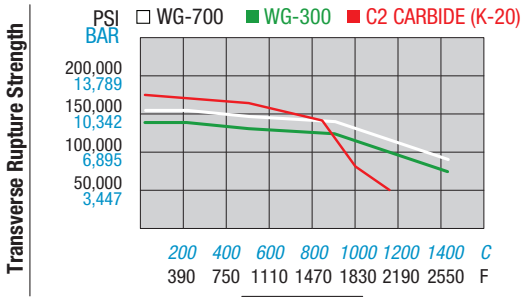
The outstanding hardness of Greenleaf whisker-reinforced ceramic inserts, combined with the high strength imparted by the reinforcing silicon-carbide whiskers, makes possible the machining of many materials previously workable only by grinding. Heat-treated alloy steels, die steels, weld overlays, and hard irons with interrupted cuts are just a few of the successful applications completed on a daily basis.

If your job is in the 45Rc to 65Rc range, chances are that Greenleaf's whisker-reinforced ceramic inserts can increase productivity and cut machining costs substantially.

Relative Strength at Elevated Temperatures

It is important to recognize that laboratory hardness and strength tests are conducted at room temperatures. Under actual cutting conditions where temperature at the tool/chip interface may reach over 1000° C, Greenleaf whisker-reinforced ceramics will retain high strength and hardness well beyond the point at which a tungsten-carbide material has softened, deformed or failed completely. Productivity advantages multiply quickly in this range of application.

Figure 5 – Relative Strength at Elevated Temperatures



Ceramic Application Guidelines

Rethink the process

The correct application of ceramic tooling on a CNC machine necessitates reprogramming of the part. Since we are doing this, we might just as well re-examine the entire process. Are we using the best geometry, largest radius, thickest insert, best tool path, etc.? When you have studied this application guide, you will be more aware of the variables and best approaches to the job using ceramic cutting tools.

Integrate the following tested methods into your programs:

Figure 6 – Ceramic Application Guidelines

1. Use a toolholder system designed for ceramic inserts.
2. Use the strongest insert shape possible.
3. Use the largest corner radius possible.
4. Use the correct edge preparation for the application.
5. Use the thickest inserts available for roughing.
6. Use a toolholder or boring bar with the largest possible cross section.
7. Consider heavy metal or carbide bars for boring applications.
8. Prechamfer on entry and exit whenever possible.
9. Keep toolholder overhang to a minimum.
10. ***Rethink the process***

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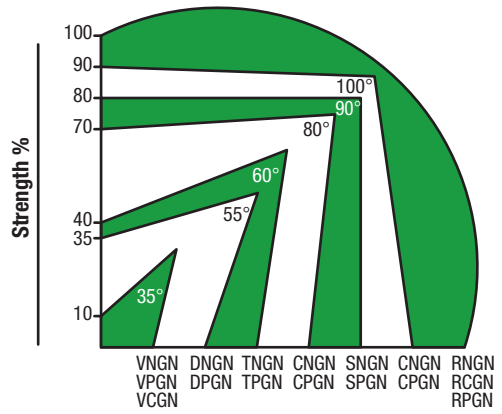
Strength Comparison of Ceramic Inserts

Use the strongest insert shape

In declining order of corner strength, the strongest inserts are: Round, 100° Diamond, Square, 80° Diamond, Triangle, 55° Diamond, and 35° Diamond. Always use the strongest possible shape to maximize corner strength and metal-removal capability.

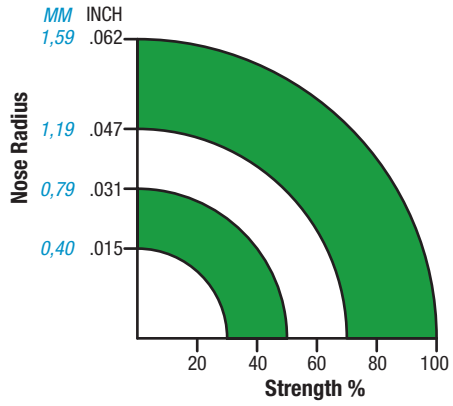
Figure 7 – Insert Shapes and Strengths



Use the largest corner radius possible

The larger the corner radius, the stronger the corner. Do not attempt to do all roughing operations with a small corner radius just because the finished fillet calls for a small radius. Use a round insert or large radius insert for roughing and change the tool for the final cuts.

Figure 8 – Relative Strength for Various Insert Radii



Use thick inserts for roughing

Increased insert thickness results in far better impact resistance, better heat dispersion, and longer tool life.

This adds to greater predictability of performance and less downtime.

Figure 9 – Relative Strength for Various Insert Thicknesses

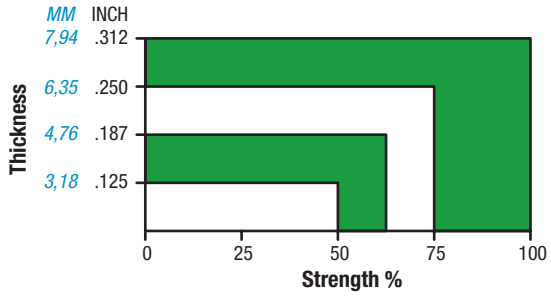


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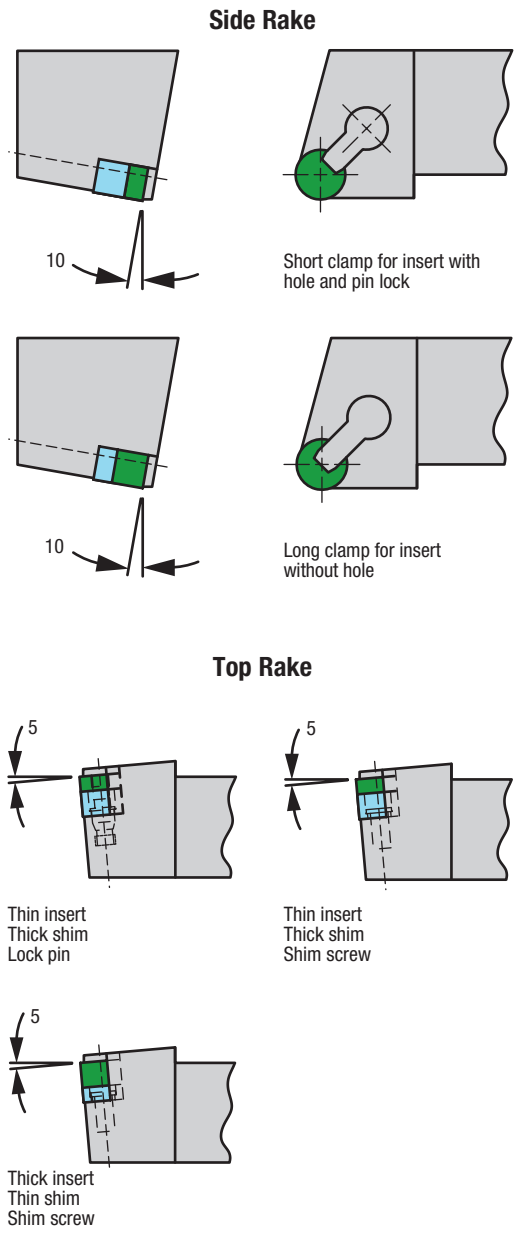
Figure 10 – Toolholder System



Use the Greenleaf toolholder system

The use of Greenleaf toolholders and accessories permits:

a) Either standard or thick inserts to be used in the same toolholder by changing shim seats.

b) The toolholders can be used for pinlock-style inserts by exchanging the shim screw for a tilt pin.

c) Alternative lengths of clamps are available with the holder being supplied standard with the large clamp to ensure good retention of ceramic inserts without holes.

d) In the case of negative-rake tooling, we have found that the normal carbide tool geometry of -5° top and side rake may be changed very advantageously to -5° top rake, and -10° side rake for materials under 45Rc hardness. Greenleaf tools for use with whisker-reinforced ceramics are illustrated in the Ceramic Toolholders in the Turning section of this catalog and have been designed to take advantage of this increased negative rake which will give longer tool life. The increased pressure associated with a greater negative rake is insignificant and not evident at the high velocity and temperatures at which these tools are used.

NOTE:
Greenleaf toolholders for v-bottom inserts are designed to take 7° side-clearance inserts as well as 11°.

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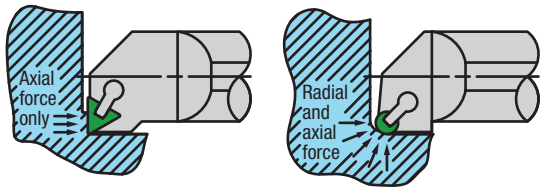
Use toolholder or boring bar with greatest cross sectional area

Stability of the tool and freedom from deflection are paramount to consistent performance. If the tool post will accept 1-1/4" *(32 mm)* shanks, do not be satisfied to take a 1" *(25 mm)* shank and shim it to suit. This is false economy.

Straight-edged inserts versus rounds

Long overhangs for tools are necessary when working with turrets in order to clear other tools. In these cases, straight-edged inserts should be applied to eliminate radial tool forces and avoid chatter.

Figure 11 – Straight-Edged Inserts vs. Round



Keep overhang to a minimum

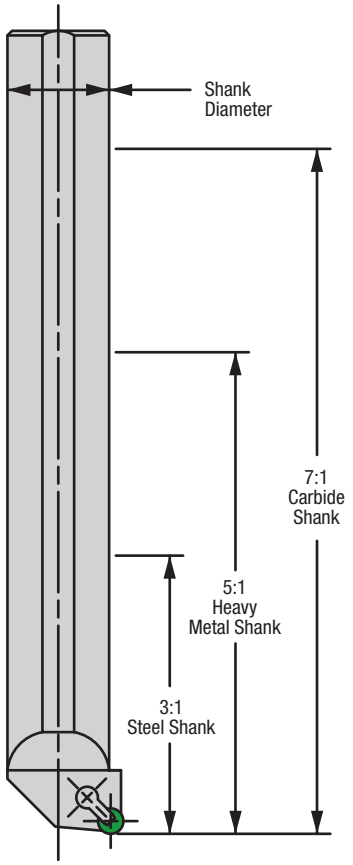
Any deflection will lead to vibrations, which are particularly damaging to ceramic tools. Unnecessary tool overhang is the principle cause of vibration. It should be noted, the force required to produce a particular deflection decreases by the cube of the overhang! That means that doubling the overhang will increase deflection eight (8) times if all other conditions are constant.

Boring bars, in particular, usually operate with much greater length-to-diameter ratios than turning tools. In this case, "heavy" metal or solid-carbide bars are often easily justified.

Solid-carbide boring bars have three (3) times the modulus of elasticity of a steel bar. This means that a carbide bar will only deflect 1/3 as much as a comparable steel bar under identical circumstances.

As a general rule, when machining nickel-based alloys, steel boring bars will give adequate performance at overhang-to-bar diameter ratios of up to 3:1. Special boring bars manufactured from "heavy" metals give an advantage over steel bars and can be used at ratios up to 5:1. Carbide boring bars extend this range to ratios up to 7:1.

Figure 12 – Shank Diameter-to-Bar-Length Ratio for Ceramic Inserted Boring Bars



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The Application of Greenleaf Advanced Ceramics

Feed and speed recommendations are expressed in the graph below *(Figure 13)*. This graph is based on empirical data gathered during extensive testing under shop conditions.

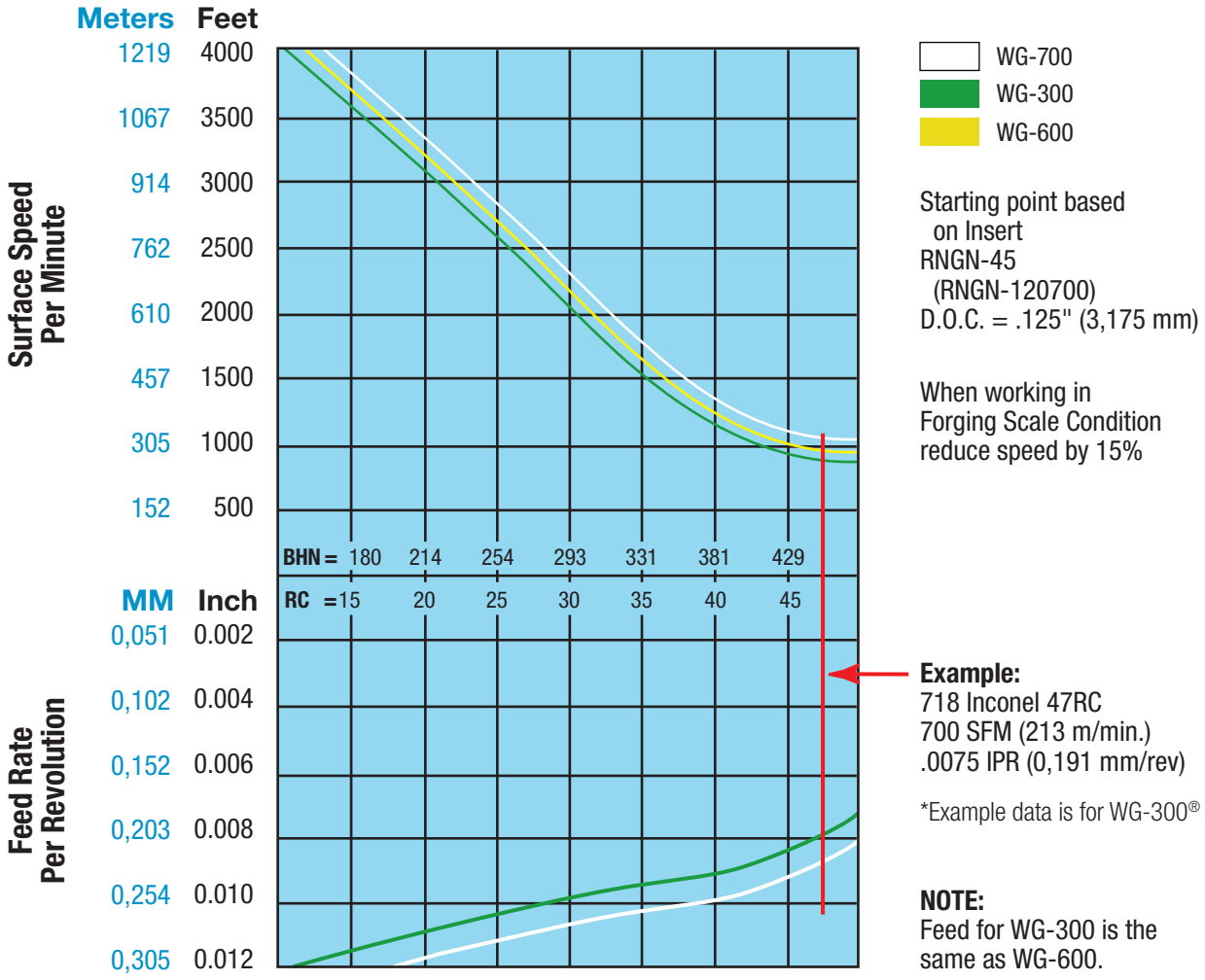
The most significant factors are the hardness of the material and the surface condition. It is on the basis of these parameters that the data are presented.

To achieve optimum cutting conditions, it is necessary to regulate not only the speed but also the feed. There must be a carefully balanced relationship between the speed and the feed. The higher temperatures required can be generated by a slower speed than the optimum, provided that the chip is thinned by reducing the feed.

Any reduction of speed from the recommended starting points without a corresponding decrease in feed results in a thicker, cooler chip and an increase in cutting forces. This may result in shortened tool life or failure by chipping and breakage.

It must be noted that thick chips provide a larger heat sink and tend to be cooler and stiffer, and that thin chips do not have sufficient heat absorbing capacity and tend to be too hot. For each metal hardness and surface condition, there is a speed and a feed at which the best temperature balance is obtained.

Figure 13 – Greenleaf Advanced Ceramics Machining Recommendations



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How to use Figure 13 graph:

1) Feed and speed are based on RNGN-45 (12 07 00) round inserts. When using inserts with weaker shapes such as triangles, etc., some reduction of feed will be required. *(Figure 21)*

2) **You must know the physical hardness of the material.**

3) The recommendations are based on an average depth of cut of .125" *(3,175 mm)*. Deeper depths will require some reduction of speed and feed, and shallower depths can be cut at elevated speeds and feeds. See *Figures 15 & 16.*

4) From the material hardness, move vertically downward to the curve and then horizontally to the left to read the recommended feed rate per revolution.

5) Whenever the recommended speed is not achievable on the machine tool, then the recommended feed must be reduced by the same percentage (%), i.e.
   Speed recommended – 2000 SFM (610 m/min.)
   Feed recommended – .010" I.P.R. *(0,254 mm)*
   Top speed on machine –
   1000 SFM (305 m/min.) = 50% of recommended speed then use feed of .005" I.P.R. *(0,127 mm)*

The feed and speed are based upon the ability of the ceramic insert to withstand high temperatures and to run with a chip thickness which results in heat being concentrated in the shear zone ahead of the tool. This will reduce cutting pressure and minimize wear. If the speed is reduced without a corresponding reduction in feed, this effect will be lost and performance will fall off due to chipping of the cutting edge from a colder chip.

General starting speeds should be eight times the uncoated carbide speeds and four times coated carbide speeds.

Compared to sialon materials, speed and then feed should be increased 25% to 50%.

Rule of thumb when cutting nickel-based cast material rather than forged material:

1. Increase speed from graph recommended by factor of 2x.
2. Decrease recommended feed to one half of value.
3. Maintain a depth of cut of less than .060" *(1,5 mm)* for an RNGN-45 (12 07 00) insert.
4. Use plentiful supply of coolant.

Aged and solution treated nickel-based cast alloys – use same parameters as forged materials, except less than .075 *(2 mm)* DOC for an RNGN-45 (12 07 00) insert.

Anticipated Tool Life

For programming purposes, it is useful to have a starting guideline for anticipated tool life. We present here some approximate values which are based upon actual experience at the maximum recommended depth of cut (1/4 of insert diameter) and at the speed given in the graph. It should be noted that these speeds are up to eight times those used with uncoated carbide tools. Even at the conservative starting values for tool life per corner given, the actual volume of metal removed per index also will be eight times that produced in the same period of time with carbide tools.

Another way of stating this is – five minutes of tool life with a Greenleaf advanced ceramic is equivalent, in work produced, to 40 minutes of life with a carbide tool! *In fact, a carbide tool will never last 40 minutes.*

Figure 14 – Anticipated Tool Life

Starting Points for Time in Cut

Round Insert	Life per Index
.250" *(6,3 mm)*	3 min.
.375" *(9,5 mm)*	4 min.
.500" *(12,7 mm)*	5 min.

Speed and Feed vs. Depth of Cut for Round Inserts

The round insert behaves differently from a straight-sided insert as depth of cut is changed.

