CARBIDE RECYCLING

SPECIALTY MANUFACTURING

PRODUCT CATALOG

PROUDLY REPRESENTING THESE EXCEPTIONAL BRANDS

HIH CARBIDE

TechMet ALLOYS LLC.

BELLEVILLE INTERNATIONAL

KGS Swiss Diamond Technology®

DURA-BIDE

CARBIDE PRODUCTS

HIHTechnologies.com

COMPONENT REPAIR

CARBIDE RECYCLING

SPECIALTY MANUFACTURING

PRODUCT LINES

HIH-CARBIDE Cutting Tools

HIH-CARBIDE Milling & Carbide Tooling

HIH-CARBIDE Hardfacing Products

KGS Diamond Flexible Super Abrasives

CARBIDE PRODUCTS

COMPONENT REPAIR

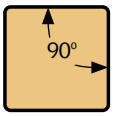
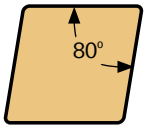
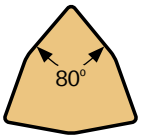
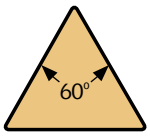
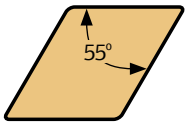
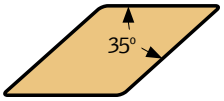
HIGH PERFORMANCE CUTTING TOOLS FOR METALWORKING

HIH CARBIDE

PRODUCT HANDBOOK

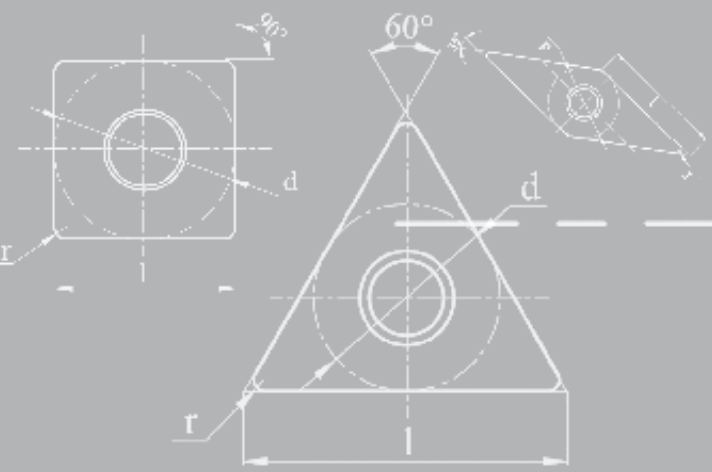
TURNING
GROOVING
THREADING
MILLING

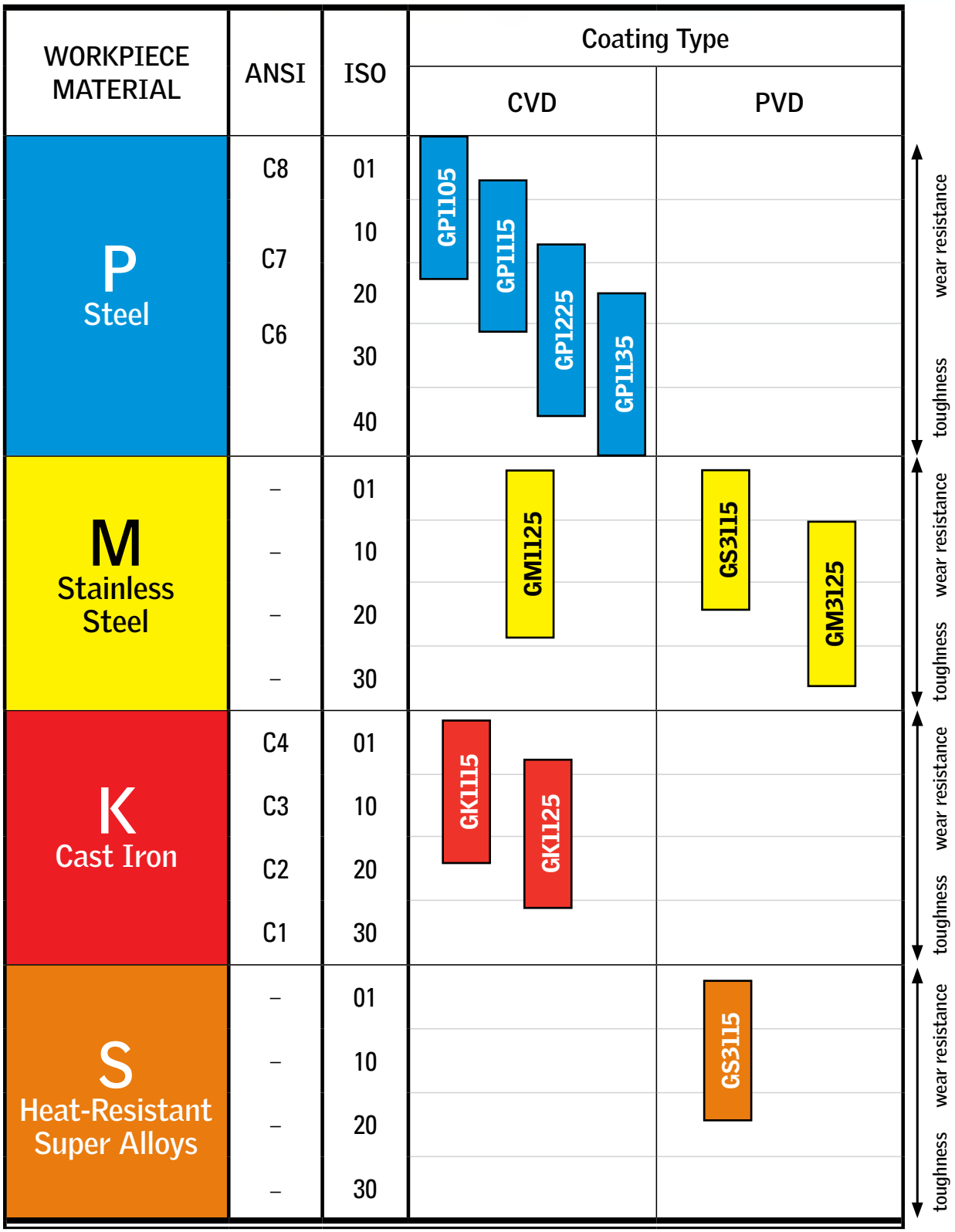
HIH CARBIDE

Insert Shape	Application Conditions (+)	Considerations (-)
 **S** - Square	• Very strong 90° corner with excellent economy (8 edges on double-sided inserts). • Most often used for rough facing operations – especially on castings, forgings and rough-sawed blanks.	• Unable to turn or face up to a shoulder (must be used in a toolholder with minimum 5° lead angle). • High radial forces push against the workpiece when used for turning. • Should always be used in a stable set-up.
 **C** - 80° Diamond	• The most popular insert shape due to high versatility. • Strong cutting edge with secure seating in the insert pocket. • 80° corner can be used for both turning and facing operations. • Opposite 100° corners can be used for general roughing applications (especially facing), providing maximum economy of 8 total cutting edges.	• With only 5° of clearance between the trailing side of the insert and the workpiece, chip jamming can occur when boring.
 **W** - 80° Corner Trigon	• Six-corner 80° diamond shape that can increase economy compared to CNMG-style inserts. • Generally used on more moderate depths of cut and feedrates than CNMG-style inserts.	• Seating of insert in pocket is not as stable as CNMG-style inserts. • Cannot take as deep a depth of cut as similar sized CNMG-type inserts.
 **T** - Triangle	• Very versatile insert shape – can be used for turning, facing, boring, copy turning and basic profiling. • Good economy with up to 6 cutting edges. • Excellent choice for general boring due to very stable seating of the insert in the boring bar pocket, and extra side clearance between the insert and the workpiece bore (greatly reducing the risk of chip jamming).	• Edge is measurably weaker than 80° diamond shaped inserts. • Be sure not to use a triangle insert that is "too large" for the application, as the cost per edge can increase. For example, a 3/8" iC (Inscribed Circle) triangle insert (TNMG-33x) can manage up to .375" depth of cut in most situations with nearly the same insert strength – but a much lower cost - than a 1/2" iC triangle insert (TNMG-43x).
 **D** - 55° Diamond	• Generally the first choice for profile / copy turning applications. • Able to "In-Copy" (plunge turn into a smaller diameter) at an angle of 30°. • Commonly used when machining close to the tailstock / live center.	• Somewhat weaker edge strength than a triangle insert. • Cost per edge is higher than most other turning inserts (except 35° diamond shape).
 **V** - 35° Diamond	• First choice for intricate shape copy turning. • Can "In-Copy" (plunge turn into a smaller diameter) at an angle up to 49°. • Can work extremely close to the tailstock / live center.	• The weakest turning insert shape / corner – depths of cut and feedrates must be lighter. • Highest cost per edge. • Negative style (VNMG) should mainly be used for external applications. • Positive style (VCMT) can be used for external and internal applications, and in many cases improved performance outweighs the increased cost per edge (2 edges vs. the 4 edges of a negative 35° diamond VNMG).

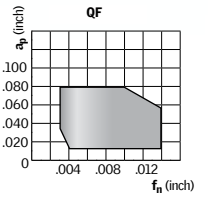
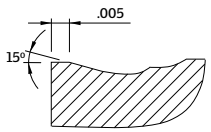
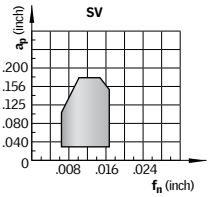
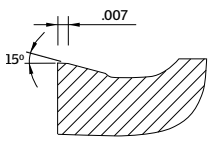
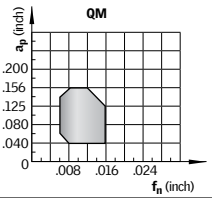
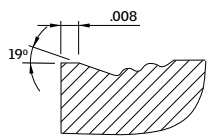
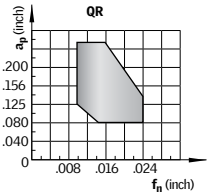
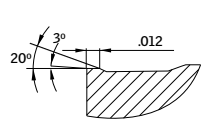
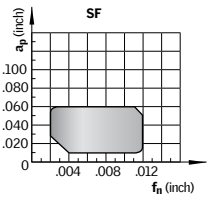
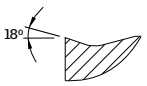
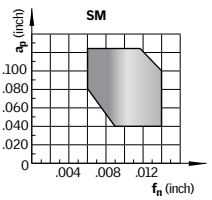
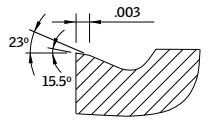
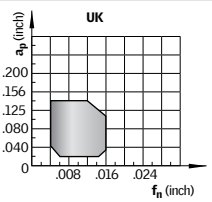
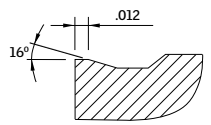
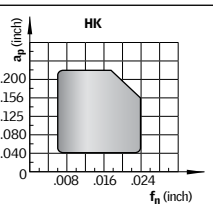
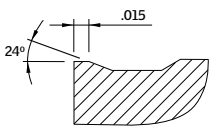
TURNING INSERTS | NEGATIVE RAKE

ANSI / ISO STANDARD INSERTS
FOR MOST EXTERNAL TURNING AND
INTERNAL MACHINING OPERATIONS

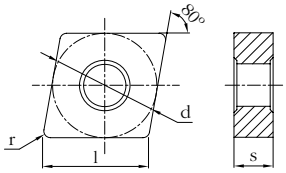




See pages 68 and 69 for more information on grades for turning.

Chipbreaker	Description	Chipbreaker Range	Design
QF P STEEL	• Butterfly geometry directs chip flow • Variable Rake Angle • Curved Edgeline • Excellent chip control at small depths of cut • High quality surface finish		
SV P STEEL	• Super-wide Chipgroove • High positive cutting action • Unique cutting edge treatment • Extremely long edgeline • Good for unstable set-ups • Able to handle varying depths of cut		
QM P STEEL	• Smooth chip formation • Variable Land balances sharpness & strength • Strengthening ribs extend tool life • Wide application range • Low cutting forces with high edge strength • Excellent all-around performance		
QR P STEEL	• High performance steel roughing chipbreaker • Strong cutting edge • Well suited for unstable application conditions • First choice for medium to heavy interruptions • Excellent chip evacuation and chip control • Smooth chip removal throughout feed range		
SF M STAINLESS STEEL	• Ultra-sharp cutting edge • Low cutting forces • Excellent chip control at small depths of cut • Top land design protects against edge hammering • Smooth cutting action without burrs • Excellent workpiece surface finish		
SM M STAINLESS STEEL	• Double-positive chipbreaker design • Strengthened positive land • Micro-edge geometry for Stainless Steel • Reduced workhardening effect • Wide application range / medium turning		
UK K CAST IRON	• Lower cutting force geometry for Cast Iron • Strengthened edgeline with open chipformer • Designed for light to moderate applications • Good choice in unstable set-ups • Problem solver for boring Cast Iron		
HK K CAST IRON	• Outstanding performance in Cast Iron • Strong edge with free cutting action • Extremely broad application range • Replaces traditional – NMA flat-top inserts • Precision lapped support surface		

CNMG-QF



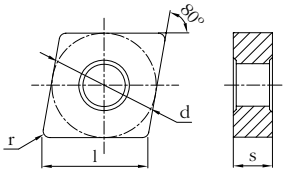
Most popular shape / style of insert. All-purpose turning, facing and boring.

QF: First Choice Geometry for finishing and semi-finishing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
CNMG 321-QF	CNMG 090304-QF	3/8	.381	1/8	1/64	.010 - .062	.003 - .010		★	★	
CNMG 322-QF	CNMG 090308-QF	3/8	.381	1/8	1/32	.016 - .080	.004 - .014		★	★	
CNMG 431-QF	CNMG 120404-QF	1/2	.508	3/16	1/64	.010 - .062	.003 - .010	★	★	★	
CNMG 432-QF	CNMG 120408-QF	1/2	.508	3/16	1/32	.016 - .080	.004 - .014	★	★	★	

Ordering Example: 20 pcs CNMG 432-QF GP1225

CNMG-SV



Most popular shape / style of insert. All-purpose turning, facing and boring.

SV: Sharp Edge Geometry for shaft turning, boring and unstable workpieces. Performs well in a wide range of depths of cut.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225			
CNMG 432R-SV	CNMG 120408R-SV	1/2	.508	3/16	1/32	.031 - .187	.006 - .016	★			
CNMG 432L-SV	CNMG 120408L-SV	1/2	.508	3/16	1/32	.031 - .187	.006 - .016	★			

Ordering Example: 20 pcs CNMG 432L-SV GP1225

NOTE: SV geometry inserts are available in both R (Right-hand) and L (Left-hand) styles. Right-hand style is shown above.
Normal External Turning applications require Right-hand (R) inserts in Right-hand holders, and Left-hand (L) inserts in Left-hand holders.
For Internal / Boring applications, Left-hand (L) inserts are used in Right-hand bars, and Right-hand (R) inserts are used in Left-hand bars.

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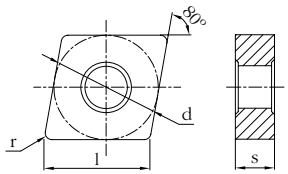
CNMG-QM



Most popular shape / style of insert. All-purpose turning, facing and boring.

QM: First Choice Geometry for medium to semi-roughing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
CNMG 321-QM	CNMG 090304-QM	3/8	.381	1/8	1/64	.016 - .141	.005 - .014		★	★	
CNMG 322-QM	CNMG 090308-QM	3/8	.381	1/8	1/32	.020 - .141	.006 - .016		★	★	
CNMG 431-QM	CNMG 120404-QM	1/2	.508	3/16	1/64	.016 - .187	.005 - .014	★	★	★	
CNMG 432-QM	CNMG 120408-QM	1/2	.508	3/16	1/32	.020 - .187	.006 - .016	★	★	★	
CNMG 433-QM	CNMG 120412-QM	1/2	.508	3/16	3/64	.031 - .187	.007 - .018	★	★	★	
CNMG 434-QM	CNMG 120416-QM	1/2	.508	3/16	1/16	.040 - .187	.008 - .020			★	
CNMG 542-QM	CNMG 160608-QM	5/8	.635	1/4	1/32	.020 - .219	.006 - .016	★	★	★	
CNMG 543-QM	CNMG 160612-QM	5/8	.635	1/4	3/64	.031 - .219	.007 - .018	★	★	★	
CNMG 642-QM	CNMG 190608-QM	3/4	.762	1/4	1/32	.020 - .266	.006 - .016		★	★	
CNMG 643-QM	CNMG 190612-QM	3/4	.762	1/4	3/64	.031 - .266	.007 - .018	★	★	★	
CNMG 644-QM	CNMG 190616-QM	3/4	.762	1/4	1/16	.040 - .266	.008 - .020			★	

Ordering Example: 20 pcs CNMG 644-QM GP1225

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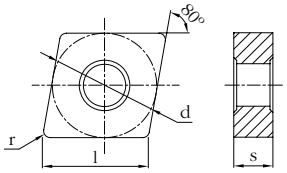
CNMG-QR



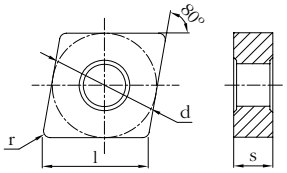
Most popular shape / style of insert. All-purpose turning, facing and boring.

QR: Strong cutting edge geometry for roughing applications in all types of Steel. Well suited for unstable conditions and interrupted cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	GP1135
CNMG 432-QR	CNMG 120408-QR	1/2	.508	3/16	1/32	.028 - .219	.007 - .020	★	★	★	★
CNMG 433-QR	CNMG 120412-QR	1/2	.508	3/16	3/64	.040 - .219	.008 - .022	★	★	★	★
CNMG 543-QR	CNMG 160612-QR	5/8	.635	1/4	3/64	.040 - .266	.008 - .022	★	★	★	★
CNMG 544-QR	CNMG 160616-QR	5/8	.635	1/4	1/16	.055 - .266	.009 - .026	★	★		★
CNMG 643-QR	CNMG 190612-QR	3/4	.762	1/4	3/64	.040 - .328	.008 - .022	★	★	★	★
CNMG 644-QR	CNMG 190616-QR	3/4	.762	1/4	1/16	.055 - .328	.009 - .026	★	★		★

Ordering Example: 20 pcs CNMG 644-QR GP1135

CNMG-SF



Most popular shape / style of insert. All-purpose turning, facing and boring.

SF: Ultra-sharp cutting edge geometry for finishing in Stainless Steels. Low cutting forces and superior workpiece surface finish without burrs.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GS3115			
CNMG 431-SF	CNMG 120404-SF	1/2	.508	3/16	1/64	.004 - .060	.002 - .012	★			
CNMG 432-SF	CNMG 120408-SF	1/2	.508	3/16	1/32	.004 - .060	.002 - .012	★			

Ordering Example: 20 pcs CNMG 432-SF GS3115

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

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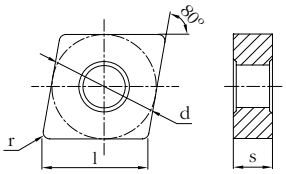
CNMG-SM



Most popular shape / style of insert. All-purpose turning, facing and boring.

SM: Keen edge geometry especially for Stainless Steel. Unique edgeline reduces work hardening. Semi-finishing to rough machining.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GM1125	GM3125		
CNMG 321-SM	CNMG 090304-SM	3/8	.381	1/8	1/64	.016 - .125	.006 - .011	★	★		
CNMG 322-SM	CNMG 090308-SM	3/8	.381	1/8	1/32	.020 - .125	.006 - .012	★	★		
CNMG 431-SM	CNMG 120404-SM	1/2	.508	3/16	1/64	.016 - .156	.006 - .011	★	★		
CNMG 432-SM	CNMG 120408-SM	1/2	.508	3/16	1/32	.020 - .156	.006 - .012	★	★		
CNMG 433-SM	CNMG 120412-SM	1/2	.508	3/16	3/64	.031 - .156	.007 - .013	★	★		
CNMG 434-SM	CNMG 120416-SM	1/2	.508	3/16	1/16	.040 - .156	.008 - .014	★	★		
CNMG 542-SM	CNMG 160608-SM	5/8	.635	1/4	1/32	.020 - .187	.006 - .012	★	★		
CNMG 543-SM	CNMG 160612-SM	5/8	.635	1/4	3/64	.031 - .187	.007 - .013	★	★		
CNMG 544-SM	CNMG 160616-SM	5/8	.635	1/4	1/16	.040 - .187	.008 - .014	★	★		
CNMG 642-SM	CNMG 190608-SM	3/4	.762	1/4	1/32	.020 - .234	.006 - .012	★	★		
CNMG 643-SM	CNMG 190612-SM	3/4	.762	1/4	3/64	.031 - .234	.007 - .013	★	★		
CNMG 644-SM	CNMG 190616-SM	3/4	.762	1/4	1/16	.040 - .234	.008 - .014	★	★		

Ordering Example: 20 pcs CNMG 644-SM GM1125

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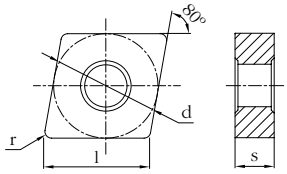
CNMG-UK



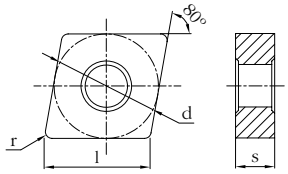
Most popular shape / style of insert. All-purpose turning, facing and boring.

UK: Lower cutting force geometry for Cast Iron. Edge geometry reduces cutting forces in moderate conditions / lighter cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
CNMG 431-UK	CNMG 120404-UK	1/2	.508	3/16	1/64	.012 - .203	.003 - .012	★	★		
CNMG 432-UK	CNMG 120408-UK	1/2	.508	3/16	1/32	.016 - .203	.004 - .014	★	★		

Ordering Example: 20 pcs CNMG 432-UK GK1115

CNMG-HK



Most popular shape / style of insert. All-purpose turning, facing and boring.

HK: Exceptionally broad application range geometry primarily for Cast Iron. Strong cutting edge, excellent durability. Semi-finishing to roughing.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
CNMG 432-HK	CNMG 120408-HK	1/2	.508	3/16	1/32	.020 - .219	.004 - .016	★	★		
CNMG 433-HK	CNMG 120412-HK	1/2	.508	3/16	3/64	.031 - .219	.006 - .020	★	★		
CNMG 543-HK	CNMG 160612-HK	5/8	.635	1/4	3/64	.031 - .297	.006 - .020	★	★		
CNMG 544-HK	CNMG 160616-HK	5/8	.635	1/4	1/16	.040 - .297	.008 - .026		★		
CNMG 643-HK	CNMG 190612-HK	3/4	.762	1/4	3/64	.031 - .359	.006 - .020	★	★		
CNMG 644-HK	CNMG 190616-HK	3/4	.762	1/4	1/16	.040 - .359	.008 - .026		★		

Ordering Example: 20 pcs CNMG 644-HK GK1125

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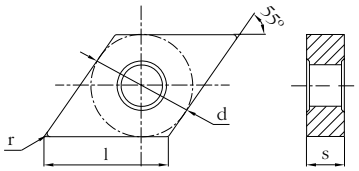
DNMG-QF



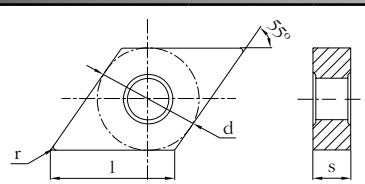
Use for profile turning, copy turning, and semi-finishing. Can turn more complex shapes due to 55° included angle.

QF: First Choice Geometry for finishing and semi-finishing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
DNMG 331-QF	DNMG 110404-QF	3/8	.458	3/16	1/64	.010 - .062	.003 - .010		★	★	
DNMG 332-QF	DNMG 110408-QF	3/8	.458	3/16	1/32	.016 - .080	.004 - .014		★	★	
DNMG 431-QF	DNMG 150404-QF	1/2	.610	3/16	1/64	.010 - .062	.003 - .010	★	★	★	
DNMG 432-QF	DNMG 150408-QF	1/2	.610	3/16	1/32	.016 - .080	.004 - .014	★	★	★	

Ordering Example: 20 pcs DNMG 432-QF GP1115

DNMG-QM



Use for profile turning, copy turning, and semi-finishing. Can turn more complex shapes due to 55° included angle.

QM: First Choice Geometry for medium to semi-roughing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
DNMG 331-QM	DNMG 110404-QM	3/8	.458	3/16	1/64	.016 - .156	.005 - .014		★	★	
DNMG 332-QM	DNMG 110408-QM	3/8	.458	3/16	1/32	.020 - .156	.006 - .016		★	★	
DNMG 333-QM	DNMG 110412-QM	3/8	.458	3/16	3/64	.031 - .156	.007 - .018		★	★	
DNMG 431-QM	DNMG 150404-QM	1/2	.610	3/16	1/64	.016 - .187	.005 - .014	★	★	★	
DNMG 432-QM	DNMG 150408-QM	1/2	.610	3/16	1/32	.020 - .187	.006 - .016	★	★	★	
DNMG 433-QM	DNMG 150412-QM	1/2	.610	3/16	3/64	.031 - .187	.007 - .018		★	★	

Ordering Example: 20 pcs DNMG 433-QM GP1115

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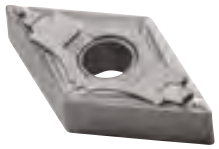
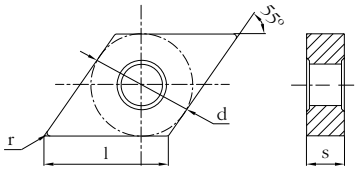
DNMG-SF





Use for profile turning, copy turning, and semi-finishing. Can turn more complex shapes due to 55° included angle.

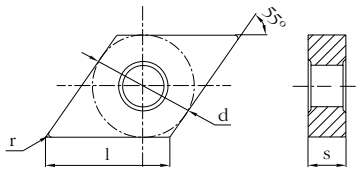
SF: Ultra-sharp cutting edge geometry for finishing in Stainless Steels. Low cutting forces and superior workpiece surface finish without burrs.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GS3115			
DNMG 431-SF	DNMG 150404-SF	1/2	.610	3/16	1/64	.004 - .060	.002 - .012	★			
DNMG 432-SF	DNMG 150408-SF	1/2	.610	3/16	1/32	.004 - .060	.002 - .012	★			

Ordering Example: 20 pcs DNMG 432-SF GS3115

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

DNMG-SM



Use for profile turning, copy turning, and semi-finishing. Can turn more complex shapes due to 55° included angle.

SM: Keen edge geometry especially for Stainless Steel. Unique edgeline reduces work hardening. Semi-finishing to rough machining.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GM1125	GM3125		
DNMG 331-SM	DNMG 110404-SM	3/8	.458	3/16	1/64	.016 - .141	.006 - .011	★			
DNMG 332-SM	DNMG 110408-SM	3/8	.458	3/16	1/32	.020 - .141	.006 - .012	★	★		
DNMG 333-SM	DNMG 110412-SM	3/8	.458	3/16	3/64	.031 - .141	.007 - .013	★	★		
DNMG 431-SM	DNMG 150404-SM	1/2	.610	3/16	1/64	.016 - .172	.006 - .011	★	★		
DNMG 432-SM	DNMG 150408-SM	1/2	.610	3/16	1/32	.020 - .172	.006 - .012	★	★		
DNMG 433-SM	DNMG 150412-SM	1/2	.610	3/16	3/64	.031 - .172	.007 - .013	★	★		

Ordering Example: 20 pcs DNMG 433-SM GM1125

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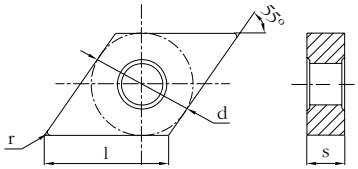
DNMG-UK



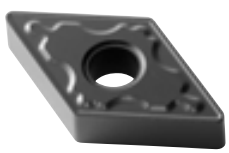
Use for profile turning, copy turning, and semi-finishing. Can turn more complex shapes due to 55° included angle.

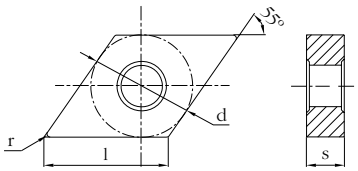
UK: Lower cutting force geometry for Cast Iron. Edge geometry reduces cutting forces in moderate conditions / lighter cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
DNMG 431-UK	DNMG 150404-UK	1/2	.610	3/16	1/64	.012 - .203	.003 - .012	★	★		
DNMG 432-UK	DNMG 150408-UK	1/2	.610	3/16	1/32	.016 - .203	.004 - .014	★	★		

Ordering Example: 20 pcs DNMG 432-UK GK1115

DNMG-HK





Use for profile turning, copy turning, and semi-finishing. Can turn more complex shapes due to 55° included angle.

HK: Exceptionally broad application range geometry primarily for Cast Iron. Strong cutting edge, excellent durability. Semi-finishing to roughing.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
DNMG 432-HK	DNMG 150408-HK	1/2	.610	3/16	1/32	.020 - .219	.004 - .016	★	★		
DNMG 433-HK	DNMG 150412-HK	1/2	.610	3/16	3/64	.031 - .219	.006 - .020	★	★		

Ordering Example: 20 pcs DNMG 433-HK GK1115

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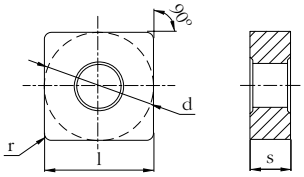
SNMG-QF



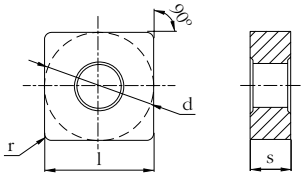
Excellent economy due to 8 cutting edges. Strong insert shape. Mainly for rough facing and chamfering (not turning to a shoulder).

QF: First Choice Geometry for finishing and semi-finishing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
SNMG 321-QF	SNMG 090304-QF	3/8	.375	1/8	1/64	.010 - .062	.003 - .010		★	★	
SNMG 322-QF	SNMG 090308-QF	3/8	.375	1/8	1/32	.016 - .080	.004 - .014		★	★	
SNMG 431-QF	SNMG 120404-QF	1/2	.500	3/16	1/64	.010 - .062	.003 - .010	★	★	★	
SNMG 432-QF	SNMG 120408-QF	1/2	.500	3/16	1/32	.016 - .080	.004 - .014	★	★	★	

Ordering Example: 20 pcs SNMG 432-QF GP1105

SNMG-SV



Excellent economy due to 8 cutting edges. Strong insert shape. Mainly for rough facing and chamfering (not turning to a shoulder).

SV: Sharp Edge Geometry for turning and facing unstable workpieces. Can handle a wide range of depths of cut.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225			
SNMG 432R-SV	SNMG 120408R-SV	1/2	.500	3/16	1/32	.031 - .187	.006 - .016	★			
SNMG 432L-SV	SNMG 120408L-SV	1/2	.500	3/16	1/32	.031 - .187	.006 - .016	★			

Ordering Example: 20 pcs SNMG 432L-SV GP1225

NOTE: SV geometry inserts are available in both R (Right-hand) and L (left-hand) styles. Right-hand style is shown above.
Normal External Turning applications require Right-hand (R) inserts in Right-hand holders, and Left-hand (L) inserts in Left-hand holders.
For Internal / Boring applications, Left-hand (L) inserts are used in Right-hand bars, and Right-hand (R) inserts are used in Left-hand bars.

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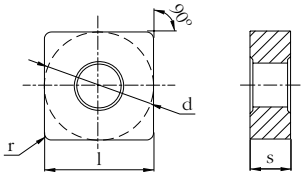
SNMG-QM



Excellent economy due to 8 cutting edges. Strong insert shape. Mainly for rough facing and chamfering (not turning to a shoulder).

QM: First Choice Geometry for medium to semi-roughing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
SNMG 321-QM	SNMG 090304-QM	3/8	.375	1/8	1/64	.016 - .141	.005 - .014		★	★	
SNMG 322-QM	SNMG 090308-QM	3/8	.375	1/8	1/32	.020 - .141	.006 - .016		★	★	
SNMG 431-QM	SNMG 120404-QM	1/2	.500	3/16	1/64	.016 - .187	.005 - .014		★	★	
SNMG 432-QM	SNMG 120408-QM	1/2	.500	3/16	1/32	.020 - .187	.006 - .016	★	★	★	
SNMG 433-QM	SNMG 120412-QM	1/2	.500	3/16	3/64	.031 - .187	.007 - .018	★	★	★	
SNMG 434-QM	SNMG 120416-QM	1/2	.500	3/16	1/16	.040 - .187	.008 - .020			★	
SNMG 542-QM	SNMG 150608-QM	5/8	.625	1/4	1/32	.020 - .219	.006 - .016		★	★	
SNMG 543-QM	SNMG 150612-QM	5/8	.625	1/4	3/64	.031 - .219	.007 - .018	★	★	★	
SNMG 643-QM	SNMG 190612-QM	3/4	.750	1/4	3/64	.031 - .266	.007 - .018	★	★	★	

Ordering Example: 20 pcs SNMG 643-QM GP1115

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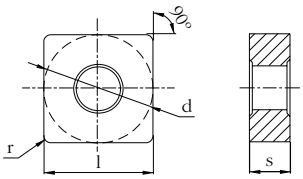
SNMG-QR



Excellent economy due to 8 cutting edges. Strong insert shape. Mainly for rough facing and chamfering (not turning to a shoulder).

QR: Strong cutting edge geometry for roughing applications in all types of Steel. Well suited for unstable conditions and interrupted cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1225	GP1135	
SNMG 432-QR	SNMG 120408-QR	1/2	.500	3/16	1/32	.028 - .219	.007 - .020	★	★	★	
SNMG 433-QR	SNMG 120412-QR	1/2	.500	3/16	3/64	.040 - .219	.008 - .022	★		★	
SNMG 543-QR	SNMG 150612-QR	5/8	.625	1/4	3/64	.040 - .266	.008 - .022	★	★	★	
SNMG 544-QR	SNMG 150616-QR	5/8	.625	1/4	1/16	.055 - .266	.009 - .026	★		★	
SNMG 643-QR	SNMG 190612-QR	3/4	.750	1/4	3/64	.040 - .328	.008 - .022	★	★	★	
SNMG 644-QR	SNMG 190616-QR	3/4	.750	1/4	1/16	.055 - .328	.009 - .026	★		★	

Ordering Example: 20 pcs SNMG 644-QR GP1135

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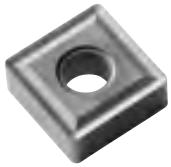
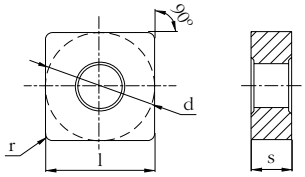
SNMG-SM





Excellent economy due to 8 cutting edges. Strong insert shape. Mainly for rough facing and chamfering (not turning to a shoulder).

SM: Keen edge geometry especially for Stainless Steel. Unique edgeline reduces work hardening. Semi-finishing to rough machining.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GM1125	GM3125		
SNMG 321-SM	SNMG 090304-SM	3/8	.375	1/8	1/64	.016 - .125	.006 - .011	★	★		
SNMG 322-SM	SNMG 090308-SM	3/8	.375	1/8	1/32	.020 - .125	.006 - .012	★	★		
SNMG 431-SM	SNMG 120404-SM	1/2	.500	3/16	1/64	.016 - .156	.006 - .011	★	★		
SNMG 432-SM	SNMG 120408-SM	1/2	.500	3/16	1/32	.020 - .156	.006 - .012	★	★		
SNMG 433-SM	SNMG 120412-SM	1/2	.500	3/16	3/64	.031 - .156	.007 - .013	★	★		
SNMG 434-SM	SNMG 120416-SM	1/2	.500	3/16	1/16	.040 - .156	.008 - .014	★	★		
SNMG 542-SM	SNMG 150608-SM	5/8	.625	1/4	1/32	.020 - .187	.006 - .012	★	★		
SNMG 543-SM	SNMG 150612-SM	5/8	.625	1/4	3/64	.031 - .187	.007 - .013	★	★		
SNMG 544-SM	SNMG 150616-SM	5/8	.625	1/4	1/16	.040 - .187	.008 - .014	★	★		
SNMG 643-SM	SNMG 190612-SM	3/4	.750	1/4	3/64	.031 - .234	.007 - .013	★	★		
SNMG 644-SM	SNMG 190616-SM	3/4	.750	1/4	1/16	.040 - .234	.008 - .014	★	★		

Ordering Example: 20 pcs SNMG 644-SM GM1125

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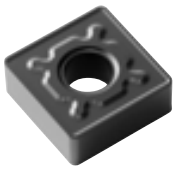
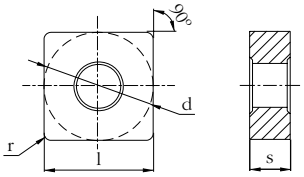
SNMG-HK





Excellent economy due to 8 cutting edges. Strong insert shape. Mainly for rough facing and chamfering (not turning to a shoulder).

HK: Exceptionally broad application range geometry primarily for Cast Iron. Strong cutting edge, excellent durability. Semi-finishing to roughing.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
SNMG 432-HK	SNMG 120408-HK	1/2	.500	3/16	1/32	.020 - .219	.004 - .016	★	★		
SNMG 433-HK	SNMG 120412-HK	1/2	.500	3/16	3/64	.031 - .219	.006 - .020	★	★		
SNMG 434-HK	SNMG 120416-HK	1/2	.500	3/16	1/16	.040 - .219	.008 - .026		★		
SNMG 543-HK	SNMG 150612-HK	5/8	.625	1/4	3/64	.031 - .297	.006 - .020	★	★		
SNMG 544-HK	SNMG 150616-HK	5/8	.625	1/4	1/16	.040 - .297	.008 - .026		★		
SNMG 643-HK	SNMG 190612-HK	3/4	.750	1/4	3/64	.031 - .359	.006 - .020	★	★		
SNMG 644-HK	SNMG 190616-HK	3/4	.750	1/4	1/16	.040 - .359	.008 - .026		★		

Ordering Example: 20 pcs SNMG 644-HK GK1125

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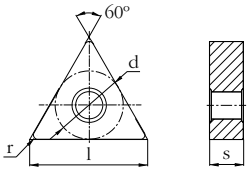
TNMG-QF



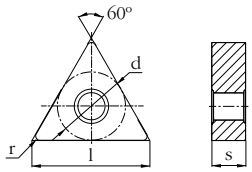
Economical insert, 6 cutting edges. General purpose turning, facing and boring. Extra long cutting edge useful when turning to shoulders

QF: First Choice Geometry for finishing and semi-finishing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
TNMG 331-QF	TNMG 160404-QF	3/8	.650	3/16	1/64	.010 - .062	.003 - .010	★	★	★	
TNMG 332-QF	TNMG 160408-QF	3/8	.650	3/16	1/32	.016 - .080	.004 - .014	★	★	★	
TNMG 431-QF	TNMG 220404-QF	1/2	.866	3/16	1/64	.010 - .062	.003 - .010		★	★	
TNMG 432-QF	TNMG 220408-QF	1/2	.866	3/16	1/32	.016 - .080	.004 - .014		★	★	

Ordering Example: 20 pcs TNMG 432-QF GP1115

TNMG-SV



Economical insert, 6 cutting edges. General purpose turning, facing and boring. Extra long cutting edge useful when turning to shoulders.

SV: Sharp Edge Geometry for shaft turning, boring and unstable workpieces. Can handle a wide range of depths of cut.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225			
TNMG 331R-SV	TNMG 160404R-SV	3/8	.650	3/16	1/64	.024 - .187	.006 - .014	★			
TNMG 331L-SV	TNMG 160404L-SV	3/8	.650	3/16	1/64	.024 - .187	.006 - .014	★			
TNMG 332R-SV	TNMG 160408R-SV	3/8	.650	3/16	1/32	.031 - .187	.006 - .016	★			
TNMG 332L-SV	TNMG 160408L-SV	3/8	.650	3/16	1/32	.031 - .187	.006 - .016	★			

Ordering Example: 20 pcs TNMG 332L-SV GP1225

NOTE: SV geometry inserts are available in both R (Right-hand) and L (left-hand) styles. Right-hand style is shown above.
Normal External Turning applications require Right-hand (R) inserts in Right-hand holders, and Left-hand (L) inserts in Left-hand holders.
For Internal / Boring applications, Left-hand (L) inserts are used in Right-hand bars, and Right-hand (R) inserts are used in Left-hand bars.

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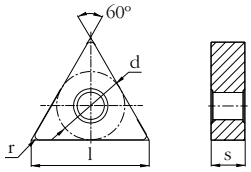
TNMG-QM



Economical insert, 6 cutting edges. General purpose turning, facing and boring. Extra long cutting edge useful when turning to shoulders.

QM: First Choice Geometry for medium to semi-roughing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
TNMG 221-QM	TNMG 110304-QM	1/4	.433	1/8	1/64	.016 - .109	.004 - .012		★	★	
TNMG 222-QM	TNMG 110308-QM	1/4	.433	1/8	1/32	.020 - .109	.005 - .014		★	★	
TNMG 331-QM	TNMG 160404-QM	3/8	.650	3/16	1/64	.016 - .156	.005 - .014	★	★	★	
TNMG 332-QM	TNMG 160408-QM	3/8	.650	3/16	1/32	.020 - .156	.006 - .016	★	★	★	
TNMG 333-QM	TNMG 160412-QM	3/8	.650	3/16	3/64	.031 - .156	.007 - .018	★	★	★	
TNMG 432-QM	TNMG 220408-QM	1/2	.866	3/16	1/32	.020 - .187	.006 - .016		★	★	
TNMG 433-QM	TNMG 220412-QM	1/2	.866	3/16	3/64	.031 - .187	.007 - .018		★	★	
TNMG 434-QM	TNMG 220416-QM	1/2	.866	3/16	1/16	.040 - .187	.008 - .020			★	

Ordering Example: 20 pcs TNMG 434-QM GP1225

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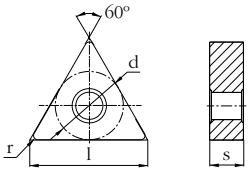
TNMG-QR



Economical insert, 6 cutting edges. General purpose turning, facing and boring. Extra long cutting edge useful when turning to shoulders.

QR: Strong cutting edge geometry for roughing applications in all types of Steel. Well suited for unstable conditions and interrupted cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225	GP1135		
TNMG 433-QR	TNMG 220412-QR	1/2	.866	3/16	3/64	.040 - .219	.008 - .022	★	★		
TNMG 434-QR	TNMG 220416-QR	1/2	.866	3/16	1/16	.055 - .219	.009 - .026		★		
TNMG 543-QR	TNMG 270612-QR	5/8	1.083	1/4	3/64	.040 - .328	.008 - .022	★	★		
TNMG 544-QR	TNMG 270616-QR	5/8	1.083	1/4	1/16	.055 - .328	.009 - .026		★		

Ordering Example: 20 pcs TNMG 544-QR GP1135

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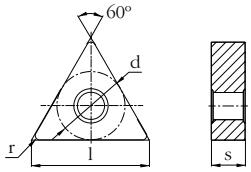
TNMG-SF



Economical insert, 6 cutting edges. General purpose turning, facing and boring. Extra long cutting edge useful when turning to shoulders.

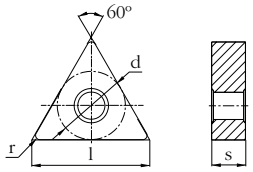
SF: Ultra-sharp cutting edge geometry for finishing in Stainless Steels. Low cutting forces and superior workpiece surface finish without burrs.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GS3115			
TNMG 331-SF	TNMG 160404-SF	3/8	.650	3/16	1/64	.004 - .060	.002 - .012	★			
TNMG 332-SF	TNMG 160408-SF	3/8	.650	3/16	1/32	.004 - .060	.002 - .012	★			

Ordering Example: 20 pcs TNMG 332-SF GS3115

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

TNMG-SM



Economical insert, 6 cutting edges. General purpose turning, facing and boring. Extra long cutting edge useful when turning to shoulders.

SM: Keen edge geometry especially for Stainless Steel. Unique edgeline reduces work hardening. Semi-finishing to rough machining.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GM1125	GM3125		
TNMG 331-SM	TNMG 160404-SM	3/8	.650	3/16	1/64	.016 - .141	.006 - .011	★	★		
TNMG 332-SM	TNMG 160408-SM	3/8	.650	3/16	1/32	.020 - .141	.006 - .012	★	★		
TNMG 333-SM	TNMG 160412-SM	3/8	.650	3/16	3/64	.031 - .141	.007 - .013	★	★		
TNMG 432-SM	TNMG 220408-SM	1/2	.866	3/16	1/32	.020 - .172	.006 - .012	★	★		
TNMG 433-SM	TNMG 220412-SM	1/2	.866	3/16	3/64	.031 - .172	.007 - .013	★	★		
TNMG 434-SM	TNMG 220416-SM	1/2	.866	3/16	1/16	.040 - .172	.008 - .014	★	★		

Ordering Example: 20 pcs TNMG 434-SM GM1125

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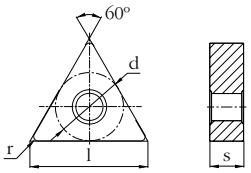
TNMG-UK



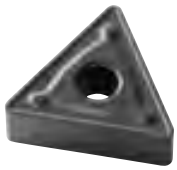
Economical insert, 6 cutting edges. General purpose turning, facing and boring. Extra long cutting edge useful when turning to shoulders.

