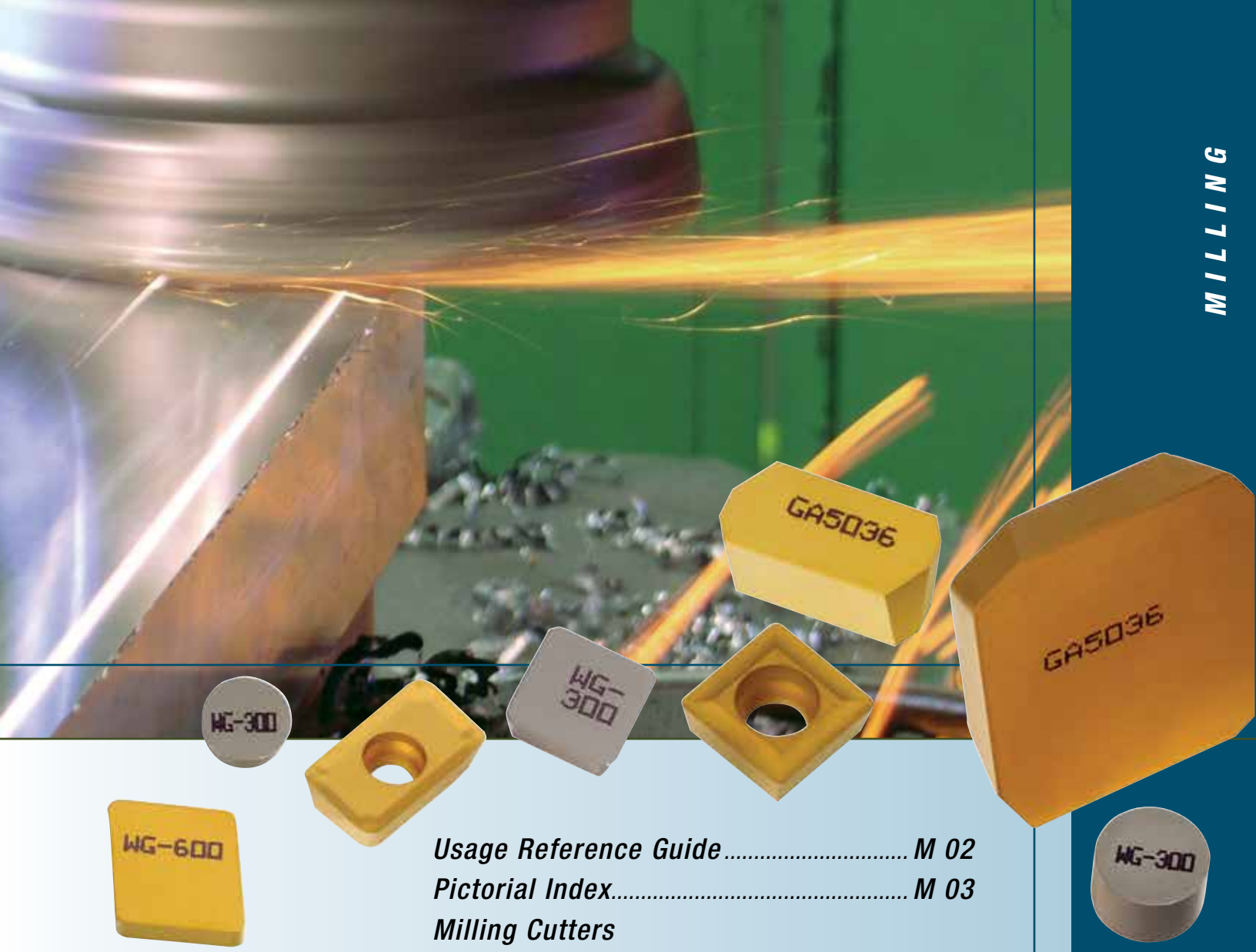
Greenleaf®

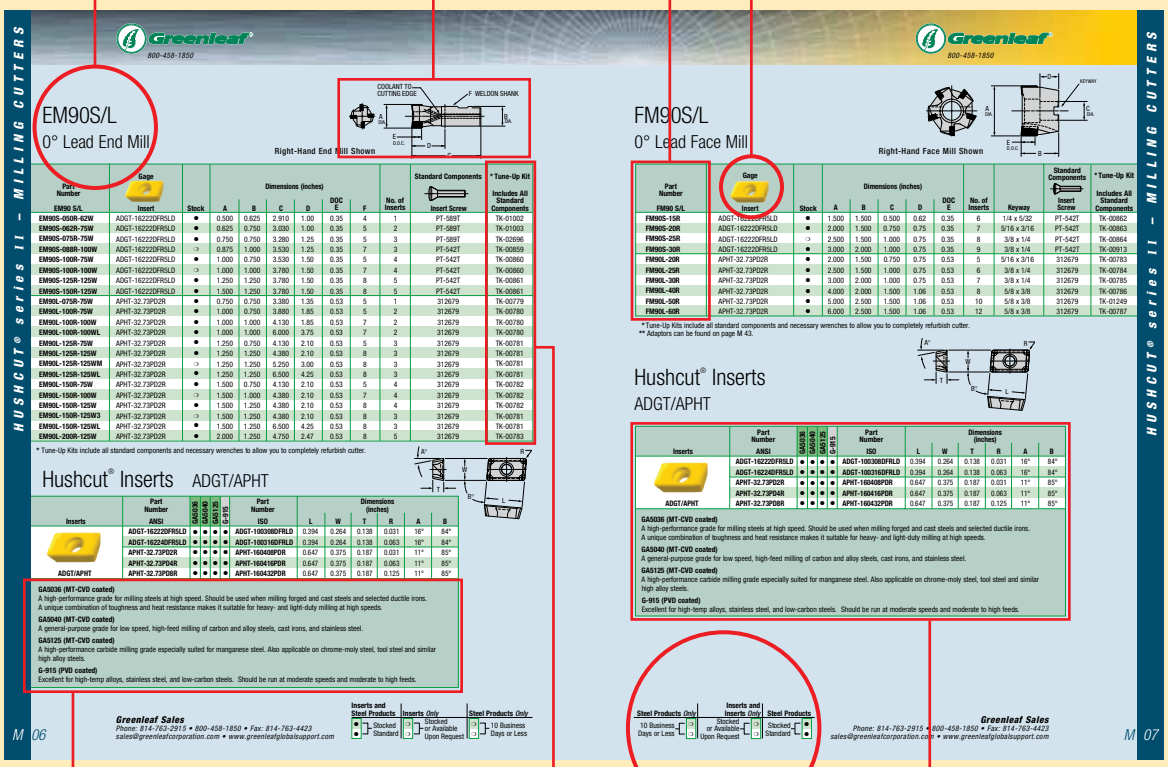
metalcutting tools and systems

2016

MILLING



Greenleaf®



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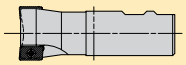
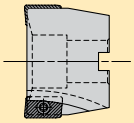
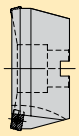
Hushcut® Series II Milling System



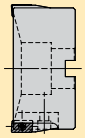
EM90
0° Lead End Mill
.375"-2.0" Diameter
page: M 06



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

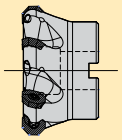


FM75
75° Lead
Face Mill
1.5"-6.0" Dia.
page: M 08



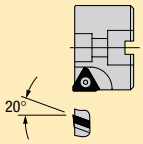
FMC90
Cartridge Style
0° Lead
Face Mill
3"-10.0" Dia.
page: M 09

Index-O-Cut™ Milling System

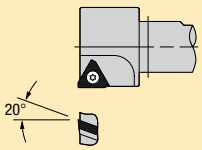


G-OFHP
High Positive Face Mill
Octagon Inserts
2.0"-8.0" Diameter
page: M 12-13

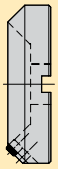
High-Shear Cutting Mills



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

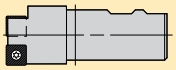


WSTHP
0° Lead End Mill
20° Positive Axial Rake
1.50"-2.5" Diameter
page: M 17



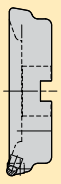
SHPC-345
45° Lead Face Mill
Negative Radial,
20° Positive Axial Rake
4"-12" Diameter
page: M 18