Because the chip produced by a round insert is crescent shaped and reduces in thickness toward the finished surface, as the depth is reduced, the thinning chip, combined with increased lead angle, gives a significant drop in pressure at the workpiece surface/tool interface. This means that both speed and feed can be increased without detriment to tool life as depth reduces.

Speed and feed should be increased by a like amount percentage (%) to achieve the best result.

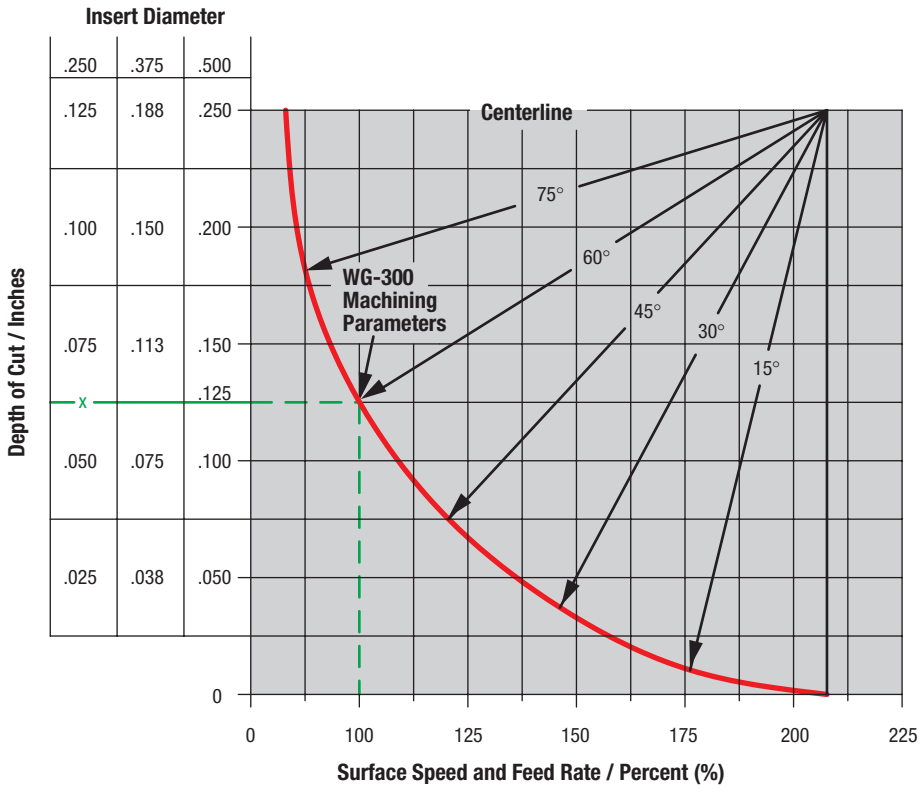
We can now refer to the graph ***Surface Speed and Feed Rate/Percent (%) Versus Depth-of-Cut of Radii***. *(Figure 15)*

1) It will be seen from reference to this chart that the speed/feed graph is set up on .125" *(3,18 mm)* depth of cut, using a .250" *(6,35 mm)* radius tool or .500" *(12,7 mm)* round insert. This results in a depth equal to the 60° mark (90° being half the diameter or radius) and gives a reasonably conservative starting point for most Inconel 718 applications. A slightly shallower depth at around the 45° line will usually give the best tool life in exchange for a small decrease in metal removal rates.

2) Finishing cuts are usually taken at depths of cut less than those set up as reference points on the graph. *(Figure 13)*

   When using round inserts, it will be possible to make substantial increases in both feed and speed beyond the values given in the graph if the depth of cut is less than "**X**" value.

Figure 15 – Surface Speed and Feed Rate/Percent (%) vs. Depth of Cut of Radii (IMPERIAL)



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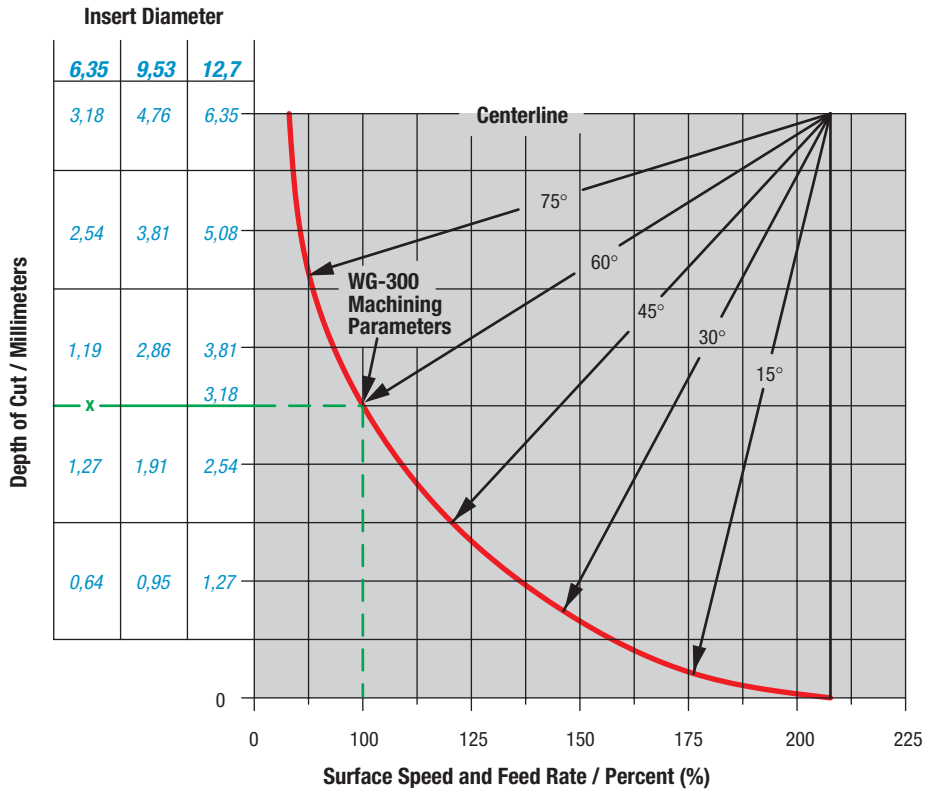
As always, the rule should be applied that feed and speed will be increased together and by the same percentage (%). Failure to regard this rule will result in cooler or hotter interface temperatures with corresponding drop-off of tool performance.

When taking a depth of cut that is less than the graph value for "X," refer to *Figures 15 and 16 (Imperial and Metric).* Select the insert diameter that best suits the application and provides the depth-of-cut capability that is closest to the graph value of "X," then adjust the speed/feed according to the chart.

For example:
Column 1 is for .250" *(6,35 mm)* round insert
or .125" *(3,18 mm)* radius.
Column 2 is for .375" *(9,53 mm)* round insert
or .188" *(4,76 mm)* radius.
Column 3 is for .500" *(12,7 mm)* round insert
or .250" *(6,35 mm)* radius.

1. Select approximate desired depth of cut
Example: .500" *(12,7 mm)* diameter round at .050" *(1,27 mm)* depth of cut is bottom box of column 3.
2. Follow the line to the right until it intersects the heavy curved line.
3. Follow the line vertically downward to the bottom scale and read value of 137% (midway between 125% and 150%).
4. You may increase the speed and feed values in the graph *(Figure 13)* by 37% for this cut.

Figure 16 – Surface Speed and Feed Rate/Percent (%) vs. Depth of Cut of Radii (METRIC)



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Lead-Angle Effect on Round Versus Straight-Edged Inserts

To emphasize the advantage of using round inserts, let us look at a comparison between the chip-thinning effect obtained at various depths on a round insert compared to the lead angle needed to get the same effect with a straight-edged insert.

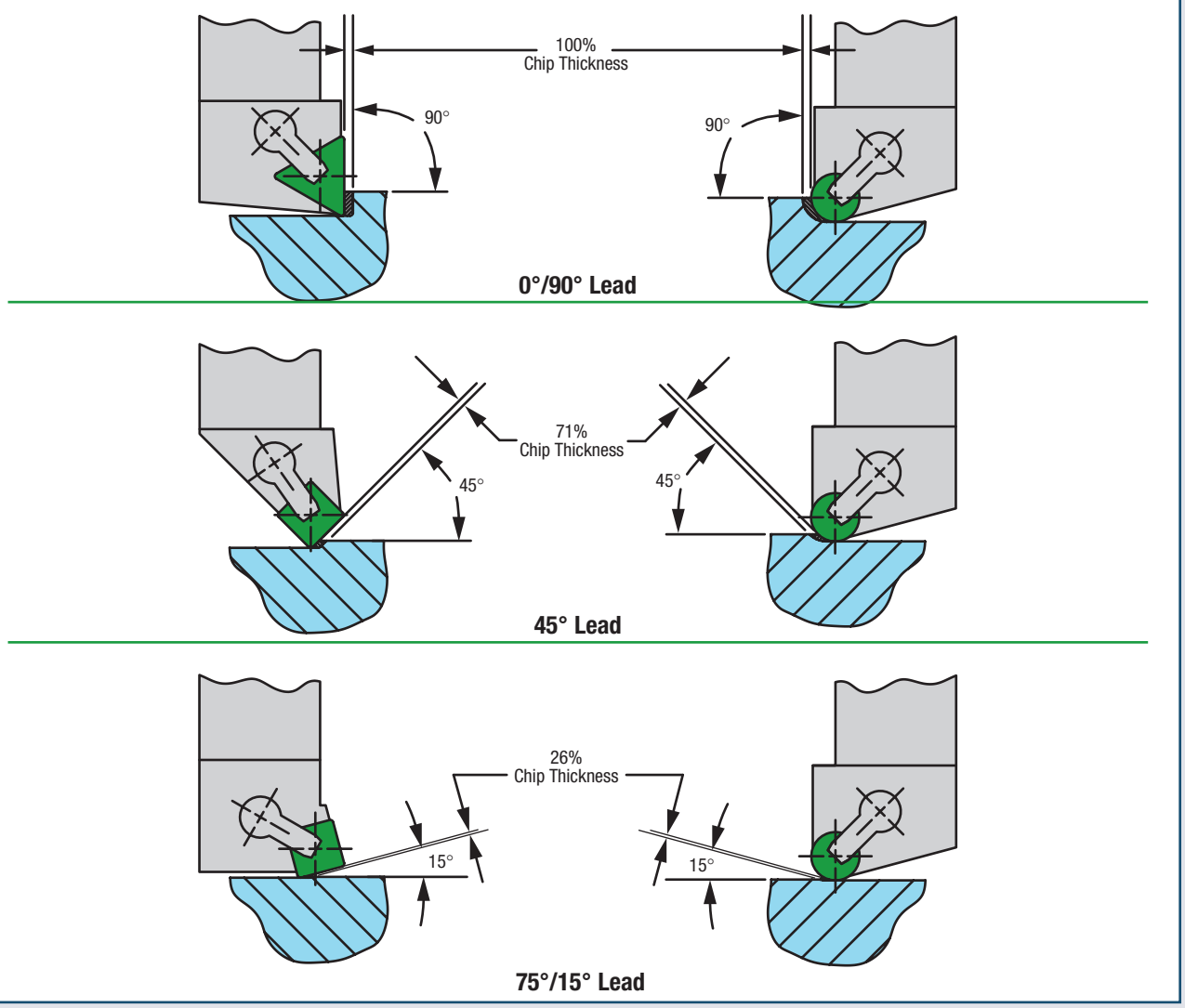
If we assume operations with lighter depths of cut, then a round insert engaged up to 45° or halfway along the available cutting edge and advancing at .010" *(0,25 mm)* per revolution will produce an actual maximum chip thickness of 71% or .007" *(0,18 mm)*.

The chip actually thins from this point gradually towards the finished surface. To thin the chip to .007" *(0,18 mm)* with a straight-edged insert requires a lead angle of 45°, which is about the maximum lead angle practical.

Beyond this point, the round insert can be used very easily at 30° or less. To get the same chip-thinning effect from a straight-edged insert requires 60° or more of lead angle which is just not practical.

In summary, the high lead-angle effect with corresponding reduction of pressure, especially at the depth-of-cut line, is more practical with round inserts.

Figure 17 – Lead-Angle Effect on Round vs. Straight-Edged Inserts and the Theoretical Chip Thickness



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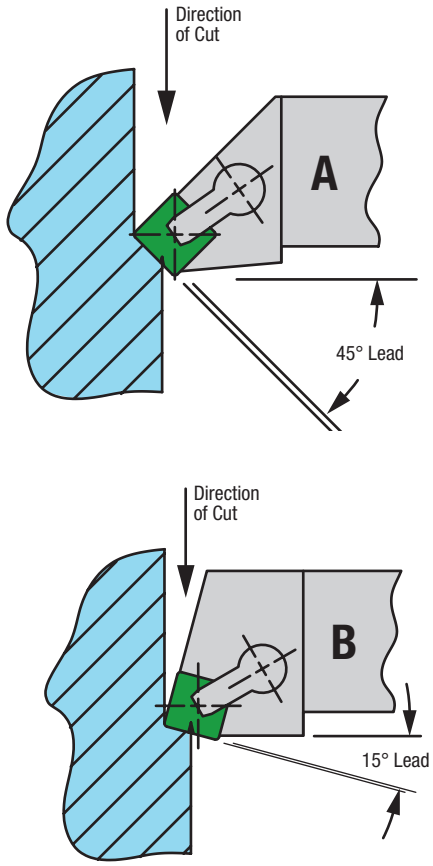
Lead-Angle Effect with Other Than Round Inserts

In the cutting of nickel-based alloys, the lead angle employed is of significance. Larger lead angles reduce chip thickness, improving tool life and surface finish.

Figure 18 shows the change in lead-angle effect. It may be necessary to design tooling which does not stand on traditional carbide values to get optimum performance.

It should be noted that example (A) will produce more pressure on the part piece and may not be feasible on thin sections.

Figure 18 – Lead-Angle Effect



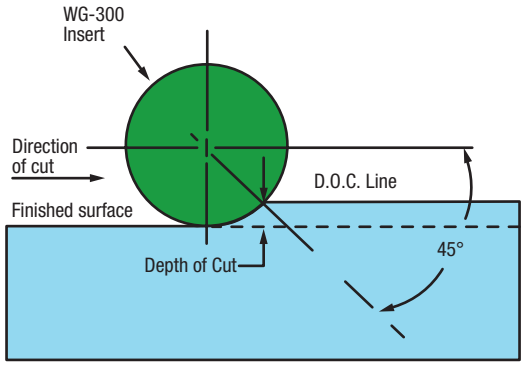
Recommended Depth of Cut for Round Inserts

For best results, there must be a planned relationship between the insert radius and the proposed depth of cut, if the notching effect at the depth-of-cut line is to be minimized.

It will be seen by reference to the illustration, *(Figure 19)* that there will be a sudden decrease in lead-angle effect beyond a given depth on a given insert radius. This point lies at the intersection of a line drawn at 45° from the center of the insert. The effect of the decreasing lead angle is increased cutting pressures. The deeper the cut with a round insert beyond this point, the greater the depth-of-cut notching.

It is often a clear advantage in nickel-based alloys to make light cuts with relatively large-diameter round inserts. Here are the depths of cut that produce the optimum relationship on given insert sizes.

Figure 19 – Recommended Depth of Cut for Round Inserts



Insert Radius		Optimum Depth of Cut	
Inches	***Millimeter***	**Inches**	***Millimeter***
.125	*3,18*	.037	*0,93*
.187	*4,76*	.052	*1,40*
.250	*6,35*	.073	*1,86*
.312	*7,94*	.092	*2,33*
.375	*9,53*	.110	*2,79*
.437	*11,11*	.128	*3,26*
.500	*12,70*	.147	*3,72*

Of course, depths lighter than those given will increase tool life at some penalty of metal removal rate. Refer back to *Figures 15 and 16* where we discuss the use of lighter depths of cut combined with increased feeds and speeds.

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Recommended Depth of Cut for Insert Nose Radii

It is very important in roughing operations with round inserts to leave the recommended amount of stock for finishing with straight inserts.

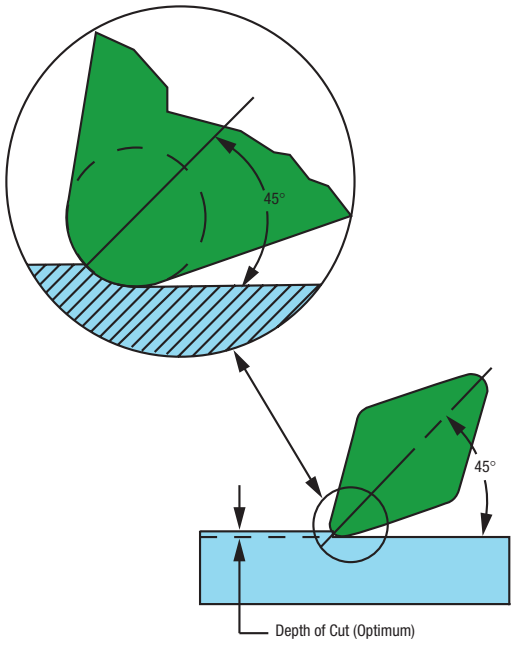
For maximum tool life when using straight-edged inserts with corner radii as opposed to round inserts, a similar effect as described with round inserts is obtained. In this case, the allowable depths of cut are related to the radius and not the insert size, assuming that the depth of cut being attempted is relatively light, such as in finishing operations.

The table to the right shows the *optimum* depth of cut at which maximum tool life (minimum notching) should start.

The accuracy for roughing therefore becomes more important, and the depth of recommended passes for finishing must be as illustrated in *Figure 20*:

A large radius, while having reduced notching tendency, will sometimes be impractical because of radius requirements on the workpiece. Larger insert radii may also cause the deflection of thin sections as a consequence of larger radial forces acting between the tool and the workpiece. A compromise between notching and these factors must often be made. However, it should be remembered that regardless of geometry, cutting force will be lower when using WG-300 high-speed techniques to plasticize the material.

Figure 20 – Recommended Depth of Cut for Insert Nose Radii



Insert Radius		Optimum Depth of Cut	
Inches	***Millimeter***	**Inches**	***Millimeter***
.015	*0,38*	.0046	*0,12*
.031	*0,80*	.0092	*0,23*
.048	*1,21*	.0139	*0,35*
.063	*1,59*	.0183	*0,47*
.094	*2,38*	.0275	*0,70*
.125	*3,18*	.0370	*0,93*

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Recommended Percentage (%) Reduction of Feed Per Revolution for Other Than Round Inserts (Except Grooving)

When applying inserts other than rounds, there are a number of variables present which have a direct effect on the ability of the insert to tolerate the cutting loads. These variables include the specific corner or nose radius of the insert, the included angle of the corner (i.e. Triangle, Square or Diamond shape), the lead angle of the cutting tool to be used, the depth of cut selected, and the part piece being machined due to entry and exit angles.