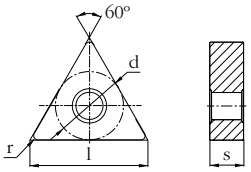
UK: Lower cutting force geometry for Cast Iron. Edge geometry reduces cutting forces in moderate conditions / lighter cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
TNMG 331-UK	TNMG 160404-UK	3/8	.650	3/16	1/64	.012 - .187	.003 - .012	★	★		
TNMG 332-UK	TNMG 160408-UK	3/8	.650	3/16	1/32	.016 - .187	.004 - .014	★	★		

Ordering Example: 20 pcs TNMG 332-UK GK1115

TNMG-HK





Economical insert, 6 cutting edges. General purpose turning, facing and boring. Extra long cutting edge useful when turning to shoulders.

HK: Exceptionally broad application range geometry primarily for Cast Iron. Strong cutting edge, excellent durability. Semi-finishing to roughing.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
TNMG 332-HK	TNMG 160408-HK	3/8	.650	3/16	1/32	.020 - .203	.004 - .016	★	★		
TNMG 333-HK	TNMG 160412-HK	3/8	.650	3/16	3/64	.031 - .203	.006 - .020	★	★		
TNMG 432-HK	TNMG 220408-HK	1/2	.866	3/16	1/32	.020 - .219	.004 - .016	★	★		
TNMG 433-HK	TNMG 220412-HK	1/2	.866	3/16	3/64	.031 - .219	.006 - .020	★	★		
TNMG 434-HK	TNMG 220416-HK	1/2	.866	3/16	1/16	.040 - .219	.008 - .026		★		
TNMG 543-HK	TNMG 270612-HK	5/8	1.083	1/4	3/64	.031 - .297	.006 - .020	★	★		
TNMG 544-HK	TNMG 270616-HK	5/8	1.083	1/4	1/16	.040 - .297	.008 - .026		★		

Ordering Example: 20 pcs TNMG 544-HK GK1125

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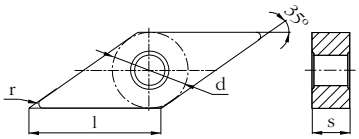
VNMG-QF



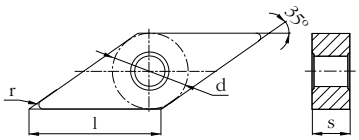
Double-sided 35° diamond. Profiling and copy turning. Not recommended for boring operations due to high negative rake of boring bar pocket.

QF: First Choice Geometry for finishing and semi-finishing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
VNMG 331-QF	VNMG 160404-QF	3/8	.654	3/16	1/64	.010 - .062	.003 - .010	★	★	★	
VNMG 332-QF	VNMG 160408-QF	3/8	.654	3/16	1/32	.016 - .080	.004 - .014	★	★	★	
VNMG 431-QF	VNMG 220404-QF	1/2	.872	3/16	1/64	.010 - .062	.003 - .010		★		
VNMG 432-QF	VNMG 220408-QF	1/2	.872	3/16	1/32	.016 - .080	.004 - .014		★		

Ordering Example: 20 pcs VNMG 432-QF GP1115

VNMG-QM



Double-sided 35° diamond. Profiling and copy turning. Not recommended for boring operations due to high negative rake of boring bar pocket.

QM: First Choice Geometry for medium to semi-roughing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
VNMG 331-QM	VNMG 160404-QM	3/8	.654	3/16	1/64	.016 - .141	.005 - .014	★	★	★	
VNMG 332-QM	VNMG 160408-QM	3/8	.654	3/16	1/32	.020 - .141	.006 - .016	★	★	★	
VNMG 333-QM	VNMG 160412-QM	3/8	.654	3/16	3/64	.031 - .141	.007 - .018		★	★	

Ordering Example: 20 pcs VNMG 333-QM GP1115

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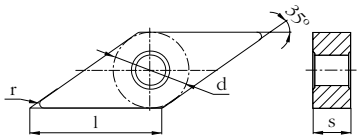
VNMG-SF



Double sided 35° diamond. Profiling and copy turning. Not recommended for boring operations due to high negative rake of boring bar pocket.

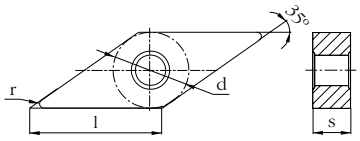
SF: Ultra-sharp cutting edge geometry for finishing in Stainless Steels. Low cutting forces and superior workpiece surface finish without burrs.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GS3115			
VNMG 331-SF	VNMG 160404-SF	3/8	.654	3/16	1/64	.004 - .060	.002 - .012	★			
VNMG 332-SF	VNMG 160408-SF	3/8	.654	3/16	1/32	.004 - .060	.002 - .012	★			

Ordering Example: 20 pcs VNMG 332-SF GS3115

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

VNMG-SM



Double-sided 35° diamond. Profiling and copy turning. Not recommended for boring operations due to high negative rake of boring bar pocket.

SM: Keen edge geometry especially for Stainless Steel. Unique edgeline reduces work hardening. Semi-finishing to rough machining.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GM1125	GM3125		
VNMG 331-SM	VNMG 160404-SM	3/8	.654	3/16	1/64	.016 - .125	.006 - .011	★	★		
VNMG 332-SM	VNMG 160408-SM	3/8	.654	3/16	1/32	.020 - .125	.006 - .012	★	★		

Ordering Example: 20 pcs VNMG 332-SM GM1125

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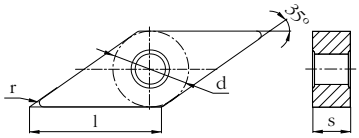
VNMG-UK



Double-sided 35° diamond. Profiling and copy turning. Not recommended for boring operations due to high negative rake of boring bar pocket.

UK: Lower cutting force geometry for Cast Iron. Edge geometry reduces cutting forces in moderate conditions / lighter cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
VNMG 331-UK	VNMG 160404-UK	3/8	.654	3/16	1/64	.012 - .156	.003 - .012	★	★		
VNMG 332-UK	VNMG 160408-UK	3/8	.654	3/16	1/32	.016 - .156	.004 - .014	★	★		

Ordering Example: 20 pcs VNMG 332-UK GK1115

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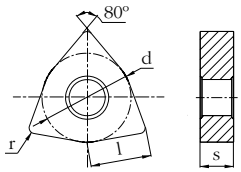
WNMG-QF



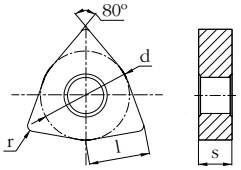
General purpose turning, facing and boring. 80° corner with 6 cutting edges. Maximum economy. Good choice for general turning.

QF: First Choice Geometry for finishing and semi-finishing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
WNMG 331-QF	WNMG 060404-QF	3/8	.257	3/16	1/64	.010 - .062	.003 - .010		★	★	
WNMG 332-QF	WNMG 060408-QF	3/8	.257	3/16	1/32	.016 - .080	.004 - .014		★	★	
WNMG 431-QF	WNMG 080404-QF	1/2	.342	3/16	1/64	.010 - .062	.003 - .010	★	★	★	
WNMG 432-QF	WNMG 080408-QF	1/2	.342	3/16	1/32	.016 - .080	.004 - .014	★	★	★	

Ordering Example: 20 pcs WNMG 432-QF GP1115

WNMG-QM



General purpose turning, facing and boring. 80° corner with 6 cutting edges. Maximum economy. Good choice for general turning.

QM: First Choice Geometry for medium to semi-roughing applications in all types of Steel.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	
WNMG 331-QM	WNMG 060404-QM	3/8	.257	3/16	1/64	.016 - .109	.005 - .014		★	★	
WNMG 332-QM	WNMG 060408-QM	3/8	.257	3/16	1/32	.020 - .109	.006 - .016		★	★	
WNMG 431-QM	WNMG 080404-QM	1/2	.342	3/16	1/64	.016 - .141	.005 - .014	★	★	★	
WNMG 432-QM	WNMG 080408-QM	1/2	.342	3/16	1/32	.020 - .141	.006 - .016	★	★	★	
WNMG 433-QM	WNMG 080412-QM	1/2	.342	3/16	3/64	.031 - .141	.007 - .018	★	★	★	
WNMG 434-QM	WNMG 080416-QM	1/2	.342	3/16	1/16	.040 - .141	.008 - .020			★	

Ordering Example: 20 pcs WNMG 434-QM GP1225

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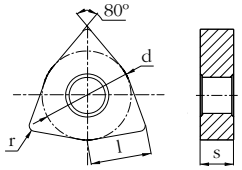
WNMG-QR



General purpose turning, facing and boring. 80° corner with 6 cutting edges. Maximum economy. Good choice for general turning.

QR: Strong cutting edge geometry for roughing applications in all types of Steel. Well suited for unstable conditions and interrupted cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	GP1135
WNMG 432-QR	WNMG 080408-QR	1/2	.342	3/16	1/32	.028 - .172	.007 - .020	★	★	★	★
WNMG 433-QR	WNMG 080412-QR	1/2	.342	3/16	3/64	.040 - .172	.008 - .022	★	★	★	★
WNMG 434-QR	WNMG 080416-QR	1/2	.342	3/16	1/16	.055 - .172	.009 - .026		★		★

Ordering Example: 20 pcs WNMG 434-QR GP1135

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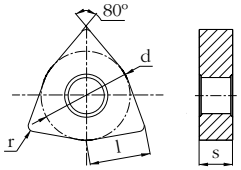
WNMG-SF



General purpose turning, facing and boring. 80° corner with 6 cutting edges. Maximum economy. Good choice for general turning.

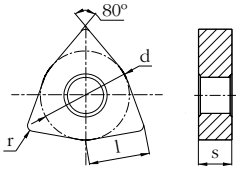
SF: Ultra-sharp cutting edge geometry for finishing in Stainless Steels. Low cutting forces and superior workpiece surface finish without burrs.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GS3115			
WNMG 431-SF	WNMG 080404-SF	1/2	.342	3/16	1/64	.004 - .060	.002 - .012	★			
WNMG 432-SF	WNMG 080408-SF	1/2	.342	3/16	1/32	.004 - .060	.002 - .012	★			

Ordering Example: 20 pcs WNMG 432-SF GS3115

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

WNMG-SM



General purpose turning, facing and boring. 80° corner with 6 cutting edges. Maximum economy. Good choice for general turning.

SM: Keen edge geometry especially for Stainless Steel. Unique edgeline reduces work hardening. Semi-finishing to rough machining.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STAINLESS STEEL			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GM1125	GM3125		
WNMG 331-SM	WNMG 060404-SM	3/8	.257	3/16	1/64	.016 - .109	.006 - .011	★	★		
WNMG 332-SM	WNMG 060408-SM	3/8	.257	3/16	1/32	.020 - .109	.006 - .012	★	★		
WNMG 333-SM	WNMG 060412-SM	3/8	.257	3/16	3/64	.031 - .109	.007 - .013	★	★		
WNMG 431-SM	WNMG 080404-SM	1/2	.342	3/16	1/64	.016 - .125	.006 - .011	★	★		
WNMG 432-SM	WNMG 080408-SM	1/2	.342	3/16	1/32	.020 - .125	.006 - .012	★	★		
WNMG 433-SM	WNMG 080412-SM	1/2	.342	3/16	3/64	.031 - .125	.007 - .013	★	★		

Ordering Example: 20 pcs WNMG 433-SM GM1125

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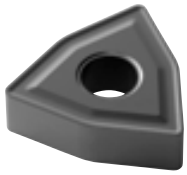
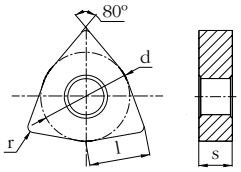
WNMG-UK





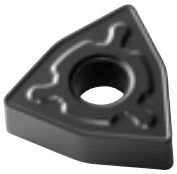
General purpose turning, facing and boring. 80° corner with 6 cutting edges. Maximum economy. Good choice for general turning.

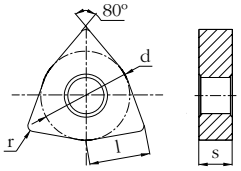
UK: Lower cutting force geometry for Cast Iron. Edge geometry reduces cutting forces in moderate conditions / lighter cuts.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
WNMG 431-UK	WNMG 080404-UK	1/2	.342	3/16	1/64	.012 - .156	.003 - .012	★	★		
WNMG 432-UK	WNMG 080408-UK	1/2	.342	3/16	1/32	.016 - .156	.004 - .014	★	★		

Ordering Example: 20 pcs WNMG 432-UK GK1115

WNMG-HK





General purpose turning, facing and boring. 80° corner with 6 cutting edges. Maximum economy. Good choice for general turning.

HK: Exceptionally broad application range geometry primarily for Cast Iron. Strong cutting edge, excellent durability. Semi-finishing through to roughing.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		CAST IRON			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GK1115	GK1125		
WNMG 432-HK	WNMG 080408-HK	1/2	.342	3/16	1/32	.020 - .172	.004 - .016	★	★		
WNMG 433-HK	WNMG 080412-HK	1/2	.342	3/16	3/64	.031 - .172	.006 - .020	★	★		

Ordering Example: 20 pcs WNMG 433-HK GK1115

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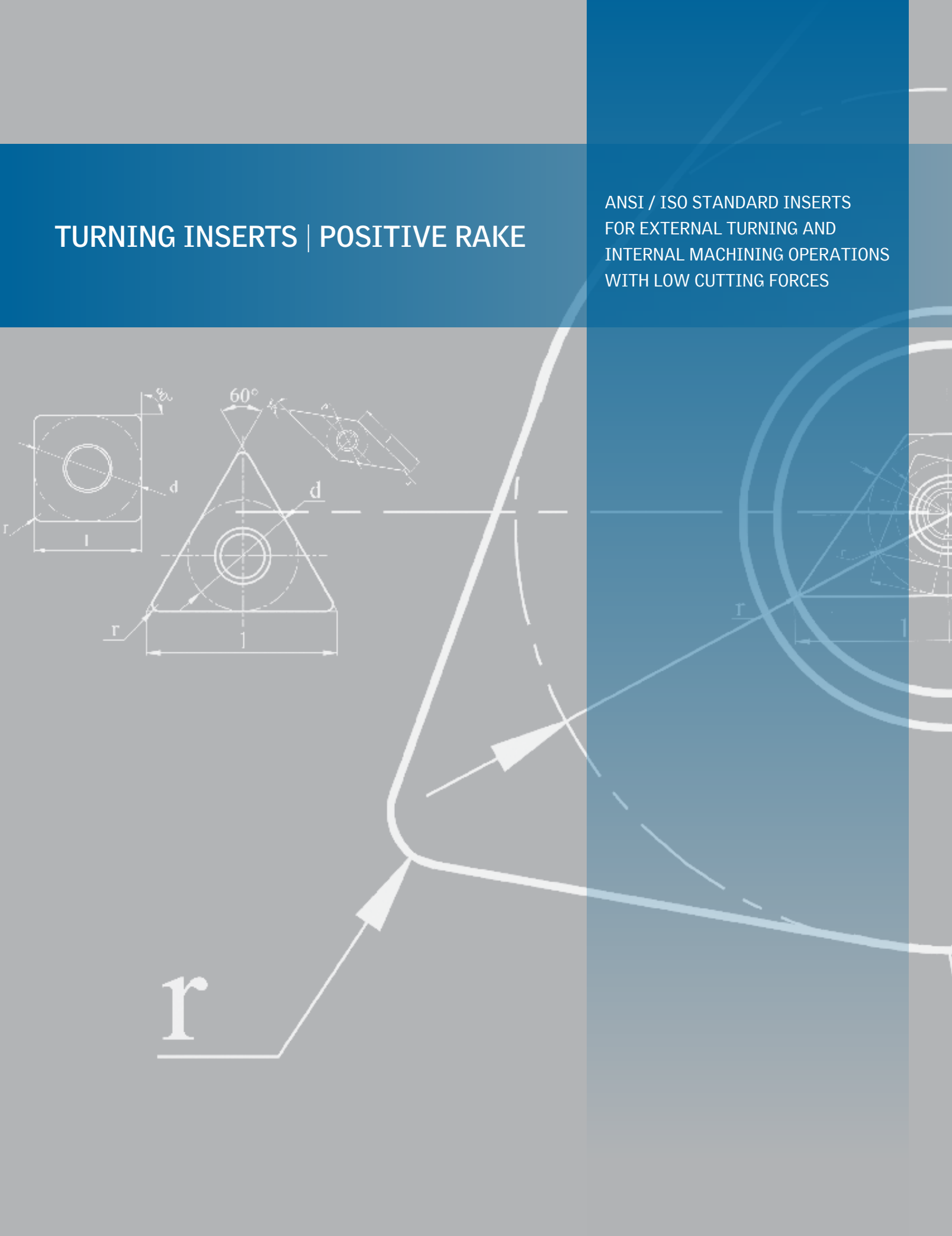
TURNING INSERTS | POSITIVE RAKE

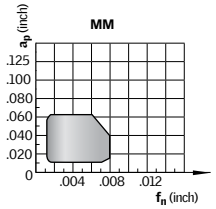
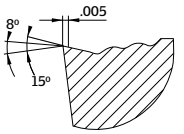
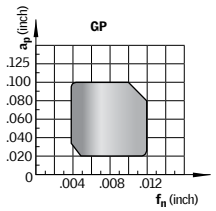
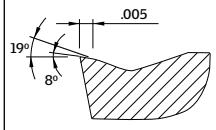
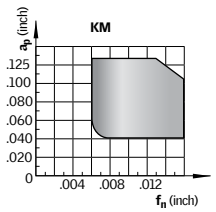
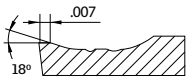
ANSI / ISO STANDARD INSERTS
FOR EXTERNAL TURNING AND
INTERNAL MACHINING OPERATIONS
WITH LOW CUTTING FORCES

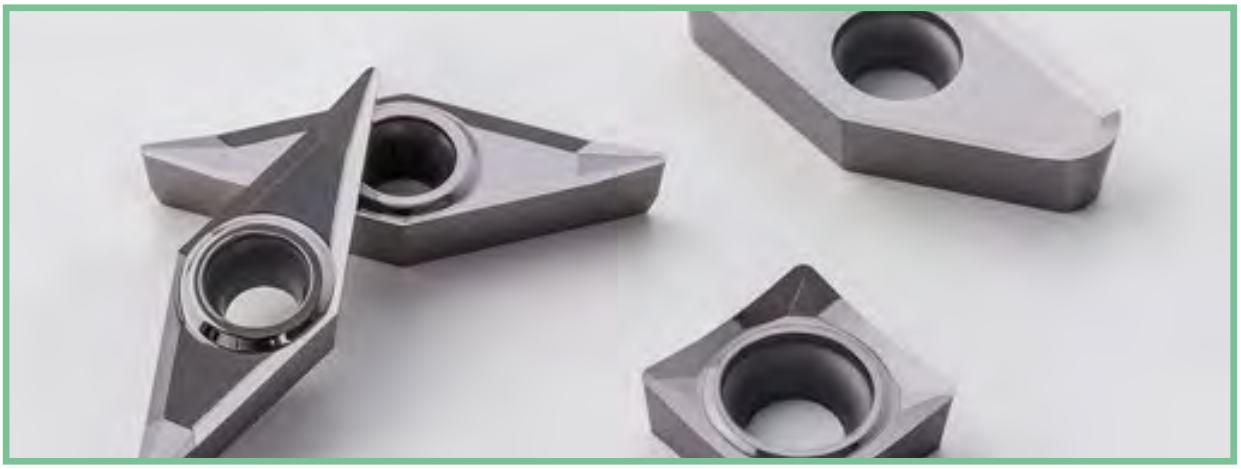


WORKPIECE MATERIAL	ANSI	ISO	Coating Type: CVD	Coating Type: PVD	Coating Type: Uncoated
P Steel	C8	01	GP1105		
		10	GP1115		
	C7	20	GP1225	GP3125	
		30			
	C6	40			
M Stainless Steel	–	01	GM1125	GS3115	
	–	10		GP3125	
	–	20			
	–	30			
K Cast Iron	C4	01	GK1115	GP3125	
	C3	10			
	C2	20			
	C1	30			
N Non-Ferrous Materials	C4	01		GN3125	GN9125
	C3	10			
	C2	20			
	C1	30			
S Heat-Resistant Super Alloys	–	01		GS3115	
	–	10			
	–	20			
	–	30			

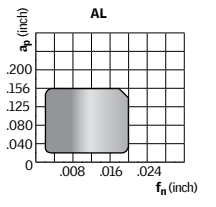
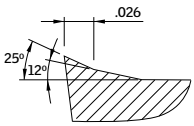
wear resistance ↔ toughness

See pages 68 and 69 for more information on grades for turning.

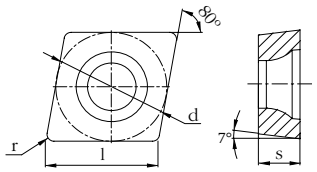
Chipbreaker	Description	Chipbreaker Range	Design
MM P M	• High performance finishing chipbreaker • Double-positive chipformer design • Exceptionally sharp cutting edge • Low cutting forces • Superior workpiece surface finish		
GP P M K	• Good All-Round geometry for Positive Inserts • Works in a broad range of materials • Double-positive chipformer design • Reduced top land for feedrates < .004" • 11º Style inserts primarily used for boring		
KM P K	• Roughing chipbreaker - tough and strong • High fracture resistance • Variable land cutting edge design • Smooth cutting action and chip flow • Exceptional performance in steel and cast iron		



AL chipbreaker inserts, for aluminum and other non-ferrous materials

Chipbreaker	Description	Chipbreaker Range	Design
AL N NON-FERROUS	• Ultra-sharp edge with polished rake face • Super Positive (25º) top rake • Free cutting and smooth chip flow • Ultra-low cutting forces • Resistant to Built-up-Edge		

CCMT-MM



80° diamond inserts for turning and facing or boring and facing. Positive rake, screw-down inserts.

MM: Ultra-sharp cutting edge geometry for finishing and semi-finishing operations. Low cutting forces and superior workpiece surface finish.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			STAINLESS	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	GS3115	GM1125
CCMT 2(1.5)0.5-MM	CCMT 060202-MM	1/4	.254	3/32	.008	.004 - .031	.002 - .005		★	★	★	★
CCMT 2(1.5)1-MM	CCMT 060204-MM	1/4	.254	3/32	1/64	.004 - .047	.002 - .006	★	★	★	★	★
CCMT 3(2.5)0.5-MM	CCMT 09T302-MM	3/8	.381	5/32	.008	.004 - .031	.002 - .005		★	★	★	★
CCMT 3(2.5)1-MM	CCMT 09T304-MM	3/8	.381	5/32	1/64	.004 - .062	.002 - .006	★	★	★	★	★
CCMT 3(2.5)2-MM	CCMT 09T308-MM	3/8	.381	5/32	1/32	.004 - .062	.003 - .008	★	★	★	★	★

Ordering Example: 20 pcs CCMT 3(2.5)2-MM GM1125

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

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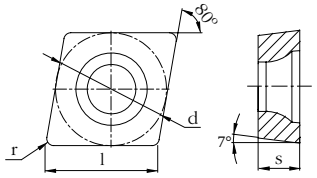
CCMT-GP



80° diamond inserts for turning and facing or boring and facing. Positive rake, screw-down inserts.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
CCMT 2(1.5)1-GP	CCMT 060204-GP	1/4	.254	3/32	1/64	.020 - .047	.003 - .008	★		★	
CCMT 2(1.5)2-GP	CCMT 060208-GP	1/4	.254	3/32	1/32	.031 - .062	.004 - .010	★		★	
CCMT 3(2.5)0.5-GP	CCMT 09T302-GP	3/8	.381	5/32	.008	.010 - .040	.003 - .006	★		★	
CCMT 3(2.5)1-GP	CCMT 09T304-GP	3/8	.381	5/32	1/64	.020 - .062	.004 - .008	★		★	
CCMT 3(2.5)2-GP	CCMT 09T308-GP	3/8	.381	5/32	1/32	.031 - .080	.005 - .010	★		★	
CCMT 431-GP	CCMT 120404-GP	1/2	.508	3/16	1/64	.020 - .062	.004 - .008	★		★	
CCMT 432-GP	CCMT 120408-GP	1/2	.508	3/16	1/32	.031 - .080	.005 - .010	★		★	
CCMT 433-GP	CCMT 120412-GP	1/2	.508	3/16	3/64	.040 - .100	.006 - .012	★		★	

Ordering Example: 20 pcs CCMT 433-GP GP1225

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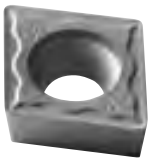
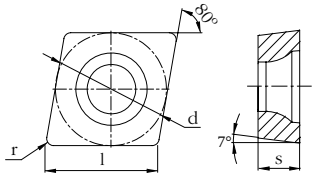
CCGT-GP





80° diamond inserts for turning and facing or boring and facing. Precision tolerance, positive rake screw-down inserts.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		P M K
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	MULTI-MATERIAL GP3125
CCGT 2(1.5)0.5-GP	CCGT 060202-GP	1/4	.254	3/32	.008	.010 - .031	.003 - .006	★
CCGT 2(1.5)1-GP	CCGT 060204-GP	1/4	.254	3/32	1/64	.020 - .047	.003 - .008	★
CCGT 2(1.5)2-GP	CCGT 060208-GP	1/4	.254	3/32	1/32	.031 - .062	.004 - .010	★
CCGT 3(2.5)0.5-GP	CCGT 09T302-GP	3/8	.381	5/32	.008	.010 - .040	.003 - .006	★
CCGT 3(2.5)1-GP	CCGT 09T304-GP	3/8	.381	5/32	1/64	.020 - .062	.004 - .008	★
CCGT 3(2.5)2-GP	CCGT 09T308-GP	3/8	.381	5/32	1/32	.031 - .080	.005 - .010	★
CCGT 431-GP	CCGT 120404-GP	1/2	.508	3/16	1/64	.020 - .062	.004 - .008	★
CCGT 432-GP	CCGT 120408-GP	1/2	.508	3/16	1/32	.031 - .080	.005 - .010	★

Ordering Example: 20 pcs CCGT 432-GP GP3125

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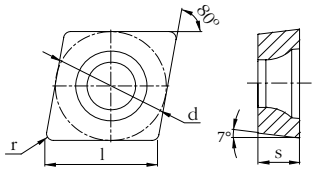
CCMT-KM



80° diamond inserts for turning and facing or boring and facing. Positive rake, screw-down inserts.

KM: Positive rake roughing geometry. Strong cutting edge with high fracture resistance. Excellent performance in steels and cast iron.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
CCMT 3(2.5)1-KM	CCMT 09T304-KM	3/8	.381	5/32	1/64	.040 - .094	.006 - .012	★		★	
CCMT 3(2.5)2-KM	CCMT 09T308-KM	3/8	.381	5/32	1/32	.040 - .109	.007 - .014	★		★	
CCMT 432-KM	CCMT 120408-KM	1/2	.508	3/16	1/32	.040 - .109	.007 - .014	★		★	
CCMT 433-KM	CCMT 120412-KM	1/2	.508	3/16	3/64	.047 - .125	.008 - .016	★		★	

Ordering Example: 20 pcs CCMT 433-KM GP1225

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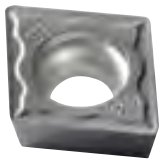
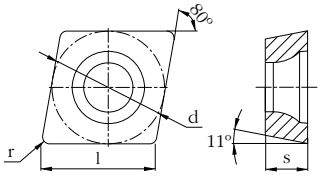
CPGT-GP





80° diamond inserts for turning and facing or boring and facing. Precision tolerance, positive rake screw-down inserts. 11° side clearance is ideal for boring.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		P	M	K
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	MULTI-MATERIAL GP3125		
CPGT 2(1.5)1-GP	CPGT 060204-GP	1/4	.254	3/32	1/64	.020 - .047	.003 - .008	★		
CPGT 2(1.5)2-GP	CPGT 060208-GP	1/4	.254	3/32	1/32	.031 - .062	.004 - .010	★		
CPGT 3(2.5)0.5-GP	CPGT 09T302-GP	3/8	.381	5/32	.008	.010 - .040	.003 - .006	★		
CPGT 3(2.5)1-GP	CPGT 09T304-GP	3/8	.381	5/32	1/64	.020 - .062	.004 - .008	★		
CPGT 3(2.5)2-GP	CPGT 09T308-GP	3/8	.381	5/32	1/32	.031 - .080	.005 - .010	★		
CPGT 431-GP	CPGT 120404-GP	1/2	.508	3/16	1/64	.020 - .062	.004 - .008	★		
CPGT 432-GP	CPGT 120408-GP	1/2	.508	3/16	1/32	.031 - .080	.005 - .010	★		

Ordering Example: 20 pcs CPGT 432-GP GP3125

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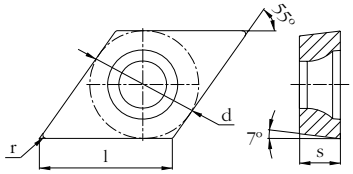
DCMT-MM



55° diamond inserts for profile turning and finishing. Positive rake screw-down inserts. Good choice for small diameter and slender workpieces.

MM: Ultra-sharp cutting edge geometry for finishing and semi-finishing operations. Low cutting forces and superior workpiece surface finish.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			STAINLESS	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	GS3115	GM1125
DCMT 2(1.5)0.5-MM	DCMT 070202-MM	1/4	.305	3/32	.008	.004 - .031	.002 - .005		★	★	★	★
DCMT 2(1.5)1-MM	DCMT 070204-MM	1/4	.305	3/32	1/64	.004 - .047	.002 - .006	★	★	★	★	★
DCMT 3(2.5)0.5-MM	DCMT 11T302-MM	3/8	.458	5/32	.008	.004 - .031	.002 - .005		★	★	★	★
DCMT 3(2.5)1-MM	DCMT 11T304-MM	3/8	.458	5/32	1/64	.004 - .062	.002 - .006	★	★	★	★	★
DCMT 3(2.5)2-MM	DCMT 11T308-MM	3/8	.458	5/32	1/32	.004 - .062	.003 - .008	★	★	★	★	★

Ordering Example: 20 pcs DCMT 3(2.5)2-MM GM1125

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

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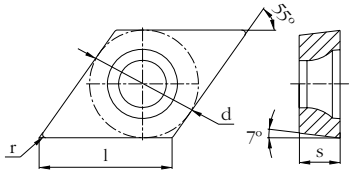
DCMT-GP



55° diamond inserts for profile turning and finishing. Positive rake screw-down inserts. Good choice for small diameter and slender workpieces.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
DCMT 2(1.5)1-GP	DCMT 070204-GP	1/4	.305	3/32	1/64	.020 - .047	.003 - .008	★		★	
DCMT 2(1.5)2-GP	DCMT 070208-GP	1/4	.305	3/32	1/32	.031 - .062	.004 - .010	★		★	
DCMT 3(2.5)0.5-GP	DCMT 11T302-GP	3/8	.458	5/32	.008	.010 - .040	.003 - .006	★		★	
DCMT 3(2.5)1-GP	DCMT 11T304-GP	3/8	.458	5/32	1/64	.020 - .062	.004 - .008	★		★	
DCMT 3(2.5)2-GP	DCMT 11T308-GP	3/8	.458	5/32	1/32	.031 - .080	.005 - .010	★		★	
DCMT 431-GP	DCMT 150404-GP	1/2	.610	3/16	1/64	.020 - .062	.004 - .008	★		★	
DCMT 432-GP	DCMT 150408-GP	1/2	.610	3/16	1/32	.031 - .080	.005 - .010	★		★	
DCMT 433-GP	DCMT 150412-GP	1/2	.610	3/16	3/64	.040 - .100	.006 - .012	★		★	

Ordering Example: 20 pcs DCMT 433-GP GP1225

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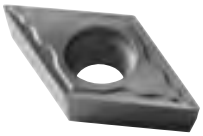
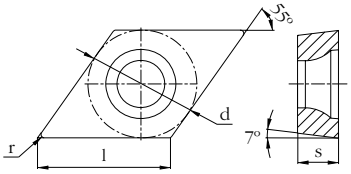
DCGT-GP





55° diamond inserts for profile turning and finishing. Precision tolerance, positive rake screw-down inserts. Good choice for small diameter and slender workpieces.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		P M K
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	MULTI-MATERIAL GP3125
DCGT 2(1.5)0.5-GP	DCGT 070202-GP	1/4	.305	3/32	.008	.010 - .031	.003 - .006	★
DCGT 2(1.5)1-GP	DCGT 070204-GP	1/4	.305	3/32	1/64	.020 - .047	.003 - .008	★
DCGT 2(1.5)2-GP	DCGT 070208-GP	1/4	.305	3/32	1/32	.031 - .062	.004 - .010	★
DCGT 3(2.5)0.5-GP	DCGT 11T302-GP	3/8	.458	5/32	.008	.010 - .040	.003 - .006	★
DCGT 3(2.5)1-GP	DCGT 11T304-GP	3/8	.458	5/32	1/64	.020 - .062	.004 - .008	★
DCGT 3(2.5)2-GP	DCGT 11T308-GP	3/8	.458	5/32	1/32	.031 - .080	.005 - .010	★

Ordering Example: 20 pcs DCGT 3(2.5)2-GP GP3125

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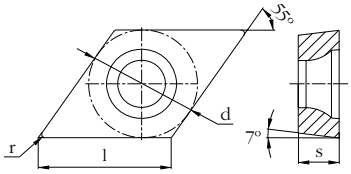
DCMT-KM



55° diamond inserts for profile turning and finishing. Positive rake screw-down inserts. Good choice for small diameter and slender workpieces.

KM: Positive rake roughing geometry. Strong cutting edge with high fracture resistance. Excellent performance in steels and cast iron.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
DCMT 3(2.5)1-KM	DCMT 11T304-KM	3/8	.458	5/32	1/64	.040 - .094	.006 - .012	★		★	
DCMT 3(2.5)2-KM	DCMT 11T308-KM	3/8	.458	5/32	1/32	.040 - .109	.007 - .014	★		★	

Ordering Example: 20 pcs DCMT 3(2.5)2-KM GP1225

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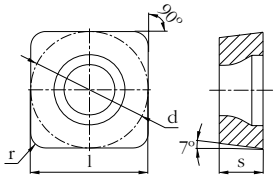
SCMT-MM



Generally used for semi-finishing operations: turning, facing or boring. Positive rake screw-down style inserts. Good economy with 4 cutting edges.

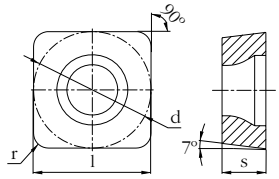
MM: Ultra-sharp cutting edge geometry for finishing and semi-finishing operations. Low cutting forces and superior workpiece surface finish.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			STAINLESS	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	GS3115	GM1125
SCMT 3(2.5)2-MM	SCMT 09T308-MM	3/8	.375	5/32	1/32	.004 - .062	.003 - .008	★	★	★	★	★

Ordering Example: 20 pcs SCMT 3(2.5)2-MM GM1125

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

SCMT-GP



Mainly for roughing operations: turning, facing or boring. Positive rake screw-down style inserts. Good economy with 4 cutting edges.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
SCMT 3(2.5)1-GP	SCMT 09T304-GP	3/8	.375	5/32	1/64	.020 - .062	.004 - .008	★		★	
SCMT 3(2.5)2-GP	SCMT 09T308-GP	3/8	.375	5/32	1/32	.031 - .080	.005 - .010	★		★	
SCMT 431-GP	SCMT 120404-GP	1/2	.500	3/16	1/64	.020 - .062	.004 - .008	★		★	
SCMT 432-GP	SCMT 120408-GP	1/2	.500	3/16	1/32	.031 - .080	.006 - .011	★		★	

Ordering Example: 20 pcs SCMT 432-GP GP1225

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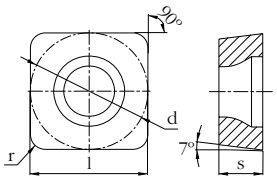
SCMT-KM



Mainly for roughing operations: turning, facing or boring. Positive rake screw down style inserts Good economy with 4 cutting edges.

KM: Positive rake roughing geometry. Strong cutting edge with high fracture resistance. Excellent performance in steels and cast iron.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
SCMT 3(2.5)2-KM	SCMT 09T308-KM	3/8	.375	5/32	1/32	.040 - .109	.007 - .014	★		★	
SCMT 432-KM	SCMT 120408-KM	1/2	.500	3/16	1/32	.040 - .109	.007 - .014	★		★	

Ordering Example: 20 pcs SCMT 432-KM GP1225

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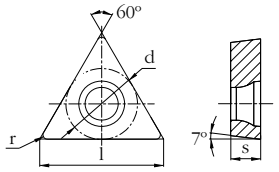
TCMT-MM



Popular for small diameter boring. Good economy and stable seating of insert. Positive rake screw down inserts.

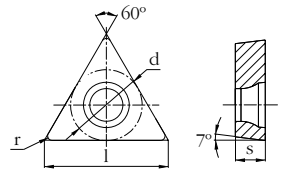
MM: Ultra-sharp cutting edge geometry for finishing and semi-finishing operations. Low cutting forces and superior workpiece surface finish.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			STAINLESS	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	GS3115	GM1125
TCMT 2(1.5)0.5-MM	TCMT 110202-MM	1/4	.433	3/32	.008	.004 - .031	.002 - .005		★	★	★	★
TCMT 2(1.5)1-MM	TCMT 110204-MM	1/4	.433	3/32	1/64	.004 - .047	.002 - .006	★	★	★	★	★

Ordering Example: 20 pcs TCMT 2(1.5)1-MM GM1125

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

TCMT-GP



Popular for small diameter boring. Good economy and stable seating of insert. Positive rake screw-down inserts.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
TCMT 2(1.5)1-GP	TCMT 110204-GP	1/4	.433	3/32	1/64	.020 - .047	.003 - .008	★		★	
TCMT 2(1.5)2-GP	TCMT 110208-GP	1/4	.433	3/32	1/32	.031 - .062	.004 - .010	★		★	
TCMT 3(2.5)1-GP	TCMT 16T304-GP	3/8	.650	5/32	1/64	.020 - .062	.004 - .008	★		★	
TCMT 3(2.5)2-GP	TCMT 16T308-GP	3/8	.650	5/32	1/32	.031 - .080	.005 - .010	★		★	
TCMT 432-GP	TCMT 220408-GP	1/2	.866	3/16	1/32	.031 - .094	.006 - .012	★		★	

Ordering Example: 20 pcs TCMT 432-GP GP1225

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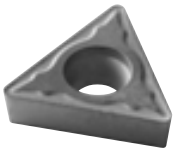
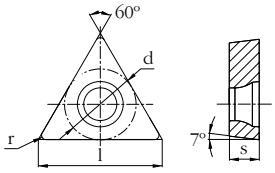
TCGT-GP





Popular for small diameter boring. Good economy and stable seating of insert. Precision tolerance, positive rake screw-down inserts.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		P	M	K
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	MULTI-MATERIAL GP3125		
TCGT 1.8(1.5)1-GP	TCGT 090204-GP	7/32	.379	3/32	1/64	.016 - .040	.002 - .005	★		
TCGT 2(1.5)0.5-GP	TCGT 110202-GP	1/4	.433	3/32	.008	.010 - .040	.003 - .006	★		
TCGT 2(1.5)1-GP	TCGT 110204-GP	1/4	.433	3/32	1/64	.020 - .047	.003 - .008	★		
TCGT 2(1.5)2-GP	TCGT 110208-GP	1/4	.433	3/32	1/32	.031 - .062	.004 - .010	★		
TCGT 3(2.5)1-GP	TCGT 16T304-GP	3/8	.650	5/32	1/64	.020 - .062	.004 - .008	★		
TCGT 3(2.5)2-GP	TCGT 16T308-GP	3/8	.650	5/32	1/32	.031 - .080	.005 - .010	★		

Ordering Example: 20 pcs TCGT 3(2.5)2-GP GP3125

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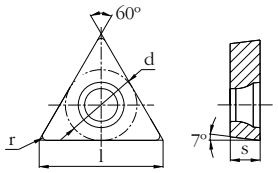
TCMT-KM



Popular for small diameter boring. Good economy and stable seating of insert. Positive rake screw down inserts.

KM: Positive rake roughing geometry. Strong cutting edge with high fracture resistance. Excellent performance in steels and cast iron.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
TCMT 2(1.5)1-KM	TCMT 110204-KM	1/4	.433	3/32	1/64	.040 - .080	.006 - .010	★		★	
TCMT 3(2.5)1-KM	TCMT 16T304-KM	3/8	.650	5/32	1/64	.040 - .094	.006 - .012	★		★	
TCMT 3(2.5)2-KM	TCMT 16T308-KM	3/8	.650	5/32	1/32	.040 - .109	.007 - .014	★		★	

Ordering Example: 20 pcs TCMT 3(2.5)2-KM GP1225

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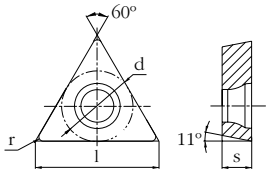
TPMT-MM



Popular for small diameter boring. Good economy and stable seating of insert. Positive rake screw-down inserts. 11° side clearance is ideal for boring.

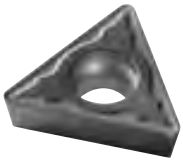
MM: Ultra-sharp cutting edge geometry for finishing and semi-finishing operations. Low cutting forces and superior workpiece surface finish.

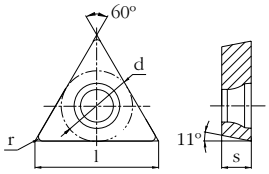
CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		STAINLESS	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1115	GP1225	GS3115	GM1125
TPMT 2(1.5)0.5-MM	TPMT 110202-MM	1/4	.433	3/32	.008	.004 - .031	.002 - .005	★	★	★	★
TPMT 2(1.5)1-MM	TPMT 110204-MM	1/4	.433	3/32	1/64	.004 - .047	.002 - .006	★	★	★	★

Ordering Example: 20 pcs TPMT 2(1.5)1-MM GM1125

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GP3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

TPGT-GP





Popular for small diameter boring. Good economy and stable seating of insert. Precision tolerance, positive rake screw-down inserts. 11° side clearance is ideal for boring.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		P	M	K
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	MULTI-MATERIAL GP3125		
TPGT 2(1.5)1-GP	TPGT 110204-GP	1/4	.433	3/32	1/64	.020 - .047	.003 - .008	★		
TPGT 2(1.5)2-GP	TPGT 110208-GP	1/4	.433	3/32	1/32	.031 - .062	.004 - .010	★		
TPGT 3(2.5)1-GP	TPGT 16T304-GP	3/8	.650	5/32	1/64	.020 - .062	.004 - .008	★		
TPGT 3(2.5)2-GP	TPGT 16T308-GP	3/8	.650	5/32	1/32	.031 - .080	.005 - .010	★		

Ordering Example: 20 pcs TPGT 3(2.5)2-GP GP3125

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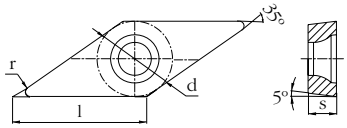
VBMT-MM



First choice shape for 35° diamond profile turning and boring. Positive rake screw-down inserts with 5° side clearance.

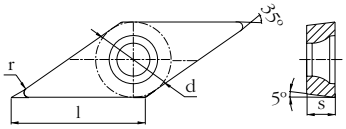
MM: Ultra-sharp cutting edge geometry for finishing and semi-finishing operations. Low cutting forces and superior workpiece surface finish.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL			STAINLESS	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1105	GP1115	GP1225	GS3115	GM1125
VBMT 221-MM	VBMT 110304-MM	1/4	.436	1/8	1/64	.004 - .047	.002 - .006		★	★	★	★
VBMT 331-MM	VBMT 160404-MM	3/8	.654	3/16	1/64	.004 - .062	.002 - .006	★	★	★	★	★
VBMT 332-MM	VBMT 160408-MM	3/8	.654	3/16	1/32	.004 - .062	.003 - .008	★	★	★	★	★

Ordering Example: 20 pcs VBMT 332-MM GM1125

NOTE: The primary application area for grade GS3115 is in stainless steel workpiece materials. GS3115 is also suitable for use with iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys.

VBMT-GP



First choice for 35° diamond external profile turning. 5° clearance angle provides more secure insert clamping than VCMT style.

GP: All-round positive rake geometry with wide application area.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
VBMT 331-GP	VBMT 160404-GP	3/8	.654	3/16	1/64	.020 - .062	.004 - .008	★		★	
VBMT 332-GP	VBMT 160408-GP	3/8	.654	3/16	1/32	.031 - .080	.005 - .010	★		★	

Ordering Example: 20 pcs VBMT 332-GP GP1225

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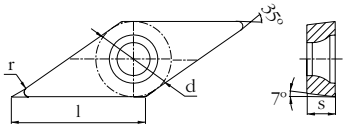
VCMT-GP



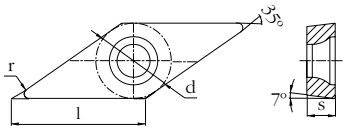
First choice shape for 35° diamond profile turning and boring. Positive cutting action provides for a more secure cutting edge than VNMG style.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
VCMT 221-GP	VCMT 110304-GP	1/4	.436	1/8	1/64	.020 - .047	.003 - .008	★		★	
VCMT 331-GP	VCMT 160404-GP	3/8	.654	3/16	1/64	.020 - .062	.004 - .008	★		★	
VCMT 332-GP	VCMT 160408-GP	3/8	.654	3/16	1/32	.031 - .080	.005 - .010	★		★	

Ordering Example: 20 pcs VCMT 332-GP GP1225

VCGT-GP



First choice shape for 35° diamond profile turning and boring. Precision tolerance. Positive cutting action provides for a more secure cutting edge than VNMG style.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		P	M	K
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	MULTI-MATERIAL GP3125		
VCGT 221-GP	VCGT 110304-GP	1/4	.436	1/8	1/64	.020 - .047	.003 - .008	★		
VCGT 331-GP	VCGT 160404-GP	3/8	.654	3/16	1/64	.020 - .062	.004 - .008	★		
VCGT 332-GP	VCGT 160408-GP	3/8	.654	3/16	1/32	.031 - .080	.005 - .010	★		

Ordering Example: 20 pcs VCGT 332-GP GP3125

NOTE: VCMT and VCGT inserts fit into and can be used with toolholders and boring bars made for VBMT-style inserts.