Screw-On Insert Style Cutters

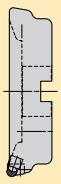


WSSCC
0° Lead End Mill
Center Cutting
.075"-1.5" Diameter
page: M 20

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

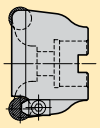


CP4 Series
Face Mill
Positive Rake Inserts
Cutters and Nests
page: M 22-23

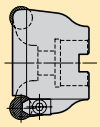


C4 Series
Face Mill
Negative Rake Inserts
Cutters and Nests
page: M 24-25

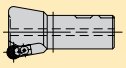
Excelerator® Milling Cutters
Ceramic and Carbide Inserts
Up to 4.0" Diameter Cutters



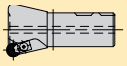
FMRP
Face Mill
Round Positive Inserts
2.0"-4.0" Dia.
page: M 26



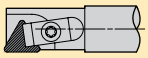
FMRN
Face Mill
Round Negative Inserts
2.0"-4.0" Dia.
page: M 26



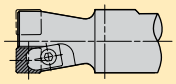
WSRP
End Mill
Round Positive Inserts
.625"-2.0" Dia.
page: M 27



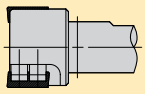
WSRN
End Mill
Round Negative Inserts
1.0"-2.5" Dia.
page: M 28



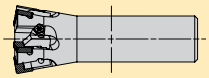
WSTP
End Mill
Positive Triangle Inserts
.5"-.625" Dia.
page: M 29



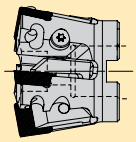
WSSP
End Mill
Positive Square Inserts
.375"-1.5" Dia.
page: M 30



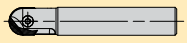
WSAN
End Mill
Parallelogram Inserts
.985"-2.465" Dia.
page: M 31



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

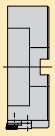


XFSP
High-Feed Face Mill
Square Positive Inserts
2" Diameter
page: M 32

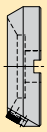


SSBN
Ball Nose End Mill
Ball Nose Inserts
.375" – 1" Diameter
page: M 34

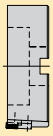
Powermill® Cutters



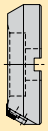
M400LNP-A
0° Lead Face Mill
Negative Radial
Positive Axial
4"-12" Diameter
page: M 38



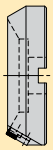
C430LNP-H
30° Lead Face Mill
Negative Radial
Positive Axial
8"-16" Diameter
page: M 42



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



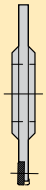
C430LNP-W
30° Lead Face Mill
Finishing Cutter
Negative Radial,
Positive Axial
8"-16" Diameter
page: M 43



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

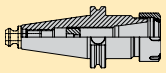
Slotting Cutters

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

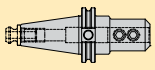
Toolholding



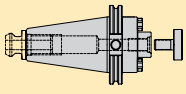
ER Collet Chucks
page: M 50-51

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.

Greenleaf Corporation is continually upgrading its products.
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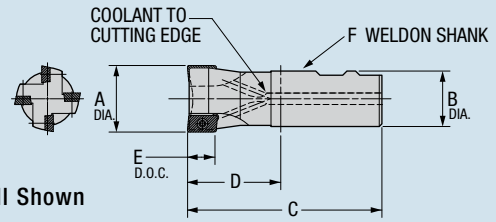
EM90S/L

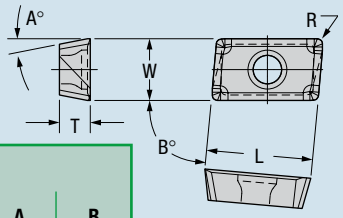
0° Lead End Mill



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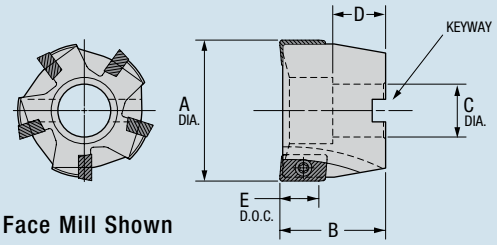
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

FM90S/L

0° Lead Face Mill



Right-Hand Face Mill Shown

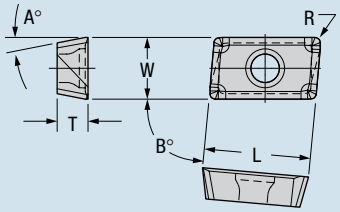
Part Number FM90 S/L	Gage Insert	Stock	Dimensions (inches) A	B	C	D	DOC E	No. of Inserts	Keyway	Standard Components Insert Screw	* Tune-Up Kit Includes All Standard Components
FM90S-15R	ADGT-16222DFR5LD	●	1.500	1.500	0.500	0.62	0.35	6	1/4 x 5/32	PT-542T	TK-00862
FM90S-20R	ADGT-16222DFR5LD	●	2.000	1.500	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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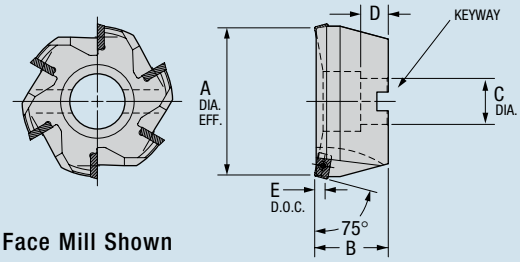
FM75L

75° Lead Face Mill



Right-Hand Face Mill Shown

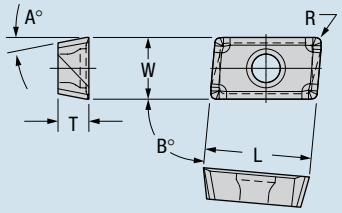
Part Number FM75 S/L	Gage Insert	Stock	Dimensions (inches) A	B	C	D	DOC E	No. of Inserts	Keyway	Standard Components Insert Screw	* Tune-Up Kit Includes All Standard Components
FM75L-20R	APHT-32.73PD2R**	●	2.000	1.500	0.750	0.75	0.31	3	5/16 x 3/16	312679	TK-00781
FM75L-25R	APHT-32.73PD2R**	●	2.500	1.500	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)
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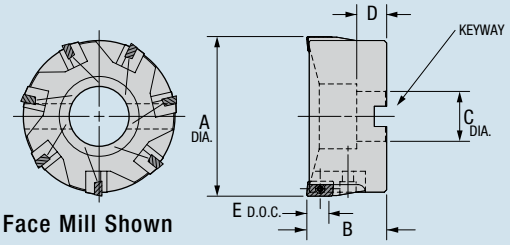
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

FMC90L

0° Lead Face Mill, Cartridge Style



Right-Hand Face Mill Shown

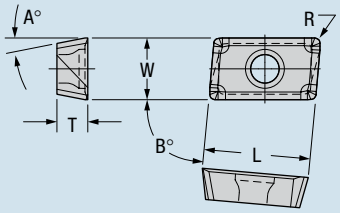
Part Number FMC90L	Gage Insert	Stock	Dimensions (inches) A	B	C	D	DOC E	No. of Inserts	Keyway	Standard Components Cartridge Screw	Cartridge	Insert Screw	*Tune-Up Kit Includes All Standard Components
FMC90L-30R	APHT-32.73PD2R**	●	3.000	2.000	1.000	0.750	0.53	6	3/8 x 1/4	1/4-20x3/4 SHCS	MC90L-R	312679	TK-00788
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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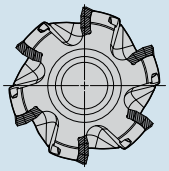
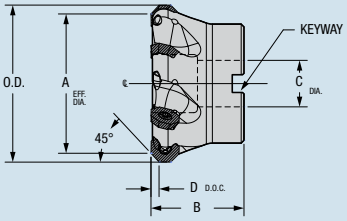
G-OFHP