It is possible to look at all of the variables and then apply percentage (%) reduction factors to the recommended feed of the graph *(Figure 13)* to compensate for them.

In all cases the speed should be maintained as recommended.

Figure 21 – Feed Adjustment for Straight-Sided Inserts

Nose radius	1/64	1/32	3/64	1/16	3/32	1/8
ANSI designation	1	2	3	4	6	8
ISO designation	04	08	12	16	24	32
Inches	.015	.031	.047	.062	.094	.125
mm	*0,4*	*0,8*	*1,19*	*1,59*	*2,38*	*3,18*
Reduction percentage	**19%**	**16%**	**13%**	**10%**	**5%**	**2%**
DOC/inches	0-.050	.125	.250	.375	.500	.750
DOC/mm	*0-1,27*	*3,18*	*6,35*	*9,53*	*12,7*	*19,05*
Reduction percentage	**5%**	**8%**	**13%**	**16%**	**18%**	**20%**
Lead angle	0° & -5°	15°	30°	45°	60°	75°
Reduction percentage	**18%**	**17%**	**15%**	**12%**	**8%**	**5%**
Included angle	35°	55°	60°	80°	90°	100°
Reduction percentage	**17%**	**13%**	**10%**	**6%**	**4%**	**2%**
Part diameter/inches	0-5	10	20	30	40	50
Part diameter/mm	*0-127*	*254*	*508*	*762*	*1016*	*1270*
Reduction percentage	**18%**	**14%**	**10%**	**6%**	**2%**	**0%**

Select and add five reduction percentage (%) factors and subtract from feed rate of graph in *Figure 13*.

Example: CNGN 432 (120408)

Nose Radius 0.031 *(0,8 mm)*	=	16%
Assumed DOC .125 *(3,18 mm)*	=	8%
Lead -5°	=	18%
Included angle (80°)	=	6%
Assumed part dia. 20" *(508 mm)*	=	10%
		58%

58% reduction of feed rate recommended from graph *(Figure 13)*.

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Theoretical Surface Roughness vs. Feed and Insert Radius

Rethink the process

The quality of the finished surface is affected directly by the radius of the tool and the feed rate at which the tool is advanced. The larger the radius, the faster the tool may be fed for a given degree of surface finish. The finish is usually stated as surface roughness in micro inches or micro meters.

The chart can be used to determine the combination of tool radius and feed rate for various roughness measurements from 8 micro inches (0,2 micro meters) to 250 micro inches (6,3 micro meters). *Using less feed rate than necessary results in premature tool wear causing bad finish, taper, and size problems.*

Figure 22 – Theoretical Surface Roughness

Roughness average											
Micro inches (Ra)		8	16	32	63	80	100	125	150	200	250
Micro meter (µm)		*0,2*	*0,4*	*0,8*	*1,6*	*2,0*	*2,5*	*3,1*	*3,8*	*5,0*	*6,3*
	Nose radius	Feed rate per revolution									
Inches	.0156	.002	.0025	.004	.0055	.0065	.007	.0075	.008	.010	.011
mm	*0,40*	*0,05*	*0,06*	*0,10*	*0,14*	*0,17*	*0,18*	*0,19*	*0,20*	*0,25*	*0,23*
Inches	.0313	.003	.004	.0055	.008	.009	.010	.011	.012	.014	.016
mm	*0,79*	*0,08*	*0,10*	*0,14*	*0,20*	*0,23*	*0,25*	*0,28*	*0,30*	*0,35*	*0,41*
Inches	.0469	.0035	.005	.007	.0095	.0105	.012	.013	.015	.017	.019
mm	*1,19*	*0,09*	*0,13*	*0,18*	*0,24*	*0,27*	*0,30*	*0,33*	*0,38*	*0,43*	*0,42*
Inches	.0625	.004	.0055	.008	.011	.0125	.014	.015	.017	.020	.022
mm	*1,59*	*0,10*	*0,14*	*0,20*	*0,28*	*0,32*	*0,35*	*0,38*	*0,43*	*0,50*	*0,56*
Inches	.0938	.0045	.007	.009	.013	.015	.017	.019	.021	.023	.026
mm	*2,38*	*0,11*	*0,18*	*0,23*	*0,33*	*0,33*	*0,43*	*0,43*	*0,53*	*0,58*	*0,66*
Inches	.125	.0055	.008	.011	.016	.018	.020	.022	.024	.027	.031
mm	*3,13*	*0,14*	*0,20*	*0,23*	*0,41*	*0,45*	*0,50*	*0,56*	*0,60*	*0,69*	*0,79*
Inches	.1875	.007	.0095	.0135	.017	.021	.025	.027	.030	.034	.040
mm	*4,76*	*0,18*	*0,24*	*0,34*	*0,43*	*0,53*	*0,64*	*0,69*	*0,76*	*0,86*	*1,02*
Inches	.250	.008	.011	.016	.022	.025	.027	.031	.034	.040	.044
mm	*6,35*	*0,20*	*0,28*	*0,41*	*0,56*	*0,65*	*0,69*	*0,79*	*0,86*	*1,02*	*1,12*

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The Effect of Increased Clearance on Tool Life

Under normal tool wear circumstances, a tool is said to be "worn out" when the flank wear has developed to the point that surface finish has deteriorated outside of acceptable limits. This is determined when the width of the wear land has decreased clearance and increased heat and pressures in the tool workpiece interface area to the point that further use will lead to complete failure of the tool by severe chipping or catastrophic breakage. On nickel-based alloys, the depth-of-cut notch may become too severe before this flank wear has progressed to that limit.

However, assuming that notching is under reasonable control, tool life, as judged by wear land development, can be prolonged by increasing the tool side clearance. With "normal" hot-pressed or cold-pressed ceramic and composites, this clearance is usually limited to about 7° since the materials are too brittle and friable to permit a larger angle. Greenleaf advanced whisker-reinforced ceramics do not suffer from this problem, and large clearances can be used because of the greater edge strength. To view the difference that, for example, an 11° clearance makes compared to a 7° clearance, refer to the illustration. *(Figure 23)*

It will be seen that with a 7° clearance angle, .003" *(0,07 mm)* of material will be worn from the insert to produce a .025" *(0,64 mm)* wear land, whereas .005" *(0,12 mm)* of material must be worn from an 11° clearance insert to produce the same amount of wear land. This will then equate to increased tool life between indexes.

It is recommended that tooling be carefully evaluated on all operations relative to using clearance angle inserts. In most cases, investments in new tools can be justified.

Remember, a Greenleaf tool is designed to take 7° side-clearance inserts as well as 11°.

Figure 23 – The Effect of Increased Clearance on Tool Life

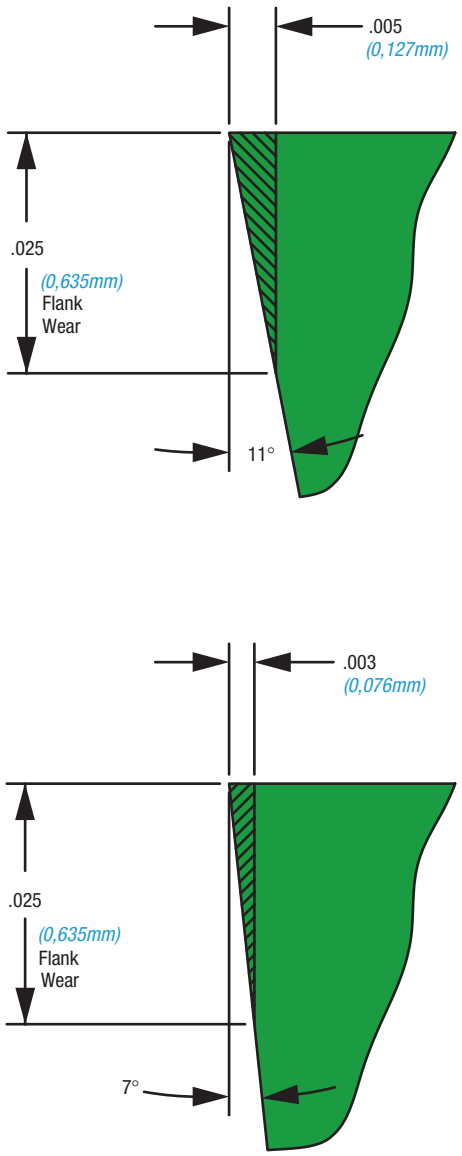

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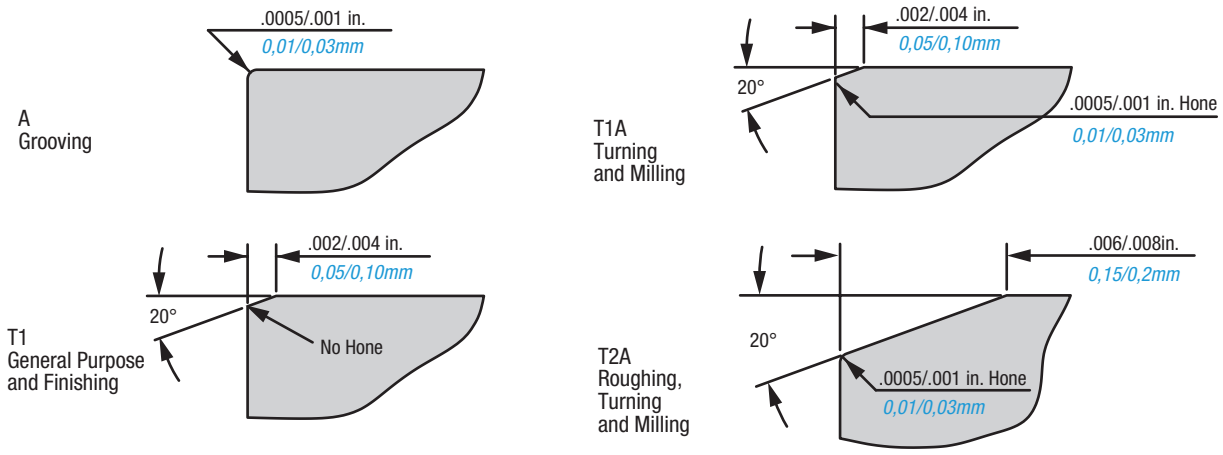
Figure 24 – Standard Edge Preparations



Edge Preparation For Nickel-Based Alloys

Greenleaf advanced whisker-reinforced ceramics have inherently strong cutting edges, and it is recommended to use them without hones, except when making heavy roughing cuts or in scale conditions. A sharp cutting edge is a clear advantage in finishing operations to avoid "burnishing" and "smearing."

For most nickel-alloy operations involving light roughing and finishing in clean material, the T1 edge preparation should be standard. *No hone is used.*

In ceramic tool applications, edge preparation is critical to tool life and surface integrity. Edge preparations are used to change the shear forces at the edge to compressive forces, thereby guarding against chipping and breakage.

If we use a wide negative land on a tool and use a very light feed rate, we have in fact changed the geometry of the tool by doing all of the cutting on the land itself. This is incorrect use of a negative land giving rise to a new set of problems. We highly recommend using a T1 edge preparation (.002"-.004" x 20°) *(0,05 mm-0,10 mm x 20°)* for increased strength with minimum "smearing" effect during finishing operations. (See *Figure 24* for more details.) It may be necessary to add a hone (T1A) when light scale conditions or minor interruptions are present.

For milling and roughing other than very heavy-duty machining, a T2A edge prep should be used (.006"-.008"x 20°+.0005" hone) *(0,15 mm-0,2 mm x 20°+ 0,013 mm hone)*. For most aircraft-type work, T1 and T2A should be the only edge conditions required.

Remember; *never* use a honed edge unless it has been shown conclusively that a hone is required. This should be in very few applications. *Always* start by testing the T1 edge preparation.

The exceptions to the general stated rule would be:

Grooving

Because a grooving tool moves constantly forward into clean material, there is no notching problem in normal usage. Also, a grooving tool is usually a relatively fragile tool especially in the narrow-width grooves found in jet engine work.

For these reasons, we highly recommend that grooving tools do not have a negative land. This will keep cutting forces to a minimum.

For grooving use an "A" hone only.

Heavy Interruptions

In severely interrupted cuts, we need to keep the cutting edge in compression to avoid shear forces. This will reduce chipping and breakage. The chip width is smaller than the negative land width.

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Coolant

The recommendation to use flood coolant on whisker-reinforced ceramics may appear to be something of a paradox. “How to Use the Properties of Greenleaf Advanced Whisker-Reinforced Cermics”, page ATI30, introduces the concept that heat produced by the application of WG-300 plasticizes the metal in front of the cutting edge. This action is desirable and heat is used advantageously. However, it is also desirable to cool the whole operation by flooding it with coolants—thus, the paradox.

Whisker-reinforced ceramics are a good heat conductor compared to ordinary ceramic materials. The heat is pulled away from the tool/workpiece interface into the body of the insert where the coolant can help to maintain a lower tool temperature. We can lower the temperature of the chip with coolant after it has formed and make it more manageable.

Coolant will also help keep the part piece temperature stable to aid in size control and reduce distortion. Use coolant liberally at all times. Unlike ordinary ceramics, the whisker-reinforced grades will not suffer breakage or cracking from intermittent coolant use.

The coolant does not decrease the temperature in the interface area; however, coolant often doubles tool life.

It is important to use clean coolant. This is not a problem when a central coolant system is used. With a stand-alone machine, the coolant must be checked very closely. Water evaporates faster than oil at these high temperatures. Adding more coolant will increase the soluble oil content, which leads to smoking, less cooling effect and shorter tool life. Contamination of the coolant from any material such as cigarette butts, coffee, etc., has proven very detrimental and should be monitored.

High coolant pressure on nickel-based alloys is not as important as volume. A minimum of a 3/8" *(10 mm)* inside diameter pipe is recommended.

The coolant must be directed exactly on the cutting area without any interference from clamps, screws, or otherwise. Oil-based, water-soluble, emulsion-type coolants have proven to be the best.

The use of straight oils is to be avoided since the hazards of oil smoke and fire exist.

Figure 25 **– Coolant**

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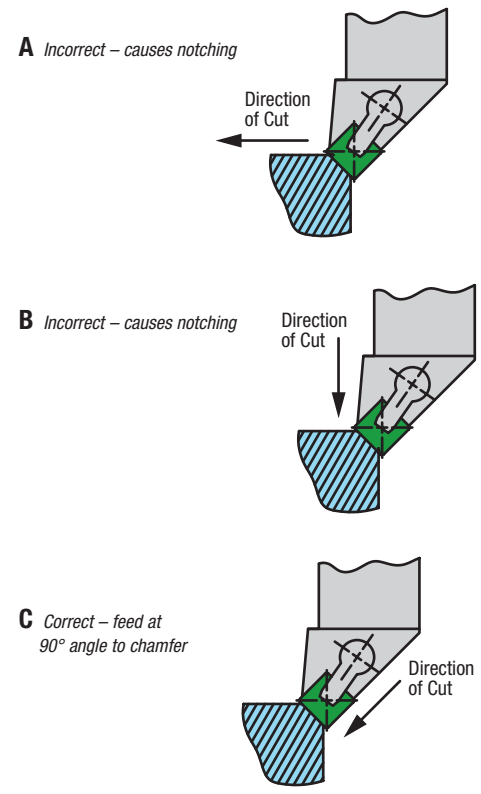
Notching and Correct Tool Path

Of all the precautions that can be taken to reduce or eliminate notching, none are as important as programming the most desirable tool path. It is very important that machine programmers, along with operators and tool engineers, are aware of the programming options. We will examine a series of circumstances that represent standard procedures for carbide tools but produce rapid failure in a notch-sensitive, ceramic material.

Pre-Chamfer Parts Whenever Possible

Pre-chamfering trues the part and ensures a progressive entry onto a true running surface. It also provides a regressive exit from the part and in both cases protects the cutting edge from damage. When using separate pre-chamfer operations as illustrated (Figure 26), the direction of feed is important to eliminate notching. Moving on a single axis, as in examples **A** and **B**, will cause notching. The direction should be at 90° to the chamfer as shown in example **C** to eliminate notching and increase tool life.

Figure 26 – Chamfering Techniques



The Chamfer Ramp Approach

In the illustration *(Figure 27)* which shows an actual operation on a jet engine rotor, we can see that feeding straight in will produce rapid notch wear. This notch will become a stress-concentration point leading to early failure.

A simple change in the programming of the part *(Figure 28)* can accomplish chamfering and facing of the part effectively in one continuous operation without any measurable difference in cutting time. This eliminates the separate pre-chamfer operation.

It is important that the program provide a “continuous move” around the part-piece edge. This will keep the material ahead of the cutting edge in a plasticized state, which is desirable for ceramic cutting methods. Another benefit is the elimination of the burr normally created with two operations, i.e. chamfer after or before the turning or facing operation.

Figure 27 – Straight Facing

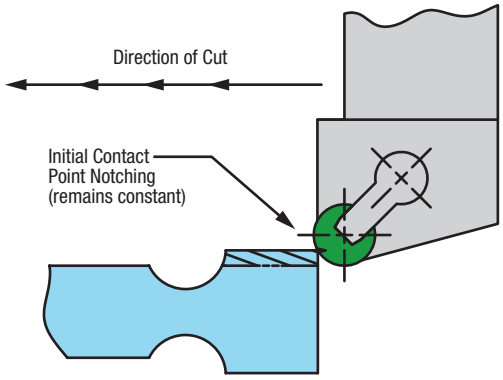
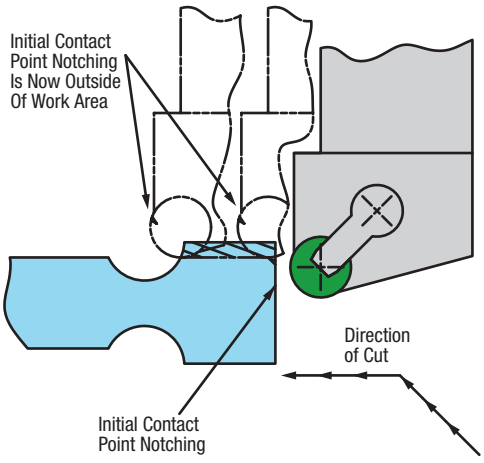


Figure 28 – Chamfering and Facing



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continued

The technique of generating a chamfer with the same tool used for the turning operation is valid and equally effective in terms of enhanced tool life with any shape of insert, any lead-angle tool and any given insert-corner radius.

In *Figure 29* we show a roughing operation using a square insert. Here we have programmed a 45° move to pre-chamfer the corner prior to the turning operation. This is done in one continuous motion with the 45° move transitioning into the straight turning. In this way, the section of insert in initial contact with the junction of two work-hardened surfaces is now outside the cut path. This will greatly reduce further notching tendencies.