REFERENCE PAGES					
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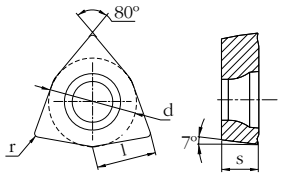
WCMT-GP



80° corner Trigon inserts for turning, facing and boring. Positive rake screw-down inserts. Extra economy due to 3 cutting edges.

GP: All-round positive rake geometry. Wide application area. Excellent for boring in most materials.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		STEEL		CAST IRON	
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GP1225		GK1115	
WCMT 3(2.5)1-GP	WCMT 06T304-GP	3/8	.257	5/32	1/64	.020 - .062	.003 - .008	★		★	
WCMT 3(2.5)2-GP	WCMT 06T308-GP	3/8	.257	5/32	1/32	.031 - .080	.005 - .010	★		★	

Ordering Example: 20 pcs WCMT 3(2.5)2-GP GP1225

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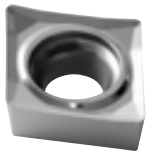
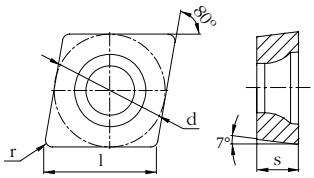
GRADE SELECTION GUIDE	34	TECHNICAL INFORMATION	59	CUTTING SPEED RECOMMENDATIONS	66

CCGX-AL





Precision Ground, High Positive, polished 80° diamond inserts for turning, boring and facing of Aluminum, non-ferrous materials and non-metallics.

AL: Extremely high 25° positive rake geometry. Super sharp edgeline with polished face for smooth chip flow.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		NON-FERROUS			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GN3125	GN9125		
CCGX 2(1.5)0.5-AL	CCGX 060202-AL	1/4	.254	3/32	.008	.010 - .047	.002 - .008	★	★		
CCGX 2(1.5)1-AL	CCGX 060204-AL	1/4	.254	3/32	1/64	.016 - .062	.004 - .010	★	★		
CCGX 2(1.5)2-AL	CCGX 060208-AL	1/4	.254	3/32	1/32	.020 - .062	.006 - .020	★	★		
CCGX 3(2.5)0.5-AL	CCGX 09T302-AL	3/8	.381	5/32	.008	.010 - .094	.002 - .008	★	★		
CCGX 3(2.5)1-AL	CCGX 09T304-AL	3/8	.381	5/32	1/64	.016 - .125	.004 - .010	★	★		
CCGX 3(2.5)2-AL	CCGX 09T308-AL	3/8	.381	5/32	1/32	.020 - .125	.006 - .020	★	★		
CCGX 430.5-AL	CCGX 120402-AL	1/2	.508	3/16	.008	.010 - .125	.002 - .008	★	★		
CCGX 431-AL	CCGX 120404-AL	1/2	.508	3/16	1/64	.016 - .187	.004 - .010	★	★		
CCGX 432-AL	CCGX 120408-AL	1/2	.508	3/16	1/32	.020 - .187	.006 - .020	★	★		

Ordering Example: 20 pcs CCGX 432-AL GN9125

REFERENCE PAGES					
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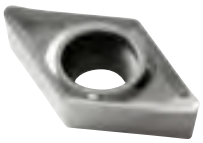
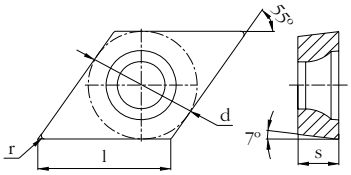
DCGX-AL





Precision Ground, High Positive, polished 55° diamond inserts for profiling of Aluminum, non-ferrous materials and non-metallics.

AL: Extremely high 25° positive rake geometry. Super sharp edgeline with polished face for smooth chip flow.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		NON-FERROUS			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GN3125	GN9125		
DCGX 2(1.5)0.5-AL	DCGX 070202-AL	1/4	.305	3/32	.008	.010 - .062	.002 - .008	★	★		
DCGX 2(1.5)1-AL	DCGX 070204-AL	1/4	.305	3/32	1/64	.016 - .094	.004 - .010	★	★		
DCGX 2(1.5)2-AL	DCGX 070208-AL	1/4	.305	3/32	1/32	.020 - .094	.006 - .020	★	★		
DCGX 3(2.5)0.5-AL	DCGX 11T302-AL	3/8	.458	5/32	.008	.010 - .094	.002 - .008	★	★		
DCGX 3(2.5)1-AL	DCGX 11T304-AL	3/8	.458	5/32	1/64	.016 - .125	.004 - .010	★	★		
DCGX 3(2.5)2-AL	DCGX 11T308-AL	3/8	.458	5/32	1/32	.020 - .125	.006 - .020	★	★		

Ordering Example: 20 pcs DCGX 3(2.5)2-AL GN9125

REFERENCE PAGES					
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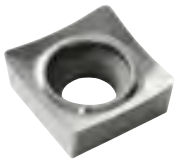
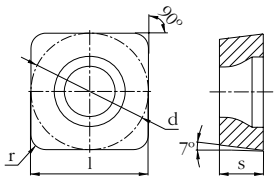
SCGX-AL





Precision Ground, High Positive, polished square inserts for turning, facing and boring of Aluminum, non-ferrous materials and non-metallics.

AL: Extremely high 25° positive rake geometry. Super sharp edgeline with polished face for smooth chip flow.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		NON-FERROUS			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GN3125	GN9125		
SCGX 3(2.5)1-AL	SCGX 09T304-AL	3/8	.375	5/32	1/64	.016 - .125	.004 - .010	★	★		
SCGX 3(2.5)2-AL	SCGX 09T308-AL	3/8	.375	5/32	1/32	.020 - .125	.006 - .020	★	★		
SCGX 431-AL	SCGX 120404-AL	1/2	.500	3/16	1/64	.016 - .156	.004 - .010	★	★		
SCGX 432-AL	SCGX 120408-AL	1/2	.500	3/16	1/32	.020 - .156	.006 - .020	★	★		

Ordering Example: 20 pcs SCGX 432-AL GN9125

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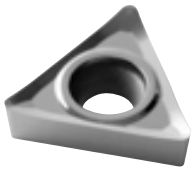
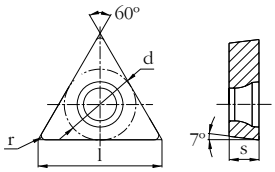
TCGX-AL





Precision Ground, High Positive, polished triangular inserts for turning and boring of Aluminum, non-ferrous materials and non-metallics.

AL: Extremely high 25° positive rake geometry. Super sharp edgeline with polished face for smooth chip flow.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		NON-FERROUS			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GN3125	GN9125		
TCGX 1.8(1.5)1-AL	TCGX 090204-AL	7/32	.379	3/32	1/64	.016 - .094	.004 - .008	★	★		
TCGX 2(1.5)0.5-AL	TCGX 110202-AL	1/4	.433	3/32	.008	.010 - .094	.002 - .008	★	★		
TCGX 2(1.5)1-AL	TCGX 110204-AL	1/4	.433	3/32	1/64	.016 - .125	.004 - .010	★	★		
TCGX 2(1.5)2-AL	TCGX 110208-AL	1/4	.433	3/32	1/32	.020 - .125	.006 - .020	★	★		
TCGX 3(2.5)0.5-AL	TCGX 16T302-AL	3/8	.650	5/32	.008	.010 - .125	.002 - .008	★	★		
TCGX 3(2.5)1-AL	TCGX 16T304-AL	3/8	.650	5/32	1/64	.016 - .156	.004 - .010	★	★		
TCGX 3(2.5)2-AL	TCGX 16T308-AL	3/8	.650	5/32	1/32	.020 - .156	.006 - .020	★	★		

Ordering Example: 20 pcs TCGX 3(2.5)2-AL GN9125

REFERENCE PAGES					
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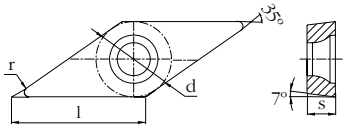
VCGX-AL



Precision Ground, High Positive, polished 35° diamond inserts for intricate profiling of Aluminum, non-ferrous materials and non-metallics.

AL: Extremely high 25° positive rake geometry. Super sharp edgeline with polished face for smooth chip flow.

CATALOG NUMBER	ISO DESIGNATION	DIMENSIONS (INCH)				CUTTING DATA (INCH)		NON-FERROUS			
		d	l	s	r	depth of cut, a_p	feed per rev, f_n	GN3125	GN9125		
VCGX 220.5-AL	VCGX 110302-AL	1/4	.436	1/8	.008	.010 - .062	.002 - .008	★	★		
VCGX 221-AL	VCGX 110304-AL	1/4	.436	1/8	1/64	.016 - .087	.004 - .010	★	★		
VCGX 222-AL	VCGX 110308-AL	1/4	.436	1/8	1/32	.020 - .087	.006 - .020	★	★		
VCGX 330.5-AL	VCGX 160402-AL	3/8	.654	3/16	.008	.010 - .125	.002 - .008	★	★		
VCGX 331-AL	VCGX 160404-AL	3/8	.654	3/16	1/64	.016 - .156	.004 - .010	★	★		
VCGX 332-AL	VCGX 160408-AL	3/8	.654	3/16	1/32	.020 - .156	.006 - .020	★	★		
VCGX 333-AL	VCGX 160412-AL	3/8	.654	3/16	3/64	.020 - .156	.006 - .031	★	★		
VCGX 220512-AL	VCGX 220512-AL	1/2	.872	7/32	3/64	.020 - .187	.006 - .031	★	★		
VCGX 220516-AL	VCGX 220516-AL	1/2	.872	7/32	1/16	.020 - .187	.006 - .031	★	★		
VCGX 220530-AL	VCGX 220530-AL	1/2	.872	7/32	.118	.020 - .187	.010 - .040	★	★		

Ordering Example: 20 pcs VCGX 220530-AL GN9125

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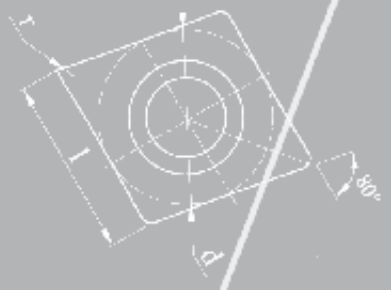
TECHNICAL INFORMATION TURNING



EXAMPLE 1

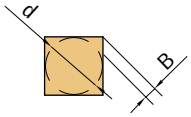
C	N	M	G	4	3	2		-	QM
1	2	3	4	5	6	7	8		9

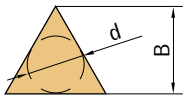
1		
Insert Shape		
C	80⁰ Diamond	
D	55⁰ Diamond	
S	Square	
T	Triangle	
V	35⁰ Diamond	
W	80⁰ Corner Trigon	

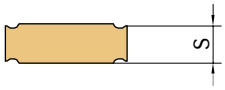
2	
Clearance Angle	
	
B	5⁰ Positive Rake
C	7⁰ Positive Rake
N	0⁰ Negative Rake
P	11⁰ Positive Rake

3

Tolerances, inch







Tolerance Class	tolerance on 'd'	tolerance on 'B'	tolerance on 's'
G	± .001	± .001	± .005
M	see table below	see table below	± .005

Tolerance Class M, inch

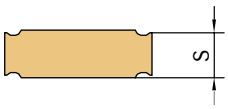
d	tolerance on 'd'	tolerance on 'B'		
	All Shapes	C, S, T, W Shapes	D Shape	V Shape
7/32	± .002	± .003	± .004	N/A
1/4	± .002	± .003	± .004	± .007
3/8	± .002	± .003	± .004	± .007
1/2	± .003	± .005	± .006	± .010
5/8	± .004	± .006	± .007	N/A
3/4	± .004	± .006	± .007	N/A

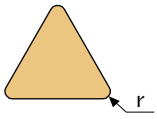
EXAMPLE 2

V	C	G	T	3	3	1		-	GP
1	2	3	4	5	6	7	8		9

4		
Insert Type		
G	With hole, Pin / Top Clamp Double-sided	
T	With hole, Screw-down Clamping Single-sided	
X	Manufacturer-Specific Design	——

5	
Insert Size	
Inscribed Circle, d, inch	
	
Symbol indicates number of 1/8ths of an inch	
Symbol	d
1.8	7/32
2	1/4
3	3/8
4	1/2
5	5/8
6	3/4

6	
Thickness, inch	
	
Symbol indicates number of 1/16ths of an inch	
Symbol	s
1.5	3/32
2	1/8
2.5	5/32
3	3/16
4	1/4

7	
Nose Radius, inch	
	
Symbol indicates number of 1/64ths of an inch	
Symbol	r
0.5	.008
1	1/64
2	1/32
3	3/64
4	1/16

8	
Hand of Insert (optional)	
R	Right-hand
L	Left-hand

9
Chipbreaker Designation
Indicates the machining properties or chipbreaker features Manufacturer-specific

EXAMPLE 1

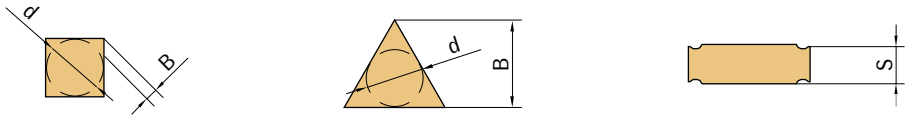
C	N	M	G	12	04	08		-	QM
1	2	3	4	5	6	7	8		9

1	
Insert Shape	
C	80⁰ Diamond
D	55⁰ Diamond
S	Square
T	Triangle
V	35⁰ Diamond
W	80⁰ Corner Trigon

2	
Clearance Angle	
B	5⁰ Positive Rake
C	7⁰ Positive Rake
N	0⁰ Negative Rake
P	11⁰ Positive Rake

3

Tolerances, mm



Tolerance Class	tolerance on 'd'	tolerance on 'B'	tolerance on 's'
G	± 0.025	± 0.025	± 0.13
M	see table below	see table below	± 0.13

Tolerance Class M, mm

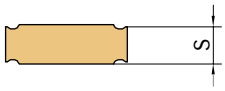
d	tolerance on 'd'	tolerance on 'B'		
	All Shapes	C, S, T, W Shapes	D Shape	V Shape
5.556	± 0.05	± 0.08	± 0.10	N/A
6.350	± 0.05	± 0.08	± 0.10	± 0.18
9.525	± 0.05	± 0.08	± 0.10	± 0.18
12.700	± 0.08	± 0.13	± 0.15	± 0.25
15.875	± 0.10	± 0.15	± 0.18	N/A
19.050	± 0.10	± 0.15	± 0.18	N/A

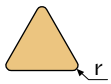
EXAMPLE 2

V	C	G	T	16	04	04		-	GP
1	2	3	4	5	6	7	8		9

4		
Insert Type		
G	With hole, Pin / Top Clamp Double-sided	
T	With hole, Screw-down Clamping Single-sided	
X	Manufacturer-Specific Design	——

5						
Insert Size						
Cutting Edge Length, mm						
Symbol	C	D	S	T	V	W
06	6.5					6.5
07		7.8				
08						8.7
09	9.7		9.5	9.6		
11		11.6		11.0	11.1	
12	12.9		12.7			
15		15.5	15.9			
16	16.1			16.5	16.6	
19	19.4		19.1			
22				22.0	22.2	
27				27.5		

6	
Thickness, mm	
	
Symbol	s
02	2.38
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35

7	
Nose Radius, mm	
	
Symbol	r
02	0.2
04	0.4
08	0.8
12	1.2
16	1.6
30	3.0

8	
Hand of Insert (optional)	
R	Right-hand
L	Left-hand

9
Chipbreaker Designation
Indicates the machining properties or chipbreaker features Manufacturer-specific

Spindle speed, n (rpm)

$$n = \frac{3.82 \times v_c}{D}$$

Cutting speed, v_c (ft / min)

$$v_c = .262 \times D \times n$$

Feed rate, v_f (in / min)

$$v_f = n \times f_n$$

Machining time, t (min)

$$t = \frac{l_m}{v_f}$$

Metal removal rate, Q (in^3 / min)

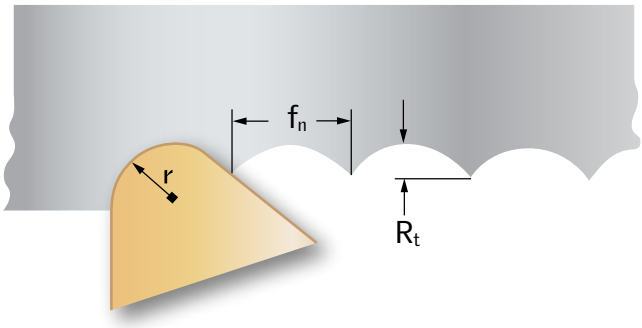
$$Q = v_c \times a_p \times f_n \times 12$$

a_p	depth of cut	inches
D	workpiece diameter	inches
f_n	feed per revolution	inches
l_m	machined length	inches
n	spindle speed	rev/min
Q	metal removal rate	$inches^3$/min
t	machining time	minutes
v_c	cutting speed	feet/min
v_f	feed rate	inches/min

The machined surface and tolerances achieved on components are directly affected by both the insert nose radius and the feed rate.

From a strictly theoretical perspective, surface roughness can be calculated from the following formula:

$$R_t = \frac{f_n^2 \times 10^6}{8 \times r}$$



Where R_t = Theoretical Profile Depth, μinches
f_n = feed / rev, inches
r = insert nose radius, inches

The following table presents feed values for common insert nose radius sizes and surface roughness requirements:

R_t, μinch	feed f_n, inches / rev				
	r = 1/64"	r = 1/32"	r = 3/64"	r = 1/16"	r = 3/32"
16	.0015	.002	.0025	.003	.0035
32	.002	.003	.0035	.004	.005
63	.003	.004	.005	.0055	.007
125	.004	.0055	.007	.008	.010
250	.0055	.008	.010	.011	.014
500	.008	.011	.014	.016	.019

The maximum feed per rev can be determined from the table by selecting the nose radius and specified surface roughness requirement.

For example, **Surface roughness requirement R_t = 63 μinches**

Insert nose radius r = 1/32"

Theoretical starting point for feed f_n => .004 inches / rev

When selecting the feed for finishing to a specified level of surface roughness, the feed values provided in the table should not be exceeded. In general the feed in a finishing operation should be kept low in order to produce an acceptable component finish.

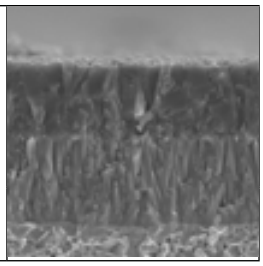
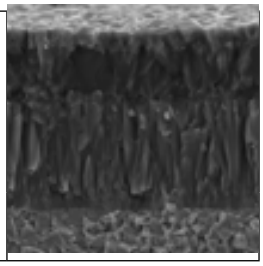
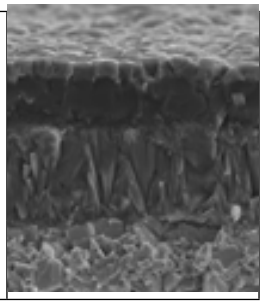
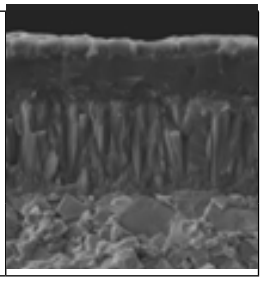
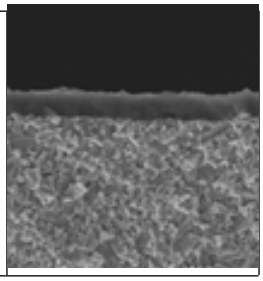
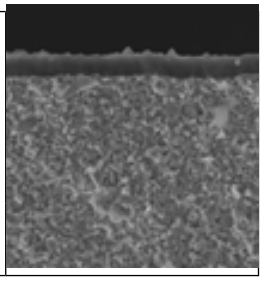
ISO	Material Group	Workpiece Material	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)														
				GP1105			GP1115			GP1225			GP1135			GP3125		
				f_n (inch/rev)			f_n (inch/rev)			f_n (inch/rev)			f_n (inch/rev)			f_n (inch/rev)		
				.004	.008	.012	.004	.008	.012	.004	.008	.016	.004	.016	.024	.004	.008	.012
P Steel	P0	Low-Carbon Steels, Long Chipping (C < .25%) Ex. A36, 1008, 1010, 1018, 1108, 1117 Brinell Hardness HB <125	<530	1760	1550	1370	1640	1445	1280	1400	1245	855	1215	790	655	655	525	400
	P1	Low-Carbon Steels, Short Chipping, Free Machining (C < .25%) Ex. 10L18, 1200 Series, 1213, 12L14 Brinell Hardness HB <125	<530	1500	1330	1120	1400	1245	1050	1180	1015	655	1015	590	525	600	475	360
	P2	Medium- and High-Carbon Steels (C > .25%) Ex. 1035, 1045, 10L45, 1080, 1137, 1144, 1525, 1572 Rockwell Hardness HRC <25	>530	1120	1050	950	1050	985	885	920	820	590	855	540	460	525	445	345
	P3	Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, O, S, M, T Rockwell Hardness HRC <35	600-850	1020	850	700	950	790	655	790	720	490	625	445	330	400	300	245
	P4	High-Strength Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, O, S, M, T Rockwell Hardness HRC 35 - 48	850-1400	850	700	560	790	655	525	590	525	330	460	300	230	310	245	180
	P5	Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series Rockwell Hardness HRC <35	600-900	1050	880	700	985	820	655	855	720	560	625	460	330	420	320	260
	P6	High-Strength Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series Rockwell Hardness HRC 35 - 48	900-1350	630	530	350	590	490	330	425	360	300	360	260	230	230	190	135

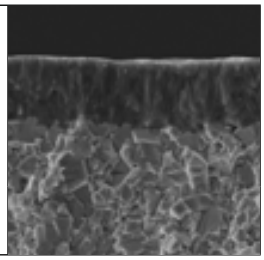
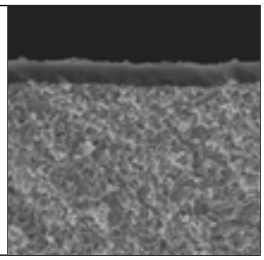
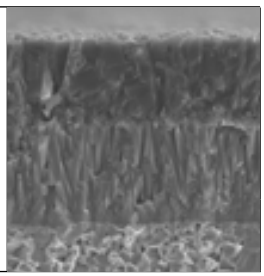
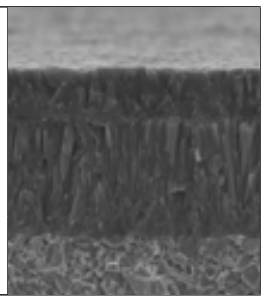
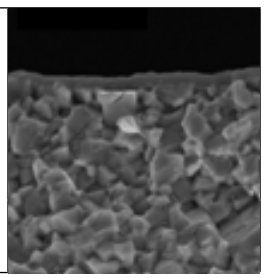
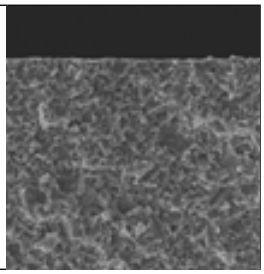
ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GS3115			GM1125			GM3125			GP3125		
						f_n (inch/rev)			f_n (inch/rev)			f_n (inch/rev)			f_n (inch/rev)		
						.004	.008	.012	.004	.008	.012	.004	.008	.012	.004	.008	.012
M Stainless Steel	M1	Austenitic Stainless Steels Ex. 200 Series, 301, 302, 304, 304L, 309	130-200		<600	820	670	490	850	750	650	620	470	290	520	380	240
	M2	High-Strength Austenitic Stainless and Cast Stainless Steels Ex. 310, 316, 316L, 321, 347, 384	150-230	<25	600-800	740	600	440	760	670	580	560	420	260	470	340	220
	M3	Duplex Stainless Steels Ex. 323, 329, F55, 2205	135-275	<30	<800	655	535	390	670	600	520	495	375	230	420	310	200

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GK1115			GK1125			GP3125					
						f_n (inch/rev)			f_n (inch/rev)			f_n (inch/rev)					
						.004	.008	.016	.004	.012	.020	.004	.008	.012			
K Cast Iron	K1	Gray Cast Iron Ex. Class 20, 25, 30, 35, 40, 45, 50, 55, 60, G1800, G3000, G3500, G4000	120-290	<32	125-500	1800	1180	885	1540	885	655	625	425	360			
	K2	Ductile Cast Irons (Nodular Irons) and Compacted Graphite Irons (CGI) Ex. 60-40-18, 65-45-12, 80-55-06, SAE J434: D4018, D4512, D5506	130-260	<28	<600	1215	885	690	885	655	490	525	380	330			
	K3	High-Strength Ductile Irons and Austempered Ductile Irons (ADI) Ex. ASTM A536: 100-70-03, 120-90-02, SAE J434: D7003	180-350	<43	>600	885	690	560	655	490	400	425	360	300			

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GN3125			GN9125								
						f_n (inch/rev)			f_n (inch/rev)								
						.004	.008	.016	.004	.008	.016						
N Non-Ferrous	N1	Wrought Aluminum Ex. 1000, 2017, 2025, 5050, 7050	60-90		<520	6900	5400	3600	6900	5400	3600						
	N2	Low-Silicon Aluminum Alloys (Si < 12.2%) Ex. 2024, 6061, 7075	70-100		<350	1640	985	655	1640	985	655						
	N3	High-Silicon Aluminum Alloys (Si > 12.2%)	60-120		200-320	985	655	400	985	655	400						
	N4	Copper and Copper Alloys Ex. C81500	60-200		200-650	1280	1050	885	1280	1050	885						

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GS3115											
						f_n (inch/rev)											
						.004	.008	.012									
S High Temp Alloys	S1	Iron-Based Heat-Resistant Alloys Ex. A286, A608, INCOLOY 800 Series, N-155, Haynes 556, Discaloy	160-260	25-48	500-1200	330	280	230									
	S2	Cobalt-Based Heat-Resistant Alloys Ex. Haynes 25 (L605), Haynes 188, Stellite, MAR-M302, MAR-M509	250-450	25-48	1000-1450	260	215	165									
	S3	Nickel-Based Heat-Resistant Alloys Ex. Astroloy, Hastelloy X, INCONEL 600 and 700 Series, Waspalloy	160-450	<48	600-1700	200	150	115									
	S4	Titanium and Titanium Alloys Ex. Commercially Pure Ti, Ti-5Al-2.5Sn, Ti-6Al-4V, Ti-3Al-8V-6Cr-4Zr-4Mo	300-400	33-48	900-1600	-	-	-									

Grade / Application Area	Description	Microstructure
GP1105 **Super-Finishing to Finishing** **P STEEL**	"First Choice" for **Super-Finishing** Applications in Steel (ISO P Materials). Outstanding combination of deformation-resistance and insert edge strength. Gradient-sintered high-performance cemented carbide substrate with unsurpassed wear resistance. Double-Coated MT-CVD Grade with TiCN and Al_2O_3 layers. Exceptional coating adhesion properties. Withstands elevated operating temperatures.	
GP1115 **Finishing and Semi-finishing** **P STEEL**	*"First Choice"* for **Finishing** Applications in Steel (ISO P Materials). Triple-Coated MT-CVD Grade with Superfine TiCN, Thick Al_2O_3, and Ultra-Smooth TiN. Gradient-sintered high performance cemented carbide substrate with very high wear resistance. Performs extremely well in continuous cutting conditions and stable set-ups.	
GP1225 **Semi-finishing to Light Roughing** **P STEEL**	*"First Choice"* for **Medium** Turning Applications in Steel w(ISO P Materials). Triple-Coated MT-CVD Grade with Superthick TiCN, Optimized Al_2O_3, and Ultra-Smooth TiN. Gradient-sintered all-round performance cemented carbide substrate with excellent balance of wear resistance and toughness. Covers a wide application range, from semi-finishing to light roughing of Steels and continuous cutting to moderate interruptions. Also recommended for workpieces with scale.	
GP1135 **Medium Machining to Roughing** **P STEEL**	*"First Choice"* for difficult **Roughing** Applications in Steel (ISO P Materials). Superior fracture toughness and wear resistance. MT-CVD Triple-Layer Coating with smooth surface and excellent fracture resistance. Gradient-sintered high performance cemented carbide substrate with exceptional toughness properties. Well suited for medium to heavy interrupted cuts and other unstable application conditions.	
GP3125 **Finishing to Light Roughing** **P M K**	Universal Turning Grade. Primary application in Steel, with wide performance range in multiple materials. TiAlN Nano-Structure PVD Coated grade. Sub-Micron carbide substrate with outstanding combination of wear resistance and toughness behavior. Excellent Choice for All-Round grade that performs in an extremely wide variety of workpiece materials.	
GS3115 **Super-Finishing to Finishing** **M STAINLESS STEEL**	*"First Choice"* Grade for **Finishing** Applications in Stainless Steel (ISO M Materials). Also suitable for finish turning iron-based, cobalt-based and nickel-based Heat Resistant Super Alloys. PVD Advanced TiAlN Coated Grade with superior heat-resistance and oxidation-resistance properties. Extremely hard deformation-resistant micro-grain cemented carbide substrate with exceptional wear resistance characteristics.	

Grade / Application Area	Description	Microstructure
GM1125 **Finishing to Medium Machining** **M STAINLESS STEEL**	*"First Choice"* Grade for Stainless Steel (ISO M Materials). Double-Coated MT-CVD Grade with outstanding adhesion of Superthick TiCN and Ultra-Smooth TiN. Gradient-sintered tough cemented carbide substrate with excellent wear resistance - even at elevated cutting speeds. Optimized for Stainless Steel machining including light interruptions.	
GM3125 **Semi-finishing to Roughing** **M STAINLESS STEEL**	TiAlN Nano-Structure PVD Coated grade on Superfine Sub-Micron carbide substrate - exceptional resistance to thermal and mechanical shock with very good wear resistance. Excellent Choice for Stainless Steel applications at moderate cutting speeds, continuous cutting to moderate interruptions.	
GK1115 **Finishing and Semi-finishing** **K CAST IRON**	*"First Choice"* for **Finishing** Applications in Cast Iron (ISO K Materials). Double-Coated MT-CVD Grade, Thick TiCN and Superthick Al_2O_3 on gradient-sintered high performance cemented carbide substrate. Unique "post-coating treatment" provides smoother cutting zone interface for extremely high wear resistance. Performs very well in continuous cutting conditions and stable set-ups.	
GK1125 **Semi-finishing to Roughing** **K CAST IRON**	*"First Choice"* for **Medium** Turning Applications in Cast Iron (ISO K Materials). Double-Coated MT-CVD Grade, Superthick TiCN and Thick Al_2O_3 . Gradient-sintered cemented carbide substrate with high wear resistance and superior toughness behavior. Covers a wide application range, from semi-finishing to roughing of Cast Iron - and continuous cutting to heavy interruptions. Performs well in poor machining conditions / on demanding castings.	
GN3125 **Semi-finishing to Roughing** **N NON-FERROUS**	PVD TiBC Coating paired with High Hardness and Wear Resistant Sub-Micron cemented carbide substrate developed specifically for Aluminum Alloys and other non-ferrous materials within the ISO N Material range. Extremely smooth top coating layer results in reduced surface friction and smooth chip flow. Also suitable for non-metallics.	
GN9125 **Semi-finishing to Roughing** **N NON-FERROUS**	Uncoated Sub-Micron cemented carbide grade. High Hardness and Wear Resistance grade developed specifically for Aluminum Alloys and other non-ferrous materials within the ISO N Material range. Also suitable for non-metallics.	

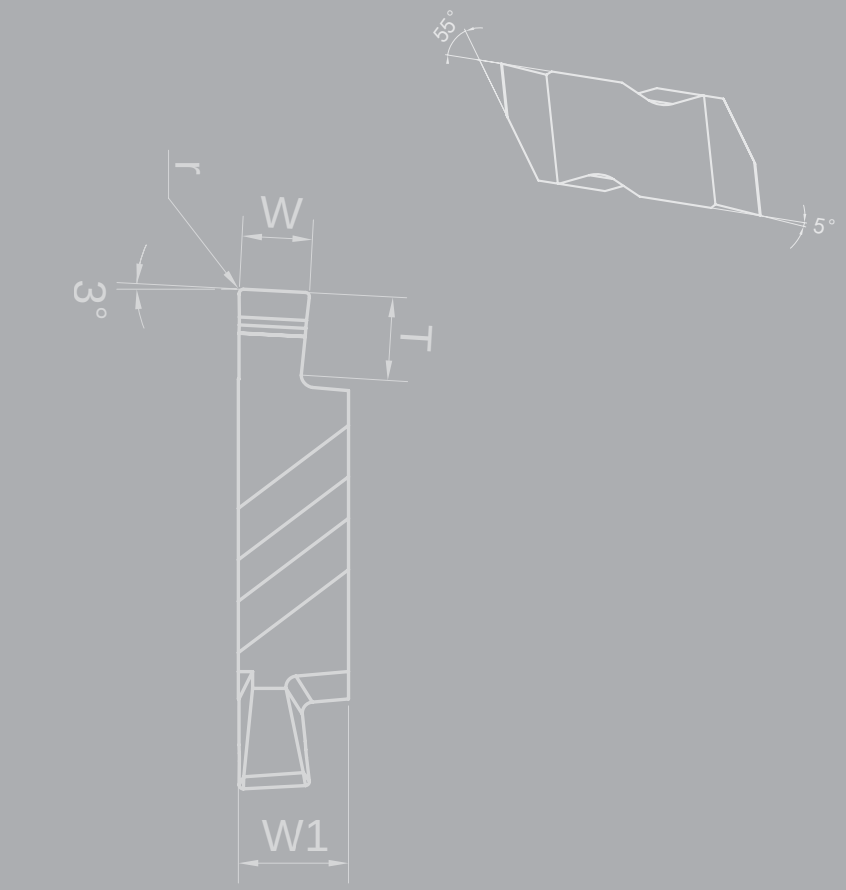
WEAR MECHANISM / PROBLEM

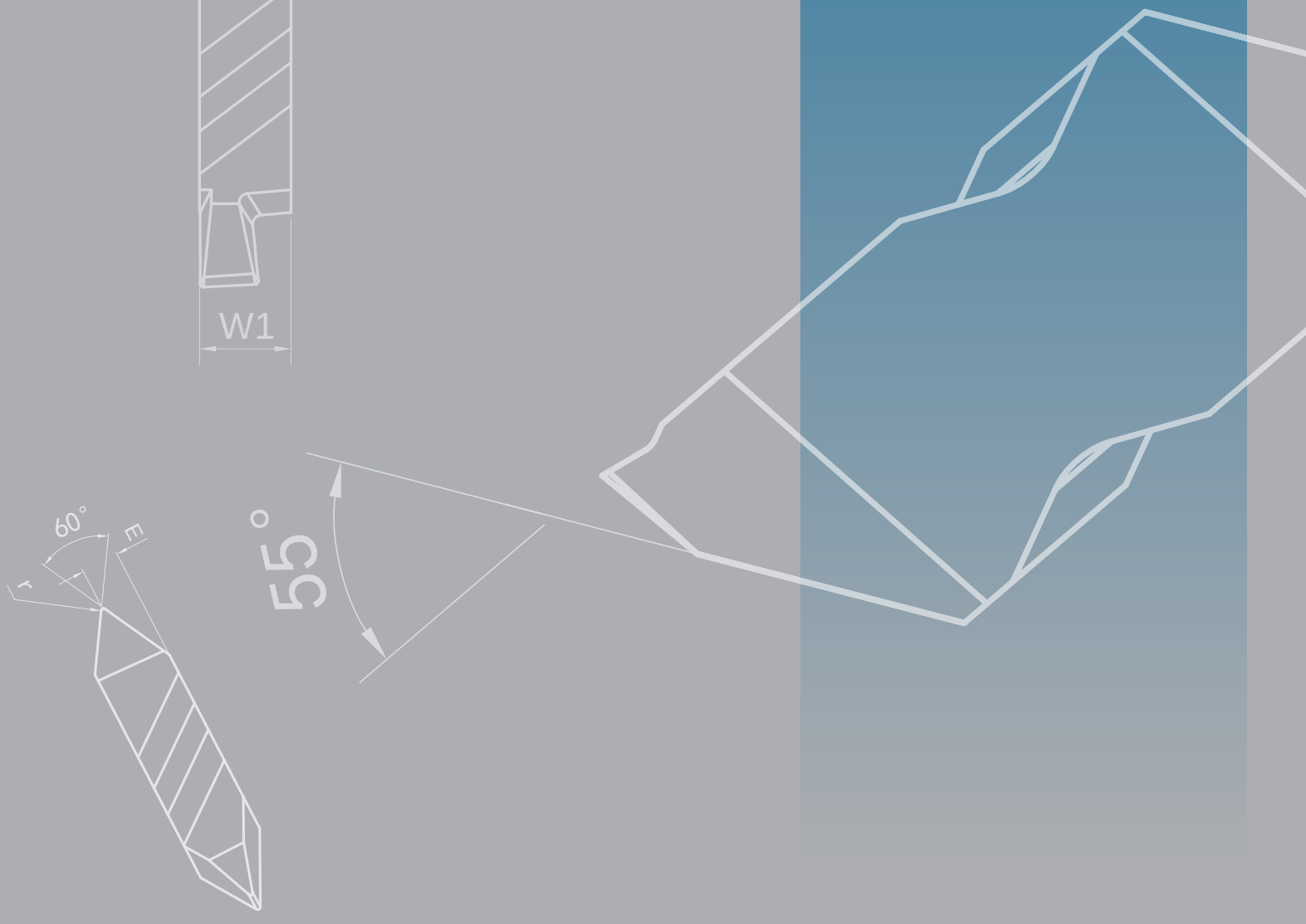
WEAR MECHANISM / PROBLEM	REMEDY: Increase the cutting speed	Reduce the cutting speed	Increase the feed	Reduce the feed	Increase the depth of cut	Reduce the depth of cut	Ensure adequate coolant flow	Choose a tougher grade	Select a more wear resistant grade	Choose a positive geometry	Use a smaller nose radius
Excessive flank wear		■	■				■		■		
Chipping				■				■			
Plastic deformation		■		■		■	■		■		
Crater wear		■		■			■		■	■	
Built-up-edge (BUE)	■			■			■			■	
Thermal cracks	■			■				■			
Notch wear		■					■		■		
Insert Breakage				■		■		■			
Vibrations		■	■			■				■	■
Chip control / long, unbroken chips			■		■						■

Increase the cutting speed | Reduce the cutting speed | Increase the feed | Reduce the feed | Increase the depth of cut | Reduce the depth of cut | Ensure adequate coolant flow | Choose a tougher grade | Select a more wear resistant grade | Choose a positive geometry | Use a smaller nose radius
REMEDY

GROOVING INSERTS | POSITIVE RAKE
THREADING INSERTS | POSITIVE RAKE

STANDARD NOTCH INSERTS
FOR GROOVING AND THREADING



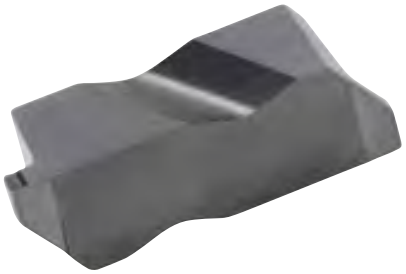


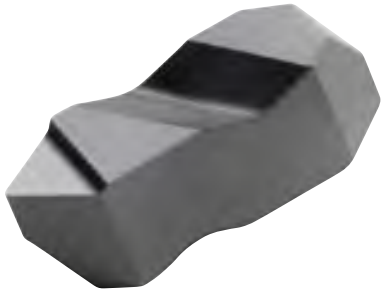
STANDARD NOTCH INSERTS

Precision ground for high performance and accurate indexing

Specialized edge treatment for extended tool life

5° positive rake - reduced cutting forces





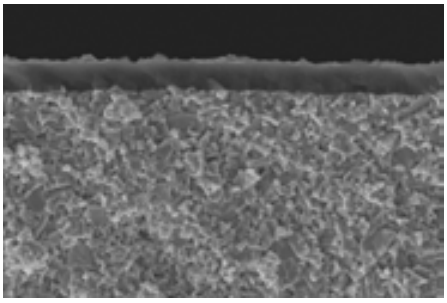
Two cutting edges per insert for economy

General purpose grooving, O-ring grooves, Circlip grooves

60° partial profile V-thread forms for a range of thread pitches

GM3125

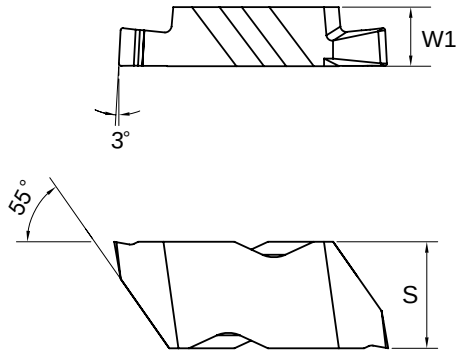
TiAlN Nano-Structure PVD Coated Grade



High resistance to thermal and mechanical shock, with exceptional wear resistance – provides superior performance in steel, stainless steel and cast iron materials.

P	M	K

G-NOTCH Insert Dimensions



Insert Size	W1	s
2	.150	.219
3	.195	.344

G	N	G	P	2	0	4	7	R
1		2	3	4	5			6

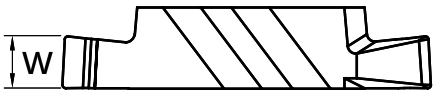
G	N	T	P	2	R
1		2	3	4	6

1	
Insert Type	
GN	G-NOTCH Grooving System

2	
Insert Style	
G	Grooving
T	Threading - 60° V-form

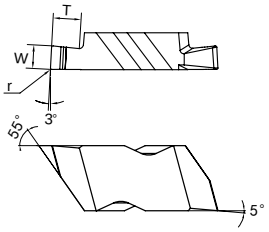
3	
Insert Characteristics	
P	Positive Rake

4	
Insert Size	
2	Notch size 2
3	Notch size 3

5	
Grooving Width	
	
Symbol indicates width W in thousandths of an inch	
Symbol	W (inch)
047	.047
062	.062
078	.078
094	.094
125	.125

6	
Hand of Insert	
R	Right-hand
L	Left-hand

GNGP



Precision ground, positive rake Notch inserts for a wide range of grooving applications.

5° positive rake for improved cutting action and reduced cutting forces.

CATALOG NUMBER		INSERT SIZE	DIMENSIONS (INCH)			CUTTING DATA (INCH)		P	M	K
RIGHT HAND	LEFT HAND		W	T	r	depth of cut, a_p	feed per rev, f_n	MULTI-MATERIAL GM3125		
GNGP 2047R	**GNGP 2047L**	2	.047	.050	.004	max .050	.001-.005	★		
GNGP 2062R	**GNGP 2062L**	2	.062	.110	.008	max .110	.001-.006	★		
GNGP 2078R	**GNGP 2078L**	2	.078	.110	.008	max .110	.002-.008	★		
GNGP 2094R	**GNGP 2094L**	2	.094	.110	.008	max .110	.002-.008	★		
GNGP 2125R	**GNGP 2125L**	2	.125	.110	.008	max .110	.003-.010	★		
GNGP 3047R	**GNGP 3047L**	3	.047	.075	.008	max .075	.001-.006	★		
GNGP 3062R	**GNGP 3062L**	3	.062	.094	.008	max .094	.001-.006	★		
GNGP 3078R	**GNGP 3078L**	3	.078	.094	.008	max .094	.002-.008	★		
GNGP 3094R	**GNGP 3094L**	3	.094	.150	.008	max .150	.002-.008	★		
GNGP 3125R	**GNGP 3125L**	3	.125	.150	.008	max .150	.003-.010	★		

Ordering Example: 20 pcs GNGP 3125R GM3125

NOTE: Right-hand insert shown; Left-hand mirror image.

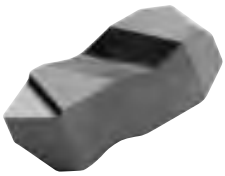
INSERT COMPATIBILITY

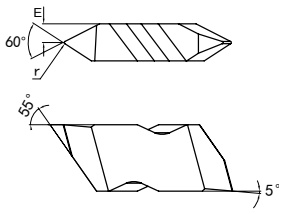
G-Notch GNGP grooving inserts are interchangeable with other Notch grooving inserts, and also fit tools using the following insert types:

NG, NGP, NG-K	FLG, FLGP, FLG-CB	TLG, TLGP

REFERENCE PAGES					
GRADE INFORMATION	72	TECHNICAL INFORMATION	72	CUTTING SPEED RECOMMENDATIONS	76

GNTP





Precision ground, positive rake Notch inserts for 60° partial profile (non-cresting) V-thread forms across a range of materials.

5° positive rake for improved cutting action and reduced cutting forces.

CATALOG NUMBER		INSERT SIZE	DIMENSIONS (INCH)		THREADS PER INCH		THREAD PITCH		P	M	K
					TPI		mm		MULTI-MATERIAL		
RIGHT HAND	LEFT HAND		E	r	EXTERNAL	INTERNAL	EXTERNAL	INTERNAL	GM3125		
GNTP 2R	**GNTP 2L**	2	.075	.004	36 - 8	20 - 7	0.70 - 3.00	1.25 - 3.50	★		
GNTP 3R	**GNTP 3L**	3	.098	.007	20 - 6	12 - 5	1.25 - 4.00	2.00 - 5.00	★		

Ordering Example: 20 pcs GNTP 3R GM3125

NOTE: Right-hand insert shown; Left-hand mirror image.