Face Mill: High Positive



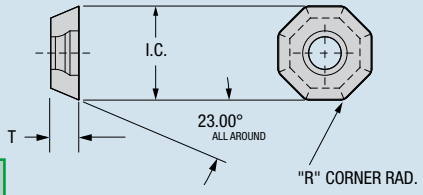


Part Number	Gage Insert	Stock	Dimensions (inches) A	O.D.	B	C	DOC** D	No. of Inserts	Keyway	Standard Components Insert Screw	*Tune-Up Kit Includes All Standard Components
G-OFHP-0545E200	OOEW-534	●	2.000	2.370	1.500	0.750	0.173	4	5/16	PT-546-T	TK-03249
G-OFHP-0545E250	OOEW-534	●	2.500	2.870	1.750	1.000	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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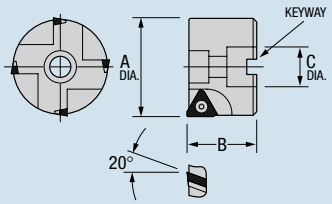
FTHP

Milling Cutters: High Shear



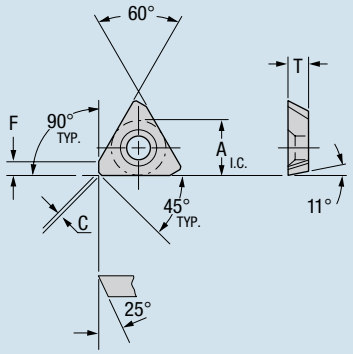
Right-Hand Face Mill Shown

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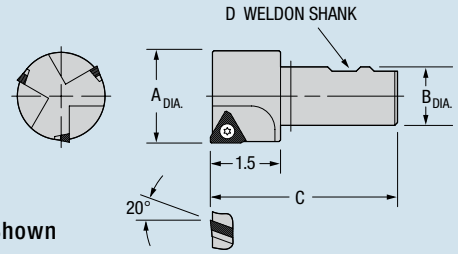
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● Stocked Standard	❍ Stocked or Available Upon Request	❍ 10 Business Days or Less
●	❍	❍

WSTHP

End Mill: Screw-On Inserts



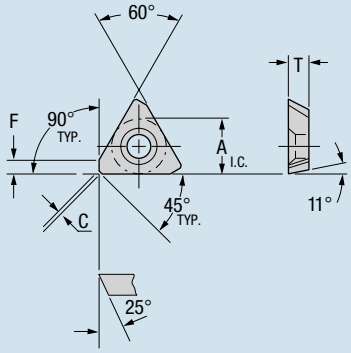
Right-Hand End Mill Shown

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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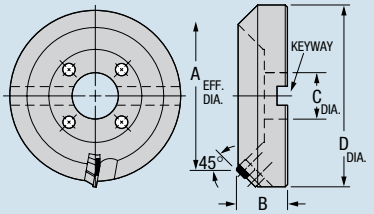
SHPC-345 45° Lead

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

Right-Hand Cutter Shown

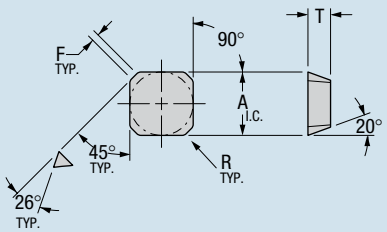


Part Number		Gage	Stock		Dimensions (inches)						No. of Inserts	Standard Components			* Tune-Up Kit
Right Hand	**Left Hand	† Insert	R	L	A	B	C	D	Keyway	Bolt Circle		Wedge	Wedge Screw	Back-Up Plate	Includes All Standard Components
SHPC4- 34504	–	SECN-42A6FR4	●	❍	4	2.250	1.500	5.180	5/8 X 3/8	–	6	411454	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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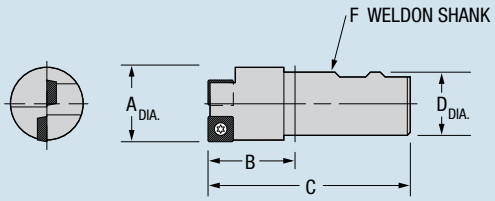
WSSCC

0° Lead End Mill, Center Cutting



Right-Hand End Mill Shown

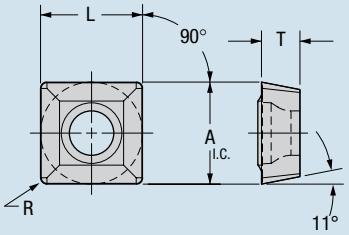
Part Number		Gage Insert	Stock	Dimensions (inches)					No. of Inserts	Standard Components	*Tune-Up Kit
Right Hand	Left Hand**			A	B	C	D	F		Insert Screw	Includes All Standard Components
WSSCC-70000.7		SPMT-2.522-X2	●	0.750	1.720	3.750	0.75	5	2	PT-543-T	TK-00737
	WSSCC-70000.7-LH	SPMT-2.522-X2	●	0.750	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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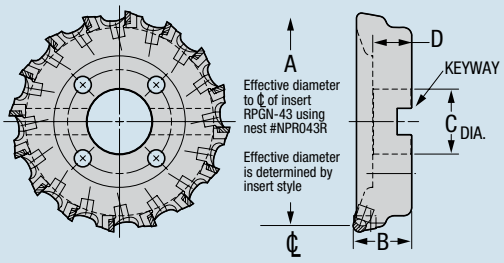
CP4 Series

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.

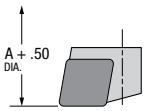
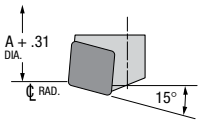
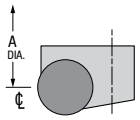
Cutters are supplied less insert and nest. Nest must be purchased separately. See below.

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

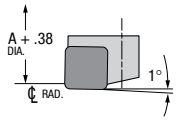
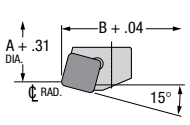
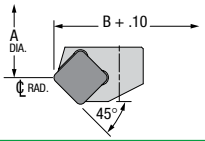
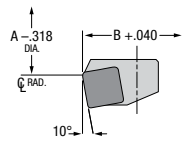
Left-hand cutters can be built to order.

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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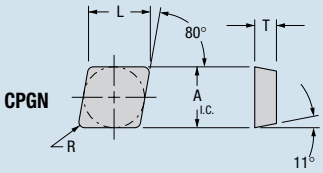
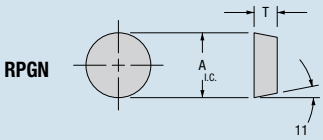
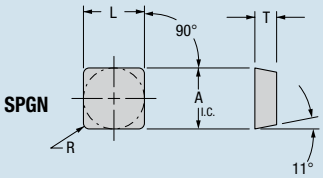
CP4 Series

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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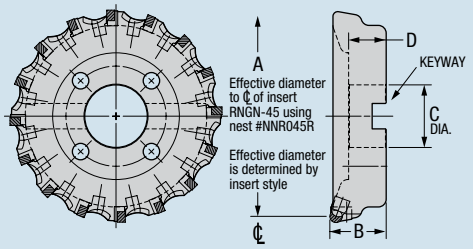
C4 Series

Negative Rake Face Mill

Right-Hand
Face Mill Shown

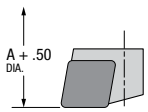
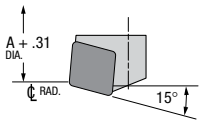
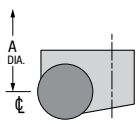


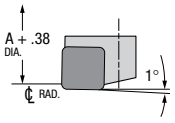
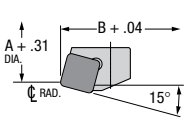
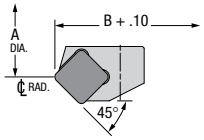
Cutter Part Number			Dimensions (inches)							Standard Components			* Tune-Up Kit
Right Hand	Left Hand	Stock	A	B	C	D	Keyway	Bolt Circle	No. of Inserts	Wedge	Wedge Screw	Nest Screw	Includes All Standard Components
C-403R	–	●	3.000	2.000	1.250	0.75	1/2 x 9/32	–	6	425605	425606	SE03-02	TK-00851
–	C-403L	❍	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.