The second example *(Figure 30)* shows a light finishing cut working on the radius of a tool. Once again, the 45° approach to the finish turned surface will reduce any notching effect initiated by the first contact. This programming approach can be used to leave a chamfer on the corner of the workpiece as well as either a radius or a sharp corner. *(See Figure 31)*

Chamfer advantages:

1. Increased tool life
2. No deburr time
3. Chips cannot hang up
4. Higher safety factor

Figure 29 – Producing a Sharp Corner

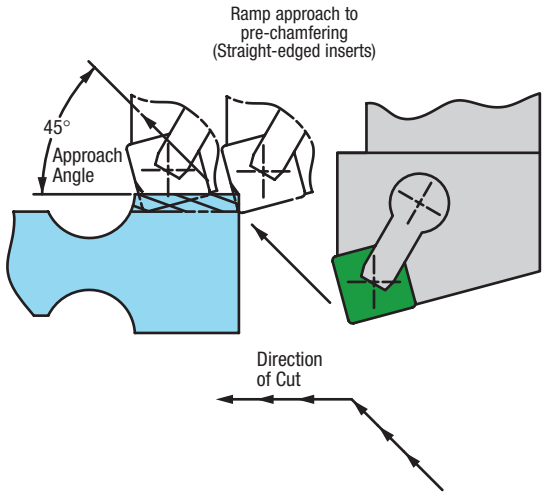


Figure 30 – Producing a Sharp Corner

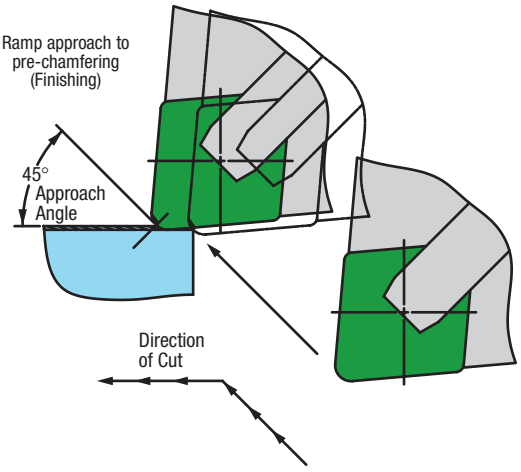
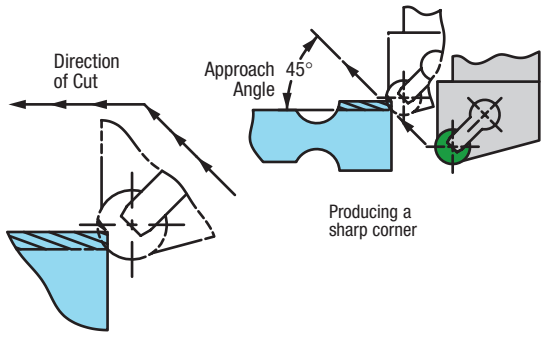


Figure 31 – Ramp Approach for Entry of Nickel-Based Alloys (Round Inserts)



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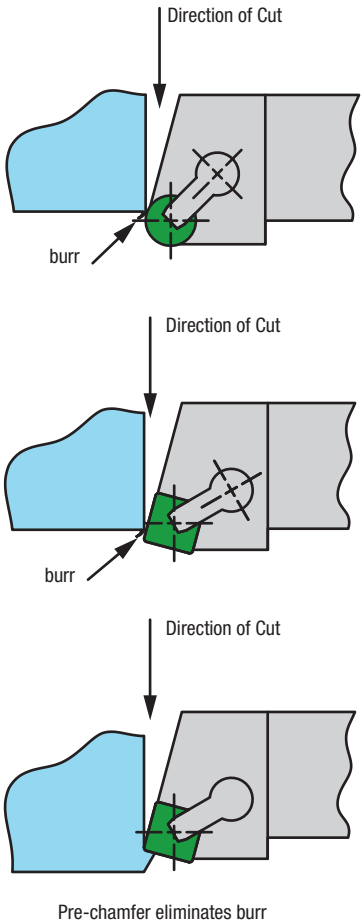
To Exit a Cut

Potential problems exist on exiting the cut if a chamfer preparation has not been made. If the exit is made on a sharp corner, on high-nickel materials in particular, a burr will result.

The burr will tend to constantly deflect or roll over and cause chipping or breakage of the cutting edge upon exit. In addition, the burr needs to be removed by a secondary operation.

The problem described tends to be more pronounced when cutting at high speeds since high heat is maintained ahead of the tool. This will mean that the material is in a more plastic condition and the rollover tendency is greater. Pre-chamfering helps correct this problem as shown. *(Figure 32)*

Figure 32 – Pre-Chamfer to Eliminate Burrs



Pre-chamfer eliminates burr

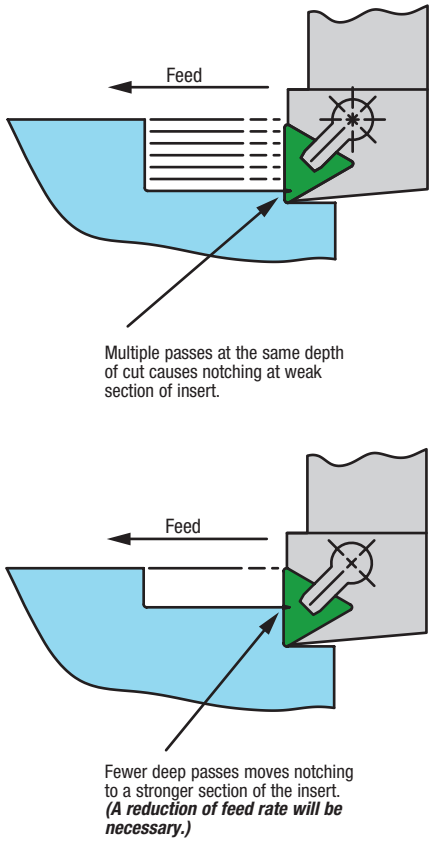
Programming Alternatives for Roughing Operations

Avoid or reduce multiple passes by taking deeper depths of cut

The strength of Greenleaf whisker-reinforced ceramics will enable much greater depths of cuts than other ceramic materials. For example, when turning with a Triangle or Diamond insert, take the greatest depth possible, even to the extent of 1/2 of the cutting edge. This not only reduces the number of passes required, it also will place any notch formed in a stronger section of the insert, leaving the tool radius area often unscathed and available for subsequent finish operations. *(Figure 33)*

A reduction of feed rate will be necessary in this case, and the feed rate recommendation chart should be used *(Figure 21)*.

Figure 33 – Rethink Depth of Cut



Multiple passes at the same depth of cut causes notching at weak section of insert.

Fewer deep passes moves notching to a stronger section of the insert. ***(A reduction of feed rate will be necessary.)***

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Preserving Tool Life

When a large amount of stock has to be removed, it is often done by taking multiple passes at the same depth of cut. *(Figure 34)* This is not a good practice. A very rapid development of severe notching will result since the same point on the cutting edge is subjected to the depth-of-cut line. Consequently, many indexes are required, escalating costs due to downtime and tool costs.

Vary the depth-of-cut contact point at the workpiece/ insert interface. This can be best accomplished by two techniques:

Variation in the depth of cut from pass to pass

Gradually decrease the depth of cut per pass. This may take a very small amount of time but will be more than compensated for by increased tool life, less indexing of the insert, and less downtime. *(Figure 35)*

Ramping

Of all the techniques readily available on a CNC machine, "ramping" has proven to be the most important. By gradually feeding out while traversing the work, depth-of-cut notching can be, for all practical purposes, eliminated. The next cut is then programmed at a constant depth since the surface itself is now ramped. A similar effect is achieved. *(Figure 36)*

Figure 34 – Multiple Passes at the Same Depth of Cut

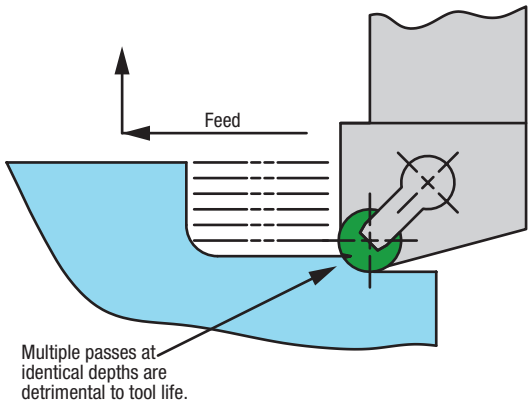


Figure 35 – Multiple Passes at Varying Depths of Cut

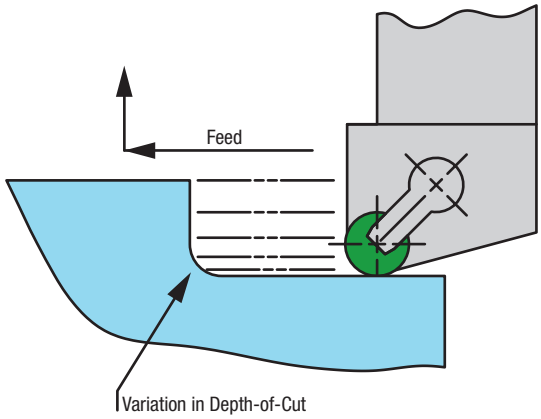
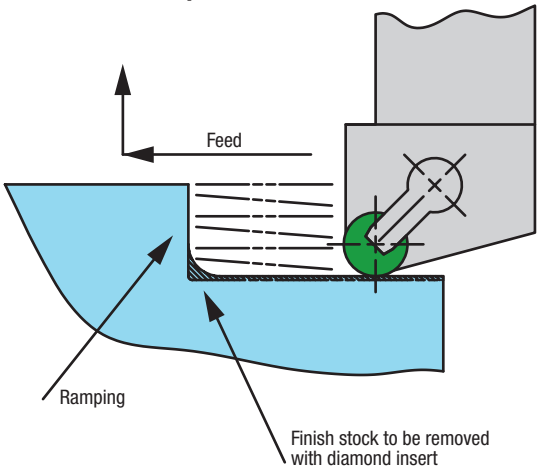


Figure 36 – Multiple Passes Using Ramping Technique



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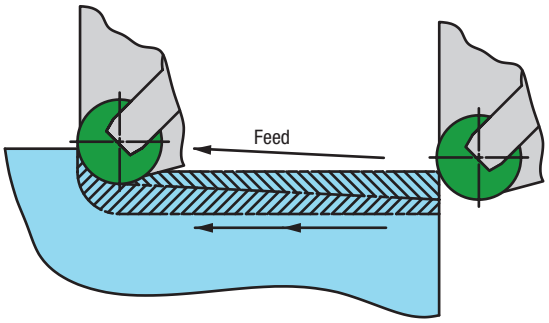
Ramping with negative round inserts

The ramp **must** start out with a deep cut, then the depth of cut must diminish. This constantly lifts the insert higher and more out of the cut, creating a ramp. The second cut is programmed straight and in the same direction, effectively removing the ramped surface left by the first cut. *(Figure 37)*

Tool life on the first cut is longer than on the second since the damaged cutting edge from the work-hardened surface is lifted out of the cut. Tool life on the second cut is shorter since the damaged cutting edge at the depth-of-cut line is buried more and more as it continues cutting straight and the ramp gets higher. However, tool life in both described ramped cuts is longer than in straight cuts.

Figure 37 – Ramping/Negative Inserts/RNGN

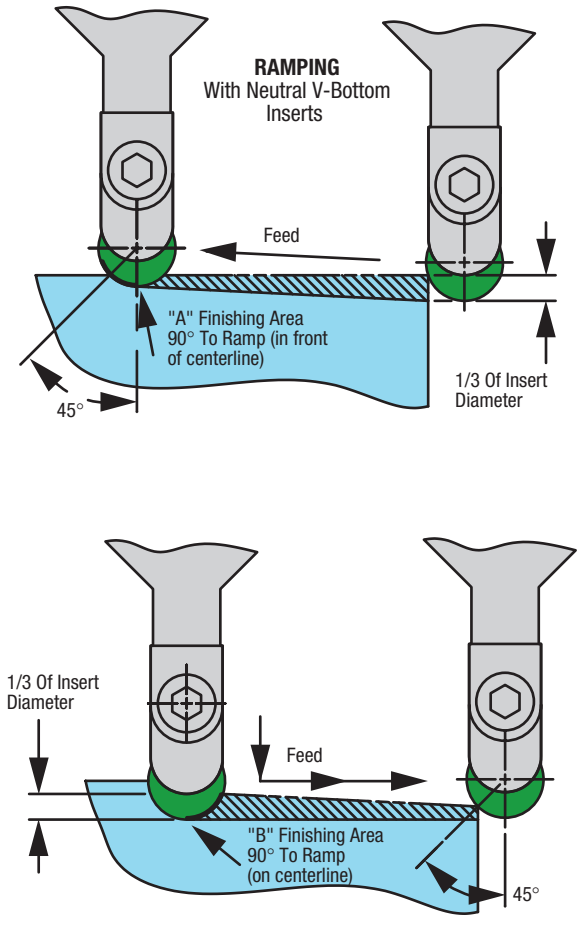


Ramping with positive round inserts

When using RPGN or RCGN inserts, ramping can be done in both directions without indexing *(Figure 38)*. Area “B,” which is the bottom of the inserts, is constantly lifted out of the cut on the first pass, and the insert finishes with area “A”. The second pass in the opposite direction will then use area “B” for finishing.

The above is not possible if the ramping is started from the lesser depth of cut then moves to the deeper depth of cut. Ramping is always better from a deep to a shallow depth.

Figure 38 – Ramping/Positive Inserts/RPGN-RCGN



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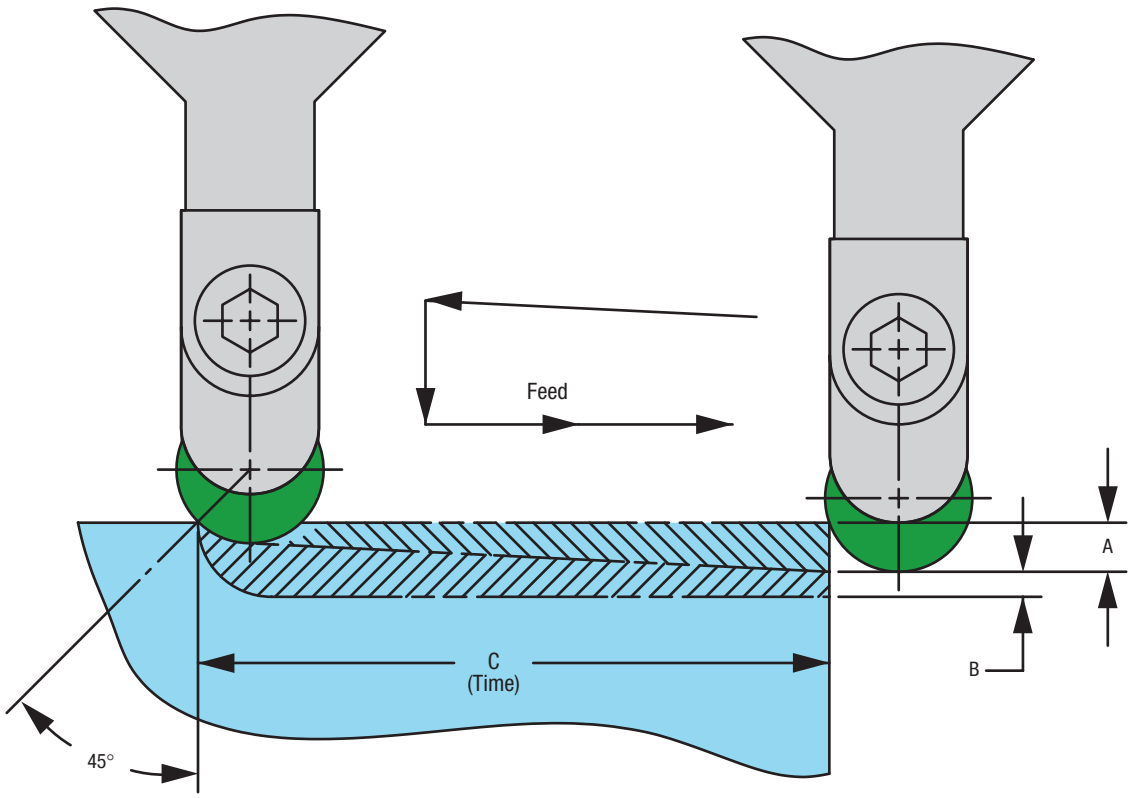
To Optimize Tool Life in a Ramping Mode

The time “C” is a maximum value in minutes. The actual length of the cut represented by “C” will vary with part piece diameter. The smaller the diameter of the workpiece, the longer the length of cut. We suggest that time be limited to approximately five minutes for a .500" diameter *(12,7 mm)* insert. *(Figure 39)*

Figure 39 – Optimized Ramping Technique



DIAMETER		“A”		“B”		“C”
inches	*mm*	inches	*mm*	inches	*mm*	minutes
.250	*6,3*	.080	*2,0*	.040	*1,0*	3
.375	*9,5*	.120	*3,0*	.060	*1,5*	4
.500	*12,7*	.160	*4,0*	.080	*2,0*	5

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To Optimize Ramping Technique *(Figure 40)*

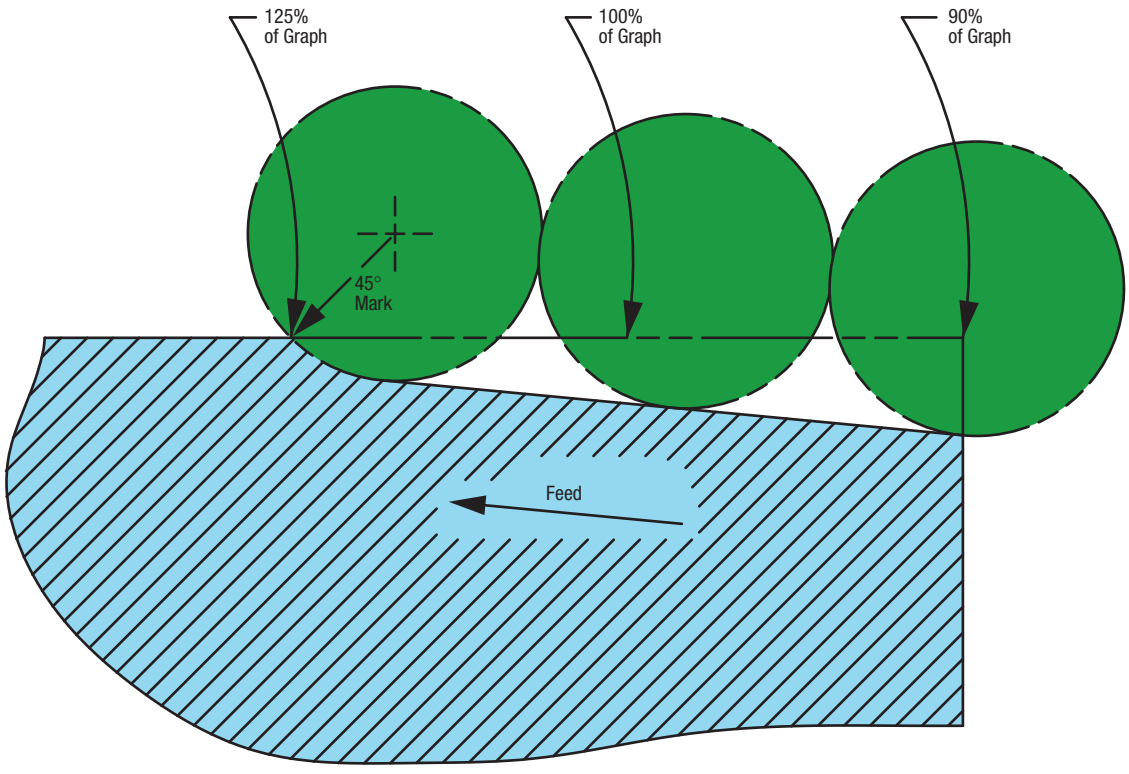
a) Using a .500 diameter *(12,7 mm)* round insert, select recommended feed and speed from graph *(Figure 13)*. This will equal 100% of feed, speed and a .125" *(3,18 mm)* depth of cut at the mid-point of the ramp.

b) Start the ramping cut at a depth of approximately 1/3 the diameter (.160") *(4,0 mm)* and select the appropriate speed and feed percentage (%). *(Figures 15 and 16)*

c) Proceed with ramping cut until the depth of cut is approximately .080" *(2,0 mm)*. This is the 45° mark on a .500" *(12,7 mm)* diameter round insert. During the cut, the feed and speed should be incrementally or continuously increased. At the conclusion of the cut, the parameters should be at the appropriate speed and feed percentage (%). *(Figures 15 and 16)*.

d) Cutting distance is measured in minutes and can be programmed for five minutes with a .500" diameter *(12,7 mm)* round insert. *(Figure 14)*

Figure 40 – Optimization of Ramping Technique with 1/2" (12,7 mm) Round Inserts



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To achieve the desired effect of a constantly changing depth of cut to eliminate notching, it is not necessary to think of ramping in terms of a straight line. For example, a wavy line achieves the same objective, perhaps more efficiently, by moving the hardened surface back and forth on the cutting edge. On both the first and second cuts, the material is gradually increased and then gradually decreased. *(Figure 41)*

Also illustrated are examples of plunging in and then ramping using a positive round insert or producing a ramp with a lead-angle tool using a straight-edged insert.