INSERT COMPATIBILITY

G-Notch GNTP threading inserts are interchangeable with other Notch threading inserts, and also fit tools using the following insert types:

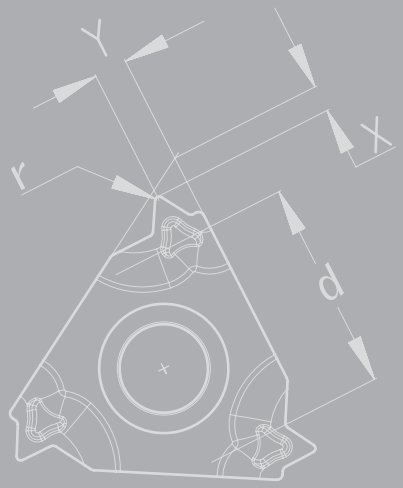
NT, NTP, NT-K	FLT, FLTP, FLT-CB	TLT, TLTP

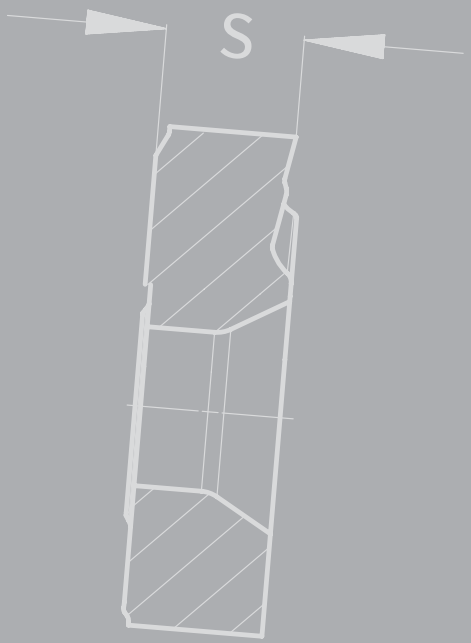
REFERENCE PAGES					
GRADE INFORMATION	72	TECHNICAL INFORMATION	72	CUTTING SPEED RECOMMENDATIONS	76

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)								
						GM3125								
						f_n (inch/rev)								
						.003	.006	.010						
P Steel	P0	Low-Carbon Steels, Long Chipping (C < .25%) Ex. A36, 1008, 1010, 1018, 1108, 1117	<125		<530	600	510	420						
	P1	Low-Carbon Steels, Short Chipping, Free Machining (C < .25%) Ex. 10L18, 1200 Series, 1213, 12L14	<125		<530	520	450	390						
	P2	Medium- and High-Carbon Steels (C > .25%) Ex. 1035, 1045, 10L45, 1080, 1137, 1144, 1525, 1572	<220	<25	>530	440	390	330						
	P3	Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, O, S, M, T	<330	<35	600-850	350	300	250						
	P4	High-Strength Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, O, S, M, T	340-450	35-48	850-1400	300	250	200						
	P5	Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series	<330	<35	600-900	360	310	260						
	P6	High-Strength Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series	340-450	35-48	900-1350	280	230	200						
M Stainless Steel	M1	Austenitic Stainless Steels Ex. 200 Series, 301, 302, 304, 304L, 309	130-200		<600	400	330	260						
	M2	High-Strength Austenitic Stainless and Cast Stainless Steels Ex. 310, 316, 316L, 321, 347, 384	150-230	<25	600-800	360	300	230						
	M3	Duplex Stainless Steels Ex. 323, 329, F55, 2205	135-275	<30	<800	320	260	200						
K Cast Iron	K1	Gray Cast Iron Ex. Class 20, 25, 30, 35, 40, 45, 50, 55, 60, G1800, G3000, G3500, G4000	120-290	<32	125-500	630	510	390						
	K2	Ductile Cast Irons (Nodular Irons) and Compacted Graphite Irons (CGI) Ex. 60-40-18, 65-45-12, 80-55-06, SAE J434: D4018, D4512, D5506	130-260	<28	<600	470	380	290						
	K3	High-Strength Ductile Irons and Austempered Ductile Irons (ADI) Ex. ASTM A536: 100-70-03, 120-90-02, SAE J434: D7003	180-350	<43	>600	380	310	230						

LAYDOWN THREADING INSERTS

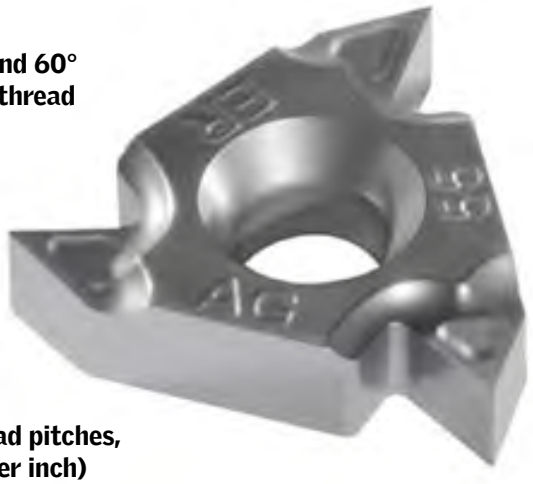
STANDARD INSERTS
FOR THREAD TURNING





STANDARD THREAD TURNING INSERTS

Inserts for 55° and 60° partial profile V-thread forms



Standard insert sizes 11, 16 and 22

Broad range of thread pitches, 48-5 TPI (threads per inch)

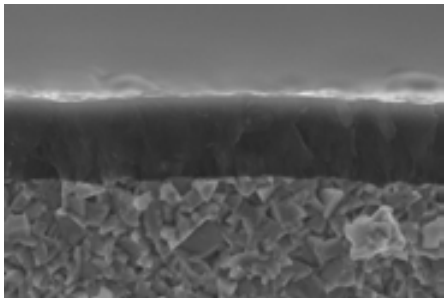
Inserts for External and Internal applications

TC chipbreaker

- Superior chip control
- Reduced cutting forces
- Large chip space promotes smooth chip evacuation

GM3225

TiAlN Nano-Structure PVD Coated Grade



Optimized coating with gradient-sintered tough cemented carbide substrate provides superior wear resistance and exceptional performance for thread turning across a broad range of materials.

P	M	K	S

16	E	R	–	A	55
1	2	3		4	5

1	
Insert Size	
Size	iC
11	.250
16	.375
22	.500

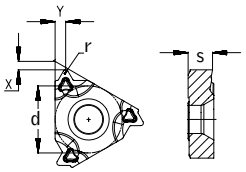
2	
Insert Type	
E	External
I	Internal

3	
Hand of Insert	
R	Right-hand

4		
Pitch		
Partial Profile		
Designation	TPI	mm
A	48 - 16	0.5 - 1.5
AG	48 - 8	0.5 - 3.0
G	14 - 8	1.75 - 3.0
N	7 - 5	3.5 - 5.0

5	
Thread Form	
55	Partial Profile 55°
60	Partial Profile 60°

PARTIAL PROFILE 60° - EXTERNAL



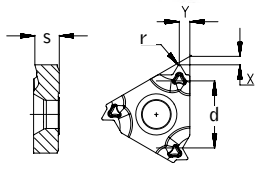
Standard inserts for 60° partial profile (non-cresting) V-thread forms across a range of materials. Three cutting edges for economy.

Special chipbreaker design with low cutting forces and superior chip control. Large chip space promotes smooth chip evacuation.

CATALOG NUMBER	THREADS PER INCH	THREAD PITCH	DIMENSIONS (INCH)					MULTI-MATERIAL			
								P	M	K	S
	TPI	mm	d	s	r	X	Y	GM3225			
16ER-A60-TC	48 - 16	0.50 - 1.50	3/8	.137	.003	.031	.035	★			
16ER-AG60-TC	48 - 8	0.50 - 3.00	3/8	.137	.003	.043	.059	★			
16ER-G60-TC	14 - 8	1.75 - 3.00	3/8	.137	.010	.047	.067	★			
22ER-N60-TC	7 - 5	3.50 - 5.00	1/2	.185	.020	.067	.098	★			

Ordering Example: 20 pcs 22ER-N60-TC GM3225

PARTIAL PROFILE 60° - INTERNAL



Standard inserts for 60° partial profile (non-cresting) V-thread forms across a range of materials. Three cutting edges for economy.

Special chipbreaker design with low cutting forces and superior chip control. Large chip space promotes smooth chip evacuation.

CATALOG NUMBER	THREADS PER INCH	THREAD PITCH	DIMENSIONS (INCH)					MULTI-MATERIAL			
								P	M	K	S
	TPI	mm	d	s	r	X	Y	GM3225			
11IR-A60-TC	48 - 16	0.50 - 1.50	1/4	.118	.003	.031	.035	★			
16IR-A60-TC	48 - 16	0.50 - 1.50	3/8	.137	.003	.031	.035	★			
16IR-AG60-TC	48 - 8	0.50 - 3.00	3/8	.137	.003	.043	.059	★			
16IR-G60-TC	14 - 8	1.75 - 3.00	3/8	.137	.005	.047	.067	★			
22IR-N60-TC	7 - 5	3.50 - 5.00	1/2	.185	.010	.067	.098	★			

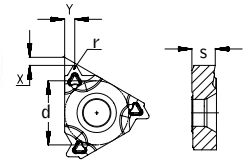
Ordering Example: 20 pcs 22IR-N60-TC GM3225

FULL PROFILE INSERTS

Many full profile thread turning inserts are also available, including the forms below. Ask for details.

ISO – ISO Metric 60° UN – Unified National Fixed Pitch (Inch UN 60°)
NPT – National Pipe Taper BSPT – British Standard Pipe Taper W - Whitworth

PARTIAL PROFILE 55° - EXTERNAL



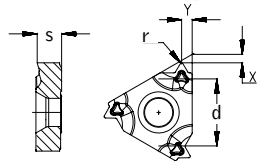
Standard inserts for 55° partial profile (non-cresting) V-thread forms across a range of materials. Three cutting edges for economy.

Special chipbreaker design with low cutting forces and superior chip control. Large chip space promotes smooth chip evacuation.

CATALOG NUMBER	THREADS PER INCH	THREAD PITCH	DIMENSIONS (INCH)					MULTI-MATERIAL			
								P	M	K	S
	TPI	mm	d	s	r	X	Y	GM3225			
16ER-A55-TC	48 - 16	0.50 - 1.50	3/8	.137	.003	.031	.035	★			
16ER-AG55-TC	48 - 8	0.50 - 3.00	3/8	.137	.003	.043	.059	★			
16ER-G55-TC	14 - 8	1.75 - 3.00	3/8	.137	.008	.047	.067	★			
22ER-N55-TC	7 - 5	3.50 - 5.00	1/2	.185	.017	.067	.098	★			

Ordering Example: 20 pcs 22ER-N55-TC GM3225

PARTIAL PROFILE 55° - INTERNAL



Standard inserts for 55° partial profile (non-cresting) V-thread forms across a range of materials. Three cutting edges for economy.

Special chipbreaker design with low cutting forces and superior chip control. Large chip space promotes smooth chip evacuation.

CATALOG NUMBER	THREADS PER INCH	THREAD PITCH	DIMENSIONS (INCH)					MULTI-MATERIAL			
								P	M	K	S
	TPI	mm	d	s	r	X	Y	GM3225			
11IR-A55-TC	48 - 16	0.50 - 1.50	1/4	.118	.003	.031	.035	★			
16IR-A55-TC	48 - 16	0.50 - 1.50	3/8	.137	.003	.031	.035	★			
16IR-AG55-TC	48 - 8	0.50 - 3.00	3/8	.137	.003	.043	.059	★			
16IR-G55-TC	14 - 8	1.75 - 3.00	3/8	.137	.008	.047	.067	★			
22IR-N55-TC	7 - 5	3.50 - 5.00	1/2	.185	.017	.067	.098	★			

Ordering Example: 20 pcs 22IR-N55-TC GM3225

FULL PROFILE INSERTS

Many full profile thread turning inserts are also available, including the forms below. Ask for details.

ISO – ISO Metric 60° UN – Unified National Fixed Pitch (Inch UN 60°)
NPT – National Pipe Taper BSPT – British Standard Pipe Taper W - Whitworth

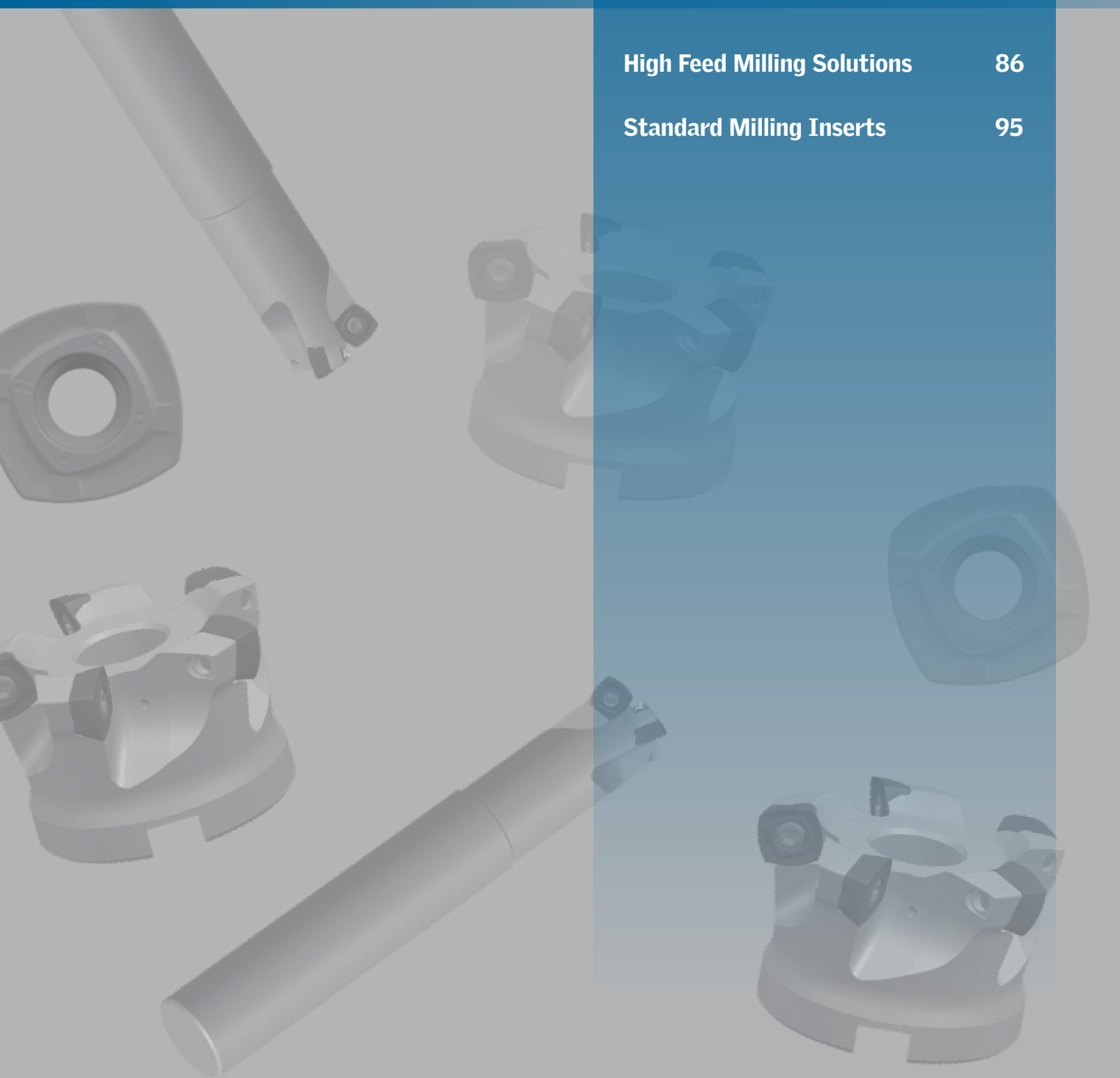
ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GM3225											
						low	start	high									
P Steel	P0	Low-Carbon Steels, Long Chipping (C < .25%) Ex. A36, 1008, 1010, 1018, 1108, 1117	<125		<530	390	560	760									
	P1	Low-Carbon Steels, Short Chipping, Free Machining (C < .25%) Ex. 10L18, 1200 Series, 1213, 12L14	<125		<530	330	490	640									
	P2	Medium- and High-Carbon Steels (C > .25%) Ex. 1035, 1045, 10L45, 1080, 1137, 1144, 1525, 1572	<220	<25	>530	300	440	580									
	P3	Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, 0, S, M, T	<330	<35	600-850	250	330	460									
	P4	High-Strength Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, 0, S, M, T	340-450	35-48	850-1400	160	270	360									
	P5	Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series	<330	<35	600-900	260	400	540									
	P6	High-Strength Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series	340-450	35-48	900-1350	140	180	260									

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GM3225											
						low	start	high									
M Stainless Steel	M1	Austenitic Stainless Steels Ex. 200 Series, 301, 302, 304, 304L, 309	130-200		<600	240	360	470									
	M2	High-Strength Austenitic Stainless and Cast Stainless Steels Ex. 310, 316, 316L, 321, 347, 384	150-230	<25	600-800	205	310	410									
	M3	Duplex Stainless Steels Ex. 323, 329, F55, 2205	135-275	<30	<800	180	270	360									

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GM3225											
						low	start	high									
K Cast Iron	K1	Gray Cast Iron Ex. Class 20, 25, 30, 35, 40, 45, 50, 55, 60, G1800, G3000, G3500, G4000	120-290	<32	125-500	260	350	490									
	K2	Ductile Cast Irons (Nodular Irons) and Compacted Graphite Irons (CGI) Ex. 60-40-18, 65-45-12, 80-55-06, SAE J434: D4018, D4512, D5506	130-260	<28	<600	220	300	400									
	K3	High-Strength Ductile Irons and Austempered Ductile Irons (ADI) Ex. ASTM A536: 100-70-03, 120-90-02, SAE J434: D7003	180-350	<43	>600	200	260	320									

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GM3225											
						low	start	high									
S High Temp Alloys	S1	Iron-Based Heat-Resistant Alloys Ex. A286, A608, INCOLOY 800 Series, N-155, Haynes 556, Discaloy	160-260	25-48	500-1200	90	130	180									
	S2	Cobalt-Based Heat-Resistant Alloys Ex. Haynes 25 (L605), Haynes 188, Stellite, MAR-M302, MAR-M509	250-450	25-48	1000-1450	60	80	100									
	S3	Nickel-Based Heat-Resistant Alloys Ex. Astroloy, Hastelloy X, INCONEL 600 and 700 Series, Waspalloy	160-450	<48	600-1700	45	60	80									
	S4	Titanium and Titanium Alloys Ex. Commercially Pure Ti, Ti-5Al-2.5Sn, Ti-6Al-4V, Ti-3Al-8V-6Cr-4Zr-4Mo	300-400	33-48	900-1600	165	200	230									

MILLING



High quality alloy tool steel construction for strong and long-lasting cutter bodies

Machined in pre-hardened state for accuracy and low runout

High precision cutter bodies provide consistent performance and tool life

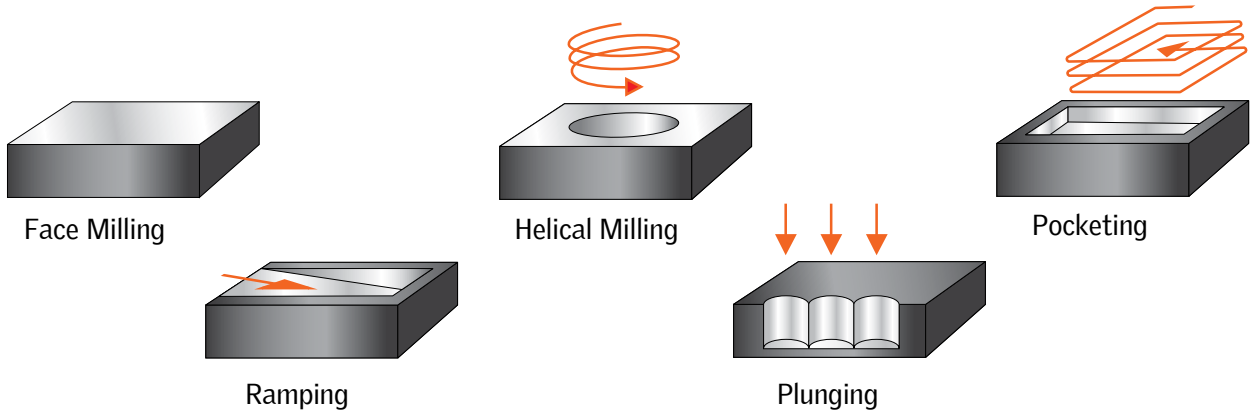
Nickel coated for durability

Four cutting edges per insert for maximum economy

Through-the-tool coolant / air capability for excellent chip evacuation

Thick, strong inserts for demanding applications

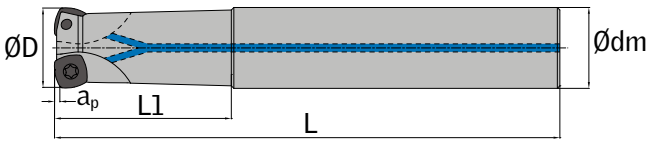
VERSATILITY | HIGH PERFORMANCE IN A VARIETY OF APPLICATIONS



SUITABLE FOR A BROAD RANGE OF MATERIALS

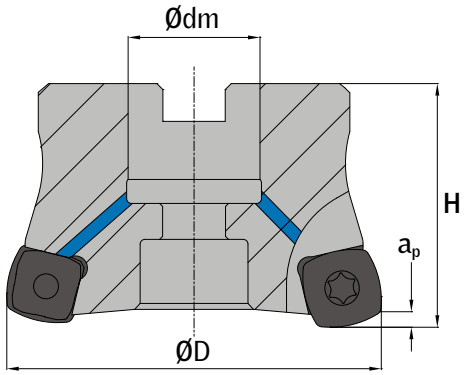
P	Steel
M	Stainless Steel
K	Cast Iron
S	High Temp Alloys
H	Hardened Steel

ENDMILLS - CYLINDRICAL SHANK



DIAMETER D	CATALOG NUMBER	NUMBER OF INSERTS z	SHANK DIAMETER dm	OVERALL LENGTH L	NECK LENGTH L1	MAX DEPTH OF CUT a_p	COOLANT THROUGH
1.250	HF13-1250C1250-12Z02	2	1.250	10.00	2.50	.078	YES
1.500	HF13-1500C1250-12Z03	3	1.250	10.00	-	.078	YES

FACEMILLS - ARBOR MOUNT



DIAMETER D	CATALOG NUMBER	NUMBER OF INSERTS z	MOUNTING BORE DIAMETER dm	HEIGHT H	MAX DEPTH OF CUT a_p	COOLANT THROUGH
2.000	HF13-2000A0750-12Z04	4	0.750	1.58	.078	YES
2.500	HF13-2500A0750-12Z05	5	0.750	1.58	.078	YES
3.000	HF13-3000A1000-12Z06	6	1.000	1.97	.078	YES
4.000	HF13-4000A1250-12Z08	8	1.250	1.97	.078	YES
5.000	HF13-5000A1500-12Z10	10	1.500	2.48	.078	YES

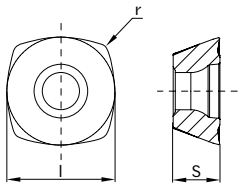
Ordering Example: 2 pcs HF13-5000A1500-12Z10

NOTE: All cutters are delivered with insert mounting screws and a wrench. Inserts are ordered separately - see page 88.

See page 93 for Spare Parts information.

HIGH FEED MILLING

SDMT



Versatile inserts for high feed facemilling, plunging, ramping and pocketing applications. Thick, strong inserts with four cutting edges for maximum economy.

GM: Medium machining with lower cutting forces
GH: Roughing with highest edge security

APPLICATION	ITEM	CATALOG NUMBER	DIMENSIONS (INCH)			MULTI-MATERIAL				P	M	S	
			l	s	r	GA4225	GA4230			GP2115	GM2140	GS4130	
MEDIUM		**SDMT 120512-GM**	.500	.219	.047	★	★			★	★	★	
HEAVY		**SDMT 120512-GH**	.500	.219	.047	★	★			★	★		

Ordering Example: 20 pcs SDMT 120512-GH GA4230

GRADE INFORMATION

GA4230 P M K S H

Universal, first-choice grade with broad application range. PVD TiAlN+ coating with excellent heat and oxidation resistance characteristics.

GA4225 P M K

Complementary grade for steel, stainless steel and cast iron materials. PVD AlCrN coating with high hardness substrate offers increased wear resistance.

GP2115 P

Best for steel machining with stable set-ups. MT-CVD dual layer TiCN and Al_2O_3 coating with extremely hard substrate offers high wear resistance.

GM2140 M

Outstanding performance in austenitic and ferritic, martensitic and PH stainless steels. MT-CVD coated grade with secondary application in titanium and HRSA materials.

GS4130 S

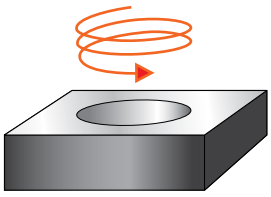
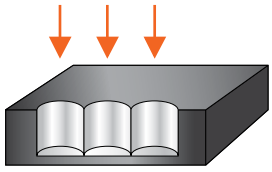
Primary application in titanium and iron-based, cobalt-based and nickel-based heat resistant alloys. Latest PVD TiAlN coating technology with complementary use in stainless steels.

REFERENCE PAGES					
MILLING CUTTERS	87	FEED RECOMMENDATIONS	89	CUTTING SPEED RECOMMENDATIONS	90

ISO	Workpiece Material	Rockwell Hardness HRC	Recommended feed per insert f_z (inches) starting (range)	
			GM (medium)	GH (heavy)
P Steel	Low-Carbon Steel	<25	.045 (.030 - .060)	.060 (.040 - .080)
	Alloy Steel and Tool Steel	<35	.045 (.030 - .060)	.060 (.040 - .080)
	Alloy Steel and Tool Steel	35 - 45	.035 (.025 - .050)	.045 (.030 - .060)
M Stainless Steel	Stainless Steel	<35	.030 (.025 - .040)	.040 (.030 - .050)
K Cast Iron	Cast Iron	<35	.045 (.030 - .060)	.060 (.040 - .080)
S High-Temp Alloys	Heat-Resistant and Titanium Alloys	<35	.015 (.006 - .024)	.020 (.008 - .036)
H Hardened Steel	Alloy Steel and Tool Steel	45 - 55	.010 (.004 - .020)	.015 (.006 - .030)

RECOMMENDED STARTING FEED VALUES RELATIVE TO DEPTH OF CUT	depth of cut a_p (inches)			
	.020	.040	.060	.078
Recommended feed per insert f_z (inches) starting (range)	.070 (.060 - .080)	.060 (.040 - .070)	.040 (.025 - .060)	.030 (.015 - .040)

OTHER APPLICATIONS

See pages 92 and 93 for feed recommendations for ramping, helical milling and plunging applications.

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GP2115			GA4225			GA4230			GM2140		
						f_z (inch)			f_z (inch)			f_z (inch)			f_z (inch)		
						.035	.050	.065	.035	.050	.065	.035	.050	.065	.030	.045	.055
P Steel	P0	Low-Carbon Steels, Long Chipping (C < .25%) Ex. A36, 1008, 1010, 1018, 1108, 1117	<125		<530	840	720	580	760	650	525	720	620	500			
	P1	Low-Carbon Steels, Short Chipping, Free Machining (C < .25%) Ex. 10L18, 1200 Series, 1213, 12L14	<125		<530	760	620	490	690	560	440	655	530	420			
	P2	Medium- and High-Carbon Steels (C > .25%) Ex. 1035, 1045, 10L45, 1080, 1137, 1144, 1525, 1572	<220	<25	>530	680	590	475	620	535	430	590	510	410			
	P3	Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, O, S, M, T	<330	<35	600-850	560	450	360	510	410	325	480	390	310			
	P4	High-Strength Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, O, S, M, T	340-450	35-48	850-1400	420	335	265	380	305	240	360	290	230			
	P5	Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series	<330	<35	600-900				605	525	420	575	500	400	545	475	380
	P6	High-Strength Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series	340-450	35-48	900-1350				440	360	285	420	340	270	400	325	255

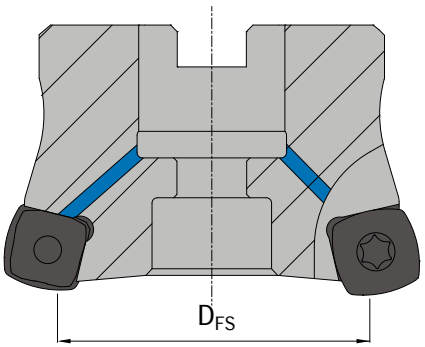
ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)											
						GA4225			GA4230			GS4130			GM2140		
						f_z (inch)			f_z (inch)			f_z (inch)			f_z (inch)		
						.025	.035	.045	.025	.035	.045	.025	.035	.045	.025	.035	.045
M Stainless Steel	M1	Austenitic Stainless Steels Ex. 200 Series, 301, 302, 304, 304L, 309	130-200		<600	560	450	340	530	430	325	500	410	310	500	410	310
	M2	High-Strength Austenitic Stainless and Cast Stainless Steels Ex. 310, 316, 316L, 321, 347, 384	150-230	<25	600-800	510	410	310	480	390	295	455	370	280	455	370	280
	M3	Duplex Stainless Steels Ex. 323, 329, F55, 2205	135-275	<30	<800	450	360	275	425	345	260	400	325	245	400	325	245

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)								
						GA4225			GA4230					
						f_z (inch)			f_z (inch)					
						.035	.050	.065	.035	.050	.065			
K Cast Iron	K1	Gray Cast Iron Ex. Class 20, 25, 30, 35, 40, 45, 50, 55, 60, G1800, G3000, G3500, G4000	120-290	<32	125-500	690	560	440	655	530	420			
	K2	Ductile Cast Irons (Nodular Irons) and Compacted Graphite Irons (CGI) Ex. 60-40-18, 65-45-12, 80-55-06, SAE J434: D4018, D4512, D5506	130-260	<28	<600	620	520	390	590	490	370			
	K3	High-Strength Ductile Irons and Austempered Ductile Irons (ADI) Ex. ASTM A536: 100-70-03, 120-90-02, SAE J434: D7003	180-350	<43	>600	550	470	360	525	450	345			

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)								
						GA4230			GS4130			GM2140		
						f_z (inch)			f_z (inch)			f_z (inch)		
						.008	.016	.024	.008	.016	.024	.008	.016	.024
S High Temp Alloys	S1	Iron-Based Heat-Resistant Alloys Ex. A286, A608, INCOLOY 800 Series, N-155, Haynes 556, Discaloy	160-260	25-48	500-1200	200	130	100	190	120	90	190	120	90
	S2	Cobalt-Based Heat-Resistant Alloys Ex. Haynes 25 (L605), Haynes 188, Stellite, MAR-M302, MAR-M509	250-450	25-48	1000-1450	170	100	80	160	90	70	160	90	70
	S3	Nickel-Based Heat-Resistant Alloys Ex. Astroloy, Hastelloy X, INCONEL 600 and 700 Series, Waspalloy	160-450	<48	600-1700	180	110	90	170	100	80	170	100	80
	S4	Titanium and Titanium Alloys Ex. Commercially Pure Ti, Ti-5Al-2.5Sn, Ti-6Al-4V, Ti-3Al-8V-6Cr-4Zr-4Mo	300-400	33-48	900-1600	190	120	95	180	110	85	180	110	85

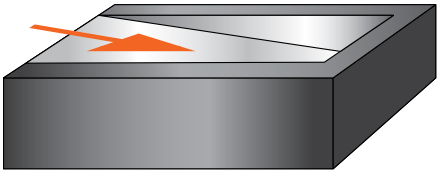
ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)								
						GA4230								
						f_z (inch)								
						.006	.012	.020						
H Hardened Steels	H1	Hardened Alloy Steels and Tool Steels Ex. H13,D2, D3, 4340,P20		44-48		320	260	210						
	H2	Hardened Alloy Steels and Tool Steels Ex. H13,D2, D3, 4340,P20		48-55		260	210	165						
	H3	Hardened Alloy Steels and Tool Steels Ex. H13,D2, D3, 4340,P20		56-60										
	H4	Hardened Alloy Steels and Tool Steels Ex. H13,D2, D3, 4340,P20		>60										

WIDTH OF CUT FOR FLAT SURFACES



CUTTER DIAMETER	D_{FS}
1.250	0.53
1.500	0.78
2.000	1.28
2.500	1.78
3.000	2.28
4.000	3.28
5.000	4.28

RAMPING



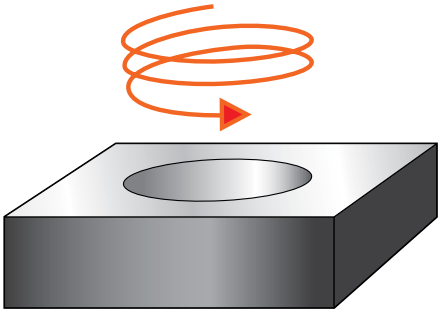
CUTTER DIAMETER	MAX RAMPING ANGLE
1.250	1.8°
1.500	1.5°
2.000	1.2°
2.500	0.9°
3.000	0.8°
4.000	0.6°
5.000	0.4°

FEED RECOMMENDATION
Reduce feed for ramping applications to 75% of normal value.

EXAMPLE: If the calculated face milling feed rate is 200 inches/min, reduce the feed rate for ramping to:

200 inches/min x 75% = 150 inches/min

HELICAL MILLING



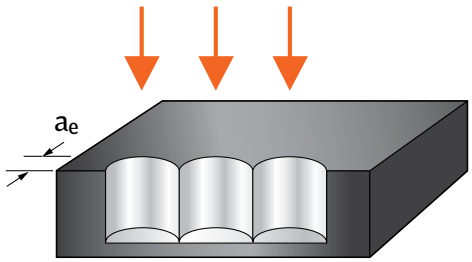
CUTTER DIAMETER	MINIMUM HOLE SIZE	MAXIMUM HOLE SIZE
1.250	1.71	2.42
1.500	2.21	2.92
2.000	3.21	3.92
2.500	4.21	4.92
3.000	5.21	5.92
4.000	7.21	7.92
5.000	9.21	9.92

FEED RECOMMENDATION
Reduce feed for helical milling applications to 30% - 50% of normal value.

EXAMPLE: If the calculated face milling feed rate is 200 inches/min, reduce the feed rate for helical milling to a range of:

200 inches/min x 30% = 60 inches/min
200 inches/min x 50% = 100 inches/min

PLUNGE MILLING

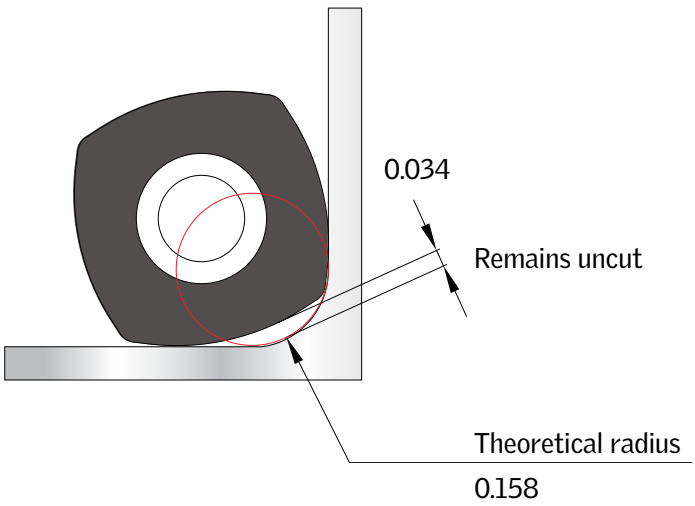


Maximum width of cut a_e = 0.330

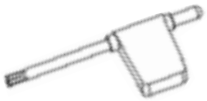
FEED RECOMMENDATION
Recommended starting feed per insert
f_Z = .006 (.002-.010)

PROGRAMMING INFORMATION

CAD/CAM systems require a defined theoretical radius value when programming pocketing applications (cavity machining). The theoretical radius value is noted on the drawing to the right, as well as the approximate amount of material that will remain uncut.



SPARE PARTS

INSERT SCREW	WRENCH
	
NS521	FWT15

Spindle speed, n (rpm)

$$n = \frac{3.82 \times v_c}{D}$$

Cutting speed, v_c (ft / min)

$$v_c = .262 \times D \times n$$

Feed rate, v_f (in / min)

$$v_f = n \times f_z \times z$$

Feed per insert, f_z (in)

$$f_z = \frac{v_f}{n \times z}$$

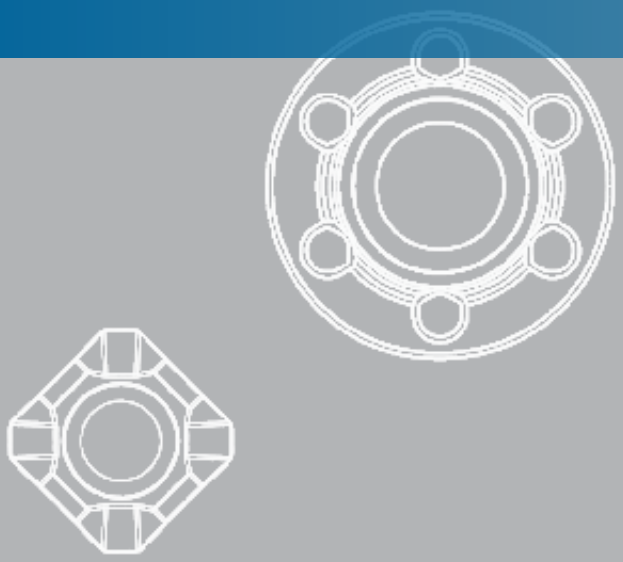
Metal removal rate, Q (in^3 / min)

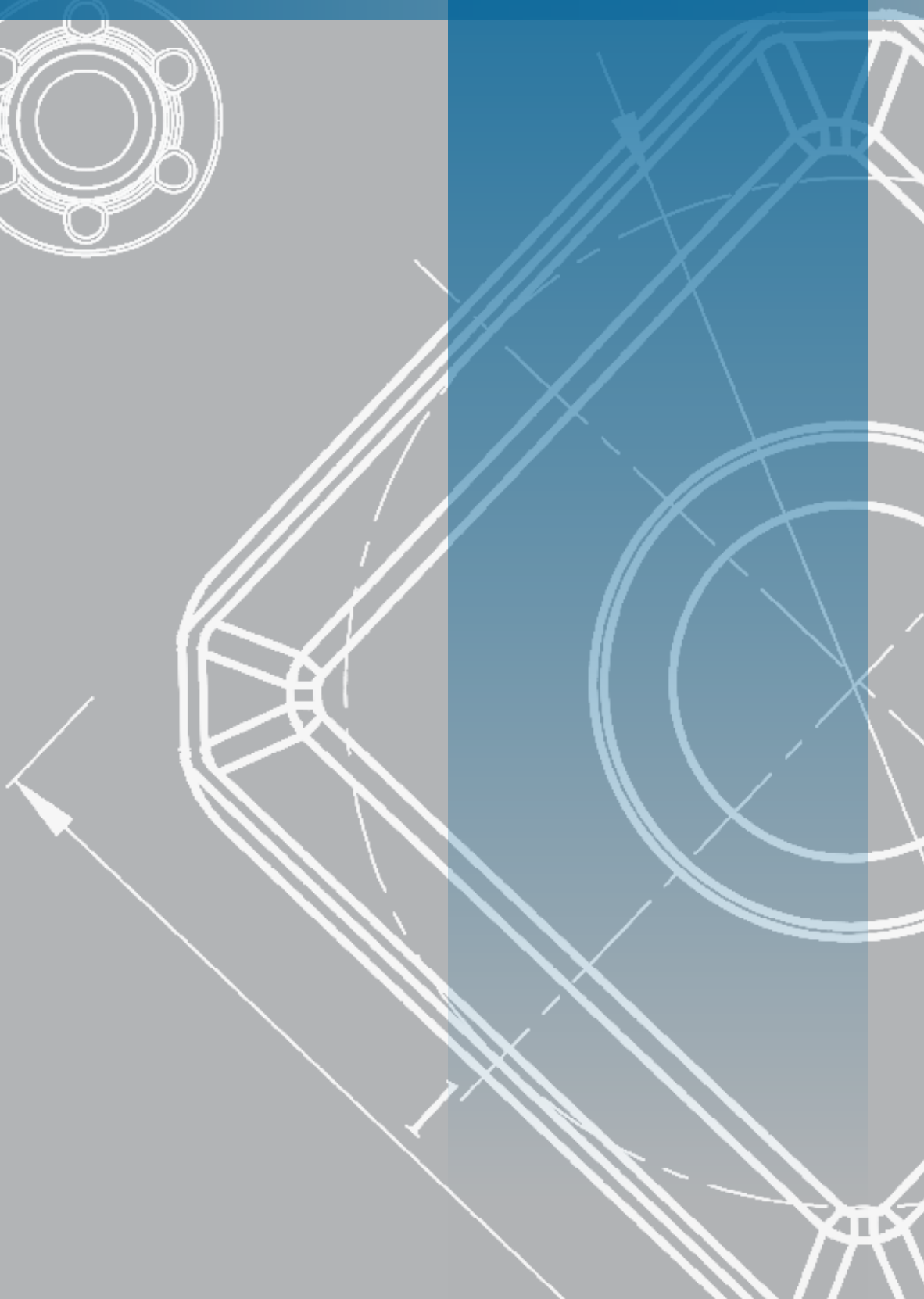
$$Q = a_e \times a_p \times v_f$$

a_e	width of cut	inches
a_p	depth of cut	inches
D	cutter diameter	inches
f_z	feed per insert	inches
n	spindle speed	rev/min
Q	metal removal rate	$inches^3$/min
v_c	cutting speed	feet/min
v_f	feed rate	inches/min
z	number of inserts	

MILLING INSERTS

INDUSTRY STANDARD INSERTS
FOR SQUARE SHOULDER, FACEMILLING
AND PROFILE MILLING APPLICATIONS





Grade GA4230

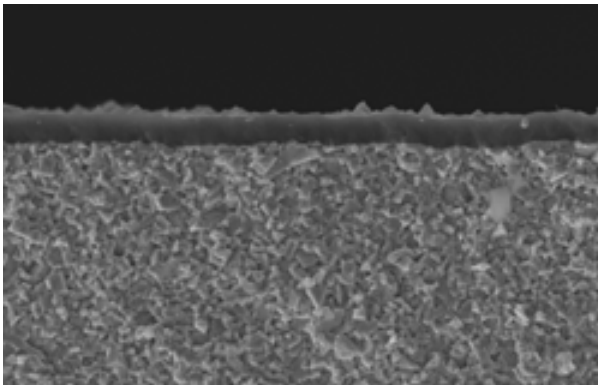
Superior Milling Performance in a Wide Range of Applications

Outstanding results in Steels, Stainless Steels, Cast Iron and Heat-Resistant Super Alloys

Withstands difficult cutting conditions – varying depths of cut, weak and unstable setups, vibrations

GA4230 - Advanced Substrate Development

- Homogeneous submicron grain structure
- Specialized processing treatment provides exceptional fracture-resistant properties and superior wear resistance
- Stable performance under a wide range of machining conditions



GA4230 - Next Generation Coating Technology

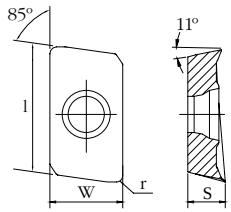
- New TiAlN+ Advanced PVD Coating
- Outstanding wear resistance properties and long tool life through improved microstructure and surface treatment
- Increased adhesion strength to substrate provides predictable tool life and reliable performance
- Effective in HRSA's and other difficult-to-machine materials due to high heat resistance and oxidation resistance characteristics

WORKPIECE MATERIAL	ANSI	ISO	Coating Type: PVD
P Steel	C8	01	
		10	
	C7	20	GA4230
	C6	30	
		40	
M Stainless Steel	–	01	
	–	10	
	–	20	GA4230
	–	30	
K Cast Iron	C4	01	
	C3	10	
	C2	20	GA4230
	C1	30	
S Heat-Resistant Super Alloys	–	01	
	–	10	
	–	20	GA4230
	–	30	

wear resistance ↕ toughness

SQUARE SHOULDER MILLING

APMT



Widely used inserts for square shoulder endmilling and facemilling applications. Two cutting edges with smooth free cutting action.

PL: Light cutting with lowest cutting forces
PM: Medium machining with broad application range
PR: Roughing with highest edge security

APPLICATION	ITEM	CATALOG NUMBER	DIMENSIONS (INCH)				CUTTING DATA (INCH)		P	M	K	S
			l	W	s	r	depth of cut, a_p	feed per insert, f_z	MULTI-MATERIAL GA4230			
LIGHT		**APMT 160408PDER-PL**	.640	.364	.187	.031	max .551	.002 - .006	★			
MEDIUM		**APMT 160408PDER-PM**	.640	.364	.187	.031	max .551	.003 - .008	★			
MEDIUM		**APMT 160416PDER-PM**	.640	.364	.187	.063	max .551	.003 - .008	★			
HEAVY		**APMT 160408PDER-PR**	.640	.364	.187	.031	max .551	.006 - .012	★			

Ordering Example: 20 pcs APMT 160408PDER-PR GA4230

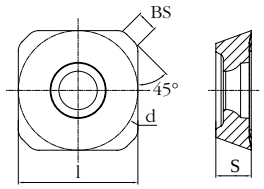
INSERT COMPATIBILITY

APMT 1604 milling inserts are interchangeable with other APMT 1604 inserts, and also fit tools using the following insert types:

APKT 1604	APKT 263	APKX 1604	APMW 1604	APMX 1604

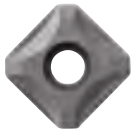
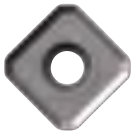
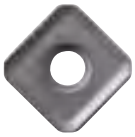
45° FACEMILLING

SEET



Very popular facemilling inserts, commonly used on low powered machines and smaller machining centers. High positive rake angles and geometries. Four cutting edges for economy.