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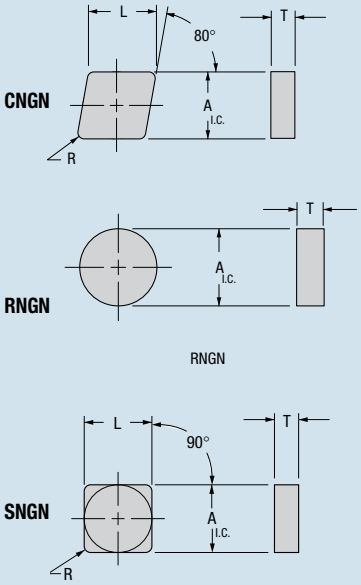

Cutter Part Number	Screw Torque Setting
C-403R/L	85 In/lbs.
C-404R/L	85 In/lbs.
C-405R/L	85 In/lbs.
C-406R/L	85 In/lbs.
C-408R/L	85 In/lbs.
C-410R/L	85 In/lbs.
C-412R/L	85 In/lbs.

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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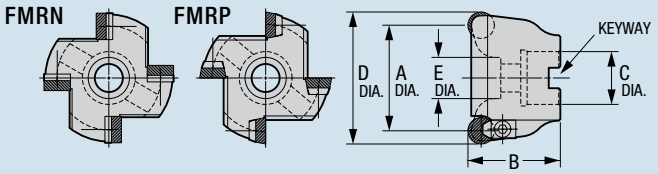
FMRP–FMRN

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.

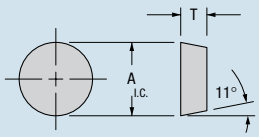
Part Number		Gage	Stock		Dimensions (inches)					No. of Inserts	Keyway	Standard Components				*Tune-Up Kit Includes All Std. Components
Right Hand	Left Hand	Insert	R	L	A	B	C	D	E†			**Anvil	Anvil Screw	Clamp	Clamp Screw	
FMRN-200R		RNGN-43	●		2.000	1.750	0.750	2.500	3/8 SHCS	4	5/16x3/16	313572	#4-40x1/4 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

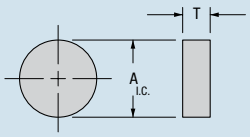
** For Insert RNGN-42, use anvil 313596. For insert RNGN-45, use no anvil.
*Tune-Up Kits include all standard components and necessary wrenches to allow you to completely refurbish cutter.

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





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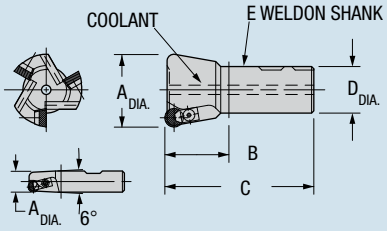
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

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.

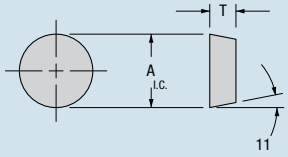
GSN100™ (Silicon Nitride Ceramic) For high-speed turning, grooving and milling of gray and ductile cast irons.

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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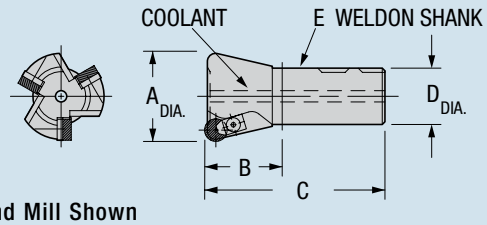
WSRN *Excelerator® Mill*

End Mill: Round Negative Inserts

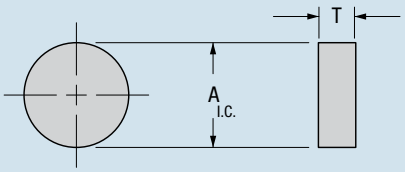


Right-Hand End Mill Shown

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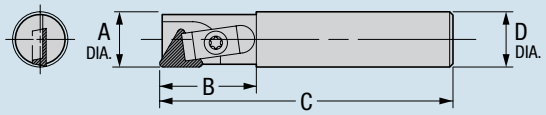
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

WSTP *Excelerator® Mill*

End Mill: Triangle Positive Inserts

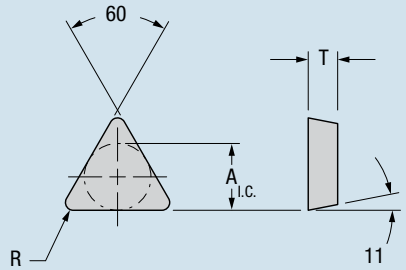


Right-Hand End Mill Shown

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	
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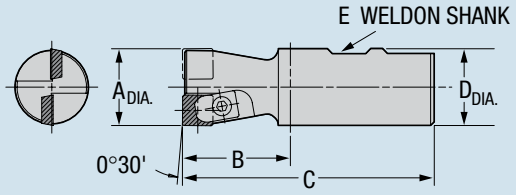
WSSP *Excelerator® Mill*

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.

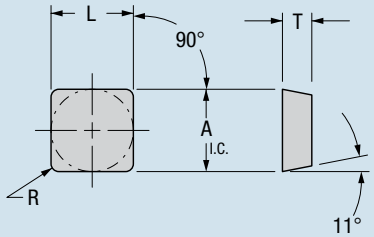
G-9230 (PVD coated) Carbide grade for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons.

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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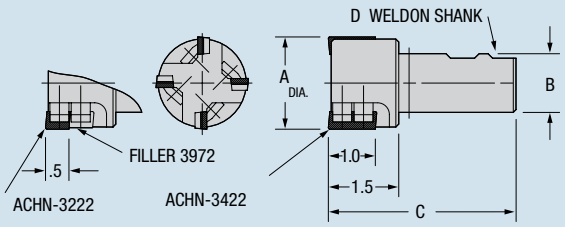
WSAN

End Mill: Parallelogram Inserts



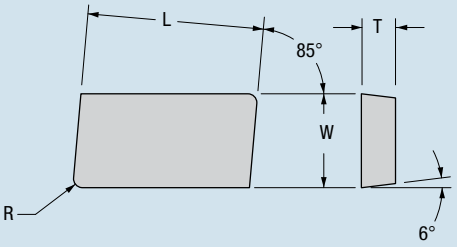
Right-Hand End Mill Shown

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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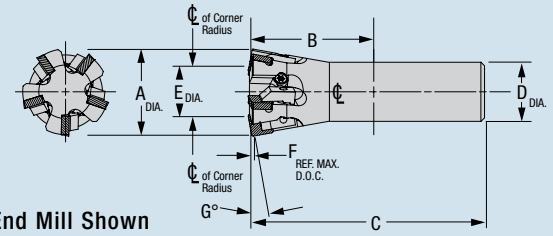
Excelerator® XF

Positive High-Feed Mills

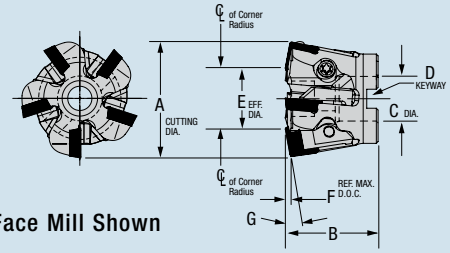


Right-Hand End Mill Shown

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 cutter.

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.

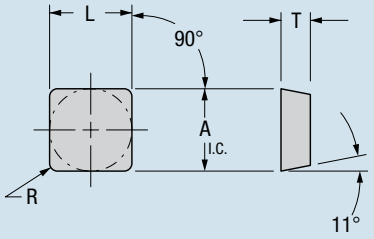
G-9230 (PVD coated) Carbide grade for medium to heavy machining of nickel alloys, cobalt alloys, titanium alloys, stainless steels and alloyed irons.

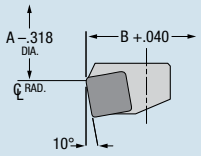
GA5036 (MT-CVD coated) A high-performance grade for milling steels at high speed. Should be used when milling forged and cast steels and selected ductile irons. A unique combination of toughness and heat resistance makes it suitable for heavy- and light-duty milling at high speeds.