Figure 41 – Various Ramping Methods

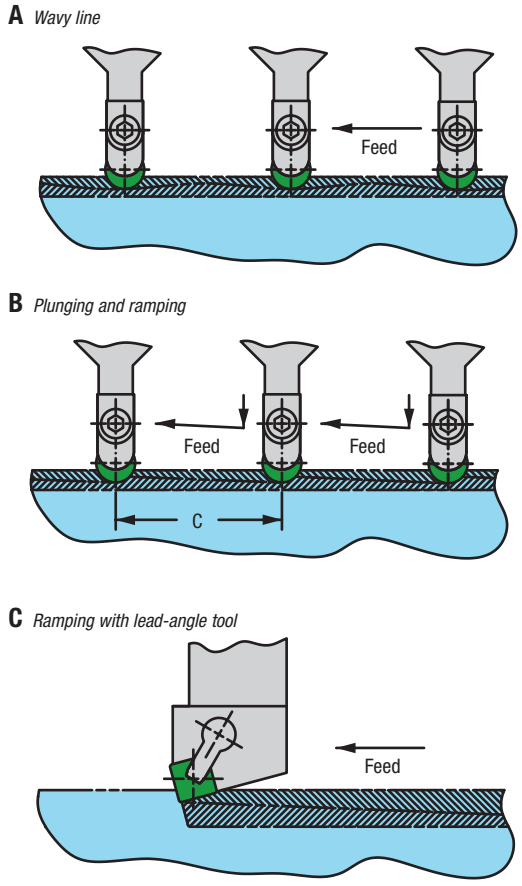
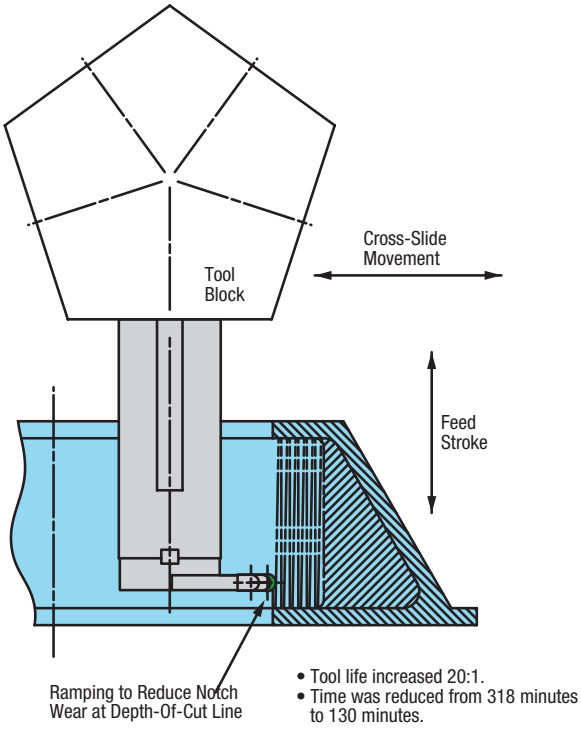


Figure 42 shows an operation boring a cavity on an Inconel 718 part on a Vertical Turret Lathe. As originally programmed, this operation required five tool indexes to bore out all of the material. Five times the tool returned to "home" position and was out of the cut.

By changing to a new program and converting from carbide to Greenleaf WG-300 with "ramping," the entire cavity was machined without a tool change. Productivity increased three (3) times and tool life increased by a factor of 20 to 1. Actual machine time was reduced from 318 minutes to 130 minutes.

Our files contain numerous cases of productivity gains of this magnitude by "ramping".

Figure 42 – Boring a Cavity with Ceramics



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Turning to a Shoulder

When rough or finish turning into a shoulder with high velocity techniques, it is most important to observe some basic rules.

With negative inserts in particular, it should be remembered that the chips are being pushed forward. As the shoulder is approached, the chips will be trapped, giving rise to an increase in tool pressure. *(Figure 43)* Also tool pressures increase as insert engagement increases near shoulders. This may result in tool breakage. *It is strongly recommended that the feed rate be reduced by about 50% when the tool is within .125" (3 mm) of the shoulder.* Reduction of the feed will tend to straighten out the chip as the chip temperature increases, reducing pressure on the insert cutting edge. ***This applies to any shape of insert.***

When the tool stops at the shoulder and then withdraws, a hard crystallized layer of material is left. This may produce a series of steps when a square insert is used or scallops when using a round insert. *(Figure 44)*

Very poor tool life will be experienced in any subsequent operation to finish machine these stepped or scalloped surfaces. The solution is to program the tool to continue moving up the shoulder face upon completion of each pass. This will remove the scallops or steps while the material is still hot ahead of the cutting edge and leave a more readily machinable surface for finishing.

Figure 43 – Chip Being Trapped Against Shoulder (increased engagement increases tool pressure)

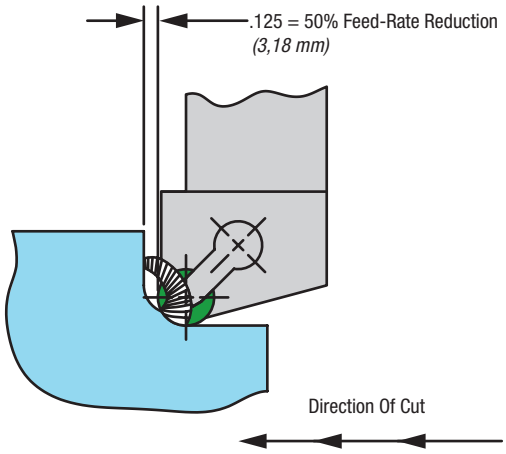


Figure 44 – Avoid Leaving Scallops at Shoulder

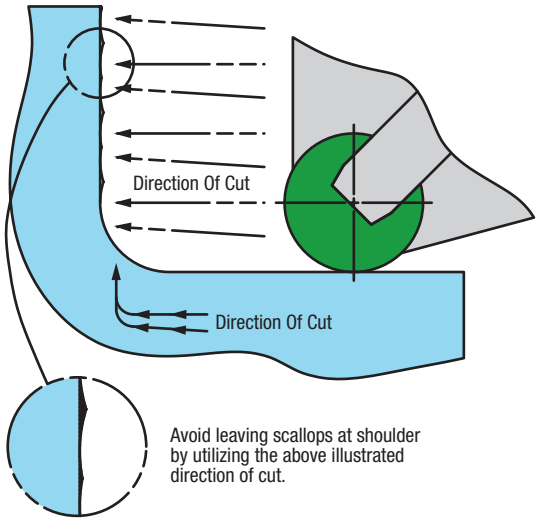
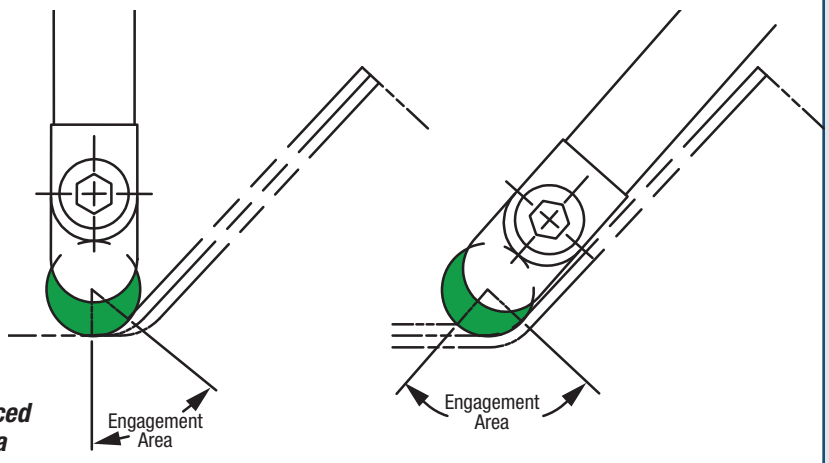


Figure 45 – Tool Engagement Angle

Maintaining a reduced engagement area as shown in *Figure 45* is preferred. If the increased engagement area is unavoidable, then a 50% feed reduction may be necessary.



Preferred - reduced engagement area

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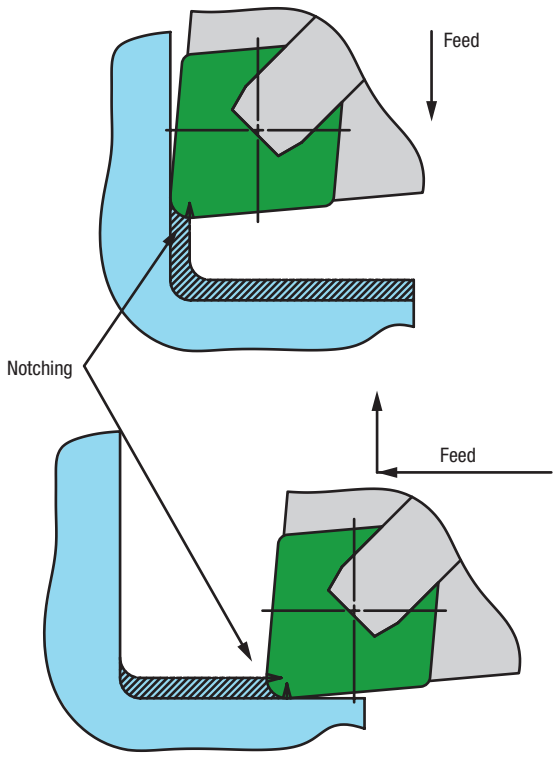
Double Notching – Not Recommended for Notch-Sensitive Situations

It is quite common to program a cut in both directions in CNC machining using carbide inserts. This may have been a matter of convenience to avoid a tool change. It should be noted however, that this is a very undesirable method in notch-sensitive situations such as in high-velocity machining with ceramics.

Here, the tool was fed first from the top and then along the bottom and a blend was made in the radius area. The problem is obvious. Notching has occurred on both sides of the insert. During the second cut, material jams into the first notch causing chipping. Stress may generate a failure crack from notch to notch and break off the corner. *(Figure 46)*

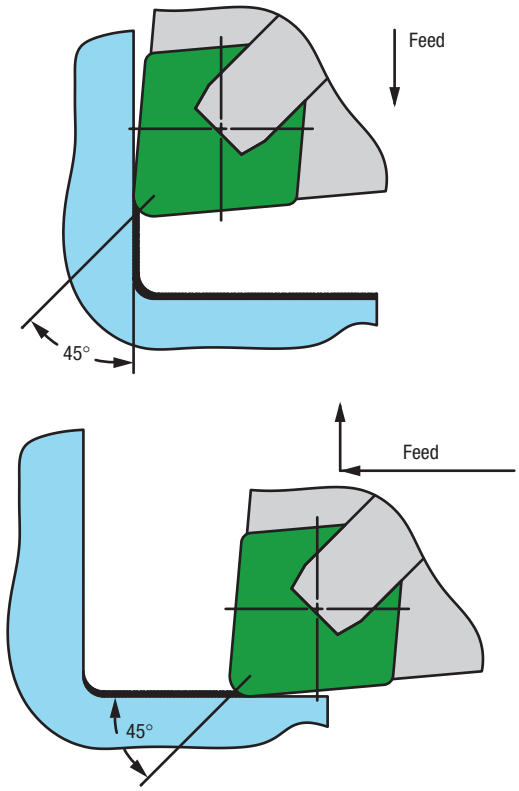
Figure 46 – Carbide Method Beware



Rethink the process

The correct procedure is to take more material off during the previous roughing application, then remove the amount of stock suitable for the nose radius of the insert *(Figure 20)* by staying below the 45° mark of the corner radius. This will minimize notching and allow a cut from both directions. *(Figure 47)*

Figure 47 – Ceramic Method



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Finishing a Fillet

Sound design criteria, especially on highly stressed parts such as jet engine components, calls for fillets or specific radii at the junction of most angles.

Problems encountered in finish machining of fillets can often be traced to the approach made in the rough-machine operations.

The amount of stock left for finishing and the shape and condition at the surface of this stock are affected greatly by the tool path and insert configuration used in roughing.

It is not uncommon for a programmer to call for a tool having the specific radius of the fillet and do the entire operation with this tool. This radius is usually small, therefore the tool is weak and must typically be indexed or changed to complete the operation.

There are a number of effective methods available to accomplish these corners, all of them superior to the common method of multiple passes with the weak radius tool.

Method 1 *(Figure 48)*

#1 – The material is roughed using a .500" *(12,7 mm)* diameter round insert. This leaves a .250" *(6,35 mm)* corner radius. In addition, stock for finishing has been left on both walls.

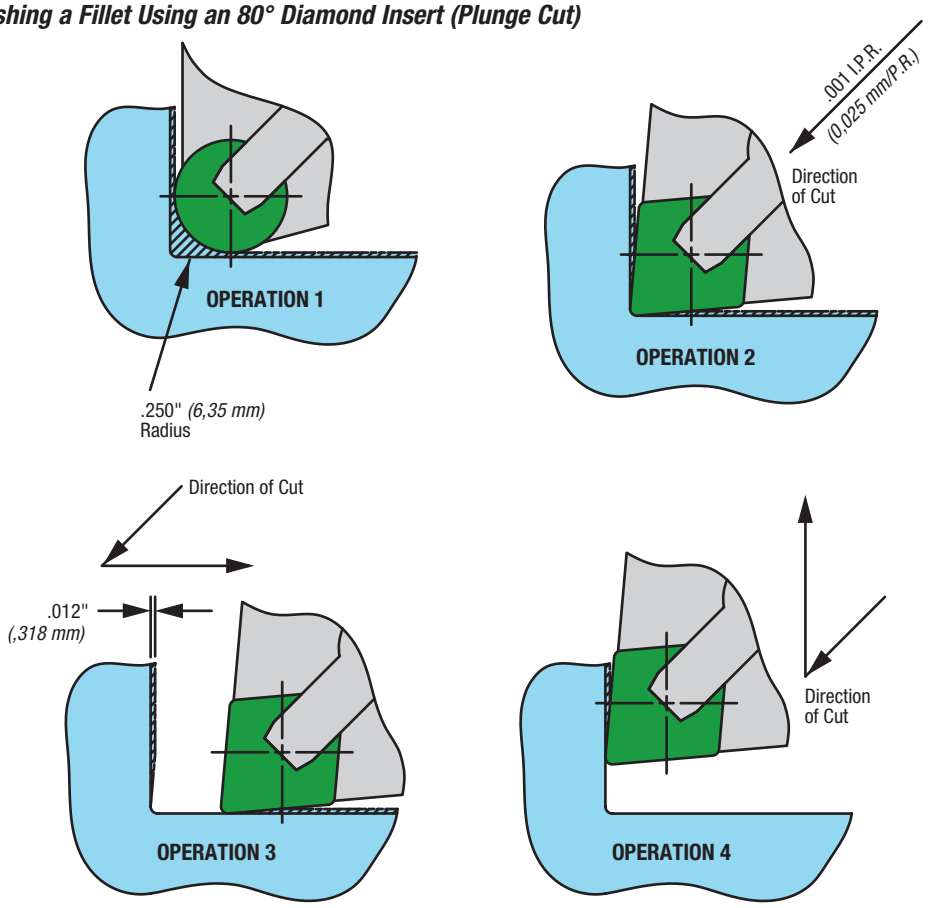
#2 – The finished radius is now generated by plunging the 80° Diamond-shaped insert finishing tool at 45° into the corner. This plunging operation spreads the effect of the work-hardened surface across the nose of the tool without notching it. In addition, the tool is supported by equalized forces on both sides. A clean, accurate radius is also produced.

#3 – The tool is then drawn across one of the faces to produce the finished surface. The long 5° reverse lead angle inherent in the 80° Diamond insert will produce a good finish without damage to the cutting edge.

#4 – The second wall is finished by turning the tool to the corner and feeding out in the other direction, again working on the long lead angle.