PL: Light cutting with lowest cutting forces
PM: Medium machining with broad application range
PH: Heavy cutting with highest edge security

APPLICATION	ITEM	CATALOG NUMBER	DIMENSIONS (INCH)				CUTTING DATA (INCH)		P	M	K	S
			d	l	s	BS	depth of cut, a_p	*feed per insert, f_z	MULTI-MATERIAL GA4230			
LIGHT		**SEET 13T3AGEN-PL**	.528	.528	.156	.067	max .240	.003 - .008	★			
MEDIUM		**SEET 13T3AGEN-PM**	.528	.528	.156	.047	max .240	.004 - .012	★			
HEAVY		**SEET 13T3AGSN-PH**	.528	.528	.156	.047	max .240	.006 - .016	★			

Ordering Example: 20 pcs SEET 13T3AGSN-PH GA4230

***NOTE**: Feed per insert (f_z) values shown include feedrate multiplier to compensate for 45° lead angle chip thinning.

INSERT COMPATIBILITY

SEET 13T3 inserts are interchangeable with, and fit tools using, the following insert types:

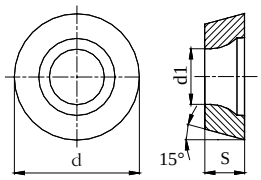
R245-12T3 SEET 13T3 SEGT 13T3 SEHT 13T3 SEKT 13T3 SEMT 13T3 SEPT 13T3

REFERENCE PAGES

GRADE INFORMATION	96	TECHNICAL INFORMATION	101	CUTTING SPEED RECOMMENDATIONS	104

PROFILE MILLING

RDET
RDMW



Industry standard profiling inserts with high performance grade and geometries. 15° clearance angle for wide variety of common industry cutters. Excellent value and economy.

BL: *Light cutting with lowest cutting forces*
GM: *Medium machining with broad application range*
T-BM, T: *Roughing with highest edge security*

APPLICATION	ITEM	CATALOG NUMBER	DIMENSIONS (INCH)			CUTTING DATA (INCH)		P	M	K	S
			d	d1	s	*depth of cut, a_p	*feed per insert, f_z	MULTI-MATERIAL GA4230			
LIGHT		**RDET 1204M0-BL**	12mm	.173	.187	.118	.003 - .010	★			
		RDET 1604M0-BL	16mm	.217	.187	.157	.004 - .010	★			
MEDIUM		**RDET 1204M0-GM**	12mm	.173	.187	.118	.004 - .012	★			
		RDET 1604M0-GM	16mm	.217	.187	.157	.004 - .014	★			
HEAVY		**RDMW 1204M0T-BM**	12mm	.173	.187	.118	.005 - .015	★			
HEAVY		**RDMW 1604M0T**	16mm	.217	.187	.157	.006 - .018	★			

Ordering Example: 20 pcs RDMW 1604M0T GA4230

***NOTE:** For general profiling applications the recommended maximum depth of cut noted is one-half the theoretical maximum depth of cut for the insert. Proper feedrates for round inserts are dependent on the depth of cut. The recommended feed values provided are for the depths of cut shown. For larger depths of cut decrease the feed; for smaller depths of cut increase the feed.

INSERT COMPATIBILITY

RDET and RDMW 1204 and 1604 inserts fit cutters using the same insert descriptions, and also fit tools using the following insert types:

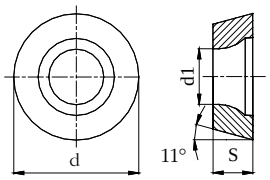
RDEW	RDEX	RDGT	RDHT	RDHW	RDHX	RDMT	RDPX

REFERENCE PAGES

GRADE INFORMATION	96	TECHNICAL INFORMATION	101	CUTTING SPEED RECOMMENDATIONS	104

PROFILE MILLING

RPET
RPMW



Industry standard profiling inserts with high performance grade and geometries. 11° clearance angle for broad range of common industry cutters. Excellent value and economy.

GL: Light cutting with lowest cutting forces
GM: Medium machining with broad application range
T: Roughing with highest edge security

APPLICATION	ITEM	CATALOG NUMBER	DIMENSIONS (INCH)			CUTTING DATA (INCH)		P	M	K	S
			d	d1	s	*depth of cut, a_p	*feed per insert, f_z	MULTI-MATERIAL GA4230			
LIGHT		**RPET 1204M0-GL**	12mm	.173	.187	.118	.003 - .010	★			
MEDIUM		**RPET 1204M0-GM**	12mm	.173	.187	.118	.004 - .012	★			
HEAVY		**RPMW 1204M0T**	12mm	.173	.187	.118	.005 - .015	★			

Ordering Example: 20 pcs RPMW 1204M0T GA4230

***NOTE:** For general profiling applications the recommended maximum depth of cut noted is one-half the theoretical maximum depth of cut for the insert. Proper feedrates for round inserts are dependent on the depth of cut. The recommended feed values provided are for the depths of cut shown. For larger depths of cut decrease the feed; for smaller depths of cut increase the feed.

INSERT COMPATIBILITY

RPET and RPMW 1204 inserts fit cutters using the same insert descriptions, and also fit tools using the following insert types:

RPCT	RPCW	RPEW	RPEX	RPHT	RPMT

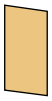
REFERENCE PAGES

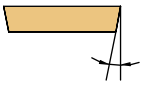
GRADE INFORMATION	96	TECHNICAL INFORMATION	101	CUTTING SPEED RECOMMENDATIONS	104

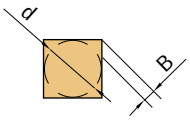
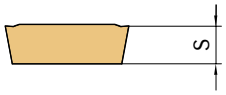
TECHNICAL INFORMATION
MILLING

EXAMPLE 1

A	P	M	T	16	04	08	P	D	E	R	-	PL
1	2	3	4	5	6	7	8	9	10	11		12

1		
Insert Shape		
A	85⁰ Parallelogram	
R	Round	
S	Square	

2	
Clearance Angle	
	
D	15⁰ Positive Rake
E	20⁰ Positive Rake
P	11⁰ Positive Rake

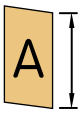
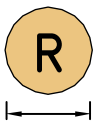
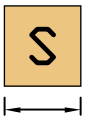
3			
Tolerances, inch			
			
Tolerance Class	tolerance on 'd'	tolerance on 'B'	tolerance on 's'
E	± .001	± .001	± .001
M	see table	see table	± .005

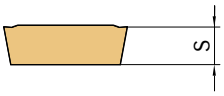
Tolerance Class M, inch		
d	**tolerance on 'd'**	**tolerance on 'B'**
3/8 (10mm)	± .002	± .003
1/2 (12mm)	± .003	± .005
5/8 (16mm)	± .004	± .006

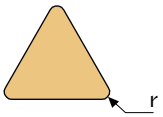
4		
Insert Type		
T	Screw-Down Clamping, Single-sided with Chipformer	
W	Screw-Down Clamping, Single-sided without Chipformer	
X	Manufacturer-Specific Design	——

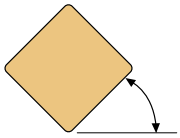
EXAMPLE 2

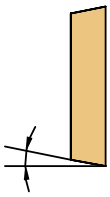
R	D	M	W	12	04	M0	T	-	BM
1	2	3	4	5	6	8	10		12

5			
Insert Size			
Nominal Cutting Edge Length, mm			
Symbol			
12		12	
13			13.4
16	16.4	16	

6	
Thickness, inch	
	
Symbol	s
T3	5/32
04	3/16

7	
Corner Radius, inch	
	
Symbol	r
08	1/32
16	1/16

8	
Cutting Edge Angle	
	
A	45⁰
P	90⁰
M0	round, metric sizes

9	
Secondary Cutting Edge Clearance Angle	
	
D	15⁰
G	30⁰

10		
Cutting Edge Preparation		
E	Honed	
S	Honed T-land	
T	T-land	

11	
Hand of Insert	
R	Right-hand
L	Left-hand
N	Neutral

12
Insert Geometry Designation
Indicates the machining properties or chipformer features
Manufacturer-specific

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)								
						GA4230								
						f_z (inch)								
						.004	.008	.012						
P Steel	P0	Low-Carbon Steels, Long Chipping (C < .25%) Ex. A36, 1008, 1010, 1018, 1108, 1117	<125		<530	920	720	590						
	P1	Low-Carbon Steels, Short Chipping, Free Machining (C < .25%) Ex. 10L18, 1200 Series, 1213, 12L14	<125		<530	820	655	490						
	P2	Medium- and High-Carbon Steels (C > .25%) Ex. 1035, 1045, 10L45, 1080, 1137, 1144, 1525, 1572	<220	<25	>530	720	590	480						
	P3	Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, O, S, M, T	<330	<35	600-850	655	560	460						
	P4	High-Strength Alloy Steels and Tool Steels (C > .25%) Ex. P20, 1300, 2000, 3000, 4000, 5000, 8000, SAE A, D, H, O, S, M, T	340-450	35-48	850-1400	590	490	390						
	P5	Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series	<330	<35	600-900	680	575	470						
	P6	High-Strength Ferritic, Martensitic and PH Stainless Steels Ex. 13-8 PH, 15-5 PH, 17-4 PH, 400 and 500 Series	340-450	35-48	900-1350	525	460	390						

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)								
						GA4230								
						f_z (inch)								
						.004	.008	.012						
M Stainless Steel	M1	Austenitic Stainless Steels Ex. 200 Series, 301, 302, 304, 304L, 309	130-200		<600	640	530	425						
	M2	High-Strength Austenitic Stainless and Cast Stainless Steels Ex. 310, 316, 316L, 321, 347, 384	150-230	<25	600-800	575	480	380						
	M3	Duplex Stainless Steels Ex. 323, 329, F55, 2205	135-275	<30	<800	510	425	340						

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)								
						GA4230								
						f_z (inch)								
						.004	.008	.012						
K Cast Iron	K1	Gray Cast Iron Ex. Class 20, 25, 30, 35, 40, 45, 50, 55, 60, G1800, G3000, G3500, G4000	120-290	<32	125-500	790	655	490						
	K2	Ductile Cast Irons (Nodular Irons) and Compacted Graphite Irons (CGI) Ex. 60-40-18, 65-45-12, 80-55-06, SAE J434: D4018, D4512, D5506	130-260	<28	<600	720	590	460						
	K3	High-Strength Ductile Irons and Austempered Ductile Irons (ADI) Ex. ASTM A536: 100-70-03, 120-90-02, SAE J434: D7003	180-350	<43	>600	655	525	430						

ISO	Material Group	Workpiece Material	Brinell Hardness HB	Rockwell Hardness HRC	Tensile Strength MPa	Recommended Starting Speeds v_c (ft/min)								
						GA4230								
						f_z (inch)								
						.004	.008	.012						
S High Temp Alloys	S1	Iron-Based Heat-Resistant Alloys Ex. A286, A608, INCOLOY 800 Series, N-155, Haynes 556, Discaloy	160-260	25-48	500-1200	180	150	115						
	S2	Cobalt-Based Heat-Resistant Alloys Ex. Haynes 25 (L605), Haynes 188, Stellite, MAR-M302, MAR-M509	250-450	25-48	1000-1450	150	110	-						
	S3	Nickel-Based Heat-Resistant Alloys Ex. Astroloy, Hastelloy X, INCONEL 600 and 700 Series, Waspalloy	160-450	<48	600-1700	160	120	-						
	S4	Titanium and Titanium Alloys Ex. Commercially Pure Ti, Ti-5Al-2.5Sn, Ti-6Al-4V, Ti-3Al-8V-6Cr-4Zr-4Mo	300-400	33-48	900-1600	170	130	-						

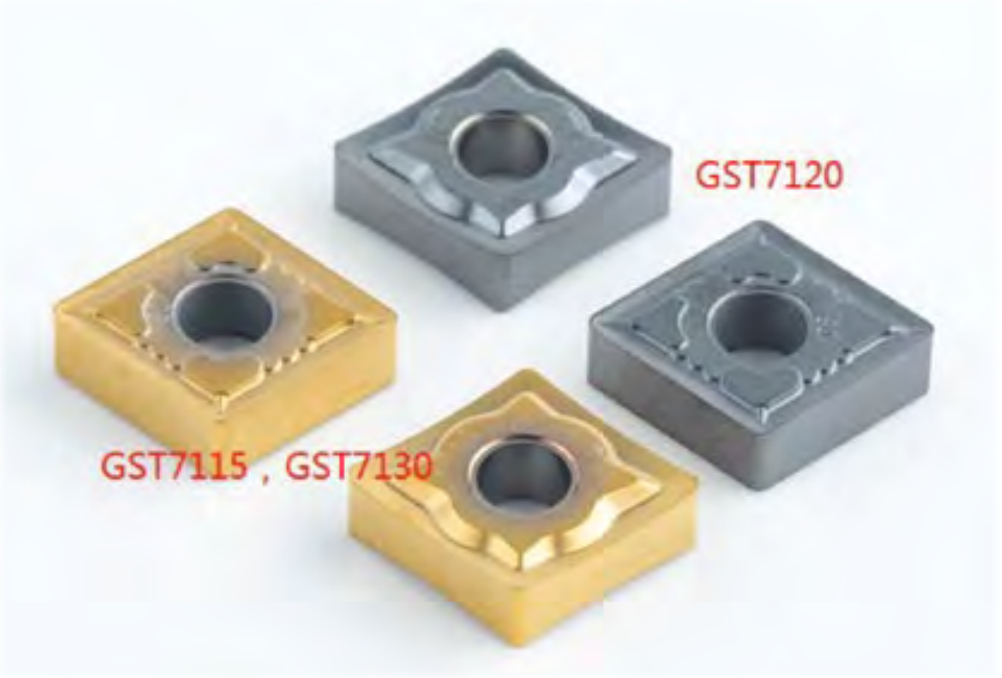
HARDNESS COMPARISON TABLE

TENSILE STRENGTH	HARDNESS		
MPa	Brinell HB	Vickers HV	Rockwell HRC
530	156	165	
560	166	175	
595	176	185	
625	185	195	
660	195	205	
690	204	215	
720	214	225	
740	219	230	
755	223	235	
770	228	240	20.3
785	233	245	21.3
800	238	250	22.2
820	242	255	23.1
835	247	260	24.0
850	252	265	24.8
865	257	270	25.6
880	261	275	26.4
900	266	280	27.1
915	271	285	27.8
930	276	290	28.5
950	280	295	29.2
965	285	300	29.8
995	295	310	31.0
1030	304	320	32.2
1060	314	330	33.3
1095	323	340	34.4
1125	333	350	35.5
1155	342	360	36.6
1190	352	370	37.7
1220	361	380	38.8
1255	371	390	39.8
1290	380	400	40.8
1320	390	410	41.8
1350	399	420	42.7
1385	409	430	43.6
1420	418	440	44.5
1455	428	450	45.3

TENSILE STRENGTH	HARDNESS		
MPa	Brinell HB	Vickers HV	Rockwell HRC
1485	437	460	46.1
1520	447	470	46.9
1555	456	480	47.7
1595	466	490	48.4
1630	475	500	49.1
1665	485	510	49.8
1700	494	520	50.5
1740	504	530	51.1
1775	513	540	51.7
1810	523	550	52.3
1845	532	560	53.0
1880	542	570	53.6
1920	551	580	54.1
1955	561	590	54.7
1995	570	600	55.2
2030	580	610	55.7
2070	589	620	56.3
2105	599	630	56.8
2145	608	640	57.3
2180	618	650	57.8
		660	58.3
		670	58.8
		680	59.2
		690	59.7
		700	60.1
		720	61.0
		740	61.8
		760	62.5
		780	63.3
		800	64.0
		820	64.7
		840	65.3
		860	65.9
		880	66.4
		900	67.0
		920	67.5
		940	68.0

Turning Inserts - HRSA Materials

Negative Rake Inserts



Introductory Program

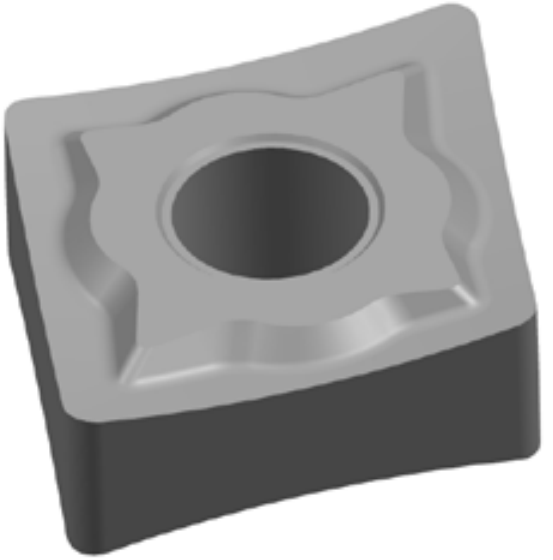
New Program Info

- Brand new products targeted at turning HRSA materials
- Two new chipbreakers, EL and EM
- Three new PVD grades GST7115, GST7120 and GST7130
- Initial assortment C, D, S, V and W shapes
- 86 total items to start
- More coming!

Dedicated Chipbreakers

EL

Semi-finishing of
HRSA Materials

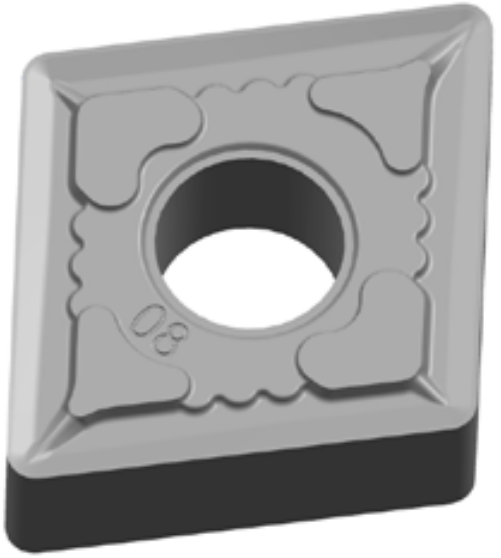


- Low cutting forces, great for thin-walled parts or long overhangs
- Depth of cut range .025” - .125”
- Feed range .004” - .009”
- Not for finishing – SF GS3115 still best choice for finishing

Dedicated Chipbreakers

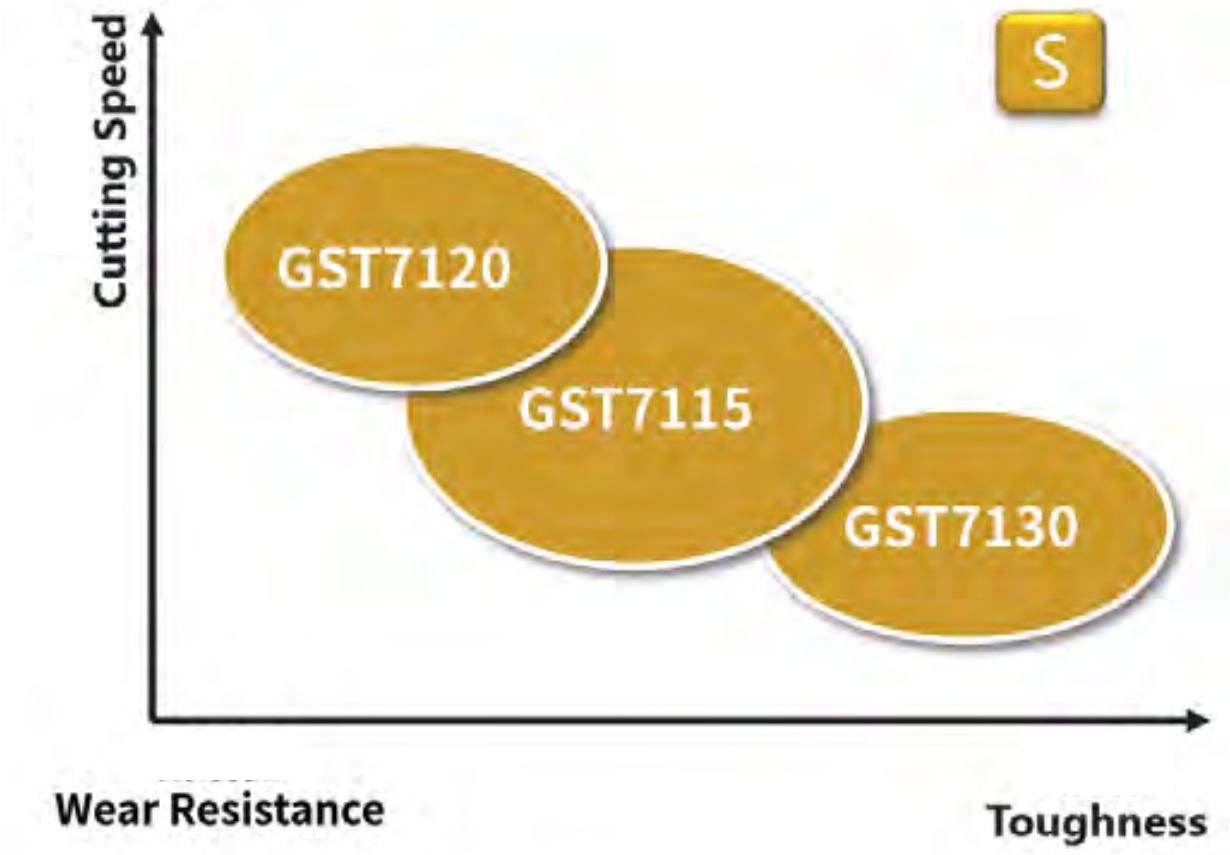
EM

Medium Machining
of HRSA Materials



- Medium to light roughing applications
- Depth of cut range .040” - .160”
- Feed range .004” - .014”

New Grades - HRSA Materials



New Grades for HRSA Materials

All grades utilize latest generation PVD multi-layer technology

GST7115

First choice grade with broadest range, typical application parameters at low to medium cutting speeds

GST7120

For best wear resistance with stable conditions, medium to higher speed applications, continuous cuts

GST7130

For toughness-demanding applications, low speed unstable conditions, interrupted cuts

HIH CARBIDE

HIH CARBIDE

Intro Product Range

CNMG-EL

Semi-finishing

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
CNMG431-EL	CNMG120404-EL	■	■	
CNMG432-EL	CNMG120408-EL	■	■	■
CNMG433-EL	CNMG120412-EL	■	■	
CNMG542-EL	CNMG160608-EL	■	■	
CNMG543-EL	CNMG160612-EL	■	■	
CNMG642-EL	CNMG190608-EL	■		■
CNMG643-EL	CNMG190612-EL	■		■

CNMG-EM

Medium Machining

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
CNMG431-EM	CNMG120404-EM	■	■	■
CNMG432-EM	CNMG120408-EM	■	■	■
CNMG433-EM	CNMG120412-EM	■	■	■
CNMG542-EM	CNMG160608-EM	■	■	■
CNMG543-EM	CNMG160612-EM	■	■	■

Intro Product Range

DNMG-EL

Semi-finishing

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
DNMG431-EL	DNMG150404-EL	■	■	
DNMG432-EL	DNMG150408-EL	■	■	
DNMG433-EL	DNMG150412-EL	■	■	
DNMG441-EL	DNMG150604-EL	■	■	
DNMG442-EL	DNMG150608-EL	■	■	
DNMG443-EL	DNMG150612-EL	■	■	

DNMG-EM

Medium Machining

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
DNMG432-EM	DNMG150408-EM	■	■	■
DNMG433-EM	DNMG150412-EM	■	■	■
DNMG442-EM	DNMG150608-EM	■	■	■
DNMG443-EM	DNMG150612-EM	■	■	■

Intro Product Range

SNMG-EM

Medium Machining

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
SNMG431-EM	SNMG120404-EM	■	■	
SNMG432-EM	SNMG120408-EM	■	■	■
SNMG433-EM	SNMG120412-EM	■	■	■

Product Bulletin

High Feed Milling Solutions

Application Information

- High-quality hardened alloy tool steel cutter bodies
- Machined in pre-hardened state for accuracy and low runout
- Diameter range 1.250” – 5.000”
- Thick, strong inserts with 4 cutting edges for max economy
- 2 geometries, 5 grades for a broad range of applications

Availability

- In the Catalog
- Cutters and Inserts - In Stock USA

Intro Product Range

VNMG-EL

Semi-finishing

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
VNMG331-EL	VNMG160404-EL	■	■	
VNMG332-EL	VNMG160408-EL	■	■	
VNMG333-EL	VNMG160412-EL	■	■	

VNMG-EM

Medium Machining

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
VNMG332-EM	VNMG160408-EM	■	■	■
VNMG333-EM	VNMG160412-EM	■	■	■

Intro Product Range

WNMG-EL

Semi-finishing

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
WNMG431-EL	WNMG080404-EL	■	■	
WNMG432-EL	WNMG080408-EL	■	■	
WNMG433-EL	WNMG080412-EL	■	■	

WNMG-EM

Medium Machining

CATALOG NUMBER	ISO Designation	Hi-Temp Alloys		
		GST7115	GST7120	GST7130
WNMG432-EM	WNMG080408-EM	■	■	■
WNMG433-EM	WNMG080412-EM	■	■	■

NEW!

TURNING SOLUTIONS FOR HRSA MATERIALS

Full Grade Profile Utilizing Advanced Material Substrates and Latest Generation PVD Coating Technology

S
Heat-Resistant Super Alloys

New Microstructure Processing Technology Increases Substrate Hardness At High Temperatures

Helps prevent cutting edge deformation and extends tool life

Innovative Nano-Structure PVD Multi-Layer Coatings

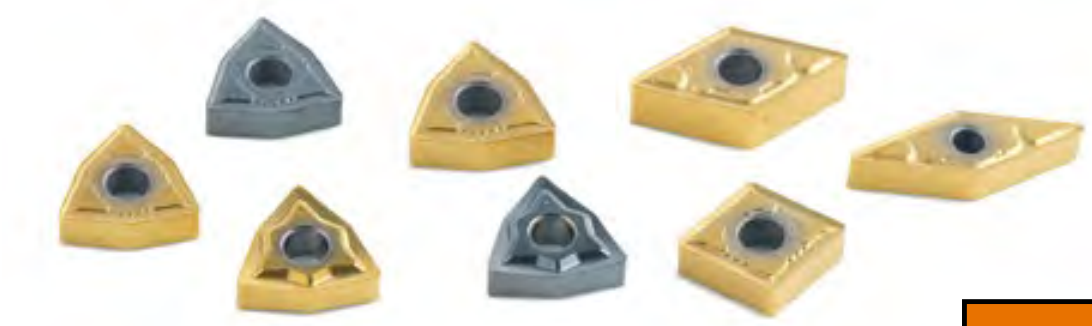
Superior coating adhesion at high temperatures for more time in cut

Coating Application Technology Optimized for HRSA Materials

Improved high temperature hardness and wear resistance for longer tool life

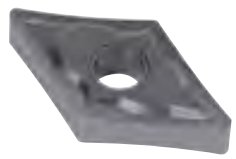
NEW!

TURNING SOLUTIONS FOR HRSA MATERIALS

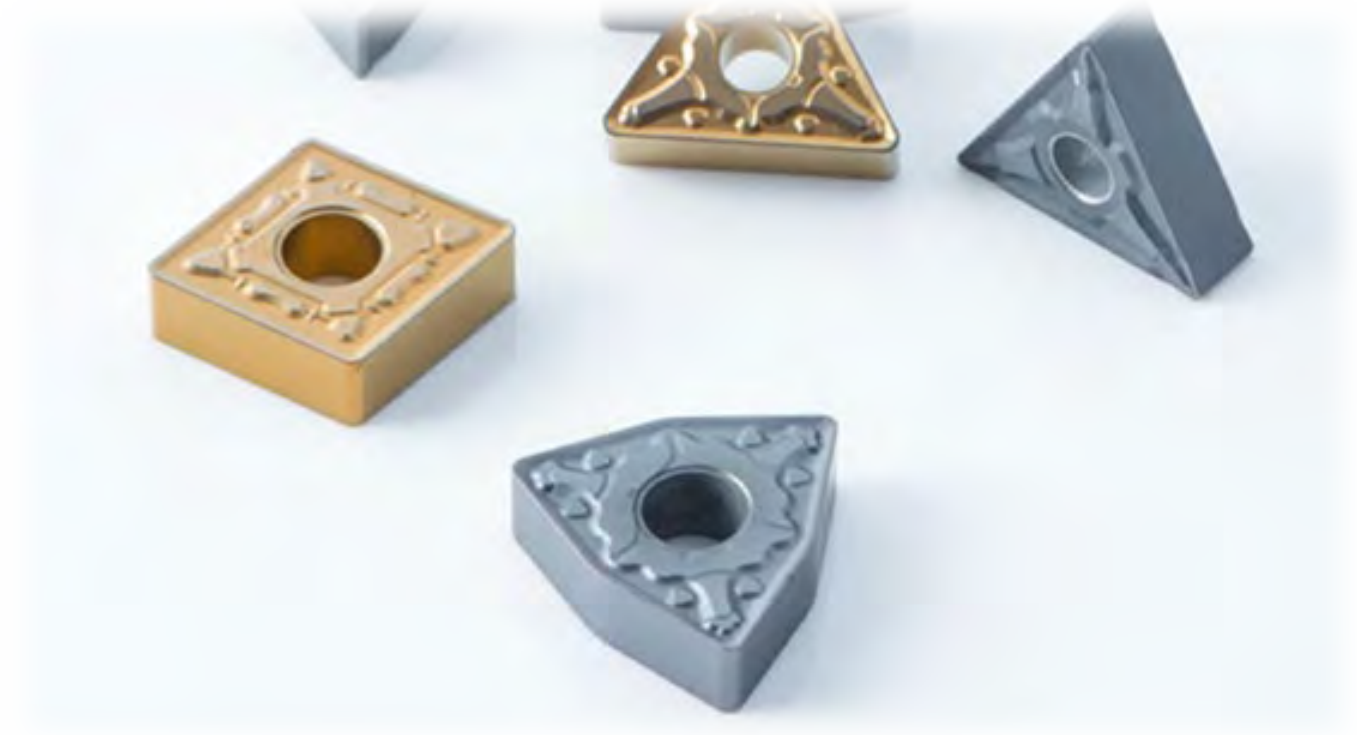


High Performance Cost-Effective Solutions

S
Heat-Resistant Super Alloys

EM	**Light Roughing to Medium Machining** • High impact resistance • Open chipbreaker design reduces cutting zone temperatures for increased tool life • Depths of cut .040" - .160" • Feed range .004" - .014"	
EL	**Semi-Finishing Applications** • Curved cutting edge design improves chip formation at small depths of cut • Low cutting forces • Depths of cut .025" - .125" • Feed range .004" - .009"	
SF	**Finishing** • Ultra-sharp cutting edge • Smooth, free cutting action without burrs • Excellent workpiece surface finish • Depths of cut .004" - .060" • Feed range .002" - .012"	

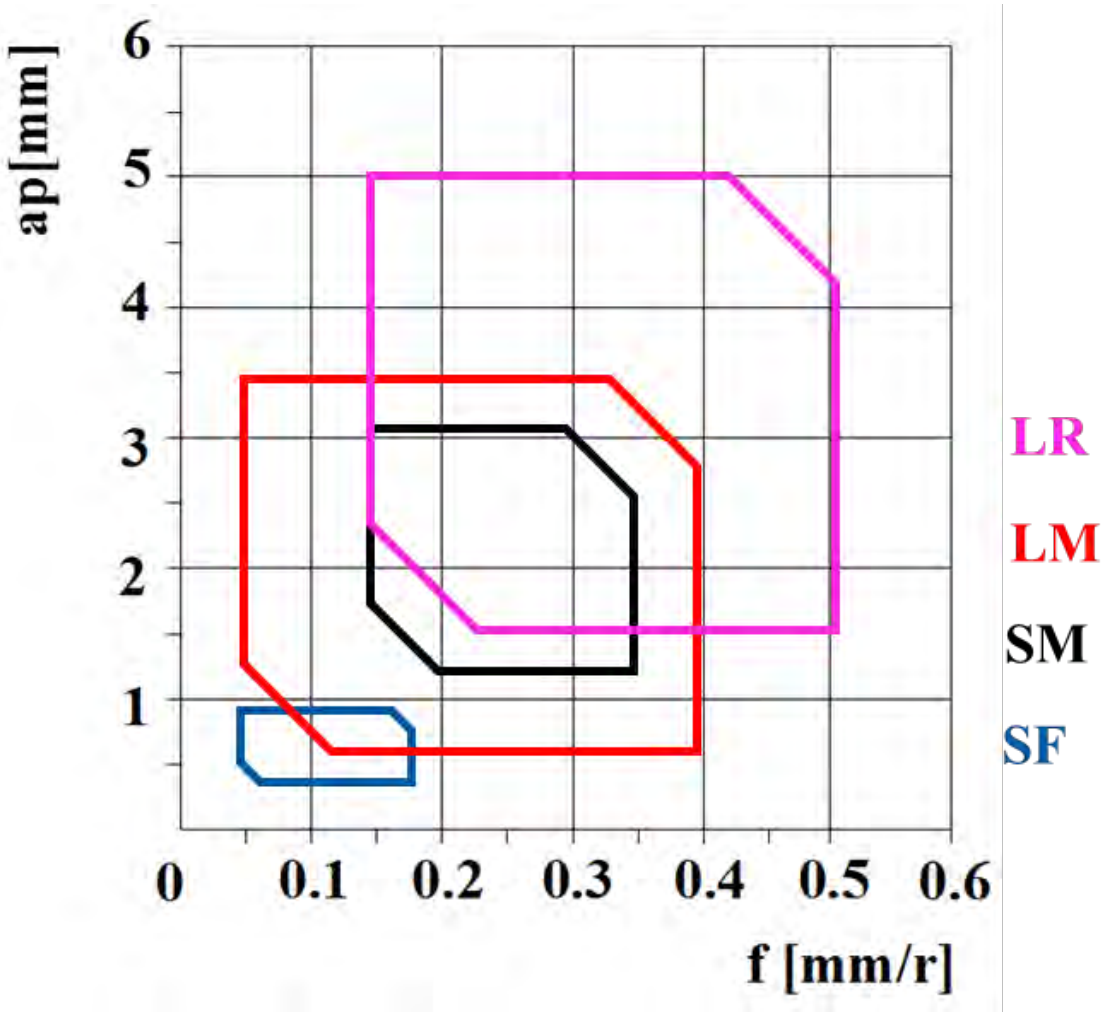
Development Program - Turning Inserts



Chipbreakers and Grades for Stainless Steel

HAND IN HAND
TECHNOLOGIES INC

Chipbreakers – LM and LR

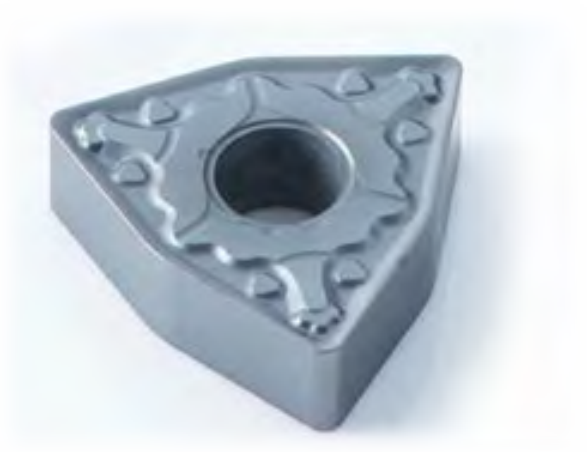


HAND IN HAND
TECHNOLOGIES INC

Chipbreakers – LM and LR

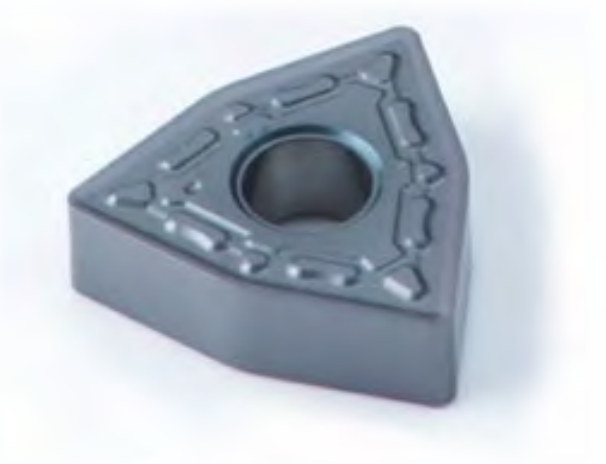
LM

Medium Machining of
Stainless Steel and HRSA



LR

Rough Machining of
Stainless Steel



HAND IN HAND
TECHNOLOGIES INC

Grades

GM1115 Stainless Steel

CVD – Stable Conditions – High Cutting Speeds

GM3215 Stainless Steel & HRSA

PVD – Stable Conditions – Medium to High Cutting Speeds

GM3225 Stainless Steel

PVD – Most Versatile / Broadest Application Area – Low to Medium Cutting Speeds

HAND IN HAND
TECHNOLOGIES INC

NEW!

STAINLESS STEEL TURNING SOLUTIONS

Complete Grade Profile for Turning Stainless Steels

- Optimized range of premium carbide substrates
- Latest generation CVD and PVD coatings

M
Stainless Steel

ISO	Grade Designation	Coating Type	Application
M Stainless Steel	**GM1115**	**CVD**	Best suited for stable conditions and high cutting speed applications. Outstanding wear resistance and coating adhesion properties. Post-coating treatment provides smoother cutting zone interface for reduced built-up edge and longer tool life.
	GM1125	**CVD**	Gradient-sintered tough substrate with excellent wear resistance – even at elevated cutting speeds. Excels at medium to high cutting speed applications, continuous cutting to moderate interruptions.
	GM3215	**PVD**	TiAlN Nano-Structure PVD-coated grade with exceptional balance of wear resistance and toughness. Well suited for stainless steel applications in stable conditions at medium cutting speeds.
	GM3225	**PVD**	Most versatile grade for stainless, with broadest working area. Optimized TiAlN PVD-coated grade, on tough, high-Co substrate. Superior performance at low to medium cutting speeds, continuous cutting to moderate interruptions.

wear resistance ↕ toughness

NEW!

STAINLESS STEEL TURNING SOLUTIONS

Premium Performance and Unbeatable Value

M
Stainless Steel

Advanced Geometry Chipbreaker Designs		
LR	**Roughing** • Unique "double-positive" chipbreaker • Optimized chip control at larger depths of cut • Reinforced edgeline for roughing • Depths of cut .060" - .200" • Feed range .006" - .020"	
LM	**Medium Machining** • Lower cutting forces with high edge sharpness • Precision micro-edge geometry optimized for stainless steel • Extremely broad application range • Depths of cut .030" - .150" • Feed range .004" - .016"	
SF	**Finishing** • Ultra-sharp cutting edge • Smooth, free cutting action without burrs • Excellent workpiece surface finish • Depths of cut .004" - .060" • Feed range .002" - .012"	

Product Bulletin

Square Shoulder Milling Solutions

Application Information

- High-quality hardened alloy tool steel cutter bodies
- Machined in pre-hardened state for accuracy and low runout
- Diameter range 0.625” – 4.000”
- 2 sizes single-sided APMT inserts, with 2 cutting edges
- 4 geometries, 7 grades for a broad range of applications
- Inserts fit Mitsubishi® BAP300, BAP400 series cutters
- Inserts also fit Korloy®, ZCC® and other supplier cutters

Availability

- Cutters and Inserts - In Stock USA

Product Bulletin

Square Shoulder Milling Inserts

R390-11T3

Application Information

- Single-sided, high-positive square shoulder milling inserts
- 2 helical cutting edges
- Fits all Sandvik® CoroMill® RA390 and R390 series milling cutters using insert size 11
- Interchangeable with Sandvik® R390-11T3 inserts

Availability

- In Stock USA

Product Bulletin

Square Shoulder Milling Inserts

SDKT 14T3

Application Information

- Single-sided, high-positive shoulder milling inserts
- 4 cutting edges
- Fits Sandvik® CoroMill® 490 series milling cutters
- Interchangeable with Sandvik® 490R-1404 inserts

Availability

- Ready to Order, see TechMet Sales Rep for info
- Overseas Stock

Product Bulletin

Square Shoulder Milling Inserts

LNMT 1506

Application Information

- Butterfly-shaped, tangentially mounted milling inserts
- 4 cutting edges
- Fits Iscar® F90LN series milling cutters
- Interchangeable with Iscar® LNKX / LNMT 1506 inserts

Availability

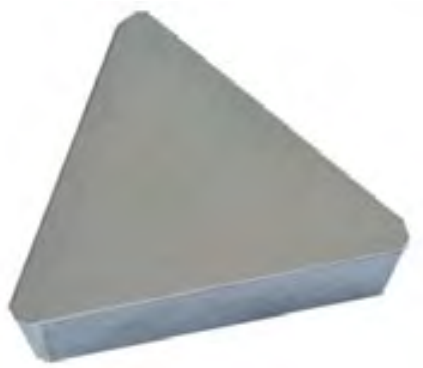
- Ready to Order, see TechMet Sales Rep for info
- Overseas Stock

Product Bulletin

Square Shoulder Milling Inserts

TPKN 32

TPKN 43



Application Information

- Industry Standard ISO milling inserts
- Available in universal PVD-coated GA4230 grade
- Available in uncoated grades GA0115 and GK0115

Availability

- Ready to Order, see TechMet Sales Rep for info
- Overseas Stock

Product Bulletin

Face Milling Inserts

SEET 13T3

Application Information

- Single-sided, high-positive 45° face milling inserts
- 4 cutting edges
- Fits Sandvik® CoroMill® 245 cutters / R245-12T3 inserts
- Fits Mitsubishi® ASX445 cutters / SExT-13T3 inserts
- Fits Sumitomo® WGX Series cutters / SExT-13T3 inserts
- Fits ZCC® FMA01/02 Series cutters / SEET-12T3 inserts

Availability

- In the Catalog
- In Stock USA

Product Bulletin

Face Milling Inserts

SNEU 1206

SNMU 1206

Application Information

- Double-sided 45° face milling inserts
- 8 cutting edges
- Fits Walter® F4033 cutters / SNxX 1205 inserts
- Fits Korloy® RM8 cutters / SNxX 1206 inserts

Availability

- Ready to Order, see TechMet Sales Rep for info
- Overseas Stock

Product Bulletin

Face Milling Inserts

HNEX 0905

Application Information

- Double-sided, 60° face milling of cast iron
- 12 cutting edges
- Fits Kennametal® HexaCut series milling cutters
- Interchangeable with HNxx inserts without hole

Availability

- Ready to Order, see TechMet Sales Rep for info
- Mixed Stock USA and Overseas

Product Bulletin

Face Milling Inserts

SEEN 42, 43

SEEN 53

Application Information

- Industry Standard ISO face milling inserts
- Available in multiple coated grades
- Available in uncoated grade GK0115

Availability

- Ready to Order, see TechMet Sales Rep for info
- Mixed Stock USA and Overseas

Product Bulletin

Face Milling Inserts

SPKN 42

SPKN 53

Application Information

- Industry Standard ISO face milling inserts
- Available in universal PVD-coated GA4230 grade
- Available in uncoated grades GA0115 and GK0115

Availability

- Ready to Order, see TechMet Sales Rep for info
- Overseas Stock

Product Bulletin

Face Milling Inserts

SBEX 1204

Application Information

- Fits Sandvik® AUTO-FS Finishing milling cutters
- SBEX 1204ZZ style inserts
- Available in PVD coated grade GK4125
- Available in uncoated grade GA0115

Availability

- Ready to Order, see TechMet Sales Rep for info
- Overseas Stock

Product Bulletin

Profile Milling Inserts

RDET, RDEW

RDMT, RDMW

Application Information

- Single-sided round milling inserts
- 15° clearance
- Sizes 5mm, 7mm, 8mm, 10mm, 12mm and 16mm
- Fit Walter®, Dijet®, ZCC® and other supplier cutters

Availability

- Sizes 12, 16 – In the Catalog, In Stock USA
- Sizes 5, 7, 8, 10 – Overseas Stock

Product Bulletin

Profile Milling Inserts

RPET, RPEW

RPMT, RPMW

Application Information

- Single-sided round milling inserts
- 11° clearance
- Sizes 8mm, 10mm, 12mm and 16mm
- Fits Dijet®, Mitsubishi® and other supplier cutters

Availability

- Size 12 – In the Catalog, In Stock USA
- Sizes 8, 10, 16 - Overseas Stock

Product Bulletin

Profile Milling Inserts

RCET

Application Information

- Single-sided round milling inserts
- Fits Sandvik® CoroMill® 200 milling cutters (metric)
- Interchangeable with Sandvik® RCHT / RCKT inserts
- Metric insert sizes – 10mm, 12mm, 16mm and 20mm

Availability

- Ready to Order, see TechMet Sales Rep for info
- Overseas Stock

Product Bulletin

Profile Milling Inserts

QTD

Application Information

- Finishing ballnose endmill inserts
- Fits Dijet® BNM milling cutters
- Fits Sandvik® R216F series milling cutters
- Metric sizes Ø12mm – Ø32mm

Availability

- Ready to Order, see TechMet Sales Rep for info
- Overseas Stock

Product Bulletin

Chamfer Milling Inserts

SPMT

Application Information

- SPMT 09T3 and 1204 size inserts
- Fits Walter® SPMT 09, 12 series cutters
- Fits Sandvik®, Kennametal®, Mitsubishi®, Widia®, ZCC® and other supplier SPMT ’12’ series cutters

Availability

- Ready to Order, see TechMet Sales Rep for info
- Mixed Stock USA and Overseas

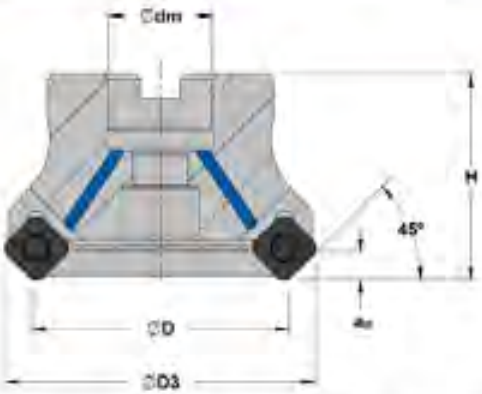
NEW PRODUCTS!