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*
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●	○	○

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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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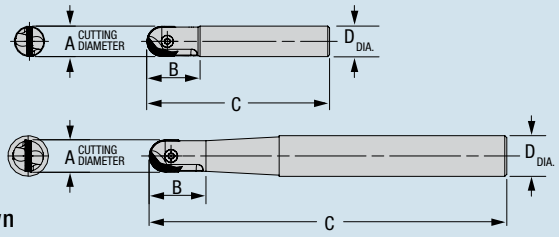
Excelerator® Ball Nose

End Mills

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



Right-Hand End Mill Shown

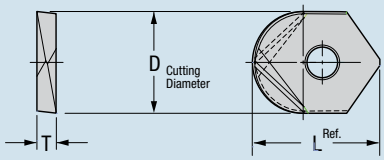
Part Number		Gage		Dimensions (inches)				Standard Component	* Tune-Up Kit Includes All Standard Components	Screw Torque Setting	Max RPM Ceramic	Max RPM Carbide
Short Series	Extended Series	Insert	Stock	A	B	C	D	Insert Screw				
SSBN-0375	—	GBN-0375	●	0.375	0.750	4.0	0.625	SM30-082	TK-02291	17.5 in/lbs	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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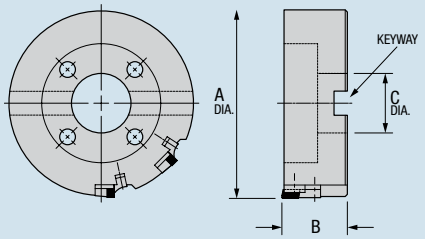
Powermill® M400LNP-A

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

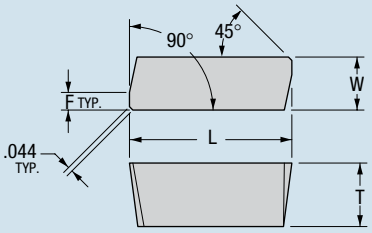
LNP Insert

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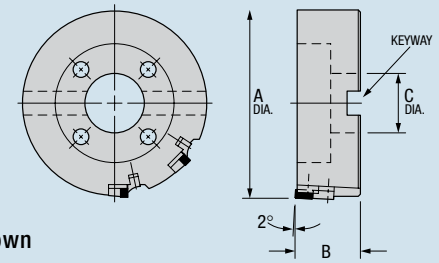
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

Powermill® M402LN-A

2° Lead, Neg-Neg



Right-Hand Cutter Shown

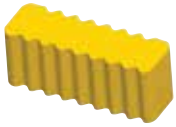
Part Number		Gage	Stock		Dimensions (inches)					No. of Inserts	Standard Components					* Tune-Up Kit Includes All Standard Compo-nents
Right Hand	**Left Hand	† Insert	R	L	A	B	C	Keyway	Bolt Circle		Wedge	Wedge Screw	Anvil	Anvil Screw	Back-Up Plate ††	
M402LN04A			●	❍	4	2.250	1.500	5/8x3/8	–	6	412151	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

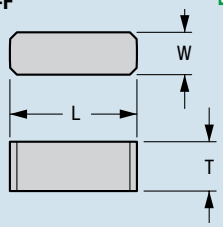
Optional Components

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

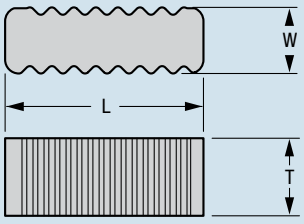
LNE, LNES Insert

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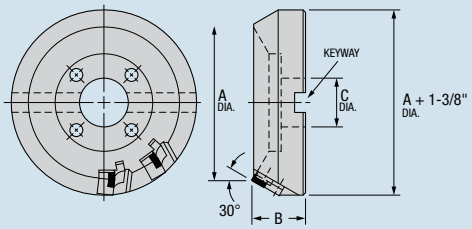
Inserts and Steel Products	**Inserts *Only***	**Steel Products *Only***
● Stocked	○ Stocked or Available	○ 10 Business
● Standard	○ Upon Request	○ Days or Less

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.

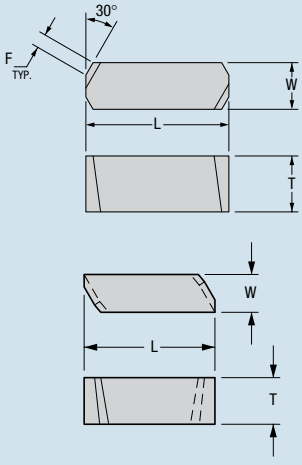
LNP Insert

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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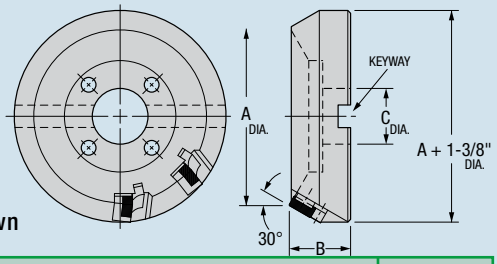
Powermill® C430LNP-H

30° Lead, Neg-Pos, Heavy Duty



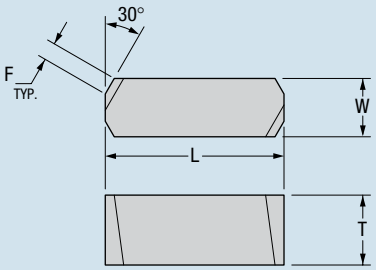
Right-Hand Cutter Shown

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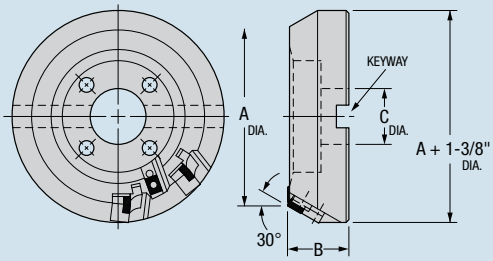
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

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

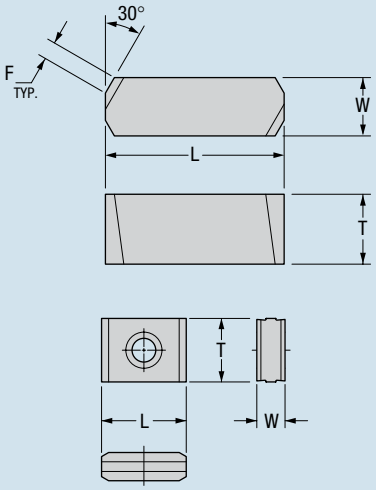
Inserts	Part Number ANSI	GA5036	GA5125	G-9120	G-60	Part Number ANSI	Dimensions (inches) T	W	L	F
	LNP-335R	●	●	●		LNP-335R	0.312	0.375	0.750	0.100
	LNP-335L	●	❍	●		LNP-335L	0.312	0.375	0.750	0.100
	LNP-34.57R	●	●	●		LNP-34.57R	0.437	0.375	1.125	0.100
	LNP-34.57L	●	●	●		LNP-34.57L	0.437	0.375	1.125	0.100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

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 Insert

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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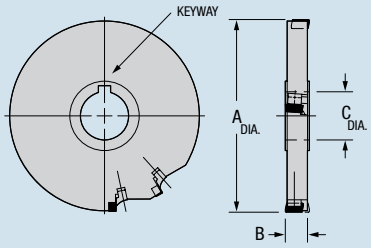
Powerslot® II Slotting Cutter

Adjustable Cutting Width

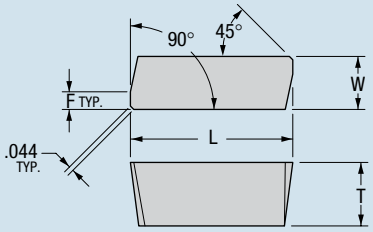


Part Number	Gage Insert Right Hand	Gage Insert Left Hand	Stock	Dimensions (inches) A	Cutting Range B	C	Keyway	No. Of Inserts R	L	Standard Components Wedge	Wedge Screw	Adj. Screw	*Tune-Up Kit Includes All Std. Components
PS2A-05625	LNP-325-90R	LNP-325-90L	❍	5	.625 - .687	1.500	3/8 x 3/16	5	5	413811	XNS-46	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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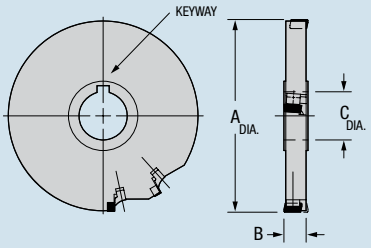
Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
● ● Stocked Standard	❍ ❍ Stocked or Available Upon Request	❍ ❍ 10 Business Days or Less