Method 1

Figure 48 – Finishing a Fillet Using an 80° Diamond Insert (Plunge Cut)



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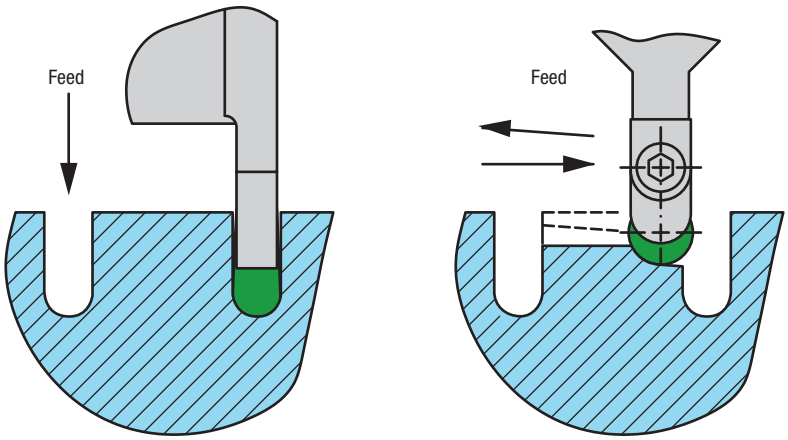
Method 2

Figure 49 – Finishing a Fillet Using a Grooving Tool and a Round Insert

Very small radius fillets on parts are often produced with the fewest problems by using a grooving tool on the first operation. A grooving tool is self-stabilizing and always moving forward into clean material. This results in efficient machining without tool notching and produces an accurate corner radius. The remaining material is then removed by ramping cuts with a round insert.

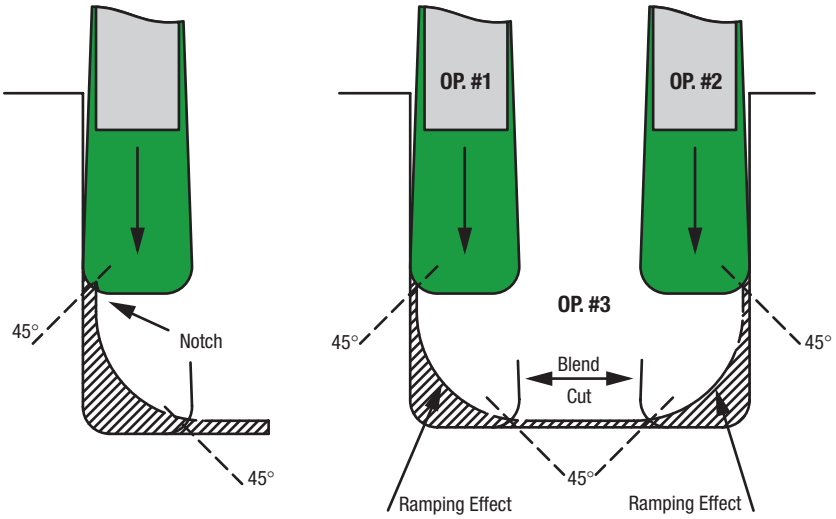


Method 3

Figure 50 – Turning to a Shoulder in Cavities with V-Bottom Grooving Inserts

This example shows the profiling of the groove or cavity using a V-bottom grooving insert. It is important to keep the finish stock very light on the sides so that the cut is below the 45° mark on the insert radius. This will vary with the radius needed. The larger the radius, the greater the stock can be. *(See Figure 20)*

In the corner itself, we use the "ramp" inherent in the radius left by the round insert used for roughing to reduce or eliminate "notching" of the tool. This is a further benefit of roughing with round inserts or profiling the corner in the program.



Watch the depth-of-cut line!

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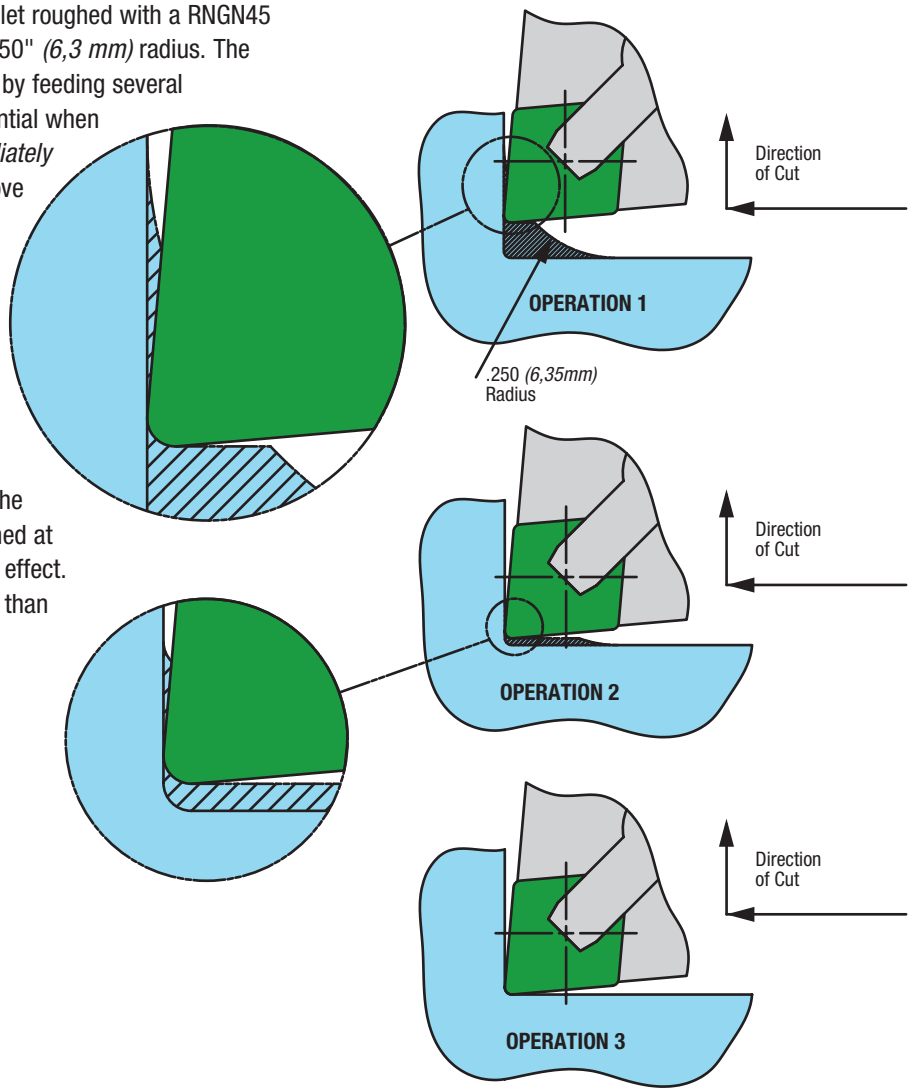
Method 4

Figure 51– Ramping Effect on Shoulder Cuts

In this method, a CNGN452 (12 07 08) insert is shown in the finish operation on a fillet roughed with a RNGN45 (12 07 00) insert leaving a .250" *(6,3 mm)* radius. The finish operation is performed by feeding several times into the fillet. It is essential when the wall is reached to *immediately* raise the tool vertical to remove the scallop which would otherwise be left on the wall. This material will tend to cool and present a hardened, irregular surface needing a subsequent operation *(Figure 43)*. The finish passes described will tend to notch the tool and should be programmed at various depths to reduce this effect. The final pass should be less than the 45° line of the tool nose radius *(Figure 20)*.



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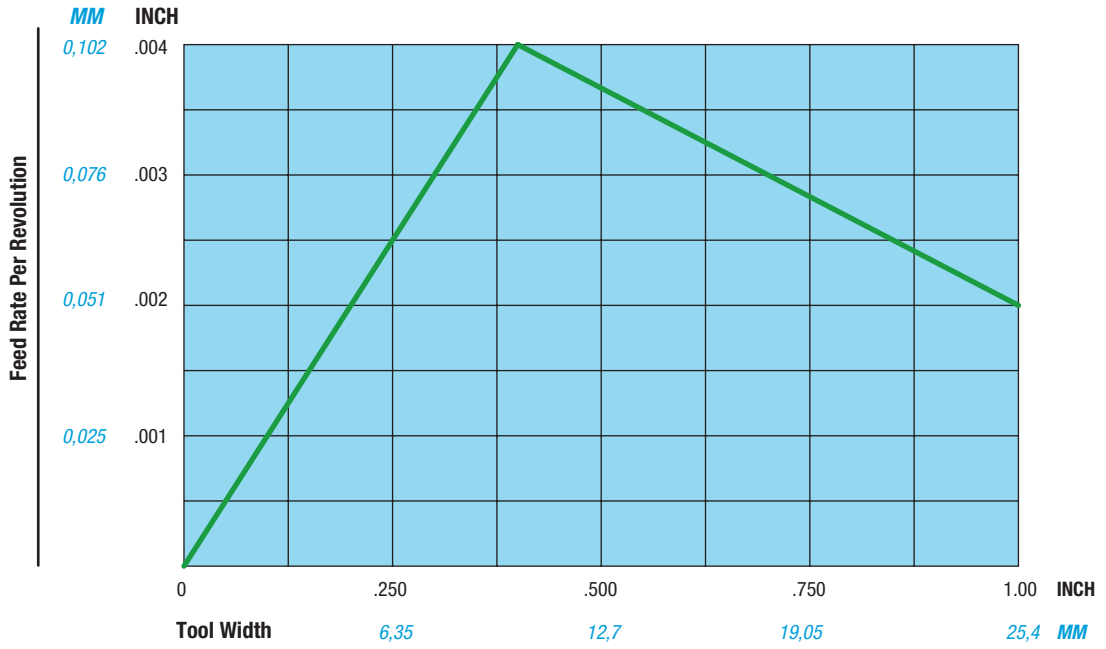
Grooving

Feed and speed for grooving

Figure 52 – Grooving Feeds vs. Tool Width



Select the correct speed from the graph using material hardness as the basis. (*Figure 13*)

A good starting point for feed rates in grooving has been shown to be one percent (1%) of the tool width for widths up to .400" *(10 mm)*. For widths over .400" *(10 mm)* some reduction of this feed will be required. (*Figure 52*)

Case history

Material Rene 95
Part 19" *(483 mm)* diameter
Application .375" *(9,53 mm)* wide O.D. Grove
.500" *(12,7 mm)* deep
Surface speed per minute 400 feet *(122 meters)*
Feed rate per revolution 0.0035" *(0,09 mm)*

	Carbide	**WG-300®**
	Cost $	Cost $
Cycle time	35 min.	3.5 min.
Burden rate	@ $60/hr=$35.00	@ $60/hr.=$3.50
Insert cost	$15.00	$50.00
Sub total	$50.00	$53.50
Time saved	0	31.5 min.
	$= 0	@ $60/hr.= $31.50
Total cost	***$50.00***	***$22.00***

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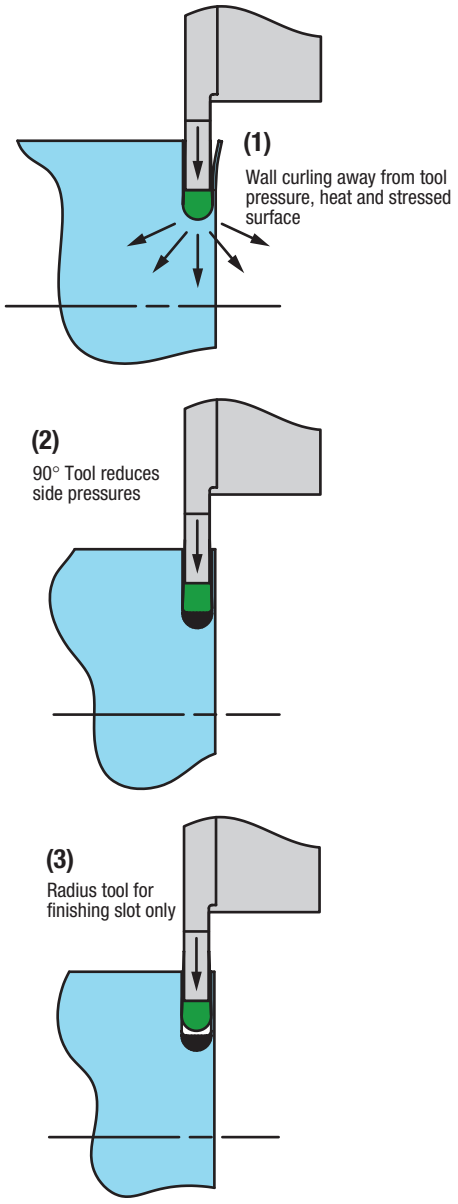
Grooving Thin-Wall Sections

A problem may occur when attempting to machine deep grooves, leaving a thin wall standing. If the groove form calls for a radius in the root, then the heat and pressure generated by cutting the entire groove with the radius tool will cause the wall to curve away from the tool. *(Figure 53,1)* This is a combined reaction of the actual pressure and heat of the cut plus the formation of a stressed surface layer.

Good practice dictates roughing the groove with a straight-edged tool ***(2)*** and finishing the radius area only with the radius tool. ***(3)*** *(Figures 53, **2** and **3**)*

Figure 53 – Thin-Wall Grooving



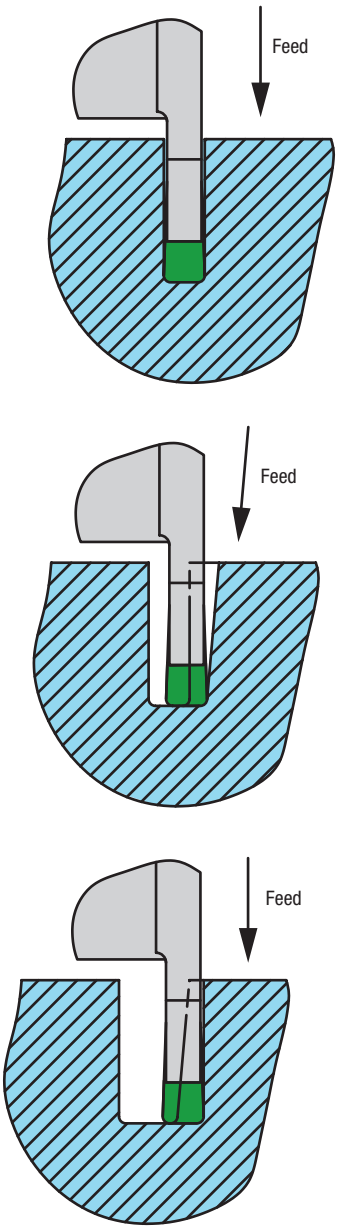
Machining Cavities with Grooving Tools

There are several proven approaches to the machining of cavities using grooving tools. All of the methods shown are satisfactory, however, Methods B and D are the most effective.

Method A *(Figure 54)*

The grooving tool is used to produce a groove in the normal manner by plunging straight into the work. The groove is then widened by using a ramping technique.

Figure 54 – Widening Cavity Techniques



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Method B *(Figure 55)*

Two grooves have been produced by plunging straight in. This allows both finished sidewalls and corner radii to be generated. The material between the grooves is removed with a round insert making a straight plunge cut to finish the cavity.

Method C *(Figure 56)*

The cavity is produced by a series of plunge cuts. In this case it is very important to keep the work-hardened surface of the previous cut working on the radius at or beyond the 45° mark to reduce notching. If this is disregarded, rapid notch wear will develop leading to the fracture of the insert corner.

Figure 55 – Additional Cavity Techniques

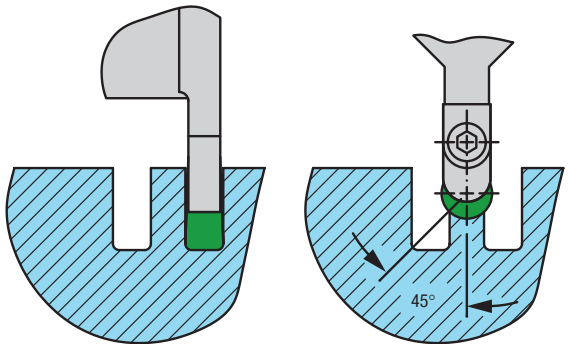
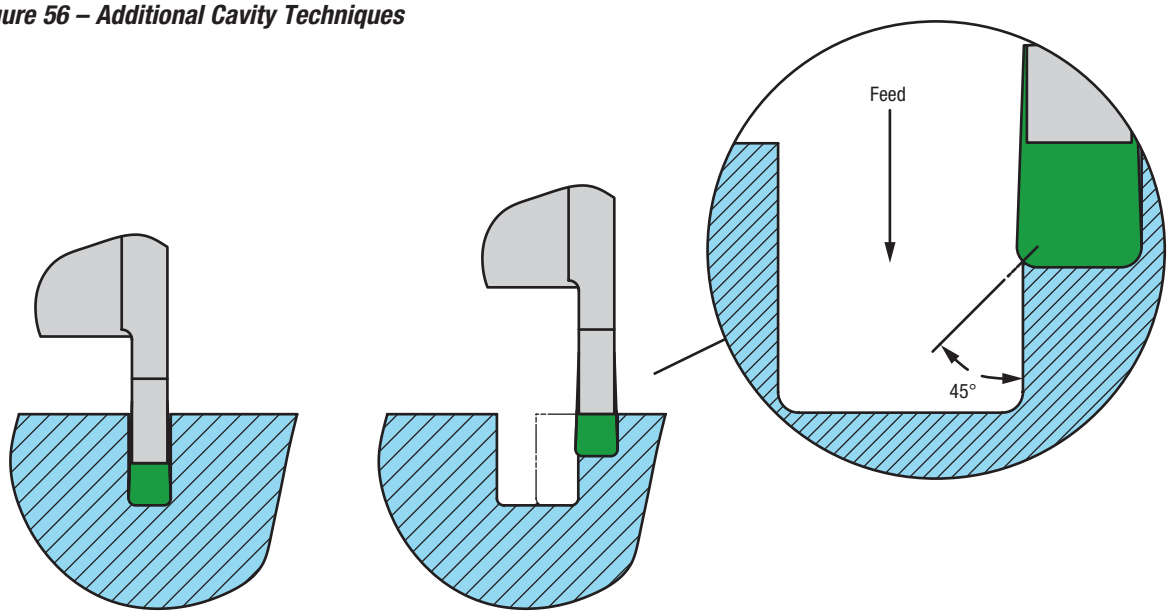


Figure 56 – Additional Cavity Techniques



Method D *(Figure 57)*

The example shown in *Figure 57* is similar to *Figure 55*, except the cavity is wider and the material between the two grooves may be removed by a ramping operation with round inserts. This is an effective method of approaching a wide-cavity application.