45° FACE MILLING SOLUTIONS

Cost-effective tools for roughing to finishing in a wide range of materials, featuring double-sided square inserts with 8 cutting edges

MILLING CUTTERS

FACEMILLS - ARBOR MOUNT



DIAMETER D	CATALOG NUMBER	NUMBER OF INSERTS z	MOUNTING BORE DIAMETER dm	MAXIMUM DIAMETER D3	HEIGHT H	MAX DEPTH OF CUT a_p	COOLANT THROUGH
2.000	FM45-2000A0750-SN12Z05	5	0.750	2.53	1.75	.250	YES
2.500	FM45-2500A1000-SN12Z06	6	1.000	3.03	2.00	.250	YES
3.000	FM45-3000A1000-SN12Z07	7	1.000	3.53	2.00	.250	YES
4.000	FM45-4000A1500-SN12Z08	8	1.500	4.53	2.50	.250	YES
6.000	FM45-6000A2000-SN12Z10	10	2.000	6.53	2.50	.250	YES

Ordering Example: 2 pcs FM45-3000A1000-SN12Z07

NOTE: All cutters are delivered with insert mounting screws and a wrench. Inserts are ordered separately - see next page.

SPARE PARTS

INSERT SCREW	WRENCH
	
NS714	FWT15

MILLING INSERTS

45° FACE MILLING

SNEU

Face milling inserts used in a wide range of applications from roughing to finishing. Suitable for use on low-powered machines and smaller machining centers, with smooth cutting action and low cutting forces. Precision ground for high accuracy. Provides superior workpiece surface finish. Double-sided inserts with 8 cutting edges for economy.

APPLICATION	ITEM	CATALOG NUMBER	DIMENSIONS (INCH) d	l	s	d1	BS	MULTI-MAT'L GA4230	P GP2115	M GM2140	K GK2115	K GK4125	N GN9125	S GS4130
LIGHT		SNEU 1206ANEN-GL	.500	.500	.250	.232	.063	★	★	★				★
MEDIUM		SNEU 1206ANEN-GM	.500	.500	.250	.232	.063	★	★	★	★	★		★
HEAVY		SNEU 1206ANSN-GH	.500	.500	.250	.232	.063	★	★	★	★	★		
NON-FERROUS		SNEU 1206ANFN-NL	.500	.500	.250	.232	.063						★	

Ordering Example: 20 pcs SNEU 1206ANFN-NL GN9125

GEOMETRIES

Designation	Application	Feed per insert, f_z (inches)
GL	Light cutting with lowest cutting forces	.003 - .009
GM	Medium machining with broad application range	.006 - .016
GH	Heavy cutting with highest edge security	.012 - .022
NL	High-positive, polished inserts for Aluminum and other Non-Ferrous materials	.004 - .014

NOTE: Feed per insert (f_z) values shown include feed rate multiplier to compensate for 45° lead angle chip thinning.

45° FACE MILLING TOOLS

GRADE SELECTION GUIDE

Grade	Workpiece Materials	Application
GA4230	P M K S	Universal, first-choice grade with broad application range. PVD TiAlN+ coating with excellent heat and oxidation resistance characteristics.
GP2115	P	Best for steel machining with stable set-ups. MT-CVD dual layer TiCN and Al_2O_3 coating with extremely hard substrate offers high wear resistance.
GM2140	M	Outstanding performance in austenitic and ferritic, martensitic and PH stainless steels. MT-CVD coated grade with secondary application in titanium and HRSA materials.
GK2115	K	Excels in cast iron milling with stable set-ups at medium to high cutting speeds. MT-CVD dual layer TiCN and Al_2O_3 coating with extremely hard substrate offers high wear resistance.
GK4125	K	Versatile grade for a wide range of cast iron milling applications at low to medium cutting speeds. PVD Nano-TiAlN coating with excellent adhesion and wear resistance properties
GN9125	N	Uncoated High Hardness and Wear Resistance grade developed specifically for Aluminium Alloys and other non-ferrous materials within the ISO N Material range. Also suitable for non-metallics.
GS4130	S	Primary application in titanium and iron-based, cobalt-based and nickel-based heat resistant alloys. Latest PVD TiAlN coating technology with complementary use in stainless steels.

MILLING & CARBIDE TOOLING

HIH CARBIDE

PRODUCT HANDBOOK

Table of Contents

2 Flute Standard Performance

2FL Sq AlCrN

1/8" x 1/8" x 1/2" x 1-1/2"	HIHC-24101-1250
3/16" x 3/16" x 3/4" x 2"	HIHC-24102-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-24103-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-24105-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-24107-5000
5/8" x 5/8" x 1-5/8" x 3-1/2"	HIHC-24108-6250
3/4" x 3/4" x 1-5/8" x 4"	HIHC-24109-7500
1" x 1" x 2-1/4" x 5"	HIHC-24120-0000

2FL Rad AlCrN

1/8" x 1/8" x 1/2" x 1-1/2" x .010"	HIHC-25201-1250
3/16" x 3/16" x 3/4" x 2" x .010"	HIHC-25202-1875
1/4" x 1/4" x 3/4" x 2-1/2" x .015"	HIHC-25203-2500
3/8" x 3/8" x 1" x 2-1/2" x .030"	HIHC-25205-3750
1/2" x 1/2" x 1-1/4" x 3" x .030"	HIHC-25207-5000
5/8" x 5/8" x 1-5/8" x 3-1/2" x .030"	HIHC-25208-6250
3/4" x 3/4" x 1-5/8" x 4" x .030"	HIHC-25209-7500
1" x 1" x 2-1/4" x 5" x .030"	HIHC-25220-0000

2FL Ball AlCrN

1/8" x 1/8" x 1/2" x 1-1/2"	HIHC-26301-1250
3/16" x 3/16" x 3/4" x 2"	HIHC-26302-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-26303-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-26305-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-26307-5000
5/8" x 5/8" x 1-5/8" x 3-1/2"	HIHC-26308-6250
3/4" x 3/4" x 1-5/8" x 4"	HIHC-26309-7500
1" x 1" x 2-1/4" x 5"	HIHC-26320-0000

3 Flute High Performance

3FL Sq ZRN

1/8" x 1/8" x 1/2" x 2-1/2"	HIHC-15701-1250
3/16" x 3/16" x 5/8" x 2-1/2"	HIHC-15702-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-15703-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-15705-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-15707-5000
5/8" x 5/8" x 2" x 4"	HIHC-15708-6250
3/4" x 3/4" x 2-1/4" x 5"	HIHC-15709-7500
1" x 1" x 3" x 5"	HIHC-15720-0000

3FL Rad ZRN

1/8" x 1/8" x 1/2" x 2-1/2" x .010"	HIHC-15901-1250
3/16" x 3/16" x 5/8" x 2-1/2" x .010"	HIHC-15902-1875
1/4" x 1/4" 3/4" x 2-1/2" x .015"	HIHC-15903-2500
3/8" x 3/8" x 1" x 2-1/2" x .030"	HIHC-15905-3750
1/2" x 1/2" x 1-1/4" x 3" x .030"	HIHC-15907-5000
5/8" x 5/8" x 2" x 4" x .030"	HIHC-15908-6250
3/4" x 3/4" x 2-1/4" x 5" x .030"	HIHC-15909-7500
1" x 1" x 3" x 5" x .030"	HIHC-15920-0000

3FL Ball ZRN

1/8" x 1/8" x 1/2" x 2-1/2"	HIHC-16101-1250
3/16" x 3/16" x 5/8" x 2-1/2"	HIHC-16102-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-16103-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-16105-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-16107-5000
5/8" x 5/8" x 2" x 4"	HIHC-16108-6250
3/4" x 3/4" x 2-1/4" x 5 x .030"	HIHC-16109-7500
1" x 1" x 3" x 5"	HIHC-16120-0000

3 Flute High Perforamnce Chipper Style

3FL Sq ZRN

1/8" x 1/8" x 1/2" x 2-1/2"	HIHC-38801-1250
3/16" x 3/16" x 5/8" x 2-1/2"	HIHC-38802-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-38803-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-38805-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-38807-5000
5/8" x 5/8" x 2" x 4"	HIHC-38808-6250
3/4" x 3/4" x 2-1/4" x 5"	HIHC-38809-7500
1" x 1" x 3" x 5"	HIHC-38820-0000

3FL Rad ZRN

1/8" x 1/8" x 1/2" x 2-1/2" x .010"	HIHC-39001-1250
3/16" x 3/16" x 5/8" x 2-1/2" x .010"	HIHC-39002-1875
1/4" x 1/4" x 3/4" x 2-1/2" x .015"	HIHC-39003-2500
3/8" x 3/8" x 1" x 2-1/2" x .030"	HIHC-39005-3750
1/2" x 1/2" x 1-1/4" x 3" x .030"	HIHC-39007-5000
5/8" x 5/8" x 2" x 4" x .030"	HIHC-39008-6250
3/4" x 3/4" x 2-1/4" x 5 x .030"	HIHC-39009-7500
1" x 1" x 3" x 5" x .030"	HIHC-39020-0000

4 Flute Standard Performance

4FL Sq AlCrN

1/8" x 1/8" x 1/2" x 1-1/2"	HIHC-10101-1250
3/16" x 3/16" x 3/4" x 2"	HIHC-10102-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-10103-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-10105-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-10107-5000
5/8" x 5/8" x 1-5/8" x 3-1/2"	HIHC-10108-6250
3/4" x 3/4" x 1-5/8" x 4"	HIHC-10109-7500
1" x 1" x 2-1/4" x 5"	HIHC-10120-0000

4FL Rad AlCrN

1/8" x 1/8" x 1/2" x 1-1/2" x .010"	HIHC-10401-1250
3/16" x 3/16" x 3/4" x 2" x .010"	HIHC-10403-1875
1/4" x 1/4" x 3/4" x 2-1/2" x .015"	HIHC-10405-2500
3/8" x 3/8" x 1" x 2-1/2" x .030"	HIHC-10410-3750
1/2" x 1/2" x 1-1/4" x 3" x .030"	HIHC-10413-5000
5/8" x 5/8" x 1-5/8" x 3-1/2" x .030"	HIHC-10415-6250
3/4" x 3/4" x 1-5/8" x 4 x .030"	HIHC-10417-7500
1" x 1" x 2-1/4" x 5" x .030"	HIHC-10419-0000

4FL Ball AlCrN

1/8" x 1/8" x 1/2" x 1-1/2"	HIHC-10301-1250
3/16" x 3/16" x 3/4" x 2"	HIHC-10302-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-10303-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-10305-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-10307-5000
5/8" x 5/8" x 1-5/8" x 3-1/2"	HIHC-10308-6250
3/4" x 3/4" x 1-5/8" x 4"	HIHC-10309-7500
1" x 1" x 2-1/4" x 5"	HIHC-10320-0000

4 Flute High Perforamnce Chipper Style

4FL Sq AlCrN

1/8" x 1/8" x 1/2" x 1-1/2"	HIHC-60001-1250
3/16" x 3/16" x 3/4" x 2"	HIHC-60002-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-60003-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-60005-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-60007-5000
5/8" x 5/8" x 1-5/8" x 3-1/2"	HIHC-60008-6250
3/4" x 3/4" x 1-5/8" x 4"	HIHC-60009-7500
1" x 1" x 2-1/4" x 5"	HIHC-60020-0000

4FL Rad AlCrN

1/8" x 1/8" x 1/2" x 1-1/2" x .010"	HIHC-61001-1250
3/16" x 3/16" x 3/4" x 2" x .010"	HIHC-61002-1875
1/4" x 1/4" x 3/4" x 2-1/2" x .015"	HIHC-61003-2500
3/8" x 3/8" x 1" x 2-1/2" x .030"	HIHC-61005-3750
1/2" x 1/2" x 1-1/4" x 3" x .030"	HIHC-61007-5000
5/8" x 5/8" x 1-5/8" x 3-1/2" x .030"	HIHC-61008-6250
3/4" x 3/4" x 1-5/8" x 4" x .030"	HIHC-61009-7500
1" x 1" x 2-1/4" x 5" x .030"	HIHC-61020-0000

5 Flute High Performance

5FL Sq Si Nano

1/8" x 1/8" x 5/8" x 2-1/2"	HIHC-50101-1250
3/16" x 3/16" x 3/4" x 2-1/2"	HIHC-50102-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-50103-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-50105-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-50107-5000
5/8" x 5/8" x 1-3/4" x 4"	HIHC-50108-6250
3/4" x 3/4" x 1-3/4" x 4"	HIHC-50109-7500
1" x 1" x 2-1/4" x 5"	HIHC-50120-0000

5FL Rad Si Nano

3/16" x 3/16" x 3/4" x 2-1/2" x .010"	HIHC-50402-1875
1/4" x 1/4" x 3/4" x 2-1/2" x .015"	HIHC-50403-2500
3/8" x 3/8" x 1" x 2-1/2" x .030"	HIHC-50405-3750
1/2" x 1/2" x 1-1/4" x 3" x .030"	HIHC-50407-5000
5/8" x 5/8" x 1-3/4" x 4" x .030"	HIHC-50408-6250
3/4" x 3/4" x 1-3/4" x 4" x .030"	HIHC-50409-7500
1" x 1" x 2-1/4" x 5" x .030"	HIHC-50420-0000

5 Flute Chipper Style

5FL Sq Si Nano

1/8" x 1/8" x 5/8" x 2-1/2"	HIHC-60501-1250
3/16" x 3/16" x 3/4" x 2-1/2"	HIHC-60502-1875
1/4" x 1/4" x 3/4" x 2-1/2"	HIHC-60503-2500
3/8" x 3/8" x 1" x 2-1/2"	HIHC-60505-3750
1/2" x 1/2" x 1-1/4" x 3"	HIHC-60507-5000
5/8" x 5/8" x 1-3/4" x 4"	HIHC-60508-6250
3/4" x 3/4" x 1-3/4" x 4"	HIHC-60509-7500
1" x 1" x 2-1/4" x 5"	HIHC-60520-0000

5FL Rad Si Nano

3/16" x 3/16" x 3/4" x 2-1/2" x .010"	HIHC-61502-1875
1/4" x 1/4" x 3/4" x 2-1/2" x .015"	HIHC-61503-2500
3/8" x 3/8" x 1" x 2-1/2" x .030"	HIHC-61505-3750
1/2" x 1/2" x 1-1/4" x 3" x .030"	HIHC-61507-5000
5/8" x 5/8" x 1-3/4" x 3-1/2" x .030"	HIHC-61508-6250
3/4" x 3/4" x 1-3/4" x 4 x .030"	HIHC-61509-7500
1" x 1" x 2-1/4" x 5 x .030"	HIHC-61520-0000

Chamfer Mills

2 Flute Chamfer Mills AlCrN Pointed Center Cutting

TOOL DESCRIPTION	60° ORDER #
1/8" x 1/8" x 1-1/2"	HIHC-CHM2-1250-60
3/16" x 3/16" x 2"	HIHC-CHM2-1875-60
1/4" x 1/4" x 2-1/2"	HIHC-CHM2-2500-60
3/8" x 3/8" x 2-1/2"	HIHC-CHM2-3750-60
1/2" x 1/2" x 3"	HIHC-CHM2-5000-60

TOOL DESCRIPTION	90° ORDER #
1/8" x 1/8" x 1-1/2"	HIHC-CHM2-1250-90
3/16" x 3/16" x 2"	HIHC-CHM2-1875-90
1/4" x 1/4" x 2-1/2"	HIHC-CHM2-2500-90
3/8" x 3/8" x 2-1/2"	HIHC-CHM2-3750-90
1/2" x 1/2" x 3"	HIHC-CHM2-5000-90

TOOL DESCRIPTION	120° ORDER #
1/8" x 1/8" x 1-1/2"	HIHC-CHM2-1250-120
3/16" x 3/16" x 2"	HIHC-CHM2-1875-120
1/4" x 1/4" x 2-1/2"	HIHC-CHM2-2500-120
3/8" x 3/8" x 2-1/2"	HIHC-CHM2-3750-120
1/2" x 1/2" x 3"	HIHC-CHM2-5000-120

Chamfer Mills

4 Flute Chamfer Mill AlCrN Pointed Center Cutting

TOOL DESCRIPTION	60° ORDER #
1/8" x 1/8" x 1-1/2"	HIHC-CHM4-1250-60
3/16" x 3/16" x 2"	HIHC-CHM4-1875-60
1/4" x 1/4" x 2-1/2"	HIHC-CHM4-2500-60
3/8" x 3/8" x 2-1/2"	HIHC-CHM4-3750-60
1/2" x 1/2" x 3"	HIHC-CHM4-5000-60

TOOL DESCRIPTION	90° ORDER #
1/8" x 1/8" x 1-1/2"	HIHC-CHM4-1250-90
3/16" x 3/16" x 2"	HIHC-CHM4-1875-90
1/4" x 1/4" x 2-1/2"	HIHC-CHM4-2500-90
3/8" x 3/8" x 2-1/2"	HIHC-CHM4-3750-90
1/2" x 1/2" x 3"	HIHC-CHM4-5000-90

TOOL DESCRIPTION	120° ORDER #
1/8" x 1/8" x 1-1/2"	HIHC-CHM4-1250-120
3/16" x 3/16" x 2"	HIHC-CHM4-1875-120
1/4" x 1/4" x 2-1/2"	HIHC-CHM4-2500-120
3/8" x 3/8" x 2-1/2"	HIHC-CHM4-3750-120
1/2" x 1/2" x 3"	HIHC-CHM4-5000-120

Spot Drills

90° TiCN Coated

1/8" x 2"	HIHC-CSD-1250-90
3/16" x 2"	HIHC-CSD-1875-90
1/4" x 3"	HIHC-CSD-2500-90
3/8" x 3"	HIHC-CSD-3750-90
1/2" x 3"	HIHC-CSD-5000-90
5/8" x 3"	HIHC-CSD-6250-90
3/4" x 4"	HIHC-CSD-7500-90
1" x 5"	HIHC-CSD-1000-90

120° TiCN Coated

1/8" x 2"	HIHC-CSD-1250-120
3/16" x 2"	HIHC-CSD-1875-120
1/4" x 3"	HIHC-CSD-2500-120
3/8" x 3"	HIHC-CSD-3750-120
1/2" x 3"	HIHC-CSD-5000-120
5/8" x 3"	HIHC-CSD-6250-120
3/4" x 4"	HIHC-CSD-7500-120
1" x 5"	HIHC-CSD-1000-120

144° TiCN Coated

1/8" x 2"	HIHC-CSD-1250-144
3/16" x 2"	HIHC-CSD-1875-144
1/4" x 3"	HIHC-CSD-2500-144
3/8" x 3"	HIHC-CSD-3750-144
1/2" x 3"	HIHC-CSD-5000-144
5/8" x 3"	HIHC-CSD-6250-144
3/4" x 4"	HIHC-CSD-7500-144
1" x 5"	HIHC-CSD-1000-144

Center Drills

TOOL DESCRIPTION	ORDER NUMBER
00	HIHC-02160-0250
0	HIHC-2160-0320
1	HIHC-2160-0470
1 x 4" Long	HIHC-2160-0474
1 x 6" Long	HIHC-2160-0476
2	HIHC-2160-0780
2 x 4" Long	HIHC-2160-0784
2 x 6" Long	HIHC-2160-0786
3	HIHC-2160-1090
3 x 4" Long	HIHC-2160-1094
3 x 6" Long	HIHC-2160-1096
4	HIHC-2160-1250
4 x 4" Long	HIHC-2160-1254
4 x 6" Long	HIHC-2160-1256
5	HIHC-2160-1880
5 x 4" Long	HIHC-2160-1884
5 x 6" Long	HIHC-2160-1886
6	HIHC-2160-2190
6 x 6" Long	HIHC-2160-2196
7	HIHC-2160-2500
7 x 6" Long	HIHC-2160-2506
8	HIHC-2160-3130
8 x 6" Long	HIHC-2160-3136

MILLING & CARBIDE TOOLING NOTES

HARDFACING PRODUCTS

HIH CARBIDE

PRODUCT HANDBOOK

HARDFACING FLEXIBLE CORDS

HIH-CARBIDE cord is a flexible cord composed of fused Tungsten Carbide grains mixed in a Nickel base matrix, hardness 40 HRc. Fused Tungsten Carbide grains are cast or spherical particles.

HIH-CARBIDE cord is applied using an oxyacetylene torch.

It is advisable to spray first an underlayer of powder to avoid oxidation of the parts.

		Fused Tungsten Carbide		Available Diameters		
	Chord Description	Size	Type	Diameter - 5 mm	Diameter - 6.5 mm	Diameter - 8 mm
Cast Spherical Carbide	DURA-BIDE_40C-02	106-150 µm	Cast	DB_40C-02-5	DB_40C-02-6.5	DB_40C-02-8
	DURA-BIDE_40C-05	106-500 µm	Cast	DB_40C-05-5	DB_40C-05-6.5	DB_40C-05-8
	DURA-BIDE_40C-08	106-800 µm	Cast	DB_40C-08-5	DB_40C-08-6.5	DB_40C-08-8
	DURA-BIDE_40C-12	106-1200 µm	Cast	DB_40C-12-5	DB_40C-12-6.5	DB_40C-12-8
	DURA-BIDE_40C-20	106-2000 µm	Cast	DB_40C-12-5	DB_40C-20-6.5	DB_40C-20-8
	DURA-BIDE_30C-05	106-500 µm	Cast	DB_30C-05-5	DB_30C-05-6.5	DB_30C-05-8
	DURA-BIDE_30C-08	106-800 µm	Cast	DB_30C-08-5	DB_30C-08-6.5	DB_30C-08-8
Spherical Tungsten Carbide	DURA-BIDE_40S-02	45-150 µm	Spherical	DB_40S-02-5	DB_40S-02-6.5	DB_40S-02-8
	DURA-BIDE_40S-05	90-500 µm	Spherical	DB_40S-05-5	DB_40S-05-6.5	DB_40S-05-8
	DURA-BIDE_40S-08	90-800 µm	Spherical	DB_40S-08-5	DB_40S-08-6.5	DB_40S-08-8
	DURA-BIDE_40C/S-02	40-80 µm 45-150 µm	Cast Spherical	DB_40C/S-02-5	DB_40C/S-02-6.5	DB_40C/S-02-8
	DURA-BIDE_40C/S-05	106-250µm 250-500 µm	Cast Spherical	DB_40C/S-05-5	DB_40C/S-05-6.5	DB_40C/S-05-8
	DURA-BIDE_40C/S-08	106-400 µm 400-800 µm	Cast Spherical	DB_40C/S-08-5	DB_40C/S-08-6.5	DB_40C/S-08-8

HARDFACING POWDERS

HIH-CARBIDE carries two ranges of Hardfacing Powders:

- Nickel-based hardfacing powders with a hardness from 20 to 60 HRC.
- Nickel-based hardfacing powders pre-mixed with crushed or pellets fused tungsten carbide with a hardness of 60 HRC.

Item Powder	Alloy	Hardness	Carbide Grains Content	Carbide Grains Size	Melting Temp	Packaging		
						0.5 Kg	1Kg	5 Kg
DURA-BIDE_20P_20010	Nickel-Chromium	20 HRC			1090°C	DB_20P_20010.05	DB_20P_20010.10	DB_20P_20010.50
DURA-BIDE_30P_30010	Nickel-Chromium	30 HRC			1070°C	DB_30P_30010.05	DB_30P_30010.10	DB_30P_30010.50
DURA_BIDE_40P_40010	Nickel-Chromium	40 HRC			1060°C	DB_40P_40010.05	DB_40P_40010.10	DB_40P_40010.50
DURA-BIDE_61P_60010	Nickel-Chromium	60 HRC			1040°C	DB_61P_60010.05	DB_61P_60010.10	DB_61P_60010.50
DURA-BIDE_61CP_62010	Nickel-Chromium	60 HRC	20% Crushed	40 to 80 µm	1040°C	DB_61CP_62010.05	DB_61CP_62010.10	
DURA-BIDE_61CP_63510	Nickel-Chromium	60 HRC	35% Crushed	40 to 80 µm	1040°C	DB_61CP_63510.05	DB_61CP_63510.10	
DURA-BIDE_61CP_64010	Nickel-Chromium	60 HRC	40% Crushed	40 to 80 µm	1040°C	DB_61CP_64010.05	DB_61CP_64010.10	
DURA-BIDE_61PP_64015	Nickel-Chromium	60 HRC	40% Pellets	40 to 150 µm	1040°C	DB_61PP_64015.05	DB_61PP_64015.10	
DURA-BIDE_61CP_64510	Nickel-Chromium	60 HRC	45% Crushed	40 to 80 µm	1040°C	DB_61CP_64510.05	DB_61CP_64510.10	
DURA-BIDE_61CP_65010	Nickel-Chromium	60 HRC	50% Crushed	40 to 80 µm	1040°C	DB_61CP_65010.05	DB_61CP_65010.10	
DURA-BIDE_61PP_65015	Nickel-Chromium	60 HRC	50% Pellets	40 to 150 µm	1040°C	DB_61PP_65015.05	DB_61PP_65015.10	
DURA-BIDE_61CP_66010	Nickel-Chromium	60 HRC	60% Crushed	40 to 80 µm	1040°C	DB_61CP_66010.05	DB_61CP_66010.10	
DURA-BIDE_61PP_66015	Nickel-Chromium	60 HRC	60% Pellets	40 to 150 µm	1040°C	DB_61PP_66015.05	DB_61PP_66015.10	

TORCH CASES

2 types of torch cases are available according to your needs of Hardfacing:

INDUSTRIAL-HD torch case designed for thick deposits of cord and powder.

INDUSTRIAL-LD torch case designed for fine deposits especially used in the glass industry.

Cases equipment		INDUSTRIAL-HD case ref. 20.009	INDUSTRIAL-LD case ref. 20.008
Case	20.001	1	
Case	20.002		1
Mixer	20.016		1
Handl e	20.017		1
Mixer	20.018	1	
Handl e	20.019	1	
Powder gun nr 4	20.020	1	
Powder gun nr 6	20.022	1	
Cord gun nr 5	20.023	1	
Powder gun nr 1	20.026		1
Powder gun nr 2	20.027		1
Powder gun nr 3	20.028		1
Aluminium hopper	20.032	1	1
Powder tube for mixer	20.033	5	5
Sealing for mixer	20.034	1	1
Spanner	20.035	1	1
Tips cleaner	20.036	1	1

Cases equipment		INDUSTRIAL-HD case ref. 20.009	INDUSTRIAL-LD case ref. 20.008
Lighter	20.038	1	1
Acetylene connection	20.065	1	1
Oxygen connection	20.066	1	1
DURABIDE powder 20010	11.20010.05		0,5 Kg
DURABIDE powder 30010	11.30010.05		0,5 Kg
DURABIDE powder 40010	11.40010.10	1 Kg	1 Kg
DURABIDE powder 60010	11.60010.05	0,5 Kg	
DURABIDE powder 62010	11.62010.05	0,5 Kg	
DURABIDE powder 64010	11.64010.05	0,5 Kg	

KGS DIAMOND FLEXIBLE SUPER ABRASIVES

HIH CARBIDE

PRODUCT HANDBOOK

TABLE OF CONTENTS

SWISS ROOTS

Started in 1906 as a Swiss family owned, cement moulding company.
Since 1952 a world leading company in the flexible diamond abrasives industy.

TECHNOLOGY DRIVEN

Control of complex technologies;
- Metallized fabrics
- Electroplating
- Metal bond and resin bond sintering
- Moulded resin expertise
- Spray coating
- Standard coated abrasives technologies

UNIQUE INNOVATIONS & PATENTS

Specialized in high-precision Metalized Fabrics for applications in screen printing, filtration and electromagnetic shielding industries. First manufacturer to offer Flexible Diamond Abrasives designed for dry grinding and polishing glass, marble and granite; KGS Swiflex®.

EXPERIENCE

Our long experience and state of the art production lines provide high volume orders and custom made solutions at the same time.

SAFETY

Member of the Federation of European Producers of Abrasives; FEPA

GLOBAL ACTIVE COMPANY

Located in 15 countries on 4 continents
6 factories, 20 sales offices Production is based mainly in Europe.

DIVISIONS
DIAMOND ABRASIVE TOOLS

STONE

FLOOR

PRECISION

See next pages for Precision markets & branches

FLEXIBLE DIAMOND ABRASIVES

FOR PRECISION APPLICATIONS ARE USED IN MANY

HEAVY INDUSTRIES

Mechanical & mould engineering

Metallography

Defense industry

Printing and paper industry

Steel rolling mills

Chemical plants & components

Oil and gas industry

Food and injection molding industry

TRANSPORTATION

Aerospace

Metro & train

General transportation

Marine

Cabins & container industry

Earth moving equipment

Electronic components

Mining

DIFFERENT INDUSTRIES

ENERGY


Power plants


Windmill


Water technology


Solar thermal power plants

BUILDING MATERIAL PROCESSING


Construction


Glass processing industry


Ceramic & rooftiles


Natural stone

LEISURE / HOUSE & GARDEN / SPORTS


Porcelain table ware


Ski industry


Optical


Gardening tools


Knives


Dental


Clothing

Mobile phone

TECHNICAL DATA

DIAMOND TOOLS
FOR HARD AND BRITTLE MATERIALS

KGS flexible diamond tools have been specifically tailored for many industrial abrasive applications. Excellent cost / performance benefit, KGS diamond tools are long lasting and faster cutting.

A wide range of materials are suitable to be ground or finished with KGS Flexible diamond tools.

HARD METALS

Grey and nodular cast iron, metal alloys with a hardness > 55 HrC, molybdenum



HARD COATINGS

Thermal sprayed materials like Tungsten Carbide, Chrome Carbide, Aluminium Oxyde, Chrome Oxyde, Yttria Zirconia Oxyde, Aluminium Titanium Oxyde.



CERAMICS

Tiles, porcelain and refractories



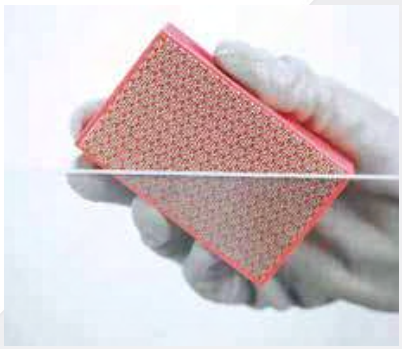
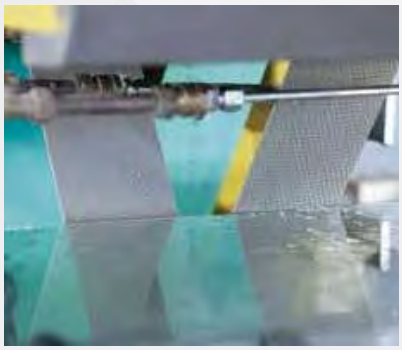
COMPOSITES

Carbon and glass fiber reinforced plastics



GLASS

Flat glass, tempered glass, sculptures, crystallerie and scientific glass

5 REASONS TO USE

FLEXIBLE DIAMOND TOOLS

1 WHEN MATERIALS CANNOT BE GROUND, POLISHED OR SHAPED WITH CONVENTIONAL ABRASIVES

- Hard and brittle material, hardness HRC > 55
- Typical materials are glass, stone, hard metals, ceramics, technical ceramics, hard coatings and composites
- Diamond is much harder and its cutting edges remain sharp, even on hard, abrasive materials

2 HIGH FINISH REQUIREMENTS

- Constant cutting rate & surface finish from beginning till end of the diamond tool lifetime
- Continuously high material removal rates

3 PERFECT EXTENSION TO THE CONVENTIONAL COATED ABRASIVE RANGE

- Requires similar type of machines and knowledge Great add-on to your existing product portfolio

4 IN MANY CASES, PROVIDES A MORE ECONOMICAL & ENVIRONMENTALLY FRIENDLY SOLUTION

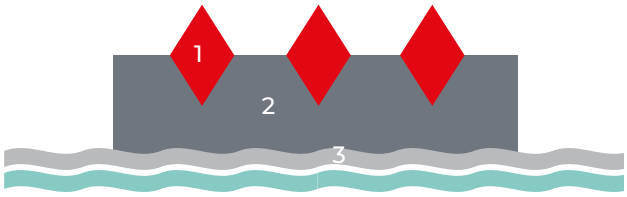
- Higher productivity
- Less down time resulting in increased productivity Far higher tool life and less waste

5 KGS FLEXIBLE DIAMOND TOOLS CAN REDUCE CYCLE TIMES, PROCESS TIME AND COST COMPARED TO DIAMOND WHEELS

- Lower purchase prices
- Easy and fast to change the KGS flexible diamond tools in different grit sizes, quicker to final results
- High flexibility for grinding hard to grind product shapes and areas

PRODUCT SPECIFICATION
& CONSTRUCTION

A flexible diamond product is made up of three basic raw materials: grit (1), bond (2) and backing (3).



1. GRITS

Diamond is the hardest material available which provides a predictable, consistent and repeatable finish for hard and brittle materials. Diamond consists of pure carbon in a crystalline structure. For grinding tools, the diamond used are generally synthetic, produced at very high temperatures under high pressure.

The grit size data for diamond is based upon the average grit diameter in µm. All grits are colour coded which is a standard for flexible diamond tools within the abrasive industry. Grit availability differs per bond (metal or resin) and pattern.

THE FOLLOWING GRIT SIZES ARE AVAILABLE

Grit size	50	60	120	200	320	400	500	800	1500	3000
Mesh	50	60	120	200	320	400	500	800	1500	3000
Fepa	P60	P80	P120	P220	P320	P400	P500	P600	P2500	
Micron	301 µm	250 µm	125 µm	74 µm	54 µm	40 µm	30 µm	20 µm	9 µm	3 µm

Stock removal — Grinding — Finishing — Polishing

FROM COARSE TO VERY FINE GRITS

A coarse grit increases stock removal and surface roughness of the workpiece. Choosing the right grit size depends on various factors;

» Application
» Material
» Tool speeds and feeds
» Wet (water, lubricant) or dry grinding
» Required finish (Roughness level Ra)

General rule: Flexible diamond tools perform best when used wet.

2. BONDS

KGS manufactures flexible diamond tools in metal and resin bond versions.

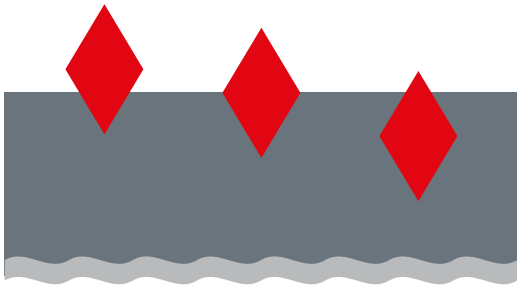
METAL BOND

Metallic bond of nickel deposit by a special electroplating process, mainly used for coarse and medium grits and operations, which require high material removal.

This process starts as metallised fabric.

The pattern is electroformed using nickel plating.

Diamond is sprinkled on, and plating continued to the required specification LS, S or G.



GRIT RANGE

The availability of metal bond grits differs by pattern.

RESIN BOND

These products are made with a continuous layer of resin. Diamond is all the way through the resin and the product works best when opened up to achieve optimum performance.

If a resin product starts to glaze or become dull it can be dressed so that new diamond will be exposed, and restore cutting power.

GRIT RANGE

The availability of resin bond grits differs by pattern.

METALLISED FABRIC

KGS Flexible diamond tools are based on a proprietary (metallised) fabric manufactured by KGS in Switzerland. This unique process provides strength and flexibility versus competitors and niche applications which require a special – often unique – construction.

This fabric gives good dimensional stability, high wear resistance plus excellent heat dissipation and can be laminated to many different types of polyester and or polycotton backings.

DIAMOND PELLETS / PATTERNS

KGS offers a wide and unique range of patterns which are often multifunctional in terms of application and performance or developed as unique patterns for specific application materials.

3. BACKERS

A wide range of backings have been designed and selected enabling KGS to provide the best option for each application. KGS backers are made of cotton, polyester or a combination of polyester and cotton (poly-cotton) for optimum diamond retention, flexibility, rigidity and superb edge wear.

Using the right type of backer is a key factor in the successful performance of the product, ease of use, performance, lifetime, finish. Backers can be combined with many different patterns and grits, customised to fit the application or specific needs of the customer. KGS offers a variety of backings to support the diamond tool. From heavy duty to very flexible backing.

OUR BACKERS CAN BE CLASSIFIED INTO FOUR GROUPS

Highly flexible & light

Semi flexible & strong

Heavy & stable

Very heavy & stable

THE FINAL CHARACERISTICS OF THE SUPPORT OF A FLEXIBLE DIAMOND TOOLS IS DETERMINED BY:

- The properties of the backer, i.e. cotton, poly-cotton, weaving structure,
- fillers The type of bond, resin or metal bond, i.e. metallized fabric
- The type of pattern, open dots, closed structure

Note : Not all backers can be combined

MAIN BACKINGS

BP

Heavy polyester Y-weight backing

BP2

Heavy polyester stable Y-weight backing

BPT

Thin Hard Polyester X-weight backing.

BYW

Strong polyester XY– backing

BYWG

Strong heavy backing, Y-weight, polyester

BPG

Flexible polyester XF- weight backing

BPR

Strong flexible XF-weight backing

BPX

Very thin hard backing X-weight polyester

FSB

Thin flexible JF - backing

FSC

Thin very flexible XF- weight backing

CV

Light weight, F-weight canvas backing

SPECIAL CONNECTING BACKERS / FIXATIONS

QRS

Quick release system (Velcro®) for quick changing grit size. Coulor coded grit sizes for easy identification

S/A

Self adhesive backer, environmentally friendly (no dust pollution risk)

MAGN

Magnetic backing for quick changing grit sizes. Magnetic disc gives flat even surface with slight “give”. Good for reducing “first contact” stress.

K-LOC

Quick change system with a mandrel which can be screwed in the back up pad for secure attachment and rapid swapping.

PATTERNS

KGS offers a wide range of different patterns, in metal and resin bond.

METAL BOND: This process starts as metallised fabric. The pattern is electroformed using nickel plating. Diamond is applied, and plating continued to realise the specified pattern. The design, pattern, and spacing of these grit islands determines the cut-rate, lifetime, grade of abrasive and pressure required to achieve the required stock removal and finish.

RESIN BOND: A continuos multi-layer or moulded shapes of resin and diamond particles spread all the way through the resin layer.

KGS TELUM®

Strong interlocking arrow pattern, specifically developed for heavy stock removal and finishing. Ideal for grinding on the slack of the belts and for grinding a surface with sharp edges.

This pattern with lines in all directions, is always in contact with the work piece ensuring a high level of consistent grinding with no witness lines. The structure of the pattern ensures good heat dissipation. Available with different backing types.

Telum® T1

FEATURES
» Metal bond
» Most closed pattern
» Coarse to fine grits
» For discs only

ADVANTAGES
» Fine finishes

GRIT RANGE
60 120 200 320 400 800 1500

Telum® T2

» Metal bond
» More open pattern

» High flexibility
» Stock removal
» Premium belt performance

60 120 200 400 800 1500

Telum® CP1

» Resin bond
» Fine to very fine grits

» Polishing applications

500 1500 000

Telum® H

» Metal bond
» Coarse to fine grits
» Most open Telum® pattern

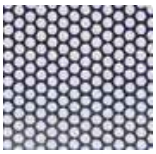
» High stock removal

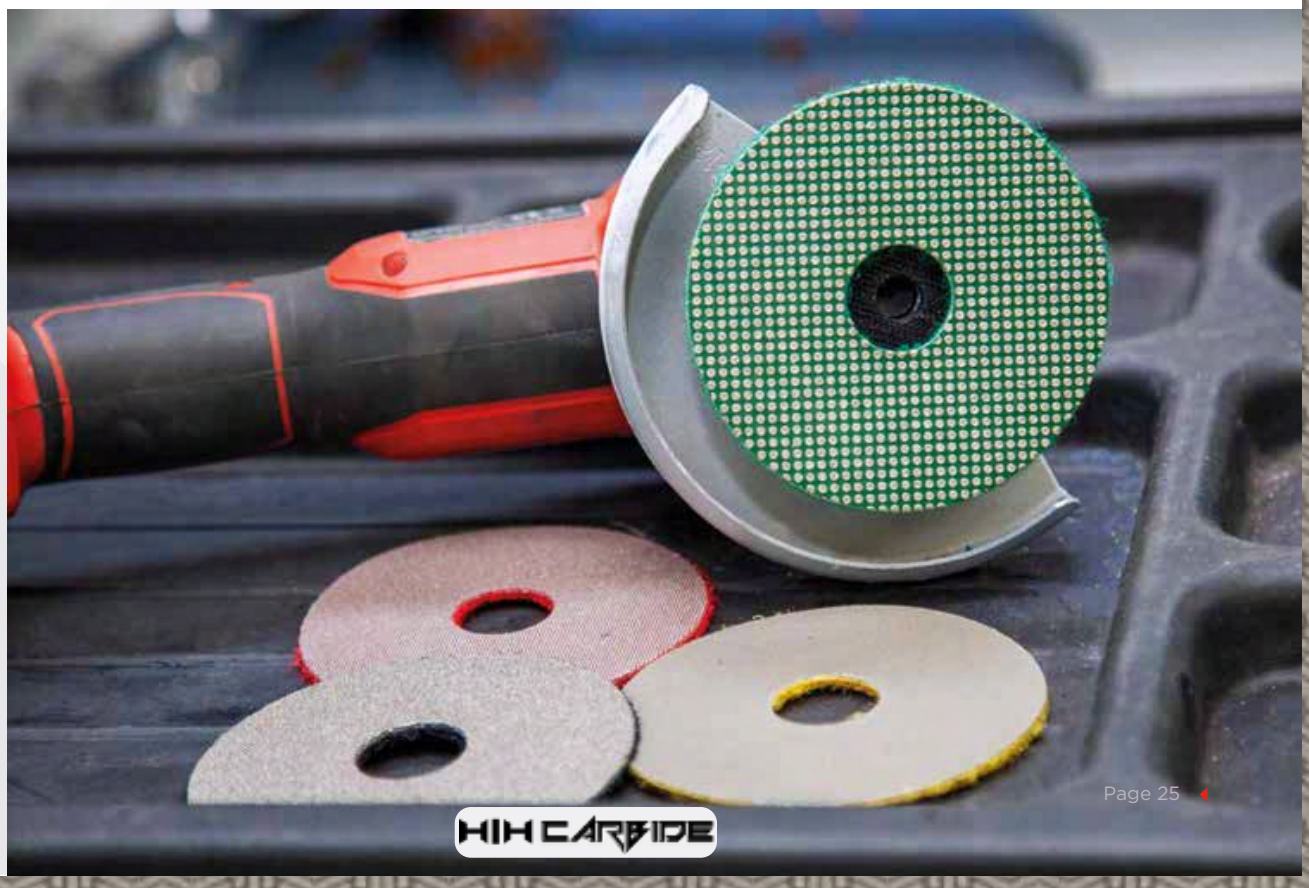
50 60 120 200 400 800 1500

KGS FLEXIS®

Standard dot pattern, positioned in a precise pattern. The dots are positioned in such a way to create an optimal balance between stock removal and surface finish.

This pattern has a high temperature resistance, due to a superior heat dissipation, which makes it outstanding in performance. Available in metal & resin bond and with different backing types.

		FEATURES	ADVANTAGES	GRIT RANGE
Flexis® 21		» Metal bond » ± 2mm ø per dot 16 dots / cm2 » Coarse grits	» Extra flexibility » Agressive cutting action Improved coolant flow » Increased swarf removal	
Flexis® 18		» Metal bond » ± 0,7mm ø per dot » 120 dots / cm2 »Medium to fine grits	» Fine finishes	
Flexis® CP1		» Resin bond »Fine to very fine grits	» Polishing applications	



KGS QUADROFLEX™

A unique and continuous cconnected wave pattern, a good general purpose pattern for high material removal.

A very strong no clogging pattern with an open structure and lower diamond concentration. It ensures higher pressure per grit and high stock removal. Available with different backing types.

		FEATURES	ADVANTAGES	GRIT RANGE
Quadroflex™ Q1		» Metal bond » Coarse grits » Open connected » pattern 6x6 mm	» For general purpose applications which require high stock removal	
Quadroflex™ Q2		» Metal bond » Medium to fine grits »More close pattern » 3x3 mm	» For general purpose applications which require stock removal and precision	

KGS TELUM® CH

Special resin cross pattern. Designed specifically for precision grinding & polishing of extremely hard materials, such as those used in the Thermal Spray Industry.