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

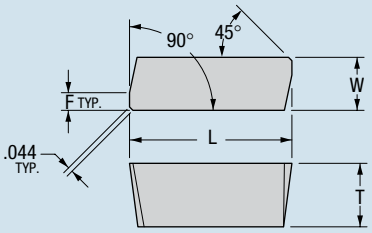
Cutter Style	Minimum Cutting Width Required	Cutter Diameter
☐ Fixed Width		
☐ Adjustable Width		

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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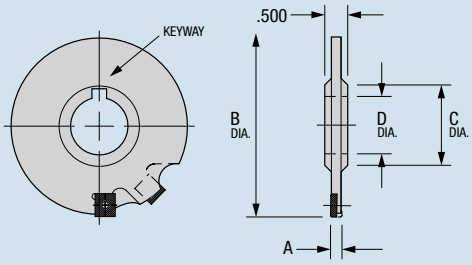
Narrow-Width Slotter

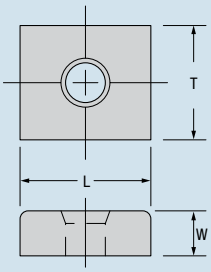


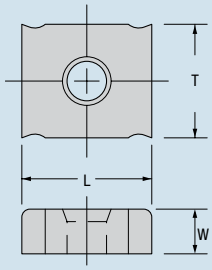
Part Number	Gage *Insert	Stock	Dimensions (inches) A	B	C	D	Keyway	No. Of Inserts	Standard Components Insert Screw	*Tune-Up Kit Includes All Standard Components	Opt. Components Positive Insert
SC-4250	LNEW-4T250R2	❍	0.250	4.000	1.750	1.250	5/16 x 5/32	10	311739	TK-00710	LNPEW-4T250R2
SC-4312	LNEW-4T312R2	●	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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Inserts and Steel Products	Inserts *Only*	Steel Products *Only*
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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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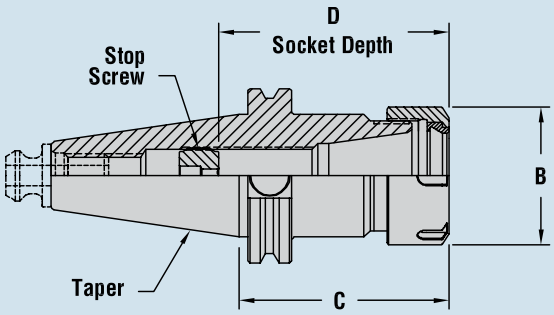
ER Collet Chucks

- 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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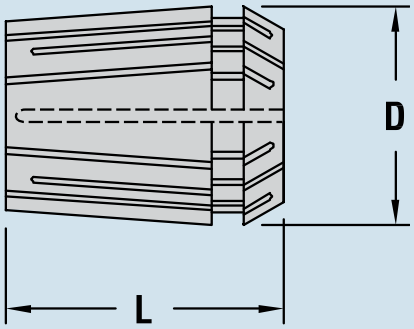
ER Collets

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

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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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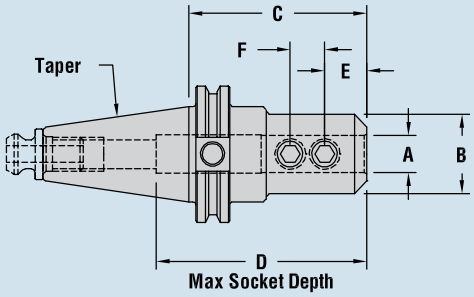
Weldon-Style End Mill Holders

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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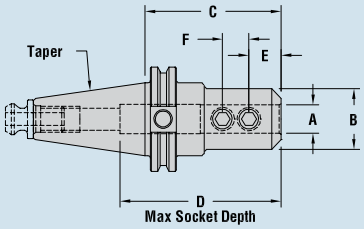
Weldon-Style
End Mill Holders



	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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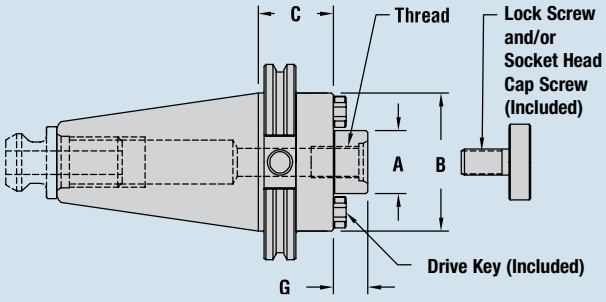
Shell Mill Holders

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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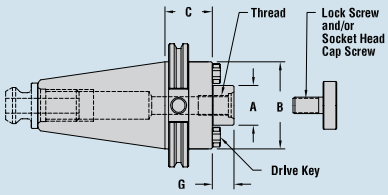
Shell Mill Holders



	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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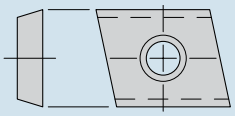
Additional Greenleaf Milling Inserts



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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)*
CDE 314L39 *(429251)*
CDE 322R02 *(306908)*
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CDE 323L23 *(427812)*
CDE 323R05 *(307715)*
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CDE 323R30 *(311842)*
CDE 323R31 *(310840)*
CDE 323L31 *(310841)*
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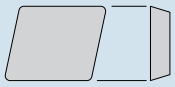
GDE 323R04 *(426277)*



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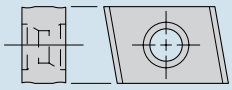

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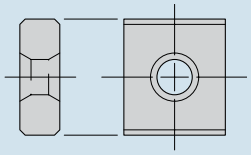
DXE 324-007 *(427719)*



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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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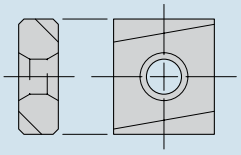
LNE 434-20 *(306242)*
LNE 443-01 *(307357)*
LNE 443-20 *(418641)*
LNE 446-01 *(38548)*



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LSE 444R02 *(426244)*
LSE 446L01 *(418959)*
LSE 446R01 *(418958)*

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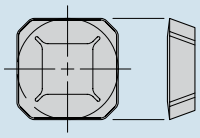

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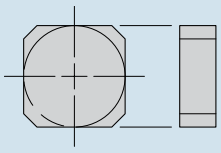

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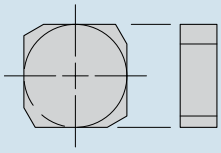

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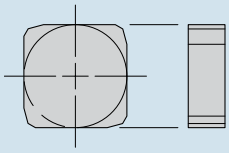

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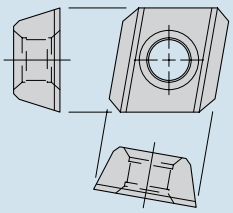

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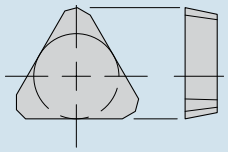

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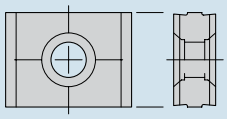

YCE 434-01
(417787)
YCE 446-01
(423783)