Figure 57– Ramping in Cavities

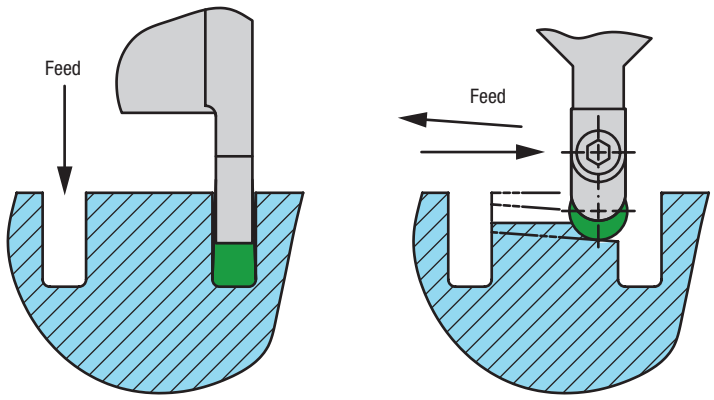
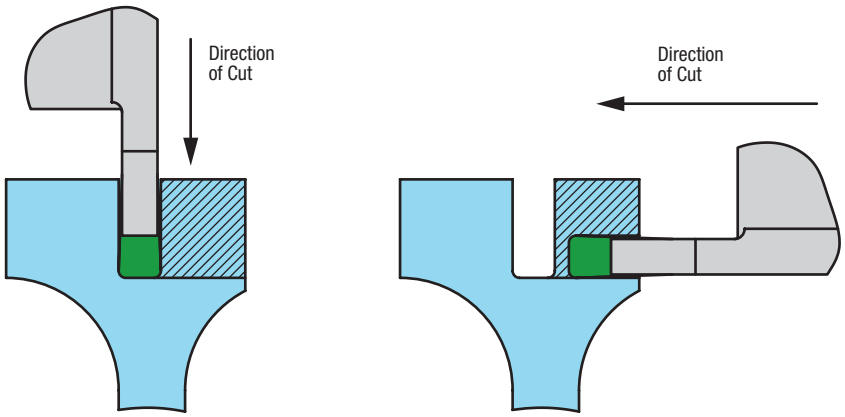


Figure 58 – Producing a Test Sample



Grooving Tools for Shoulder Cuts

It is possible to make shoulder cuts with grooving tools involving the removal of large amounts of material by producing a complete ring.

This technique is being applied in the production of large jet engine discs very effectively but requires special set-up. The method is illustrated in *Figure 58*.

In effect, two 90° opposing grooves are plunged into the part using a V-bottom grooving tool. This generates two clean walls and the required corner radius.

When the second groove breaks into the first one, a complete ring is produced which may be used for some other component. A fixture must be used to hold the ring as it parts from the main forging. It is worth constructing a special clamping fixture for such cases since the method itself is so economical.

Rethink the process

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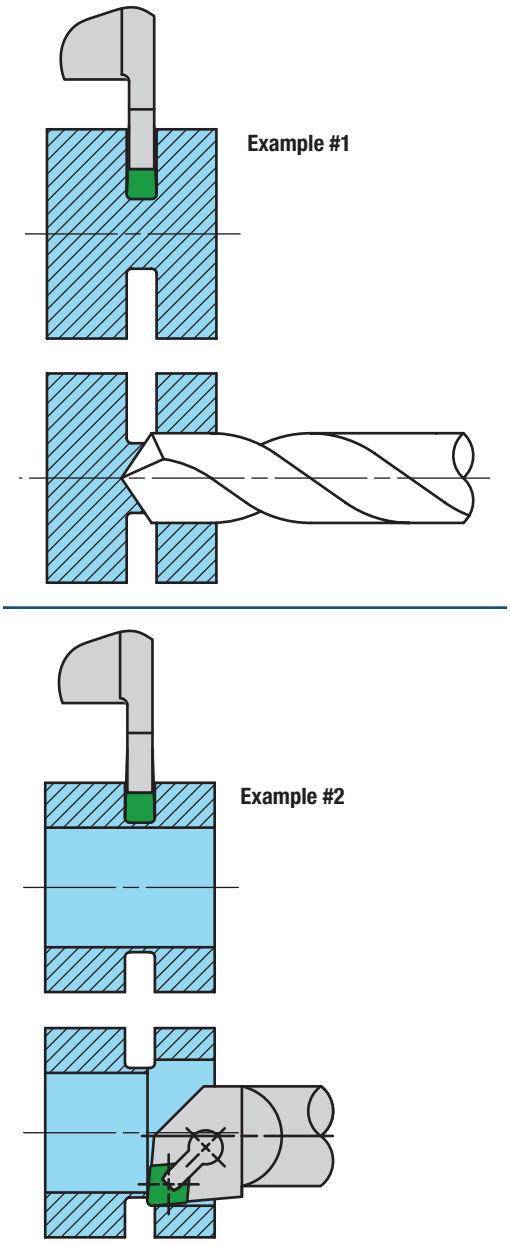
Cut-Off Operation with Ceramic Inserts

Using a whisker-reinforced ceramic grooving tool and then completing the cut-off with a drill or boring tool in a secondary operation is illustrated in *Figure 59*. This will eliminate tool breakage which would occur if attempting to totally cut off with a ceramic tool. This technique works best with smaller components where the cut-off piece can be captured on the drill or boring tool. There are other variations of this method.

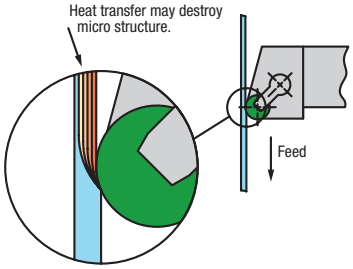
Figure 59 – Ceramic Inserts Used in Cut-Off Operations



Thin-Wall Applications

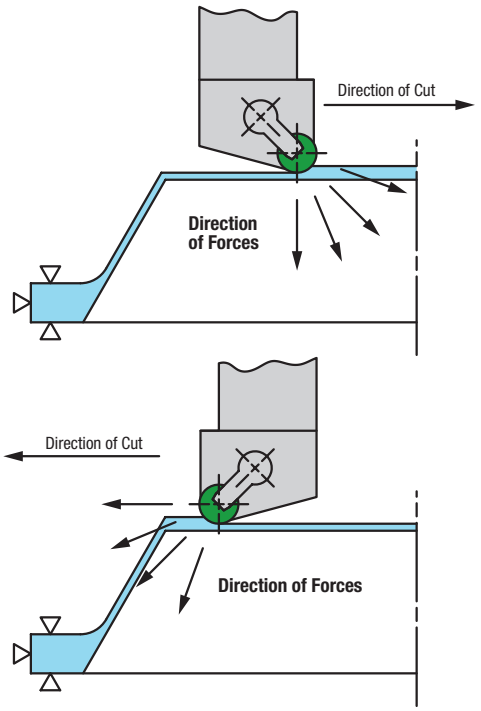
Many turbine components have very thin sections. Distortion of thin-wall parts can become a significant problem. Too much heat in the part due to excessive tool pressure and stress in the material surface due to deformed metal can be the cause of this distortion. In very thin walls, heat may penetrate an entire section causing microstructural damage in the material *(Figure 60)*. In these cases, the speed reduction necessary to limit heat penetration may dictate the use of carbide insert technology.

Figure 60 – Thin-Wall Heat Penetration



In certain situations, the direction of the cut may be of extreme importance. For example, a severe chatter/deflection problem was eliminated in the illustrated aircraft part by a change to facing from the center out. Facing in this way concentrated the resultant forces into a supported section of the part. *(Figure 61)*

Figure 61 – Cutting Direction Resultant Forces



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Thin-Wall Applications cont'd

It is important to note the following rules of good practice for thin-walled parts:

1. Reduce the tool nose radius while maintaining the largest radius for best tool life that does not cause distortion.
2. Reduce the lead angle so that the resultant force is directed into a strong or supported section of the part piece.
3. Reduce depth of cut.
4. Do not cause the tool to dwell excessively.
5. Reduce speed.
6. If necessary, change back to carbide for lower surface speed resulting in less deflection, less surface material distortion and less heat.

Rethink the process

Interrupted Cuts

Whisker-reinforced ceramics are inherently very strong and able to withstand interruptions provided the recommended speeds *(Figure 13)* are increased. Speed is all-important in the successful cutting of parts with interruptions.

Do not give in to the temptation to reduce speed.

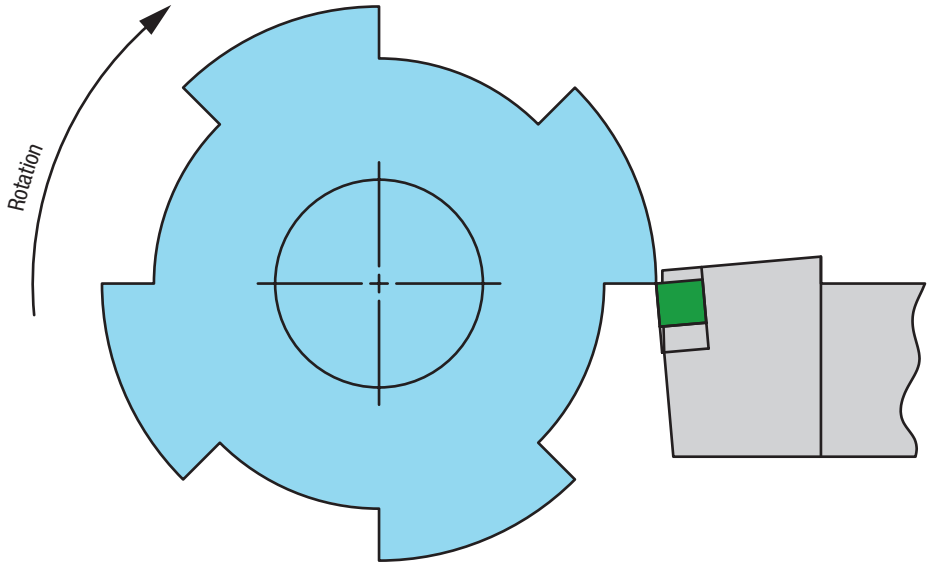
The amount of increase in the recommended speed for severely interrupted cuts can usually be calculated. It is necessary to increase the speed to get back into a temperature zone where the interruptions have lowered by virtue of the intermittent contact between tool and workpiece. First, calculate the circumference of the part and then subtract the sum total of the interruptions. This will give a smaller diameter value. Then increase the RPM so the smaller diameter value returns us to the originally recommended surface speed.

As a simple example *(Figure 62)*, if 50% of the material is taken away by voids or interruptions at the surface, 50% of the surface remains in contact with the tool compared to an uninterrupted part. In this case, double the surface speed to compensate.

A simple estimate will often suffice. Look at the part. Estimate the percentage of surface missing due to interruptions and then increase the speed by at least that amount.

Rethink the process

Figure 62 – Interrupted Cuts



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Edge Preparations for Interrupted Cuts

It is advantageous in interrupted cutting to ensure that the feed rate is less than the width of the negative edge preparation on the insert. This assures that the insert cutting edge is in compression at all times and not in shear, as would be the case if the feed exceeds the width of the land. For this reason the T2A or T7A edge preparation should be used.

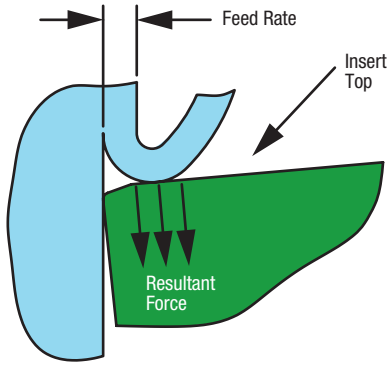
Feed rate must be reduced on severe interruptions to get more heat into a thinner chip. This will reduce the cutting pressures. If these rules are followed, few problems will be encountered on interrupted cuts. *(Figure 63)*

For interrupted cuts, the rules are:

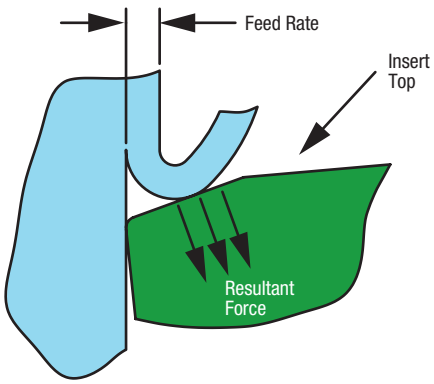
1. Select a larger edge preparation
2. Reduce feed rate
3. Increase recommended speed

Figure 63 – Edge Preparations

Uninterrupted Cuts



Interrupted Cuts



Surface Hardening

Incorrect tooling practices, worn tools, tools with too much hone, etc., can cause excessive surface hardening effects during the machining of nickel-based alloys, particularly in finishing.

It has been shown that cutting with the higher speeds and feeds will decrease (not eliminate) the work-hardening effect and will be an eventual factor in tool life due to notching of the tool at the depth-of-cut line.

If a tool is allowed to dwell without feed, the workpiece will be burnished or glazed and thereby work-hardened. Sharp tools are needed for light operations to avoid burnishing.

Greenleaf whisker-reinforced ceramics have the advantage of being available without hones to accomplish finishing cuts and has the edge strength to make this possible.

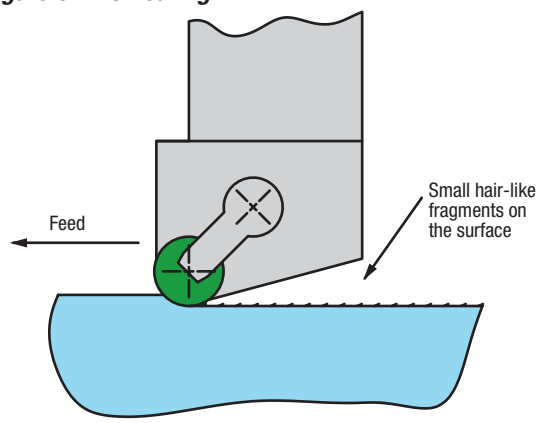
Smearing

Smearing can often be identified as small hair-like particles embedded into the finished surface. *(Figure 64)* This is caused by the nickel, being very gummy in nature, which is built up on the flank of the tool and then swept past a worn, chipped, or honed area of the insert under great pressure and is embedded or pressure-welded in small fragments into the finished surface.

Greenleaf advanced whisker-reinforced ceramics are strong enough that inserts are recommended and produced as standard without a hone. A clean, sharp edge is then presented to the part piece, reducing stress and eliminating the tendency to smear the material in finishing cuts.

Smearing will occur even with whisker-reinforced ceramics if the tool is allowed to wear excessively before indexing or if it chips or flakes due to side pressures caused by flank wear.

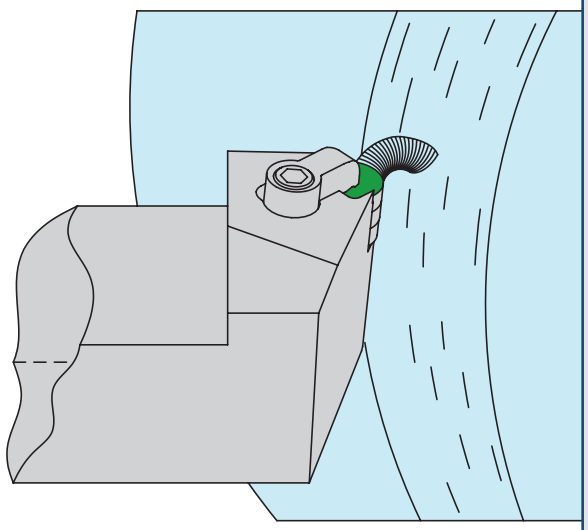
Figure 64 – Smearing



Impingement

Conditions can arise where the chip is curled onto the finish surface immediately behind the tool. Under these circumstances, fragments of the hot, plasticized chip may adhere to the finished surface. *(Figure 65)* Every effort must be made to avoid this condition when cutting at ceramic speeds. Usually a change in tool geometry lead angle, tool radius, depth of cut, feed rate or some combination of these will redirect the chip away from the finished surface.

Figure 65 – Impingement



Boring Holes

With a quill feed machine, boring into a hole increases the spindle extension and as the tool becomes dull, the cutting forces increase *(Figure 66)*. The cutting conditions will deteriorate as the quill becomes progressively less rigid. The results are bores that are tapered and not concentric.

Additionally, chips may accumulate in the bottom of the bore and will eventually be re-cut, further worsening conditions.

It is often advantageous to back bore a hole *(Figure 67)*. This improves the spindle's stability as the insert wears while giving better size, finish and roundness to the bore with less chance of insert breakage and no chance of chip clogging.

Rethink the process

Figure 66 – Spindle Overhang Increasing

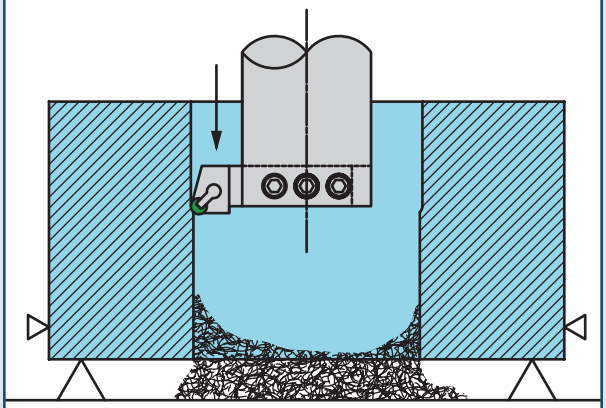
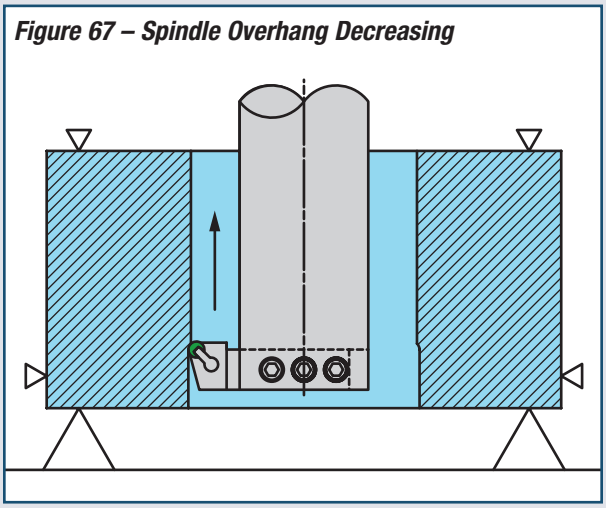


Figure 67 – Spindle Overhang Decreasing



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Wear Mechanisms

The normal wear patterns on Greenleaf advanced whisker-reinforced ceramic inserts are unlike the familiar wear patterns on carbide tools. Any attempts to analyze wear or failure mechanisms based upon that prior knowledge will result in ineffective utilization of the WG Ceramics material.

Flaking off of small pieces around the top periphery of the insert is the result of pressure caused by the development of flank wear. In **roughing operations** where surface finish is not of primary concern, this type of tool wear *(Figure 68)* is not usually detrimental to tool performance. In fact, as the tool flakes, a new sharp edge is produced and the tool may go on cutting for long periods in this flaked condition with satisfactory results. In finishing cuts, the flaking will be detrimental to the finish and may also lead to smearing.

At the moment of flaking, sparking can be seen mainly in an upward direction from the insert top surface. The high-temperature material now flowing over a rough top surface of the insert creates sparks. This is not a matter of concern for tool failure. We recommend that the feed rate be turned back 50% to finish the cutting operation.