Telum® CH

FEATURES
» Swiss flag pattern
» Individual resin "island"
» Thick bond layer
» Tough, hard resin
» From coarse to very fine grit

ADVANTAGES
»Unique and recognizable
» Mechanically strong and durable
» Long life, excellent finish
» Roughing to super finishing
» Greatly reduced cycle times compared to bonded wheels in roll grinding and precision

GRIT RANGE

KGS SWIFLEX® SDA

Thin structured diamond abrasive resin layer, which can be used for various applications, for both wet & dry usage. Available with different backing types – flexible and rigid – for flat or complex shapes.

The feel, look and touch of this product is very similar to the conventional coated products.

Swiflex® SDA 1

FEATURES
» Resin bond
» Coarse to
» medium grits
» Coarse pattern structure

ADVANTAGES
» Stock removal applications

GRIT RANGE

Swiflex® SDA 2

» Resin bond
» Medium to fine grits

» Finishing and polishing applications

PRODUCTS

DIAMOND SPIRAL

Spirals belts can be used on hard to grind materials such as glass, porcelain, rhodium, iridium, titanium, technical ceramics and hard coatings like tungsten carbide. Finishing of corners, edges and cleaning of hard to reach areas. The spiral belts remove uneven surfaces, ensure flatness providing an excellent base for fittings. They can be used for shaping, cleaning edges of drilled holes and corner dubbing. Artisan companies use them for shaping sculptures.

Specialized glass companies, like glass fencing firms (swimming pools) utilize KGS spiral belts for shaping and cleaning the edges of drilled holes (for locking systems) in glass doors. Spiral belts are also used for corner dubbing applications which need a high accuracy and fine adjustments. Available up to Ø150 mm for expanding rubber drums. These products are often used in the crystal glass industry, lapidary, technical quartz, and in the stone industry.

Spiral belts are ideal for curved and contoured surfaces that need high attention and accuracy. Polishing of corners, edges and cleaning of hard to reach areas, like pre-moulded holes of porcelain sanitary ware.

TYPE OF GRINDING MACHINE

Hand-Held machines. The spiral belts have a reinforced backing which allows high speeds up to 45 m/s ensuring a superb finish. Optimum speed will vary with the material ground. Slower speeds may prove beneficial with the finer grits.

KGS TELUM® SPIRAL BELTS

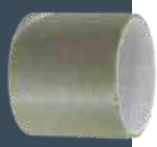
The KGS Telum® pattern is generally best for corner dubbing machines and for flat surface area's providing a smooth grinding action (– no soldering).

• DIMENSION Ø 15x30, 22x20, 25x25, 30x30, 45x30, 50x42, 75x38 & 75x42 mm

KGS FLEXIS® SPIRAL BELTS

Industry standard - dot pattern. The dot pattern is more flexible and ideal for smaller diameters as the dots tend to give more grip on uneven surfaces.

• DIMENSION Ø 15x30, 22x20, 25x25, 30x30, 45x30, 50x42 & 75x42 mm



KGS SWIFLEX® SDA SPIRAL BELTS

Good alternative for dry running applications - can be used on all difficult hard brittle materials.

• DIMENSION Ø 15x30, 25x25, 30x30, 45x30, 50x42 & 75x38 mm

KGS TELUM® SPIRAL BELTS

The spiral belts can be used for corner dubbing machines, providing a smooth grinding action, no soldering. Ideal for shaping, cleaning the edges of drilled holes. Spirals can also be used for overspray removal to remove the surplus of coatings fast.

Backing BPR - Strong flexible XF-weight backing

Materials Glass, natural stone, ceramic, hard coatings, hard metal

Usage

Size (mm)	Grit	Art. no.
15x30	60	10002
	120	10003
	200	10004
	400	10005
	800	10006

Size (mm)	Grit	Art. no.
22x20	60	10011
	120	10012
	200	10013
	400	10014

Size (mm)	Grit	Art. no.
25x25	60	10019
	120	10020
	200	10021
	400	10022
	800	10023

Size (mm)	Grit	Art. no.
30x30	60	10028
	120	10030
	200	10032
	400	10034
	800	10036

Size (mm)	Grit	Art. no.
45x30	60	10044
	120	10045
	200	10046
	400	10047
	800	10048

Size (mm)	Grit	Art. no.
50x42	60	10064
	120	10066
	200	10068
	400	10070

Size (mm)	Grit	Art. no.
75x38	60	10053
	120	10055
	200	10057
	400	10059

Size (mm)	Grit	Art. no.
75x42	60	10086
	120	10087
	200	10088
	400	10089
	800	31620
	1500	31621

KGS FLEXIS SPIRAL BELTS

The spiral belts can be used for corner dubbing machines, provided a smooth grinding action, no soldering. Ideal for shaping, cleaning the edges of drilled holes. Spirals can also be used for overspray removal to remove the surplus of coatings fast.

Backing BPR - Strong flexible XF-weight backing

Materials Glass, natural stone, ceramic, hard coatings, hard metal

Usage

Size (mm)	Grit	Art. no.
15x30	60	10118
	120	10121
	200	10123
	400	10125
	800	10127

Size (mm)	Grit	Art. no.
22x20	60	10138
	120	10139
	200	10140
	400	10141
	800	10142

Size (mm)	Grit	Art. no.
25x25	60	10146
	120	10147
	200	10148
	400	10150
	800	10151

Size (mm)	Grit	Art. no.
30x30	60	10158
	120	10160
	200	10161
	400	10162
	800	10163

Size (mm)	Grit	Art. no.
45x30	60	10170
	120	10172
	200	10174
	400	10176
	800	10178

Size (mm)	Grit	Art. no.
50x42	60	10194
	120	10196
	200	10198
	400	10200
	800	10202

Size (mm)	Grit	Art. no.
75x42	60	10213
	120	10214
	200	10215
	400	10216

KGS SWIFLEX® SDA SPIRAL BELTS

Good option from dry running applications - can be used on all difficult hard brittle materials.

Backing BYW3 - Strong and stable, XY-weight polyester, water proof.

Materials Glass, natural stone, ceramic, hard coatings, hard metal

Usage

Size (mm)	Grit	Art. no.
15x30	60	10355
	120	10356
	200	10357
	400	10358
	800	10359
	1500	10360
	3000	10361

Size (mm)	Grit	Art. no.
25x25	60	10362
	120	10363
	200	10364
	400	10365
	800	10366
	1500	10367
	3000	10368

Size (mm)	Grit	Art. no.
30x30	60	10348
	120	10349
	200	10350
	400	10351
	800	10352
	1500	10353
	3000	10354

Size (mm)	Grit	Art. no.
45x30	60	10384
	120	10385
	200	10386
	400	10387

Size (mm)	Grit	Art. no.
50x42	60	10369
	120	10370
	200	10371
	400	10372
	800	10373
	1500	10374
	3000	10375

Size (mm)	Grit	Art. no.
75x38	60	10341
	120	10342
	200	10343
	400	10344
	800	10345
	1500	10346
	3000	10347

Size (mm)	Grit	Art. no.
75x42	120	10376
	200	10377
	400	10378

Size (mm)	Grit	Art. no.
100x38	60	10379
	120	10380
	400	10381

KGS RUBBER WHEELS FOR SPIRAL BELTS

6X40 MM SHAFT

Size (mm)	Art. no.
15x30	22035
22x20	22034
25x25	22033
30x30	22032
45x30	22031

M14

Size (mm)	Art. no.
50x42	22037

KGS MANDREL M14

For KGS rubber wheel with bore 25

Size (mm)	Art. no.
M14x25	21546

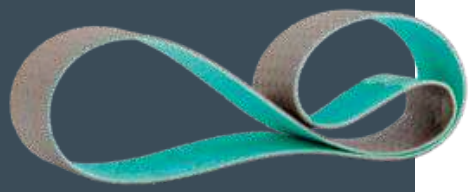
SMALL DIAMOND BELTS

Small diamond belts can be used on hard to grind materials such as glass, porcelain, hard metals and hard coatings like tungsten carbide.

Since these small belts – used for difficult corners or small cut-outs, run over a small pulley, it is important to pay attention to the flexibility of the belt specification. KGS Flexis® belts have a more open pattern which give it the right flexibility to run smoothly over the pulley. Especially on very small pulleys the KGS Telum® pattern can be too stiff.

KGS TELUM® BELTS

The KGS Telum® pattern is generally best for corner dubbing machines and for flat surface area's providing a smooth grinding action (– no soldering).



- DIMENSIONS 330x8, 533x30, 520x20 & 762x25 mm
- MATERIALS Glass, hard coatings, hard metals

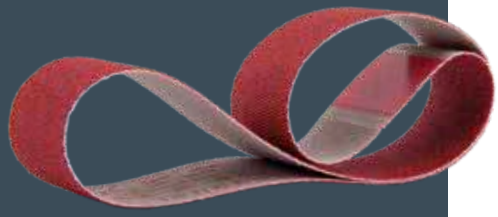
KGS FLEXIS® BELTS

Industry standard - dot pattern. The dot pattern is more flexible and ideal for smaller diameters as the dots tend to give more grip on uneven surfaces.

- DIMENSIONS 305x13, 330x10, 457x13, 457x18, 520x20, 533x30 & 762x25 mm
- MATERIALS Glass, hard coatings, hard metals

KGS SWIFLEX® SDA BELTS

Good option for dry running applications.



- DIMENSION 520x20, 533x30 mm
- MATERIALS All difficult hard brittle materials.

KGS TELUM® BELTS

Premium product, with special interlocked arrow pattern delivers top performance and has a extra long life time. The interlocked arrow pattern ensures high mechanical strength. The belts have a strong tough flexible backer, ideal for grinding on slack of the belt. The KGS Telum® pattern avoids soldiering. High productivity output.

Backing — Available with BP2, BPG or BPR backing

Materials — Glass, hard coatings, hard metals

Usage

BP2 BACKING

Strong tough flexible poly cotton backer, water- and emulsion proof

Size (mm)	Grit	Art. no.
533x30	60	12063
	120	12064
	200	12065
	400	12066
	800	12067

Size (mm)	Grit	Art. no.
520x20	60	39271
	120	12147
	200	12148
	400	12149

Size (mm)	Grit	Art. no.
762x25	60	39386
	120	39387
	200	39388
	400	39389

Size (mm)	Grit	Art. no.
457x18	60	39243
	120	12082
	200	30304
	400	39244

BPG BACKING

Flexible polyester XF-weight backing

Size (mm)	Grit	Art. no.
330x8	60	10777
	120	10778
	200	10779
	400	10780
	800	10781

BPR BACKING

Thin flexible F-weight backing

Size (mm)	Grit	Art. no.
330x8	120	10754
	200	10755

KGS FLEXIS® BELTS

Flexible diamond belts for hand-held machines. The flexible diamond belts are often used to remove overspray of HVOF and TBC coatings. It's the ideal solution for grinding off the surplus of coatings fast, with considerable time saving, compared to conventional abrasive tooling.

Backing BP2 - Strong tough flexible poly cotton backer, water- and emulsion proof

Materials Glass, hard coatings, hard metals

Usage

Size (mm)	Grit	Art. no.
305x13	60	34645
	120	34646
	200	39211
	400	39212

Size (mm)	Grit	Art. no.
330x10	60	11071
	120	11072
	200	11073
	400	11074

Size (mm)	Grit	Art. no.
457x13	60	34100
	120	31813
	200	10947
	400	32138

Size (mm)	Grit	Art. no.
457x18	60	39103
	120	10858
	200	39104
	400	39105

Size (mm)	Grit	Art. no.
520x20	60	10853
	120	10854
	200	10855
	400	10856

Size (mm)	Grit	Art. no.
533x30	60	12205
	120	12206
	200	12207
	400	12209
	800	12210

Size (mm)	Grit	Art. no.
762x25	60	39100
	120	39101
	200	10803
	400	39102

KGS SWIFLEX® SDA BELTS

Standard flexible diamond coated product, delivers good performance. The coarse pattern makes the belt very suitable for stock removal. Low pressure is required, thanks to a thin structured diamond abrasive resin layer, this makes the KGS Swiflex® SDA belts easy to use. Grinds faster and longer vs. conventional abrasives. Excellent value for money.

Backing	BYW4 - Strong polyester XY– backing
Materials	Glass, hard coatings, hard metals
Usage	

Size (mm)	Grit	Art. no.
520x20	60	41039
	120	41040
	200	41041
	400	41042

Size (mm)	Grit	Art. no.
533x30	60	33253
	120	11169
	200	11171
	400	11173
	800	11175
	1500	11176

TECH TIP
For longer life, try to grind on the slack of the belt, not the fixed platen or pulley. This will enhance the lifetime of the diamond belt.

LARGE DIAMOND BELTS

KGS Diamond offers a broad selection of sizes and grits for most dimensioning, intermediate grinding and polishing belt applications on hard and brittle materials. We have a long history in manufacturing flexible diamond belts, standard sizes as well as tailor-made. We specialize in working on extremely hard to grind materials with challenging surface finish requirements. The feedback of customers, operators and engineers have offered us the possibility to develop a range of joints which offer a solutions for most of your demands on materials where conventional abrasives can no longer meet your requirements.

This is our expertise and commitment to the customer, our specialty to offer engineered solutions in customized products and sizes to fit your application – in small quantities that fit the needs of the customer, without becoming too expensive.

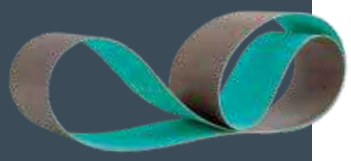
PRODUCT OFFERING

Below are examples - a snapshot of belt types and sizes we manufactured, we have hundreds more to choose from to meet the exact specifications of your application. For additional belt sizes, contact us with your requirements, we will be pleased to be of service to you. More about our special dimensions you will find on page 49.

KGS LARGE TELUM® BELTS

Premium product with top performance and extra long life time.

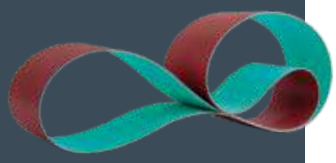
• DIMENSIONS: 1800x100, 1830x100, 2130x60, 3000x100, 3350x100 & 2000x50 mm



KGS FLEXIS® BELTS

Professional industrial product with high temperature resistance

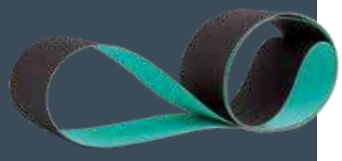
• DIMENSIONS: 1800x100, 1830x100, 2130x60, 3000x100, 3350x100 & 2000x50 mm



KGS SWIFLEX® SDA BELTS

Good alternative for dry running applications.

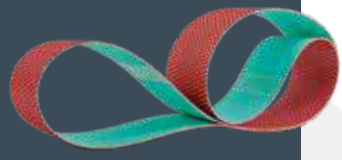
• DIMENSIONS: 1800x100, 1830x100, 2500x100, 3000 x100 & 2000x50 mm



KGS TELUM® CH BELTS

Specifically engineered to replace both metal bond diamond wheels and super-finishing systems.

• DIMENSIONS: 2000x50 and many other dimensions on request



KGS TELUM® BELTS

Premium product, with special interlocked arrow pattern delivers top performance giving extra long life time. The interlocked arrow pattern ensures high mechanical strength.

The belts have a strong tough flexible backer, this makes them ideal for grinding on slack of the belt. The KGS Telum® pattern avoids soldiering. High productivity output. Suitable for stand alone grinding machines.

Backing BP2 - Heavy polyester Y-weight backing

Materials Glass

Usage

Size (mm)	Grit	Art. no.
1800x100	60	12090
	120	12091
	200	12092

Size (mm)	Grit	Art. no.
1830x100	60	39045
	120	39046
	200	12100

Size (mm)	Grit	Art. no.
2000x50	400	11358

Size (mm)	Grit	Art. no.
2130x60	60	38989
	120	12152
	200	12153

Size (mm)	Grit	Art. no.
3000x100	60	12079
	120	39047
	200	39048

Size (mm)	Grit	Art. no.
3350x100	60	12087
	120	39049
	200	12088

KGS FLEXIS® BELTS

Flexible diamond belts for hand-held machines. The flexible diamond belts are often used to remove overspray for HVOF and TBC coatings.

It's the ideal solution for grinding off the surplus of coatings fast, with considerable time saving, compared to conventional abrasive tooling.

Backing BP2 - Heavy polyester Y-weight backing

Materials Glass, hard coatings, hard metals

Usage

Size (mm)	Grit	Art. no.
1800x100	60	12253
	120	12254
	200	39422

Size (mm)	Grit	Art. no.
1830x100	60	39390
	120	39391
	200	12229

Size (mm)	Grit	Art. no.
2000x50	60	39974
	120	11600
	200	11601
	400	11602

Size (mm)	Grit	Art. no.
2130x60	60	39044
	120	11475
	200	11476

Size (mm)	Grit	Art. no.
3000x100	60	39392
	120	39419
	200	39421

Size (mm)	Grit	Art. no.
3350x100	60	12248
	120	12249
	200	12250

KGS SWIFLEX® SDA BELTS

Standard flexible diamond coated product, delivers good performance. The coarse pattern makes the belt very suitable for stock removal.

Low pressure is required, thanks to a thin structured diamond abrasive resin layer, this makes the KGS Swiflex® SDA belts easy to use. Grinds faster and longer vs. conventional abrasives. Excellent value for money.

Backing BP3 - extra heavy Y polyester, waterproof.

Materials Glass, hard coatings, hard metals

Usage

Size (mm)	Grit	Art. no.
1800x100	60	39240
	120	39241
	200	39242

Size (mm)	Grit	Art. no.
1830x100	60	39127
	120	11904
	200	11906

Size (mm)	Grit	Art. no.
2000x50	60	11179
	120	11180
	200	38933
	400	38934
	800	38936
	1500	38937
	3000	38938

Size (mm)	Grit	Art. no.
2500x100	60	11181
	120	11183
	200	11185

Size (mm)	Grit	Art. no.
3000x100	60	11927
	120	11928
	200	39146

KGS TELUM® CH BELTS

For wet grinding and polishing of cylinders with hard coatings. Especially those used in the pulp, paper & printing industries. Including Chrome replacement with HVOF Tungsten Carbide - Hydraulic rams and shock absorbers plus rolls and cylinders used for hot rolling in the metal industry.

KGS Telum® CH Belts are engineered to replace both metal bond diamond wheels and super-finishing systems. Combines the accuracy of rigid tools (bonded wheels); with the speed, consistency & ease of use of a flexible diamond belt system. And for many applications, can replace the need for Diamond Film Finishing. Benefits: Same results every time - Grinds fast, can polish too - Hard pulley gives high calibration An efficient, low cost solution - Lower grinding force than wheels - Much lower capital investment

Backing BP2 - Heavy and very durable backing, Y-weight poly-cotton, waterproof

Materials Hard materials and coatings like HVOF

Usage

Size (mm)	Grit	Art. no.
2000x50	60	11727
	120	11728
	200	11729
	400	11730
	800	11731

- Other dimensions and grit sizes are available on request

Grit range: 50 up to 3000

Dimensions

	min (mm)	max (mm)
Width 20		300
Length 533		5000

TECH TIP

For calibration hard materials and coatings use grit 60. For finishing use grit 800 (sometimes grit 400 will be enough also) to achieve an RA of around 0.2.

Use coolant additives suitable for belt grinding operations like Shell Metalina B200 or D3202 (non-solvent base), avoid oil based coolants.

HIH CARBIDE

ENGINEERED SOLUTIONS

The market for thermal spray coatings and other advanced materials are showing a strong upward trend. Special and very hard coatings are applied for resurfacing metal parts to minimize the effects of mechanical wear, extending the “material life”.

Examples are tungsten carbide coatings for corrosive low-temperature wear and nickel chromium carbides for elevated temperature wear (1000° C). Carbide coatings containing cobalt chrome have over 4 - 6 times the abrasive wear. Wire flame, powder and plasma arc spraying are examples of thermal spray wear coating methods, next to the well-known HVOF (High Velocity Oxygen Fuel Spraying method) which creates very high micro structure densities close to that of rough materials.

All these coatings are very hard to grind and often applied to complex 3D shapes which makes it a challenge to achieve the required surface finish during the grinding process while keeping up productivity.

These hard to grind materials require engineered flexible diamond abrasive solutions to keep productivity at the right pace, costs under control and servicing within expectations.

KGS highly-engineered flexible diamond belts are the most efficient tools to grind and polish hard coatings on flat, concave and complex 3D shapes. KGS diamond tools for hard to grind coated geometries offer a perfect balance between cut-rate, flexibility, strength, surface finish and high productivity.

Flexible diamond tools are easier to use, require less operators’ skills and are more sustainable than other abrasives, resulting in a more consistent and predictable result.

PRODUCT AVAILABILITY

- In grits 50 to 3000
- Metal and resin bond
- In different types of backers, strong, heavy and flexible In
- dimensions up to 300mm wide and 10.000mm long

APPLICATIONS

For many different applications such as:

- Mud rotor finishing Page: 50
- Extrusion spirals Page: 52
- Rolls and cylinders Page: 54

FLEXIBLE DIAMOND BELTS FOR MUD ROTOR FINISHING

The high-end manufacturers of down hole mud rotors in the oil and gas industry are using KGS diamond belts to finish and blend the tungsten carbide coating. An obvious choice, which increases productivity, lifetime, the surface finish and thus the performance of the rotors. Most applications need belts to work dry. KGS offers enhanced joint technology, this enables the resulting belt joint to withstand the maximum pressure under dry working conditions.

Type of grinding machines: Several set-ups are possible to reach the required finish. Stationary belt grinders provide a consistent finish where manual belt grinders allow the finishing of more difficult to reach areas.

The belts can be used with or without coolant. Use with coolant gives a better lifespan. With KGS diamond belts finishes up to high gloss (Ra < 0.05) are within reach and conceivable.

KGS FLEXIS® BELTS

These sustainable belts have a dot pattern, metal bond design, that ensures a very strong, precise diamond grain adhesion which delivers long-lasting durability, high cut-rate and consistent grinding results.

The flexible backer allows the diamond abrsive to respond to surface imperfections and contoured shapes, with continuous high cut-rate and excellent productivity. The open dot pattern allows the removal of swarf, reducing loading, providing longer lifetime. KGS Flexis® belts perform at best when used wet.

AVAILABLE ON REQUEST

Grit range: 120 up to 1500
Dimensions:

	min (mm)	max (mm)
Width	8	300
Length	305	5000

KGS SWIFLEX® SDA BELTS

These sustainable belts have a flexible backer with a thin structured resin bond diamond layer. The feel and touch of this product is very similar to coated abrasives.

KGS Swiflex® SDA are designed for wet and dry use. The flexible backer, type FSC, has a high flexibility to follow intricately contoured shapes

AVAILABLE ON REQUEST

Grit range: 60 up to 3000
Dimensions:

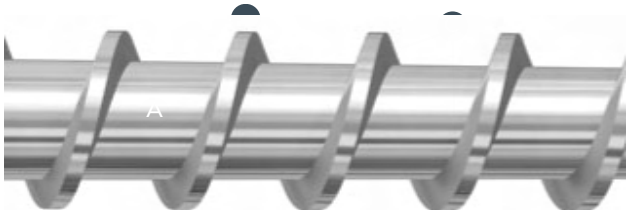
	min (mm)	max (mm)
Width	8	300
Length	305	5000

FLEXIBLE DIAMOND BELTS FOR EXTRUSION SPIRALS

Extrusion spirals shapes have different geometries with hard to reach area's requiring different abrasive tools to achieve the required surface finish, reducing productivity and increasing grinding costs.

For these type of complex grinding processes KGS DIAMOND sets a new standard. To grind and polish both the outside and inside radius with one specification in a few short steps.

TYPE OF GRINDING MACHINE
Complex 3D spiral shapes such as injection molding screws.



A: Simple to reach area
B: Not to diffulct to reach area C: Hard to reach area

Our products can do both A & C in one operation

KGS FLEXIS® BELTS

These sustainable belts have a dot pattern, metal bond design, that ensures a very strong, precise diamond grain adhesion which delivers long-lasting durability, high cut-rate and consistent grinding results.

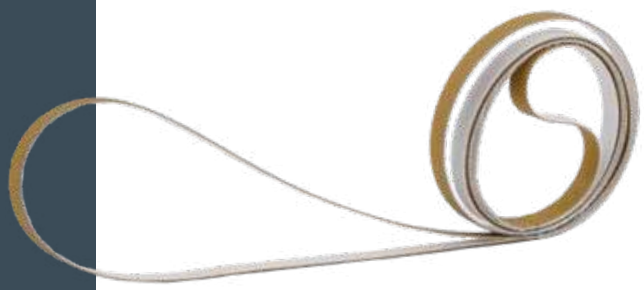
The flexible backer allows the diamond abrsive to respond to surface imperfections and contoured shapes, with continuous high cut-rate and maintaining the productivity. The open dot pattern allows the removal of swarf, reducing loading and providing longer lifetime.

KGS Flexis® belts perform at their best when used wet. Roughness finish Ra < 0.1 can be achieved, depending on the coating type. Recommended grit sequence: BK-120 (125 micron) , RD-200 (74 micron), Ye-400 (40 micron).

AVAILABLE ON REQUEST

Grit range: 120 up to 1500
Dimensions:

	min (mm)	max (mm)
Width	8	300
Length	305	5000



KGS SWIFLEX® SDA BELTS

These sustainable belts have a flexible backer with thin structured resin bond diamond layer. The feel and touch of this product is very similar to coated abrasives.

KGS Swiflex® SDA are designed for wet and dry use. The flexible backer, type FSC, has a high flexibility to follow adequately contoured shapes. Recommended grit sequence: BK-120 (125 micron) , RD-200 (74 micron), Ye-400 (40 micron).

AVAILABLE ON REQUEST

Grit range: 60 up to 3000
Dimensions:

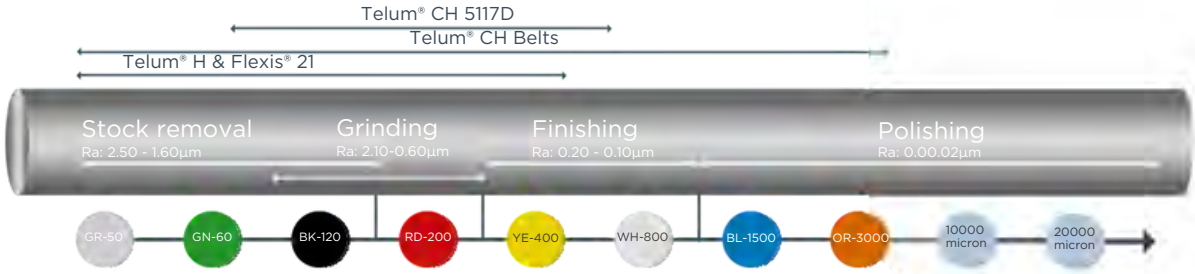
	min (mm)	max (mm)
Width	8	300
Length	305	5000

FLEXIBLE DIAMOND BELTS AND STRIPS FOR ROLLS AND CYLINDERS

For wet grinding, finishing and polishing of cylinders with hard coatings, especially those used in the pulp, paper & printing industries. Including chrome replacement with HVOF tungsten carbide. hydraulic rams and shock absorbers plus rolls and cylinders used for hot rolling in the metal industry.

THE GRINDING PROCESS

FROM STRIPPING TO SUPERFINISHING



STOCK REMOVAL

METAL BOND BELTS & STRIPS TELUM H & FLEXIS 21

Start the dimensioning step of your operation with KGS Telum® H or Flexis® 21 in grits 60 up to 400. These nickel belts are designed for fast grinding operations with high stock removal. Easy to use, yet still providing consistent and accurate results.

Depending on the Ra finish your product requires, these products provide the right preparation for a final finish and polish step with the resin bond KGS Telum® CH product.

GRINDING

METAL BOND BELTS & STRIPS TELUM H, FLEXIS 21 AND TELUM CH

® ® ®

The KGS Telum® H, Flexis® and Telum® CH are versatile belts used for grinding purposes. The flexible backer combined with the highly-engineered diamond grain adhesion allows the system to become a market leader in fast dimensioning and durability. Especially designed for hard materials and coatings like HVOF and available in various grits.

POLISHING

KGS-Telum® CH Resin Belts - engineered to replace both metal bond diamond wheels and super-finishing systems. Combines the accuracy of rigid tools (bonded wheels); with the speed, consistency & ease of use of a flexible diamond belt system and suitable for many applications which can also replace the need for diamond film finishing. KGS Telum® CH belts are available in grit 50 up to 3000 for high stock removal and superfinishing applications.

FLEXIBLE DIAMOND BELTS AND STRIPS FOR ROLLS AND CYLINDERS

KGS FLEXIS® BELTS

Stronger pattern, ideal for grinding on slack of belt. Available with BP2 backing, excellent for roll grinding, aggressive cutting with reduced loading.

Also availanle with BPT backing, for applications where more stiffness is required, reduced loading, aggressive cutting.

AVAILABLE ON REQUEST

Grit range: 50 up to 1500
Dimensions:

	min (mm)	max (mm)
Width	8	300
Length	305	5000

KGS TELUM® H BELTS

Stronger pattern, ideal for grinding on slack of belt.

AVAILABLE ON REQUEST

Grit range: 50 up to 1500
Dimensions:

	min (mm)	max (mm)
Width	10	300
Length	305	5000

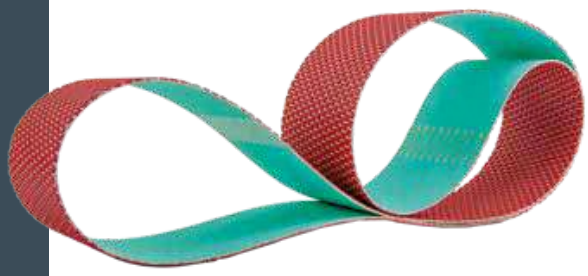
KGS TELUM® CH BELTS

Superior performance with resin bond product, less pressure required compared to metal bond.

AVAILABLE ON REQUEST

Grit range: 50 up to 1500
Dimensions:

	min (mm)	max (mm)
Width	25	300
Length	533	5000



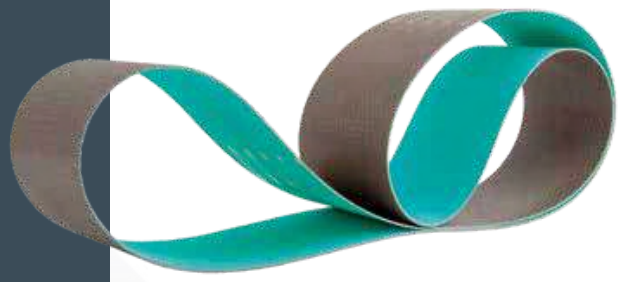
KGS TELUM® BELTS

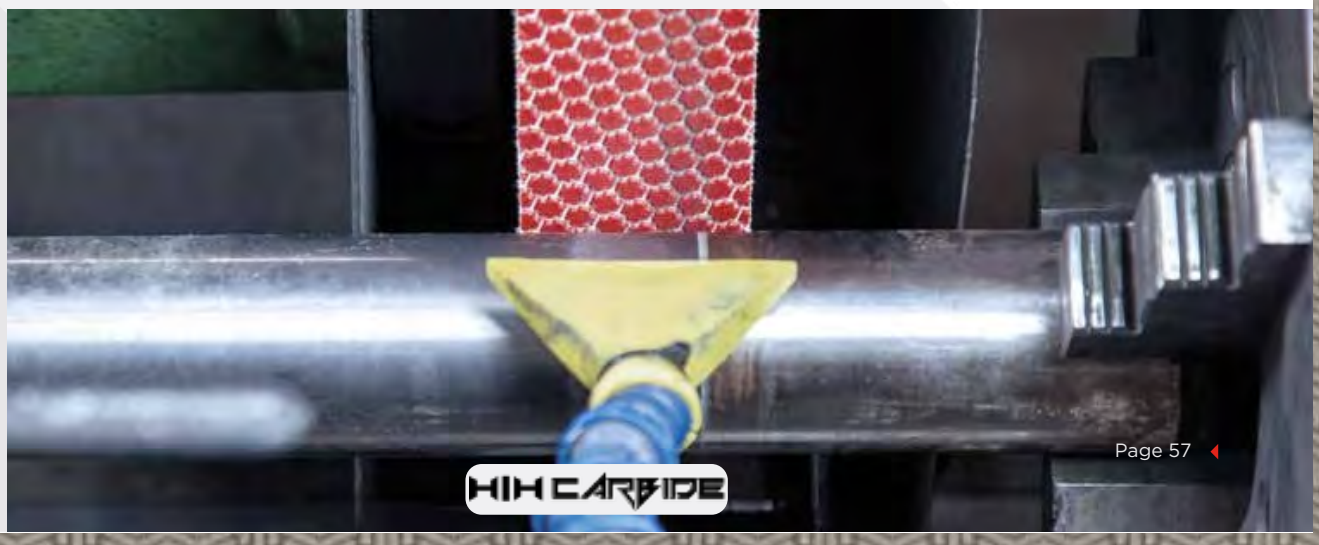
For applications where more stiffness is required in combination with connected pattern.

AVAILABLE ON REQUEST

Grit range: 50 up to 1500
Dimensions:

	min (mm)	max (mm)
Width	10	300
Length	305	5000





DIAMOND STRIPS

KGS flexible diamond tools are used on super-finishing machines for roll finishing of very hard materials like tungsten carbide, ceramics, thermal spray, epoxy and special alloys. This process in mainly used for precision engineering applications, ensuring improved operations and a longer product life.

TYPE OF GRINDING MACHINE

Superfinishing machines from OEM's like Loeser, GEM, Dynabrade, offered for installation on existing lathes or as a complete finishing line.

INDUSTRY

Pulp, paper, printing, hot rolling mills, oil, gas, mining, drilling, water engineering, earthmoving equipment.

PRODUCT OFFERING

KGS TELUM® STRIPS

For superfinishing applications, premium pattern

• MATERIALS Very hard materials like tungsten carbide, ceramics, thermal spray, epoxy and special alloys.

KGS FLEXIS® STRIPS

For superfinishing applications, open pattern reduces loading, aggressive cutting

• MATERIALS Very hard materials like tungsten carbide, ceramics, thermal spray, epoxy and special alloys.

KGS TELUM® STRIPS

Diamond strips, with strong interlocking arrow pattern. These long strips – also known as MO-strips - are available in various widths and lengths. The strips have 1000 mm tails for lead-in and lead-out and are supplied on a 75mm keyed plastic core. Flexible diamond tools perform at best when used with coolant.

Backing BYW3

Materials Very hard materials like tungsten carbide, ceramics, thermal spray, epoxy and special alloys.

AVAILABLE ON REQUEST

Grit range: 60 up to 1500
Dimensions:

	min (mm)	max (mm)
Width	50	200
Length	200	10000

» Popular widths: 50, 75, 100, 150 & 200 mm
» Popular lengths: 3.200/1.200, 4.000/2.000, 6.000/4.000, 7.000/5.000, 12.000/10.000 mm

KGS FLEXIS® STRIPS

Diamond strips for superfinishing applications, open pattern reduces loading, aggressive cutting. The strips have 1000 mm tails for lead-in and lead-out and are supplied on a 75 mm keyed plastic core. Flexible diamond tools perform at best when used with coolant.

Backing BYW3

Materials Very hard materials like tungsten carbide, ceramics, thermal spray, epoxy and special alloys.

AVAILABLE ON REQUEST

Grit range: 60 up to 1500
Dimensions:

	min (mm)	max (mm)
Width	50	200
Length	1200	10000

» Popular widths: 50, 75, 100, 150 & 200 m
» Popular lengths: 3.200/1.200, 4.000/2.000, 6.000/4.000, 7.000/5.000, 12.000/10.000 mm

BENEFITS OF KGS SUPERFINISHING STRIPS

» Tight tolerance material, less maintanance, less replacement costs / investments. This system provides predictable, consistent (over the entire surface) and repeatable finishes. It improves the surface structure which can easily be compared to levels reached by honing or lapping.

» The ability to achieve the desired surface texture. From a highly reflective finish and low Ra value, to a specific surface roughness for friction grip and/or ink, water or oil retention. During the constant use of these rolls, they tend to lose this surface roughness and become “polished” over time. In this way rolls can be refurbished many times before fully being stripped and recoated.

» Removal of chatter marks, feed marks and other imperfections left by previous grinding operations.

DIAMOND HANDPADS

THE MOST USEFUL TOOL IN YOUR TOOLBOX - LASTS MUCH LONGER THAN SANDPAPER! Precision diamond super abrasive within a nickel or resin matrix. Delivers professional results on every job.

Handpads are versatile, general purpose tools for manual edging and shaping. Handpads are used for beveling edges manually, removing small faults, and corner dubbing. Excellent for de-burring and finishing applications. They are often used dry. To obtain a more polished finish with resin pads, they must be used wet, - plain water is usually perfectly ok.

Suitable for work on hard metals, hard coatings, natural and engineered stone, composites, glass, ceramic, or concrete surfaces, e.g. spot/selective grinding for concrete cosmetics.

The 75x75 mm handpads have only 10 mm foam, this extra flexibility means they are very suitable for grinding and polishing on profiled surfaces.

KGS TELUM®HANDPAD

Diamond handpad with an unique KGS design, for a perfect finish! Premium product for handpad application, with extra long lifetime, consistent performance and finish.

• DIMENSIONS 55x90 & 75x75 mm

• MATERIALS Hard metal, hard coatings, natural stone, ceramic, engineered stone, concrete, composite, glass and many more.

KGS FLEXIS® HANDPADS

Professional standard dot pattern with good price-performance ratio. Fast grinding and polishing. Safely and easily grind and polish difficult shapes, such as corners, flats, and round edges.

• DIMENSION 55x90 & 75x75 mm

• MATERIALS Hard metal, hard coatings, natural stone, ceramic, engineered stone, concrete, composite, glass and many more.

KGS TELUM® HANDPADS

Diamond handpads with an unique KGS design for maximum performance. A versatile tool with very long service life, consistent material removal and finish. The KGS Telum® handpads are a premium product for handpad applications with comfort for manual grinding, finishing and polishing.

Suitable for hard-to-reach places, corners, edges, and for manual work, such as deburring, tool sharpening, and general defect removal. The handpad 75x75 series is available for greater flexibility and for sanding round or curved surfaces.

Backing: With flexible foam backing

Grit range: 60 - 800 metal bond (m)
500 - 3000 resin bond (r)

Materials: Hard metal, hard coatings, natural stone, ceramic, engineered stone, concrete, composite, glass and many more.

Usage: Wetting the surface with a little bit of water improves the grinding process.

Size (mm)	Grit	Art. no.
90x55	60 (m)	14733
	120 (m)	14735
	200 (m)	14738
	400 (m)	14742
	500 (r)	14749
	800 (m)	14744
	1500 (r)	14750
	3000 (r)	14751

Size (mm)	Grit	Art. no.
75x75	60 (m)	14753
	120 (m)	14754
	200 (m)	14755
	400 (m)	14756
	500 (r)	14758
	800 (m)	14757
	1500 (r)	14759
	3000 (r)	14760

KGS FLEXIS® HANDPADS

Diamond Handpad, with a nickel or resin dot matrix. Delivers professional results on every job: wet or dry; cost-effective. Suitable for hard-to-reach places, corners, edges, and for manual work, such as deburring, tool sharpening, and general defect removal. The KGS Flexis® pattern have a high temperature resistance due to superior heat dissipation. An extremely versatile tool and suitable for a large number of materials

The handpad 75x75 series is available for greater flexibility and for sanding round or curved surfaces.

Backing: With flexible foam backing

Grit range: 60 - 800 metal bond (m)
500 - 3000 resin bond (r)

Materials: Hard metal, hard coatings, natural stone, ceramic, engineered stone, concrete, composite, glass and many more.

Usage Wetting the surface with a little bit of water improves the grinding process.

Size (mm)	Grit	Art. no.
90x55	60 (m)	14801
	120 (m)	14807
	200 (m)	14815
	400 (m)	14822
	500 (r)	14837
	800 (m)	14829
	1500 (r)	14842
	3000 (r)	14846

Size (mm)	Grit	Art. no.
75x75	60 (m)	14850
	120 (m)	14852
	200 (m)	14854
	400 (m)	14857
	500 (r)	14861
	800 (m)	14859
	1500 (r)	14863
	3000 (r)	14865

DIAMOND HAND FILES

Diamond files, another great addition to any toolbox. The files are very usefull hen working with a variety of materials. Perfect tool for deburring and finishing hard materials, stone, metal, glass, ceramics and composites.

Ideal for deburring and smoothing delicate surfaces, beveling edges, removing burs and sharpening tools. The hand files are color-coded for easy grit identification. The diamond embedded in the metal bond gives high strength and superior heat dissipation which ensures a long lasting consistent performance. The plastic handle is lightweigth, rigid and strong with an ergonomical design for operator comfort.

KGS FLEXIS®HANDFILES

Available in 4 different shapes and sizes – facilitate easy access to a variety of workpieces. Ideal solution for those parts and shapes that may have hard-to-reach areas or edges, for industrial application, and also suitable for all kind of other tools and materials.

• DIMENSIONS Type 1: 38x19 mm, flat
Type 2: 43x12 mm, flat
Type 3: 43x12 mm, half round
Type 4: 60x6 mm, flat

• MATERIALS Hard materials, like hard metal, hard coatings, glass, stone and ceramics and composites.

KGS FLEXIS® HANDFILES

Diamond files are very usefull when working with a variety of materials. Perfect tool for deburring and finishing hard materials, stone, metal, glass, ceramics and composites. Ideal for deburring and smoothing delicate surfaces, beveling edges, removing burs and sharpening tools. The hand files are color-coded for easy grit identification.

Materials Hard materials, like hard metal, hard coatings, glass, stone and ceramics and composites

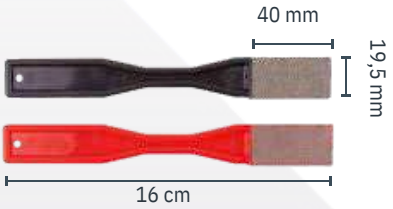
Usage

Dimension Four different shapes in one pack 60x6 mm (flat), 43x12 mm (half round), 43x12 mm (flat) and 38x19 mm (flat)

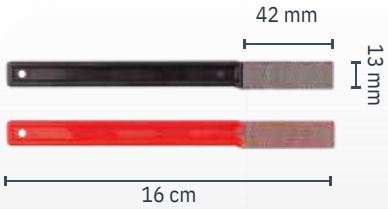
Size (mm)	Grit	Art. no.
Set of 4 files in different shapes	120 - Black	34562
	200 - Red	34563

DIFFERENT SHAPES OF THE DIAMOND FILES

Type 1: 38x19 mm, flat



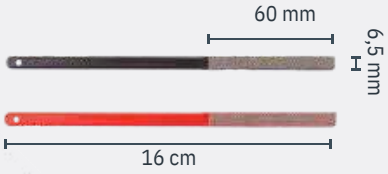
Type 2: 43x12 mm, flat



Type 3: 43x12 mm, half round

*Radius = +/- 5 mm

Type 4: 60x6 mm, flat



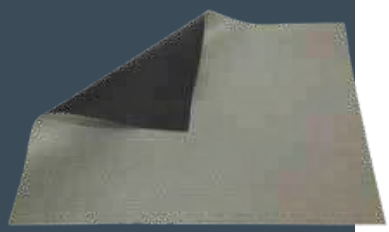
DIAMOND SHEETS

Very flexible hand sheets for wet grinding and polishing by hand with water. Available in canvas (CV) backing for plain sheets. Also available with Quick Release System (QRS) or Self-Adhesive (SA) backing.

The sheets can easily be cut to the desired shape and size, for example for a file, sandpaper or a tool for sanding stones and skirting boards. The KGS Telum® sheets are more durable than the KGS Flexis® dot pattern. The dot pattern has a more open structure which gives more flexibility.

KGS TELUM®SHEETS

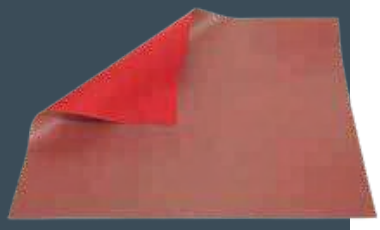
Diamond sheet with an unique KGS design for maximum performance. Premium product, with extra long lifetime, cconsistent material removal and finish. Best choice in terms of performance and lifetime.



- DIMENSIONS 120x70, 130x55 and 280x230 mm
- MATERIALS Natural stone, ceramic, engineered stone, concrete, composite, glass and many more.

KGS FLEXIS®SHEETS

Diamond sheet with a professional standard dot pattern with good price-performance ratio. The dot pattern is a more open pattern which make it more flexible. Fast grinding and polishing. High temperature resistance due to superior heat dissipation.



- DIMENSIONS 120x70, 130x55 and 280x230 mm
- MATERIALS Natural stone, ceramic, engineered stone, concrete, composite, glass and many more.

KGS TELUM® SHEETS

Very flexible diamond sheets for wet grinding, finishing and polishing of hard and brittle materials by hand. Very flexible colour coded canvas backing, easy to tear. Premium product for, with extra long lifetime, consistent performance and finish.