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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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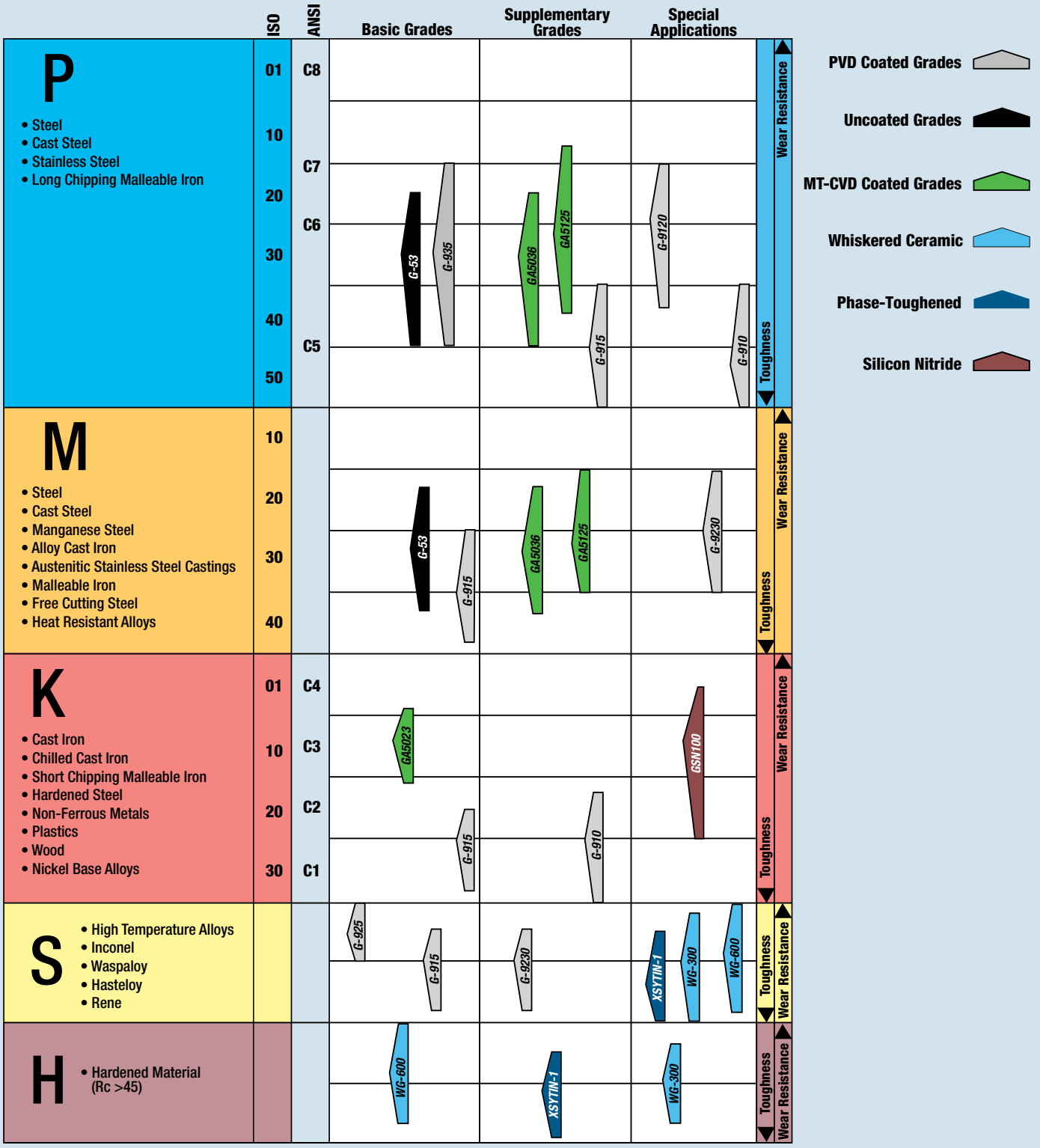
Insert Grade Reference for Milling



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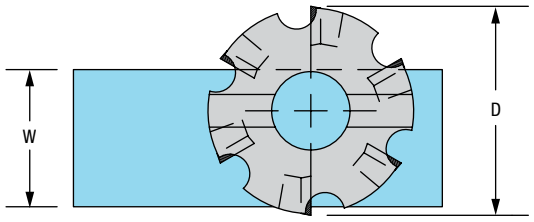
Selection of Correct Cutter Diameter

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.

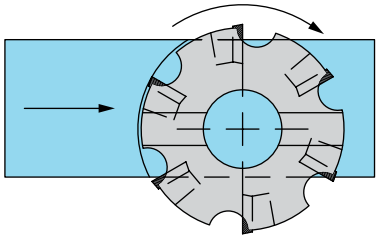


W = Width of work
D = Cutter diameter

Choose a cutter diameter approximately 1.5 times the workpiece width.

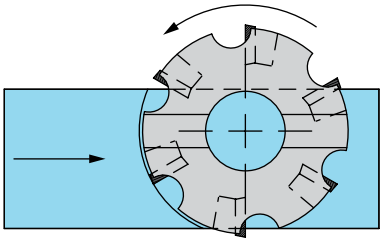
Hand of Cutters

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

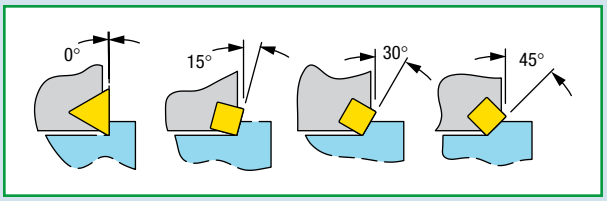
Lead Angle

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.

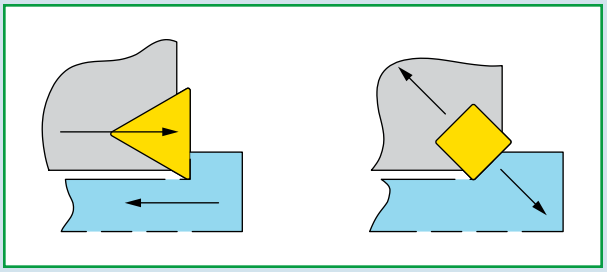


Lead Angles and Cutting Forces

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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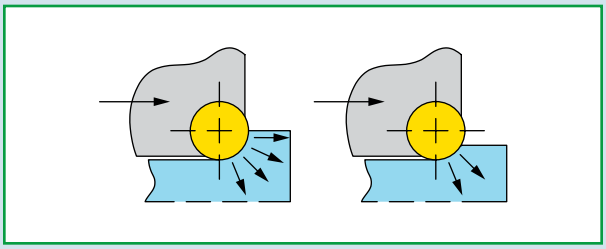
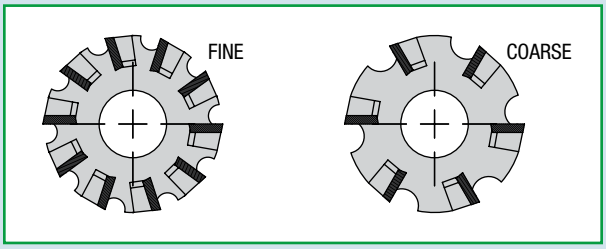
The Round Insert Cutter

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.

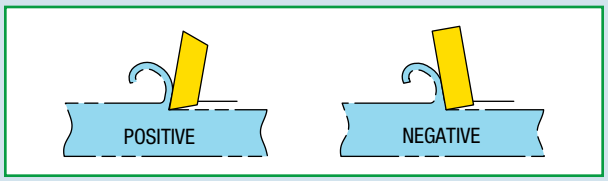
Negative Versus Positive Geometry

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.

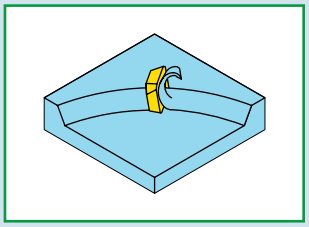
In general, use negative rakes for cast iron, interrupted cuts, and on rigid high horsepower machining for steels.

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



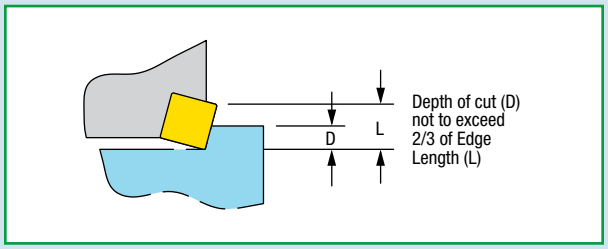
There are many milling cutters with a combination of positive and negative rakes often called shear-angle design. These cutters offer some of both worlds, although inserts are essentially like positive inserts and cannot be turned over. Shear angle cutters do provide continuous chip ejection since the 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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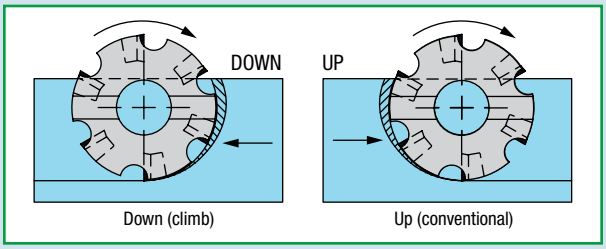
Up Milling and Down Milling

This refers to direction of rotation relative to the feed.