Before the next operation, a tool inspection should determine whether or not the edge needs to be indexed. It is very important to use the insert to the maximum flaked condition in roughing before indexing or discarding the inserts. Do not make hasty judgment of the tool's ability to continue based upon this flaked appearance. Greenleaf whisker-reinforced ceramics are a completely different material. Continue to use the insert until some experience has been gained on where the limits actually lie in your operation.

Caution! *When sparks are visibly being carried along the cutting surface, then the insert cutting edge is chipped or broken severely enough that it is not able to cut anymore. This may cause catastrophic failure. Quick action to withdraw the cutting tool is recommended.*

Unlike traditional ceramics, WG Ceramics does not fail by catastrophic breakage except under conditions of severe misuse. The most commonly observed wear/failure modes are chipping of the edge, flank wear, notching and flaking.

Flank wear is a normal progressive wear phenomenon present in all cutting tools. The magnitude of this wear and the speed at which it develops are the values by which tool life should be judged.

In nickel-based alloys, notching will occur at the depth-of-cut line under almost all circumstances. The ideal tool application would be one in which the notch wear was at an acceptable maximum at exactly the same time as flank wear had developed to an acceptable maximum. However, one wear phenomenon usually develops ahead of the other.

Notch wear should not extend past 1/3 of the thickness of the insert. Rapid notch wear or chipping of the insert is often the result of insufficient heat in the shear zone ahead of the tool. Increasing the speed or decreasing the feed or a combination of both can remedy this.

Figure 68

Indexing of Inserts

If the following indexing practices are observed in the application of Greenleaf whisker-reinforced ceramics, the result may be two to three times more part production per insert than when following indexing practices for traditional ceramic or carbide tools. Tooling costs may be cut in half…or better.

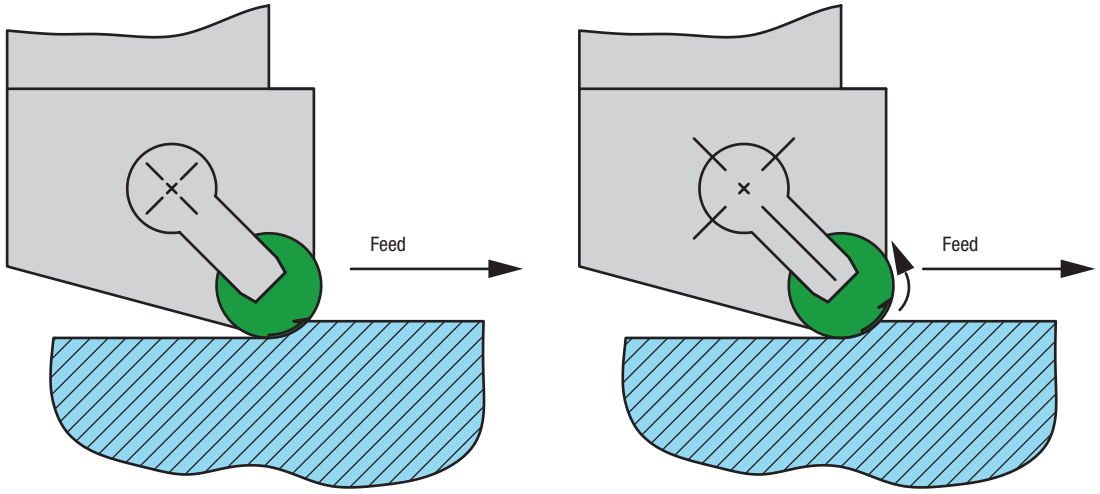
For Optimum Tool Life:

Method 1 *(Figure 69)*
When notching has reached the maximum depth of 1/3 the thickness of the insert, but the flank wear land is not at the maximum; index the inserts as illustrated so that the next notch is developed on an area where the wear land is now present. This is done by turning the insert away from the finished surface so that the notch is clear of the hardened surface layer, but the wear land is still inside the next cutting zone.

Method 2 *(Figure 70)*
When both notching and flank wear land have developed at an equal pace and both are at a determined maximum, index the insert's notch towards the finished surface so that the notch is just clear of the finished surface and adjacent to the start of the toolholder pocket.

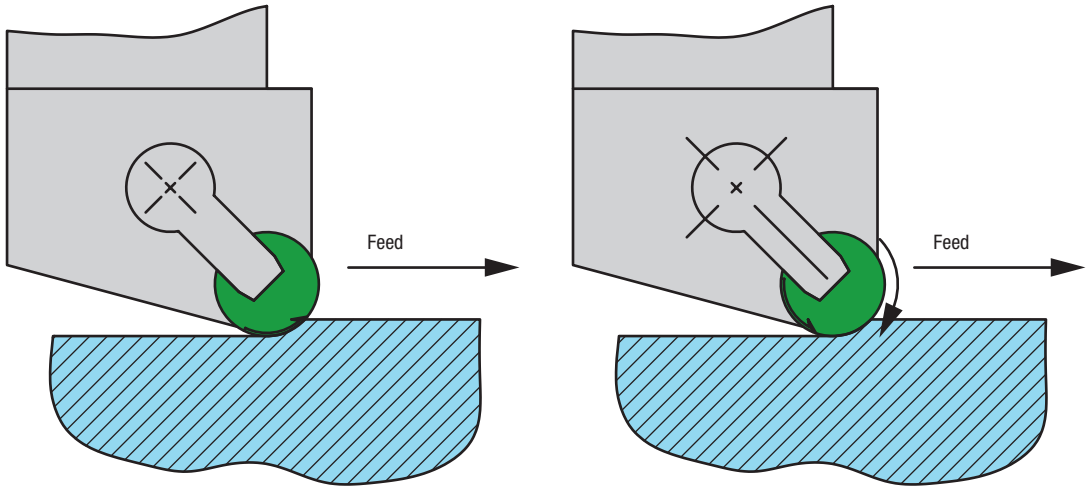
Method 1

Figure 69 – Indexing of Round Inserts (Due to Notching)



Method 2

Figure 70 – Indexing of Round Inserts (Due to Notching and Wear)



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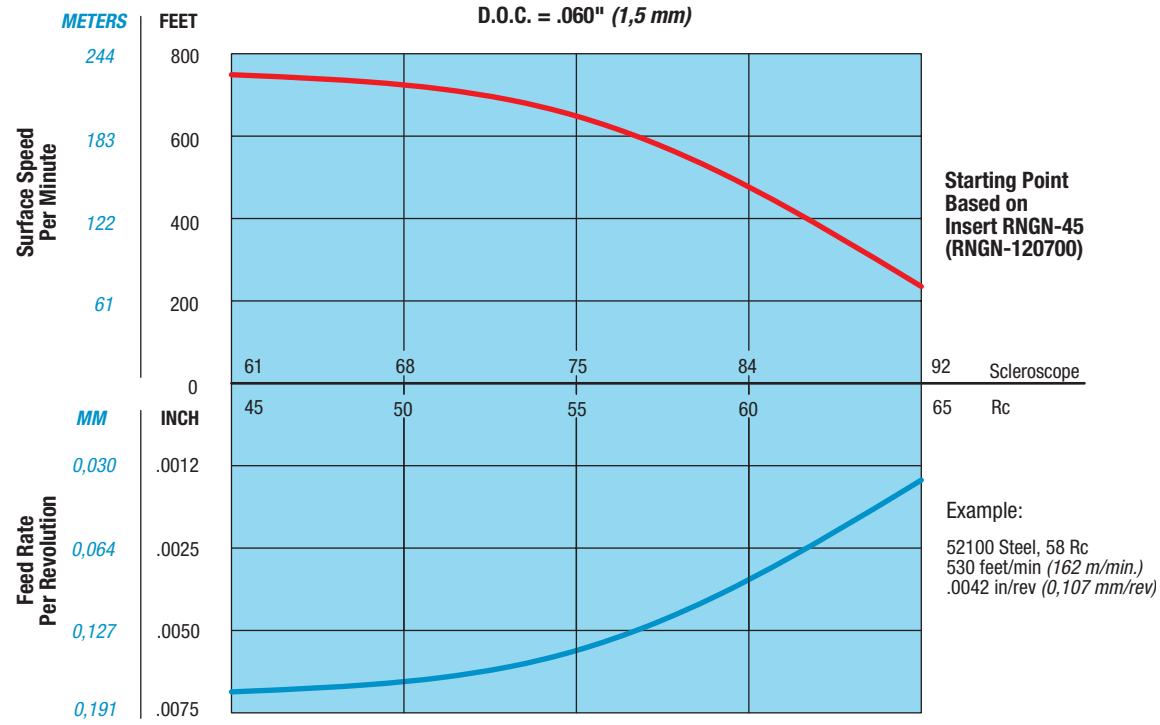
Turning Hard Materials 45-65 Rc

Figure 71 – Machining Recommendations for Hardened Materials



Greenleaf advanced whisker-reinforced ceramics are successfully used for the turning of hard materials other than nickel-based alloys in the range of 45-65 Rc. The outstanding hardness, combined with the high strength imparted by the reinforcing silicon carbide whiskers, makes possible the machining of many materials previously workable only by grinding. Some areas where the greatest savings have been shown are in the heat-treated alloy steels, die steel, weld overlays, hard facings and hard irons.

As in nickel-based alloys, speeds can be increased up to 8x those used for uncoated tungsten carbide tools and 4x those of coated carbide tools.

The above graph *(Figure 71)* gives starting points for speeds and feeds based upon material hardness. In hard turning the use of a light hone on the insert such as edge preparation T1A may help reduce chipping. ***Coolant should not be used.*** In this application we also recommend the use of an "ANSI" toolholder system which inherently has a five-degree double-negative rake.

If your job is in the 45 to 65 Rc range, chances are that Greenleaf whisker-reinforced ceramics can increase productivity and cut machining costs substantially.

Milling of Nickel-Based Alloys

Milling can be compared to interrupted machining in turning. Since each insert is in and out of the cut during each revolution, the desirable temperature ahead of the tool is not easily achieved and calls for increased surface speed, reduced feed per tooth or a combination of both. It can be surprising how much extra speed is needed in some operations to get the heat back compared to machining the same material continuously as in turning. The increase can be many times the turning speed.

If a cutter designed for carbide is employed, new problems can arise. Often carbide insert milling cutter designs do not incorporate safety features to prevent components from dislodging at high speeds.

The use of coolants is not recommended.

With milling, unlike turning, the chip can be generated from thin to thick as in conventional or "up" milling or thick to thin as in "climb" or "down" milling. It is highly recommended to use the climb milling technique to avoid high heat in a thin section of the chip which encourages chip welding and re-cutting of the chip, which in turn reduces tool life.

To summarize, when milling with Greenleaf whisker-reinforced ceramics:

1. Increase the speed from the turning recommendations in *Figure 13* according to the width of cut.
2. Reduce the feed rate recommended for turning in *Figure 13* by about 50%. **Remember, this is feed per tooth, not per revolution of the milling cutter.**
3. Be sure to use a Greenleaf high-velocity milling cutter or a cutter designed specifically for use with ceramics at high surface speeds.

Recommended Speed Increase for Milling with Various Declining Widths of Cut

In a milling operation the width of cut has a direct bearing upon the temperature generated ahead of the inserts. As the width is decreased, so is the temperature since each insert now passes through air for a longer time than it actually cuts material.

Figure 72 shows the percentage of increase to the speeds given in the graph *(Figure 13)* for various declining widths of cut. The widths are also expressed as percentages of the cutter diameter so the chart can be applied to all cutter sizes.

At the very best, a milling insert can only be cutting 50% of each revolution if the path of cut is equal to the cutter diameter. For this reason, it will always be necessary to increase speed and reduce feed compared to the turning recommendations in *Figure 13* to achieve the same temperature range.

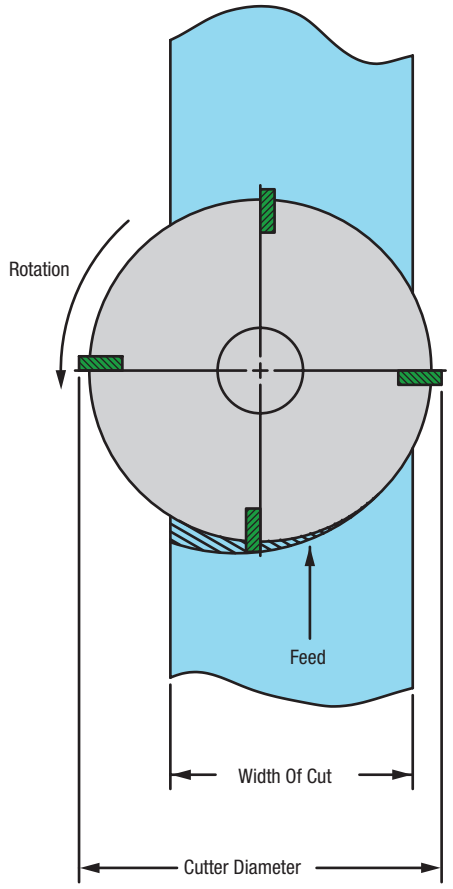
Example of a Ceramic Milling Application

The following data indicates outstanding success with a ceramic milling application:

Material..... *Waspaloy*
Condition..... *Forging*
Hardness..... *41 Rc*
Operation ..... *Rough and Finish Milling*
Cutter Diameter..... *3" (76 mm) WSRN-60003*
Number of Inserts *4*
Depth of cut (rough) ..... *0.050" (1,27 mm)*
Depth of cut (finish)..... *0.025" (0,64 mm)*
Insert ..... *RNGN 45 T2 (120700)*
Grade ..... *WG-300®*
Speed ..... *3144 SFM (958 m/min)*
Feed..... *64 ipm (1,6 m/min)*
Feed per tooth..... *0.004" (0,1 mm)*

This application resulted in an 80-to-1 reduction in the cutting time cycle over carbide.

Figure 72 – Recommended Speed Increase for Milling with Various Declining Widths of Cut



Width of Cut in Percentage of Cutter Diameter Engaged in Workpiece	Surface Speed in Percentage of Graph (Figure 13)
100%	125%
90%	150%
80%	220%
70%	280%
60%	340%
50%	400%
40%	460%

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Targeted Application Areas for Greenleaf Advanced Whisker-Reinforced Ceramics

The potential for applying whisker-reinforced ceramics extends considerably outside of the aircraft industry and involves categories of materials where little or no work has been done to date.

In order to provide you with a starting point for cost justification calculations, a rating list follows.

This list is extrapolated from carbide performance data published by leading users of the alloys listed. A sampling of the data gives us every reason to believe that it will work very well for WG-300® as a starting point. Here's how it works.

a.) In the Ceramic Productivity Manual, the graph *(Figure 13)* gives speeds and feeds for a given hardness value assuming the use of RNGN 45 (120700) inserts. The value represents 100% in that system.

b.) The following list gives a percentage rating for a number of materials where there is existing data. ***Note:*** *This is for forged (wrought) materials. Only the speed is to be considered at these new machinability values as a starting point with WG-300®. For values below 100%, speed, feed, depth of cut and time in cut must be reduced to the suggested rating.*

Starting Point from *Figure 13* for Various Materials

Alloy	#AMS	UNS#	% Rating
A-286	5726	S66286	115
A-286	5731	S66286	115
A-286	5732	S66286	130
A-286	5734	S66286	115
Astroloy	5882	N1307	120
Custom 450	5863	S45000	180
Custom 455	5617	545500	140
Greek Ascoloy	5616	S41800	250
Hastelloy B		N10001	
Hastelloy C	5750	N10002	180
Hastelloy D			
Hastelloy G		N06007	
Hastelloy N	5771	N10003	150
Hastelloy S	5711	N06635	180
Hastelloy W	5755	N10004	130
Hastelloy X	5754	N06002	130
Haynes 25	5759	R30605	85
Haynes 188	5772	R30188	85
Haynes 263		N07263	50
IN-100	5397	N13100	60
Incoloy 804		N06804	
Incoloy 825		N08825	
Incoloy 901	5660	N09901	130
Incoloy 901 Mod.	5661	N09901	115
Incoloy 903		N19903	120
Incoloy 925			100
Inconel 600	5665	N06600	140
Inconel 601	5715	N06601	140
Inconel 617	5887	N06617	100
Inconel 625	5666	N06625	115
Inconel 700			
Inconel 702		N07702	
Inconel 706	5702	N09706	115
Inconel 718	5662	N07718	100
Inconel 718	5663	N07718	100
Inconel 718	5664	N07718	140
Inconel 721		N07721	
Inconel 722	5717	N07722	115
Inconel X-750	5667	N07750	115
Inconel 751		N07751	
MP-35-N	5758	R30035	115
Monel 400		N04400	
Monel 401		N04401	
Monel 404		N04404	
Monel 502		N05502	
Monel K500		N05500	
Monel R405		N04405	
Nicocraly			
Nickel 200		N02200	
Nickel 201	5553	N02201	200
Nickel 205	5555	N02205	220
Nickel 211		N02211	

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Alloy	#AMS	UNS#	% Rating
Nickel 220		N02220	
Nimonic 75		N06075	
Nimonic 80		N07080	
Nimonic 90		N07090	
Nimonic 95			
Nimonic C-263	5886	N07263	30
Nitralloy 125			
Nitralloy 135			
Nitralloy 135 Mod.			120
Nitralloy 225			
Nitralloy 230			
Nitralloy EZ			
Nitralloy N			
Permanickel 300		N03300	
Rene 41	5712	N07041	80
Rene 41	5713	N07041	80
Rene 63			
Rene 77			
Rene 88			80
Rene 95			60
Stainless Steel 15-5 PH	5659	S15500	115
Stainless Steel 17-4 PH	5622	S17400	115
Stainless Steel 17-4 PH	5643	S17400	115
Stainless Steel 410	5618		85
Stainless Steel 430	5627	S43000	400
Tool Steel D2		T30402	125
Tool Steel D3		T30403	

Alloy	#AMS	UNS#	% Rating
Tool Steel D4		T30404	
Tool Steel D5		T30405	
Tool Steel D6			
Tool Steel D7		T30407	
Tool Steel H-10		T20810	
Tool Steel H-11		T20811	
Tool Steel H-12		T20812	
Tool Steel H-13		T20813	125
Tool Steel H-14		T20814	
Tool Steel H-19		T20819	
Tool Steel H-21		T20821	
Tool Steel H-23		T20823	
Tool Steel H-24		T20824	
Tool Steel H-25		T20825	
Tool Steel H-26		T20826	
Tool Steel H-42		T20842	
Udimet 500	5751	N07500	100
Udimet 500	5384	N07500	85
Udimet 630			
Udimet 700			
Udimet 710			
Waspaloy	5704	N07001	115
Waspaloy	5706	N07001	100
Waspaloy	5707	N07001	100
Waspaloy	5708	N07001	100
Waspaloy	5709	N07001	100

*AMS # = Aerospace Material Specification Number

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