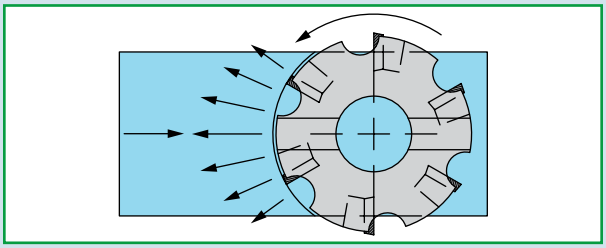


With a modern machine in good condition, down milling will give the best results. This is because the thickest section of the chip is against the insert to avoid welding, and pressure is progressively relieved towards the finished surface.

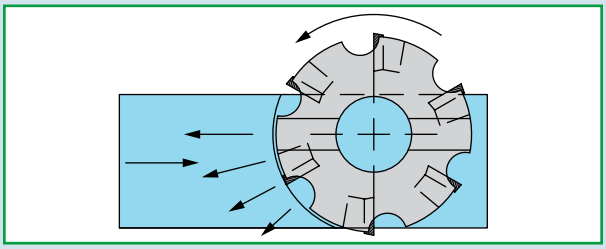
In up milling, friction and pressure build up before the chip starts to form, causing premature edge wear. It should be in rare cases that up milling is needed. This could be, for example, on an older machine with backlash in the table feed.

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.

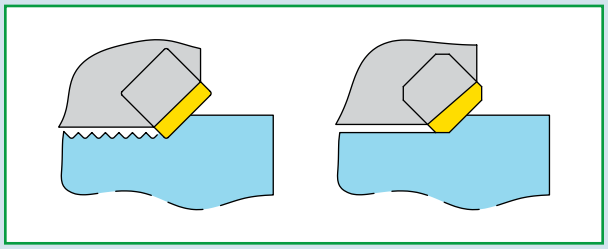


When moving off center, the path of cut is longer since each insert now sweeps a longer arc with each revolution. This may have a measureable impact on tool life, and cutting temperature will tend to increase.

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.

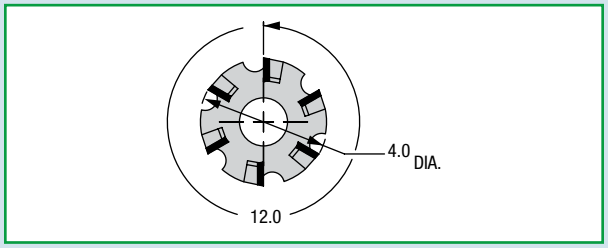


For this reason, most inserts designed especially for milling, use flats on the insert rather than a radius. In this way, the highest insert produces a wiping effect removing the variances of the other inserts and leaving a much improved finish. “Wiper” inserts installed in a few stations can be used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

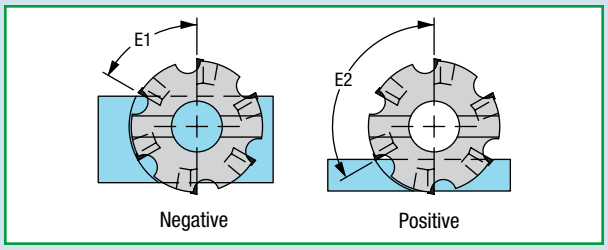
IPM = Inches per minute feed rate

K = K Factor

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

Angle of Entry

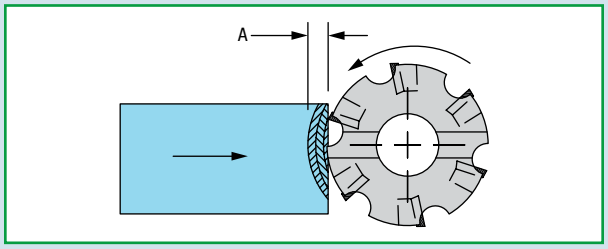
In face milling operations, the angle of entry can have a significant impact upon insert performance. A positive angle of entry can cause breakage or chipping, especially when using positive inserts. Positive angle of entry will occur when the path of cut is narrow relative to cutter diameter.



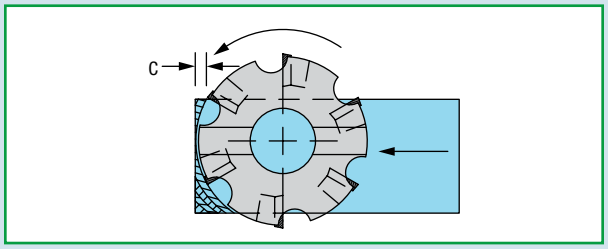
1. When the angle of entry (E1) is less than 90°, the initial impact occurs at a position behind the point of the tool. The insert has a greater section and is stronger here and better able to withstand the impacts.

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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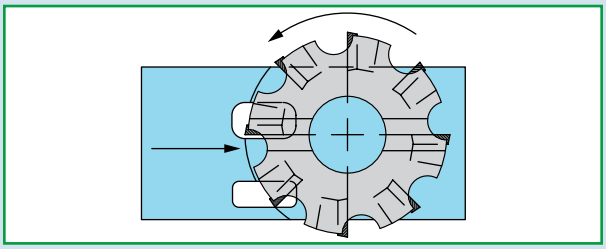
Interruptions

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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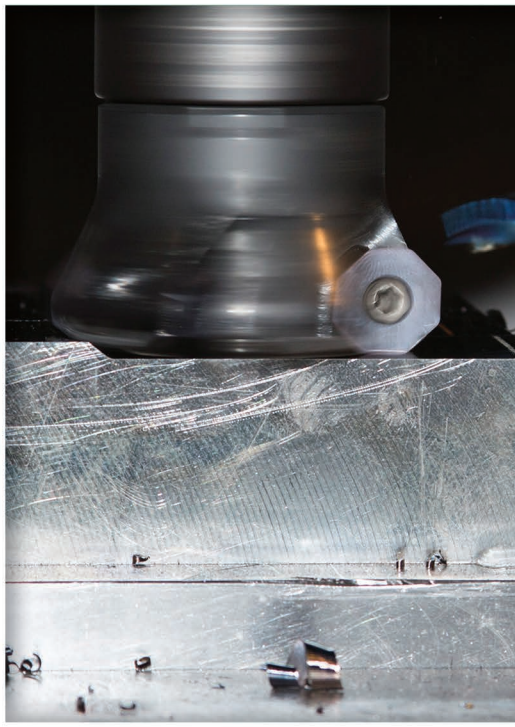

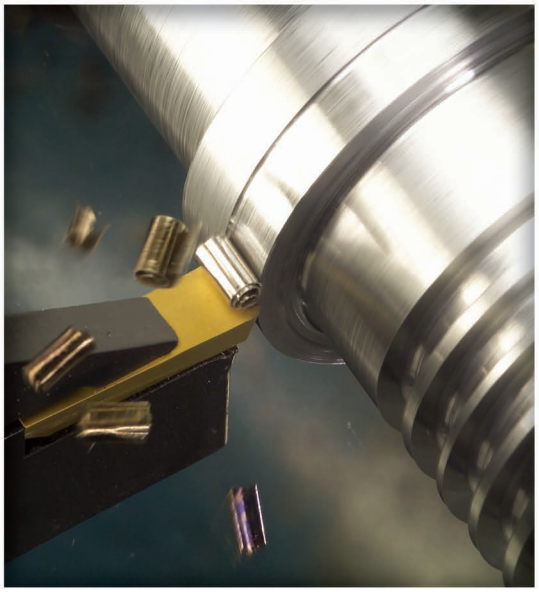

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GREENLEAF CORPORATION
18695 Greenleaf Drive
PO Box 1040
Saegertown, PA 16433 USA
US Phone: +1-814-763-2915
sales@greenleafcorporation.com

GREENLEAF EUROPE BV
De Steeg 2
6333 AP Schimmert
The Netherlands
EU Phone: +31-45-404-1774
eurooffice@greenleafcorporation.com

GREENLEAF (HUNAN) HIGH-TECH MATERIALS CO., LTD.
6F, Building C1, Lu Gu Com-Park
No. 27 Wenxuan Road
High-Tech Zone
Changsha, Hunan 410205
China
CN Phone: +86-731-89954796
info@greenleafcorporation.com.cn