Backing Available in different backeers:

» Canvas (CV)
» Self adhesive (SA)
» Quick Release system (QRS)

Materials Natural stone, ceramic, engineered stone, concrete, composite, glass and many more

Usage

CANVAS BACKING

Size (mm)	Grit	Art. no.
280x230	60	15210
	120	15211
	200	15212
	400	15213
	800	15214

SELF ADHESIVE BACKING

Size (mm)	Grit	Art. no.
280x230	60	15229
	120	15230
	200	15231
	400	15232
	800	15234

QRS (VELCRO®) BACKING

Size (mm)	Grit	Art. no.
120x70	60	15239
	120	15240
	200	15241
	400	15242
	800	15243

Size (mm)	Grit	Art. no.
130x55	60	15202
	120	15203
	200	15204
	400	15205
	800	15206

Size (mm)	Grit	Art. no.
280x230	60	15323
	120	15324
	200	15325
	400	15326

KGS WOODEN BLOCK

Dimension	Art. no.
130x55 mm	17158

KGS FLEXIS® SHEETS

Very flexible diamond sheets for wet grinding, finishing and polishing of hard and brittle materials by hand. Very flexible colour coded canvas backing, easy to tear. The KGS Flexis® dot pattern is a more open pattern, this makes the sheets very flexibel. Good price-performance ratio

Backing Available in different backeers:
» Canvas (CV)
» Self adhesive (SA)
» Quick Release system (QRS)

Materials Natural stone, ceramic, engineered stone, concrete, composite, glass and many more

Usage

CANVAS BACKING

Size (mm)	Grit	Art. no.
280x230	60	15492
	120	15494
	200	15496
	400	15498
	800	15500

SELF ADHESIVE BACKING

Size (mm)	Grit	Art. no.
280x230	60	15527
	120	15529
	200	15532
	400	15534
	800	15535

QRS (VELCRO®) BACKING

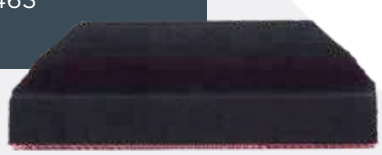
Size (mm)	Grit	Art. no.
120x70	60	38968
	120	38969
	200	38970
	400	32289
	800	15547

Size (mm)	Grit	Art. no.
130x55	60	15467
	120	15470
	200	15473
	400	15476
	800	15479

Size (mm)	Grit	Art. no.
280x230	60	15695
	120	15697
	200	15700
	400	15703
	800	15705

KGS FOAM BLOCK WITH QRS-HOOK

Dimension	Art. no.
120x70 mm	21463



DIAMOND WHETSTONES

KGS Diamond whetstones for very fast sharpening of hard, brittle materials. No need for conventional sharpening stones any more. Diamond sharpening stones work much faster, keeping an aggressive cut, maintaining an incredible long life.

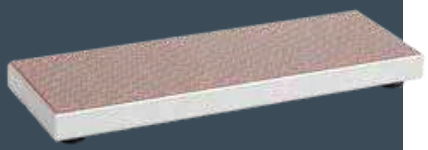
The KGS Whetstone is a precision diamond sharpening tool. The whetstone has metal bonded diamond for high strength. The aluminium support plate has plastic nubs on the back, preventing the slipping of the whetstone during sharpening.

The precision diamond tools is well suited for sharpening or deburring any hard, brittle materials. Ideal for precision faceting and sharpening of chisels, blades, knives, ice-skates, for any type of tools that requires resharpening.

KGS TELUM® WHETSTONES

Premium strong interlocking arrow pattern for precision grinding and polishing similar to conventional rigid diamond tools, with an even greater performance and very long life.

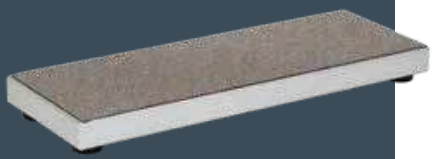
- DIMENSIONS 100x25, 150x50 & 200x75 mm
- MATERIALS Hard and brittle material, hard metals like Tungsten Carbide.



KGS FLEXIS® WHETSTONES

Professional standard dot pattern with high temperature resistance due to superior heat dissipation, open dot pattern reduces loading.

- DIMENSIONS 100x25, 150x50 & 200x75 mm
- MATERIALS Hard and brittle material, hard metals like Tungsten Carbide.



KGS TELUM® WHETSTONE

Diamond whetstone with a premium strong interlocking arrow pattern for sharpening, deburring and defect removal. Suitable for manually controlled sharpening of chisels, drills and cutting tools, especially those made out of hard and brittle material, like Tungsten Carbide.

The KGS Telum® whetstones work much faster and have an incredible long life compared to conventional whetstones. They are available in five different grits and in a combination of two grits. Thanks to the two different grits on one whetstone it's easy to switch between grinding and finishing.

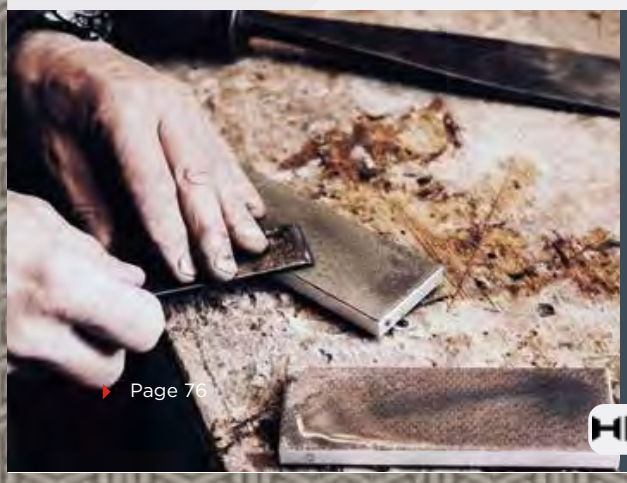
Materials Hard and brittle material, hard metals like Tungsten Carbide.

Usage Wet is recommended. When using them wet, use water (not oil).

Size (mm)	Grit	Art. no.
100x25	120	16223
	200	16224
	400	16225
	800	33081

Size (mm)	Grit	Art. no.
150x50	120	16227
	200	16228
	400	16229
	800	16230
	200 & 400	16240

Size (mm)	Grit	Art. no.
200x75	120	16231
	200	39972
	400	16232
	800	16233



MANUALLY CONTROLLED SHARPENING
Make the surface extremely sharp!

Perfect for chisels, drills and cutting tools, especially those made out of hard and brittle material, like Tungsten Carbide.

KGS FLEXIS® WHETSTONE

Diamond whetstone with a professional standard dot pattern with a high temperature resistance due to superior heat dissipation, open dot pattern reduces loading. Perfect tool for sharpening, deburring and defect removal. Suitable for manually controlled sharpening of chisels, drills and cutting tools, especially those made out of hard and brittle material, like Tungsten Carbide.

The KGS Flexis® whetstones work much faster and have an incredible long life compared to conventional whetstones. They are available in five different grits and in a combination of two grits. Thanks to the two different grits on one whetstone it's easy to switch between grinding and finishing.

Materials Hard and brittle material, hard metals like Tungsten Carbide.

Usage Wet is recommended. When using them wet, use water (not oil).

Size (mm)	Grit	Art. no.
100x25	120	16252
	200	16254
	400	29626

Size (mm)	Grit	Art. no.
150x50	120	16258
	200	16259
	400	16261
	800	16262
	200 & 400	16266

Size (mm)	Grit	Art. no.
200x75	120	41591
	200	33274
	400	16264
	800	16265

The sharp diamond abrasives make dull cutting edges sharp again. These 100 x 25 mm diamond whetstones make hand sharpening easy, which leads to faster work and sharper edges. The whetstone is also very suitable for faceting stone and tile edges.

DIAMOND K-LOC DISCS

K-Loc discs are flexible diamond quick change discs (Ø25, 50 and 75 mm). The diamond disc “screws” into the mandrel for a tight hold. This does make the disc stiffer so they will work best on flat surfaces and straight edges. K-Loc discs can be used on different materials such as stone, glass, ceramics, composites, hard metals and hard coatings.

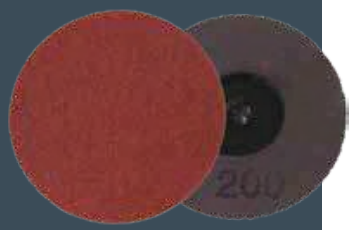
KGS TELUM® K-LOC

KGS Telum® - Strong interlocking arrow pattern, specifically developed for heavy stock removal and finishing. The structure of the pattern ensures good heat dissipation.

- DIMENSIONS Ø25, 50 & 75 mm
- MATERIALS Hard coatings, hard metals, glass, ceramics, composites, and stone

KGS SWIFLEX® SDA K-LOC

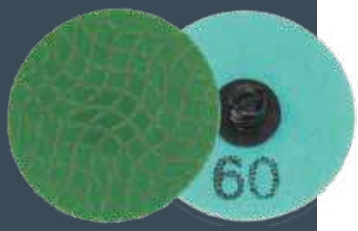
Flexible diamond tools perform best when used wet. Sometimes the circumstances or equipment does not allow operators to grind wet. For optimal dry grinding results KGS Swiflex® SDA has been developed. A resin bond product which can be used wet and dry.



- DIMENSIONS Ø25, 50 & 75 mm
- MATERIALS Hard coatings, hard metals, glass, ceramics, composites, and stone

KGS QUADROFLEX™ K-LOC

KGS Quadroflex™ - A unique and continuous connected wave pattern, for high stock general purpose. Excellent for cooler grinding and heavy grinding applications. A very strong no clogging pattern with an open structure and lower diamond concentration. It ensures high stock removal and higher pressure per grit.



- DIMENSIONS Ø25, 50 & 75mm
- MATERIALS Tungsten carbide and chrome carbide, thermal sprays, Yttria-Stabilized Zirconia (YSZ) and alumina ceramics.

KGS TELUM® K-LOC

K-Loc system (quick change system) suitable for corner dubbing of glass and finishing thermal barrier coatings and ceramics in complex three dimensional shapes such as the aerospace or prosthetics industry.

Backing BP - strong, durable & thick Y-weight poly-cotton, water- and emulsion proof.

Materials Hard coatings, hard metals, glass, ceramics, composites, and stone

Usage

Size (mm)	Grit	Art. no.
Ø 25	60	12633
	120	12634
	200	12635
	400	12636
	800	12637

Size (mm)	Grit	Art. no.
Ø 75	60	12647
	120	12649
	200	12650
	400	12651

Size (mm)	Grit	Art. no.
Ø 50	60	12638
	120	12639
	200	12640
	400	12641
	800	12642

KGS SWIFLEX® SDA K-LOC

K-Loc disc with a thin structured diamond abrasive resin layer, which can be used for various applications, for both wet & dry usage. The feel and touch of this product is very similar to conventional coated products.

Backing BYW4 - Strong heavy Y polyester, waterproof

Materials Hard coatings, hard metals, glass, ceramics, composites, and stone

Usage

Size (mm)	Grit	Art. no.
Ø 25	60	12808
	120	12809
	200	12810
	400	12811
	800	12812
	1500	12813
	3000	12814

Size (mm)	Grit	Art. no.
Ø 50	60	12815
	120	12816
	200	12817
	400	12818
	800	12819
	1500	12820
	3000	12821

Size (mm)	Grit	Art. no.
Ø 75	60	12822
	120	12823
	200	12824
	400	12825
	800	12826
	1500	39691
	3000	39692

KGS QUADROFLEX™ K-LOC

The KGS Quadroflex™ k-loc disc is primarily used for grinding thermal barrier coatings. Versatile and flexible diamond tool for finishing and dimensioning flat and contoured surfaces, also for hard to reach areas.

Rigid enough to remove material at a high rate and flexible enough to follow difficult geometries easily. Suitable for a variety of hard-to-grind materials. It removes coating overspray's and coatings prior to part refurbishment.

Backing BP - strong, durable & thick Y-weight poly-cotton, water- and emulsion proof.

Materials Tungsten carbide and chrome carbide, thermal sprays, Yttria-Stabilized Zirconia (YSZ) and alumina ceramics

Usage

Size (mm)	Grit	Art. no.
Ø 25	60	12720
	120	12721
	200	12722

Size (mm)	Grit	Art. no.
Ø 50	60	12715
	120	12716
	200	12717
	400	12718

Size (mm)	Grit	Art. no.
Ø 75	60	12729
	120	12732
	200	12735
	400	12737

K-LOC BACK-UP PAD

6X40 MM SHAFT

K-Loc back-up pad / mandrel, with 6 mm shaft

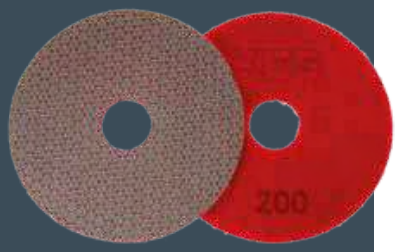
Size (mm)	Art. no.
Ø 25	21929
Ø 35	21486
Ø 45	21928
Ø70	21927

DIAMOND DISCS

Depending on the application, KGS offers a range for wet and dry grinding discs. For wet grinding and polishing our QRS disc range, with hole for central water feeding, iis available in KGS Telum® and KGS Flexis® versions. The mounting on a QRS back up pad ensures a flat and stable surface for controlled edging application.

KGS TELUM® DISCS - WITH QRS BACKING
Premium diamond disc with high performance. The KGS

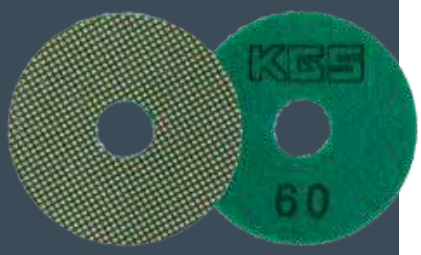
Telum®
pattern ensures comfortable grinding and high stock removal.



• DIMENSIONS Ø75, 100, 115 and 125 mm

• MATERIALS Glass, ceramics, porcelain,
granite, marble and composites

KGS FLEXIS® DISCS - WITH QRS BACKING
Professional industrial diamond disc with dot pattern for general purpose. Perfect heat dissipation and free cutting.



• DIMENSIONS Ø75, 100, 115 and 125 mm

• MATERIALS Glass, ceramics, porcelain, granite, marble and composites.

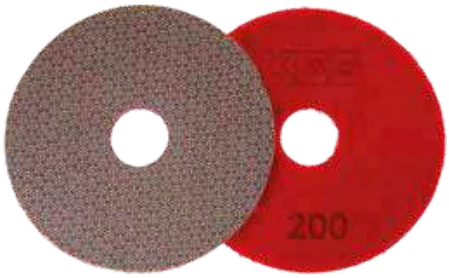
KGS TELUM® DIAMOND DISCS

Premium diamond disc with strong QRS system, making the disc easy to change. Suitable for electric and air tools. The KGS Telum® pattern delivers high performance, ensures comfort when grinding and has a high material removal rate, thanks to the high diamond content and the special interlocking arrow pattern.

Backing QRS - Quick release system (Velcro®) for quick changing grit size. Coulor coded grit sizes for easy identification

Materials Glass, ceramics, porcelain, granite, marble and composites.

Usage



Size (mm)	Grit	Art. no.
Ø 75x25	60	12845
	120	12846
	200	12847
	400	12848
	800	12849

Size (mm)	Grit	Art. no.
Ø 100x25	60	13092
	120	13093
	200	13094
	400	13095
	800	13096

Size (mm)	Grit	Art. no.
Ø 115x25	60	13102
	120	13103
	200	13104
	400	13105
	800	13106

Size (mm)	Grit	Art. no.
Ø 125x25	60	13118
	120	13119
	200	13120
	400	13121
	800	13122

KGS FLEXIS® DIAMOND DISCS

Professional industrial diamond disc with strong QRS system, making the disc easy to change. Suitable for electric and air tools. A versatile diamond disc that can be used for various grinding and polishing applications. The KGS Flexis® pattern ensures perfect heat dissipation and free cutting.

Backing QRS - Quick release system (Velcro®) for quick changing grit size. Coulor coded grit sizes for easy identification

Materials Glass, ceramics, porcelain, granite, marble and composites

Usage

Size (mm)	Grit	Art. no.
Ø 75x25	60	12906
	120	12907
	200	12908
	400	12909
	800	12910

Size (mm)	Grit	Art. no.
Ø 100x25	60	13249
	120	13253
	200	13257
	400	13261
	800	13263

Size (mm)	Grit	Art. no.
Ø 115x25	60	13276
	120	13280
	200	13284
	400	13288
	800	13291

Size (mm)	Grit	Art. no.
Ø 125x25	60	13343
	120	13346
	200	13349
	400	13352
	800	13355

KGS Telum® is our premium pattern, because of the interlocking structure these discs follow the material the best for smooth grinding. However sometimes you need more free cutting and for these applications we advise KGS Flexis®.

For both patterns goes; do not apply a lot of pressure, let the diamond do the work!

BACK-UP PADS FOR QRS DISCS

KGS BACK-UP PAD M14 VELCRO®

Back-up pad with Velcro connection.

Size (mm)	Art. no.
Ø 75x10	21925
Ø 100x10	21923
Ø 125x10	41187

KGS BACK-UP PAD M14 VELCRO® WITH 10 MM FOAM

Back-up pad with Velcro connection and industrial foam for more flexibility and a softer grind.

Size (mm)	Art. no.
Ø 100	41190
Ø 115	41191
Ø 125	41192

KGS BACK-UP PAD FLEXIBLE RUBBER M14 VELCRO®

Flexible rubber back-up pad with Velcro connection. Especially for grinding and polishing of geometric shapes and curves.

Size (mm)	Art. no.
Ø 100	22007

DIAMOND TRIANGLE PADS

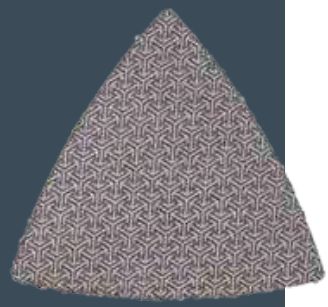
Flexible diamond polishing pads can be used on various materials such as natural stone, ceramic, engineered stone, and concrete. Great for work in hard-to-reach corners and edges.

MACHINE TYPE

KGS Diamond triangle pads are suitable for use on standard Fein (80x80 mm) and Bosch (94x94 mm) triangle grinding machines.

KGS TELUM® TRIANGLE PADS

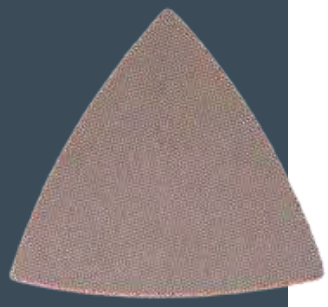
Innovative design, patented technology with interlocked arrow, snowflake pattern. Ideal for grinding and polishing of corners. Leaves a nice polished surface. Long life product



- DIMENSIONS 80x80 mm (Fein machines)
  94x94 mm (Bosch machines)
- MATERIALS Hard metal, hard coating, ceramic, engineered stone, concrete and natural stone

KGS FLEXIS® TRIANGLE PADS

Professional standard dot pattern with good price-performance ratio. Fast grinding and polishing. Safely and easily grind and polish difficult shapes, such as corners, flats, and round edges.



- DIMENSIONS 80x80 mm (Fein machines)
  94x94 mm (Bosch machines)
- MATERIALS Hard metal, hard coating, ceramic, engineered stone, concrete and natural stone

KGS TELUM® TRIANGLE PADS

Premium diamond triangle pad with KGS Telum® pattern, this patterns delivers high performance, ensures comfort when grinding and has a high material removal rate, thanks to the high diamond content and the special interlocking arrow pattern. The triangle pads are ideal for grinding and polishing of corners. Leaves a nice polished surface. Suitable for use on standard Fein and Bosch triangle grinding machines.

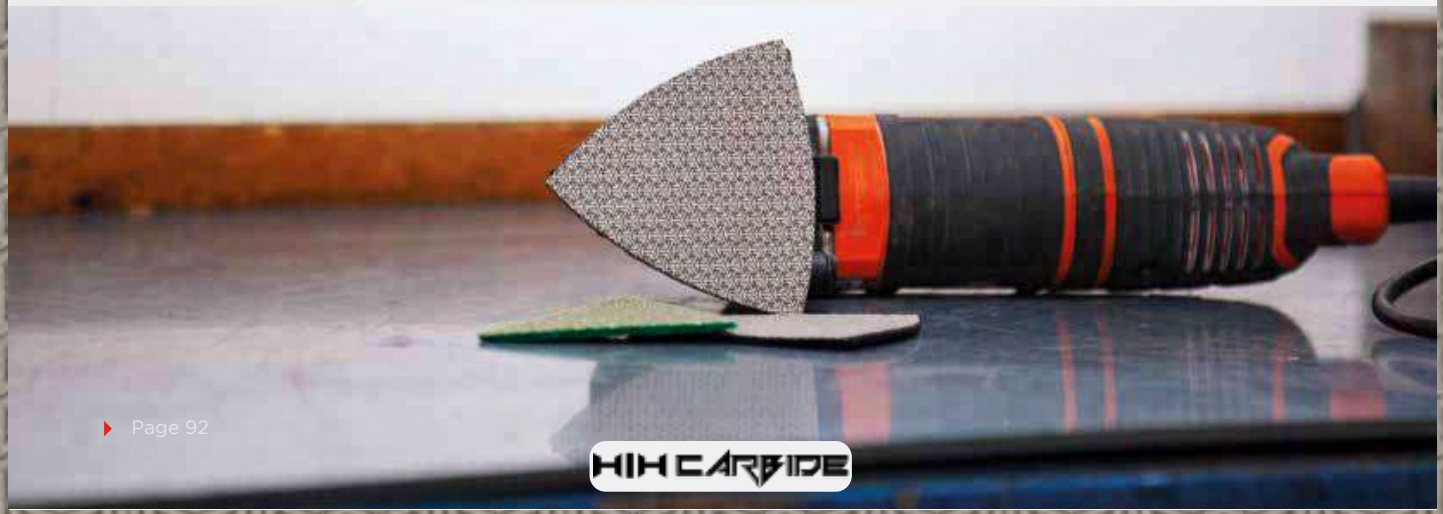
Backing QRS - Quick release system (Velcro®) for quick changing grit size. Coulor coded grit sizes for easy identification.

Materials Hard metal, hard coating, ceramic, engineered stone, concrete and natural stone

Usage

Size (mm)	Grit	Art. no.
80x80 (Fein)	60	15094
	120	15095
	200	15096
	400	15097
	800	15098

Size (mm)	Grit	Art. no.
94x94 (Bosch)	60	15104
	120	15105
	200	15106
	400	15107
	800	15108



KGS FLEXIS® TRIANGLE PADS

Diamond triangle pads with professional standard dot pattern, offers a good price-performance ratio. Ideal for fast grinding and polishing of different materials. The KGS Flexis® triangle pads can be used on standard Fein and Bosch triangle grinding machines. Great for work in hard-to-reach corners and edges.

Backing QRS - Quick release system (Velcro®) for quick changing grit size. Coulor coded grit sizes for easy identification

Materials Hard metal, hard coating, ceramic, engineered stone, concrete and natural stone

Usage

Size (mm)	Grit	Art. no.
80x80 (Fein)	60	15136
	120	15139
	200	15142
	400	15145
	800	15148

Size (mm)	Grit	Art. no.
94x94 (Bosch)	60	15160
	120	15162
	200	15164
	400	15166
	800	15168

TECH TIP
Triangular sanders are without water feed, dry working is possible, but not ideal.

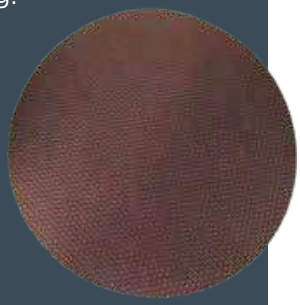
To enhance both lifetime and performance we advise to moisten your workpiece.

LARGE DIAMOND DISCS

Flat lapping grinders can be used with flexible diamond discs for rough grinding through final polish. KGS offers a wide range of large discs for different applications. Flexible diamond discs grind and polish much faster than a diamond slurry system.

Both electroplated and resin discs are available - from diameter 200 to 600 mm and larger sizes are available on request.

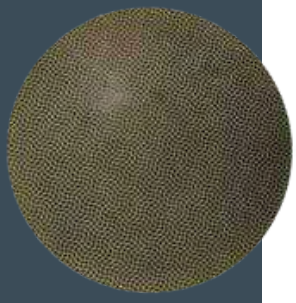
The electroplated discs, with a very abrasive surface, are used at the initial grinding stage for removing material, leaving a rough but consistent and predictable finish. Having used the metal bond discs, it is not possible to polish the surface. The next step, following the diamond metal bond disc, would be a resin diamond disc, for smoothing the rough surface. Then the workpiece is ready for polishing. Discs can be supplied with various quick change options; self adhesive (SA), magnetic (MAGN) or quick release system (QRS) backing.



KGS TELUM® LARGE DISCS

The strong interlocking arrow pattern, specifically developed for stock removal and finishing is ideal for grinding non-metallic materials.

- DIMENSIONS Ø200, 250, 300, 450 and 600 mm
- MATERIALS Glass, ceramics and stone



KGS QUADROFLEX™ LARGE DISCS

The open structure of this pattern increases the grinding pressure per diamond, ideal for flattening larger pieces.

- DIMENSIONS Ø200, 300 and 600 mm
- MATERIALS Glass, ceramics, porcelain, granite, marble and composites

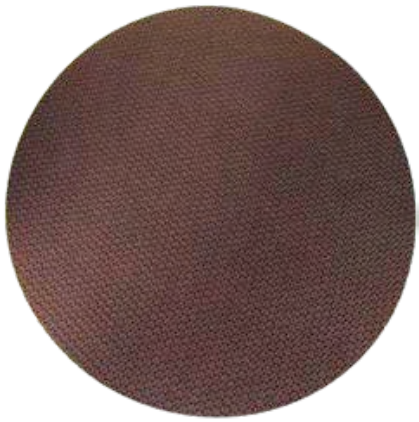
KGS SWIFLEX® SDA

This resin product can deliver rapid polishing at an economical cost. This product is more suitable for small part grinding and polishing.

- DIMENSIONS Ø200, 250 300 and 600 mm
- MATERIALS Glass, ceramics and stone

KGS TELUM® LARGE DISCS

The strong interlocking arrow pattern, specifically developed for stock removal and finishing is ideal for grinding non-metallic materials such as ceramics, glass and stone. This pattern, with the arrows in multi directional line structure, has continuous contact with the work piece ensuring a clear, homogeneous grinding action that eliminates any witness lines. TThese discs are extremely flat, highly aggressive and have a long lifetime which allows perfect control of automatic cycles. Best used with coolant.



Backing Available in different backers:

» Self adhesive (SA)
» Magnetic (MAGN)
» Quick Release system (QRS)

Materials Ceramic, glass and stone

Usage

SELF ADHESIVE BACKING

Size (mm)	Grit	Art. no.
Ø 200	60	14033
	120	14034
	200	14035
	400	14036
	800	14037
	1500	14038

Size (mm)	Grit	Art. no.
Ø 300	60	14008
	120	14009
	200	14010
	400	14011
	800	14012
	1500	14013

Size (mm)	Grit	Art. no.
Ø 250	60	14019
	120	14138
	200	14139
	400	14140
	800	14141

Size (mm)	Grit	Art. no.
Ø 450	60	30553

MAGNETIC BACKING

Size (mm)	Grit	Art. no.
Ø 200	60	39469
	120	14096
	200	14097
	400	39470
	800	39623

Size (mm)	Grit	Art. no.
Ø 300	60	14089
	120	14090
	200	14091
	400	14092
	800	39438

Size (mm)	Grit	Art. no.
Ø 600	60	28237
	120	39439
	200	39466
	400	39467
	800	39468

QRS BACKING

Size (mm)	Grit	Art. no.
Ø 200	60	14073
	120	14074
	200	14075
	400	14076
	800	14077
	1500	14078

KGS QUADROFLEX™ LARGE DISCS

Electroplated discs, used for removing material from your workpiece, leaving a rough but consistent and predictable finish. The open structure of the KGS Quadroflex™ pattern increases the grinding pressure per diamond, ideal for flattening larger pieces.

Backing Available in different backers
» Self adhesive (SA)
» Magnetic (MAGN)

Materials Glass

Usage

SELF ADHESIVE BACKING

Size (mm)	Grit	Art. no.
Ø 200	60	14470
	120	14471
	200	14472
	400	14473

Size (mm)	Grit	Art. no.
Ø 300	60	14474
	120	14432
	200	14433
	400	14434
	800	32349

MAGNETIC BACKING

Size (mm)	Grit	Art. no.
Ø 300	60	39859
	120	39861
	200	14437
	400	14438

Size (mm)	Grit	Art. no.
Ø 600	60	39871
	120	39872
	200	39873
	400	39892

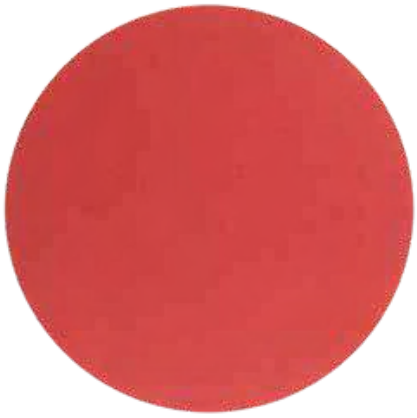
TECH TIPS: It is important to follow the correct working sequence, starting from coarse grits, working towards the fine grits. Skipping grits can be possible, but must be tested for each workpiece material, depending on surface finish requirements.

Keep your used discs clean! During the grinding process ground material will build up on your diamond surface. It is recommended to wash the discs after each session, otherwise it will influence the life and cutting capacity of the product.

KGS SWIFLEX® SDA LARGE DISCS

KGS Swiflex® SDA discs can be used for both wet and dry grinding. This resin product can deliver rapid polishing at an economical cost. Grinds faster and longer vs. conventional abrasives. These discs are more suitable for small part grinding & polishing.

Backing Available in different backers:
» Self adhesive (SA)
» Magnetic (MAGN)
» Quick Release system (QRS)



Materials	Glass and metallography
Usage	

SELF ADHESIVE BACKING

Size (mm)	Grit	Art. no.
Ø 200	60	14694
	120	14695
	200	14696
	400	14697
	800	14698
	1500	14699
	3000	14700

Size (mm)	Grit	Art. no.
Ø250	60	39945
	120	39946
	200	14635
	400	14636
	800	14637
	1500	14638
	3000	14639

Size (mm)	Grit	Art. no.
Ø300	60	14640
	120	14641
	200	14642
	400	14643
	800	14644
	1500	14646
	3000	14648

QRS BACKING

Size (mm)	Grit	Art. no.
Ø200	60	40429
	120	40430
	200	40431
	400	40432
	800	40434
	1500	40436
	3000	40437

MAGNETIC BACKING

Size (mm)	Grit	Art. no.
Ø300	60	14626
	120	14627
	200	14628
	400	14629
	800	14630
	1500	14631
	3000	14632

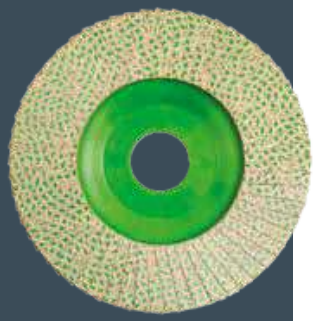
DIAMOND FLAP DISCS

Diamond flap discs can be used for sanding almost all materials, often often they are used for natural stone, concrete, technical ceramics, glass or composite materials. The focus is on material removal and deburring, excellent for chamfering and bevelling, also suitable for both edge and surface grinding.

The KGS diamond flap discs offer a smooth and even grind, protection for the operator, and significantly reduced hand and arm vibrations compared to cup wheels.

KGS HYBRID® FLAP DISCS

Focus is on material removal and deburring, excellent for chamfering and bevelling, also suitable for both edge and surface grinding.



- DIMENSIONS Ø115 x M14

Ø115 x 22.23 mm

- MATERIALS Hard metal, hard coatings, technical ceramics, natural stone, engineered stone, concrete, composites, glass and many more.

KGS HYBRID® T FLAP DISCS

Fast material removal with a soft and smooth feel, with reduced hand and arm vibrations compared to cup wheels.

- DIMENSIONS Ø115 x M14

Ø115 x 22.23 mm

- MATERIALS Hard metal, hard coatings, technical ceramics, natural stone, engineered stone, concrete, composites, glass and many more.

KGS HYBRID® FLAP DISCS

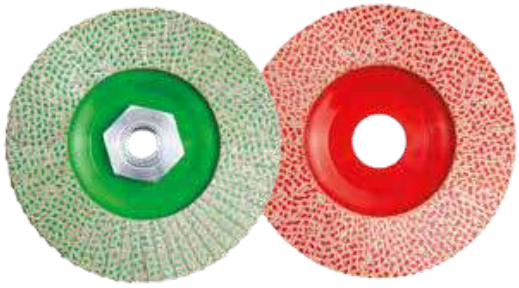
KGS Hybrid diamond flap discs are made of metal bonded diamond flaps, this makes the discs very aggressive compared to the KGS Hybrid® T discs.

Diamond flap discs can be used for grinding almost all materials. The focus is on material removal and deburring, excellent for chamfering and bevelling, also suitable for both edge and surface grinding.

Material removal and speed of the KGS Hybrid® flap disc is equal to that of cup wheels, however, the vibrations of the machine during use are much less.

Materials Hard metal, hard coatings, technical ceramics, natural stone, engineered stone, concrete, composites, glass and many more

Usage

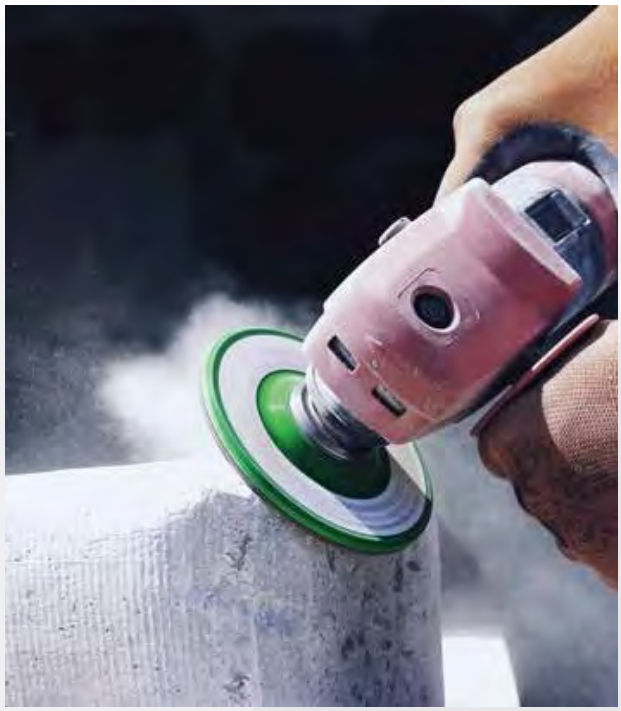


M14 22.23 mm

Size (mm)	Grit	Art. no.
Ø 115 x M14	50	18941
	60	18931
	120	18932
	200	18933

Size (mm)	Grit	Art. no.
Ø 115 x 22.23	60	18911
	120	18912
	200	18913

The discs are available with regular 22.23 hole and with M14 thread. The M14 thread can be screwed directly on the machine and enables you to change discs faster! Also available in 5/8"-11 thread



KGS HYBRID® T FLAP DISCS

KGS Hybrid® T flap discs are made of metal bonded diamond flaps combined with silicon carbide flaps. This results in fast material removal with a soft and smooth feel, with reduced hand and arm vibrations compared to cup wheels.

The focus is on material removal and deburring. Very well suited for chamfering, also suitable for edge and surface grinding.

Materials: Hard metal, hard coatings, technical ceramics, natural stone, engineered stone, concrete, composites, glass and many more.

Usage

M14 22.23 mm

Size (mm)	Grit	Art. no.
Ø 115 x M14	60	28088
	120	28089
	200	28090
	400	27431

Size (mm)	Grit	Art. no.
Ø 115 x 22.23	60	18914
	120	18915
	200	18916
	400	18917

The discs are available with regular 22.23 hole and with M14 thread. The M14 thread can be screwed directly on the machine and enables you to change discs faster! Also available in 5/8”-11 thread

DIAMOND FLAPWHEELS

The indispensable tool for blending, deburring and finishing; KGS Flexis® diamond flapwheel. Flexible diamond tools continue to work and maintain high productivity on hard to grind materials, working both fast and precise.

The abrasive flaps offer a long lasting supply of fresh abrasives and have a load resistant design. Interwoven abrasive flapwheels have a high finishing/removal capacity and can be used to remove small faults on surfaces.

KGS Flexis® diamond flapwheels are the perfect tool for use on various materials, like stone, glass, crystal and concrete shapes, hard materials like titanium, removal of overspray of hard coatings and hard materials in complex 3D shapes.

TYPE OF GRINDING MACHINE

Flapwheels are commonly used with die grinders or bench grinders. Available in spindle mounted construction on a 6mm shaft with flexible diamond in metal bond. Non-woven abrasive flapwheels are used on electrical, pneumatic and flexible shaft machines for work on intricate surfaces.

KGS FLEXIS® FLAPWHEEL · DIMENSIONS	Ø60x30 & 30x20 mm
· MATERIALS	Stone, glass, crystal, concrete, titanium, hard coatings and hard metals

KGS FLEXIS® FLAPWHEEL

Diamond flapwheel is a combination of diamond with non-woven flaps. Perfect solution for blending, deburring and finishing of flat and contoured surfaces, giving easy access on difficult to reach areas. The alternated flaps ensure a comfortable and clean polishing process, with a high finishing/removal capacity. Perfect tool for use on various materials and removal of overspray of hard coatings and hard materials in complex 3D shapes.

Materials Stone, glass, crystal, concrete, titanium, hard coatings and hard metals

Usage

Size (mm)	Grit	Art. no.
30x20	60	39209
	120	29969
	200	29970
	400	29971
	800	39210

Size (mm)	Grit	Art. no.
60x30	60	39207
	120	29894
	200	29895
	400	29896
	800	39208

SEMI-FLEXIBLE DISCS

Silicon carbide semi-flexible grinding discs consist of a special heavy red fibre backing with several layers of silicon carbide (SIC) abrasive grits embedded in a resin bond. The focus is on material removal, grinding, and deburring, from rough grinding to medium grinding. Excellent for both edge and surface grinding.

Semi-flexible grinding discs create less grinding vibration in comparison to grinding wheels.

KGS SEMI FLEXIBLE TYPE A – ALUMINUM OXIDE
KGS Semi Flexible disc for metal work with angle grinders. Applications include aggressive grinding, leveling and cleaning of surface imperfections. Perfect for weld removal, rust cleaning and most metal abrasive applications.

- DIMENSIONS Ø115, 127 and 178 mm

- MATERIALS Iron, stainless steel welds, cleaning off rust, deburring and most metal applications.

KGS SEMI FLEXIBLE TYPE C – BLACK SILICON CARBIDE
KGS Semi Flexible disc for soft stones and plastic materials use with angle grinders. Applications include aggressive grinding, leveling and cleaning of surface imperfections. Semi-flexible abrasive grinding discs are perfect for joint leveling, glue and resin removal and other cleaning applications.

- DIMENSIONS Ø115, 127 and 178 mm

- MATERIALS Marble, granite terazzo, concrete, fiberglass bodies, mastic glue, and coating removal.

KGS SEMI FLEXIBLE TYPE A – ALUMINUM OXIDE

KGS Semi Flexible Aluminum Oxide disc for metal work with angle grinders. Applications include aggressive grinding, leveling and cleaning of surface imperfections in iron, stainless steel, copper, bronze or aluminium.

Aluminum Oxide Semi-flexible abrasive grinding discs are perfect for weld removal, rust cleaning and most metal abrasive applications. The red semi-flexible fiber reduces vibrations that normally occur with the use of grinding wheels, it facilitates the operator's labor while providing an excellent performance. Spiral pattern with cooling ridges to improve productivity and avoid loading. Semi-flexible discs must be used with the appropriate backing pad.

Backing Red fiber backing, very flexible back-up pad required.

Gritrange 16, 24, 36, 60, 80

Materials Iron, stainless steel welds, cleaning off rust, deburring and most metal applications.
Usage

Size (mm)	Grit	Art. no.
Ø 115x22	16	28276
	24	28277
	36	28278
	60	28279
	80	28280

Size (mm)	Grit	Art. no.
Ø 127x22	16	28256
	24	28257
	36	28258
	60	28259
	80	28260

Size (mm)	Grit	Art. no.
Ø 178x22	16	28261
	24	28262
	36	28263
	60	28264
	80	28265

* Grit 80 for diameter 115, 127 and 178 mm are available on request

KGS SEMI FLEXIBLE TYPE C – BLACK SILICON CARBIDE

KGS Semi Flexible Black Silicon Carbide discs for soft stones and plastic materials use with angle grinders. Applications include aggressive grinding, leveling and cleaning of surface imperfections in marble, concrete, terrazzo, ceramic tiles, glass fiber and glue.

Semi-flexible abrasive grinding discs are perfect for joint leveling, glue and resin removal and other cleaning applications. The red semi-flexible fiber reduces vibrations that normally occur with the use of grinding wheels, it facilitates the operator's labor while making it more precise. Spiral pattern with cooling ridges to improve productivity and avoid loading. Semi-flexible Silicon Carbide Sanding discs must be used with the appropriate backing pad.

Backing Red fiber backing, very flexible back-up pad required.

Gritrange 16, 24, 36, 60, 80, 120

Materials Marble, granite terazzo, concrete, fiberglass bodies mastic, glue, and coating removal.

Usage

Size (mm)	Grit	Art. no.
Ø 115x22,2	16	19163
	24	19164
	36	19165
	60	19166
	80	19167
	120	19168

Size (mm)	Grit	Art. no.
Ø 127x22,2	16	19169
	24	19170
	36	19171
	60	19172
	80	19173
	120	19174

Size (mm)	Grit	Art. no.
Ø 178x22,2	16	19175
	24	19176
	36	19177
	60	19178
	80	19179
	120	19180

Diameter 230 mm
available on request

SUCCESS STORIES

GLASS SEAMING

KGS Flexible diamond belts for glass edging on automatic seaming lines. Specifically developed in co-partnership with OEM's for seaming of architectural glass in tempering plants to produce toughned glass.

"KGS Telum® glass edging belts proven to be the best in the industry"

KGS has aquired a leading position in the glass industry with the well known KGS Telum® glass edging belts.

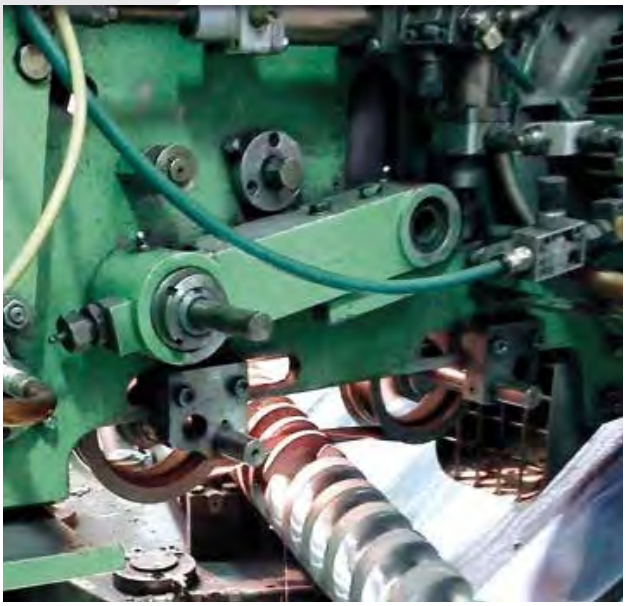
These well known KGS Telum® belts have been used in this typical application on a wide range of glass seaming machines.

The interlocking (patented) structure gives the product a longlasting continuous performance. Proven to be the best in the industry.

ROLL GRINDING

The market for thermal spray coatings and other advanced materials is showing a strong upward trend. Special and very hard coatings are applied for resurfacing cylindrical parts to minimize the effects of mechanical wear, extending the "material life", or increase the resistance against elevated temperatures controlling the thermal wear.

KGS flexible diamond belts are easier to use, require less operators skills, for more consistent, faster and predictable results. From stripping to finishing, for the wet grinding and polishing of cylinders with hard coatings KGS brings a metal and resin bond range with proven products like KGS Flexis®, KGS Telum®, KGS Telum® H and KGS Telum® CH.



POLISHING OF COMPLEX SHAPES

Special shapes and hard to reach areas. KGS flexible diamond belts are the most efficient tools to grind and polish hard coatings on concave and complex 3D shapes (Mud rotors, Extrusion spirals).

Our resin and metal bond diamond technology, our wide range of flexible backers in combination with our application experience have resulted in taking a strong position in this market.

ELECTRONICS

Our latest investment in new resin diamond technology and machinery has lead us into a leading position into the electronics industry, i.e. the polishing of cellphone frames & cases made from various materials like stainless steel, very hard ceramics and aluminum.

“Optimal price / performance levels with incredible high productivity”

New resin diamond product concepts have proven to very successful by delivering optimal price / performance levels with incredible high productivity figures with consistent and repeatable surface finish.

PORCELAIN

The production of porcelain tableware has gone through a process of automation of equipment for polishing the bases and feet of porcelain tableware. This, combined with today's trend of short series diversity requires flexible production techniques.

KGS flexible diamond tools have been developed to fit the machine concepts from OEM's like Lippert, Sama and customized machines from engineering teams. All of these factors have enabled KGS to take a leading position in diamond grinding technology within the porcelain industry.

TURBINE BLADES

Thermal barrier coatings (TBC) are highly advanced materials systems applied to metallic surfaces, such as on gas turbine or aero-engine parts, operating at elevated temperatures, as a form of exhaust heat management.

These coatings create a very hard and tough to grind surface on turbine blades in different shapes and geometries, from small to quite large sized parts.

KGS DIAMOND has developed a special range of small K-Loc discs for this specific application, the Quadroflex™ K-Loc, which creates the perfect balance between cutting power and accuracy.

SAFETY

ALWAYS READ THE SAFETY INSTRUCTIONS

Abrasive products improperly used
can be very dangerous.
» Always follow the instructions provided
on the product and by the machine supplier.

» Ensure that the abrasive product is suitable for its
intended use. Always examine all products for damage
when re-using or defects upon first use.

» Follow the correct procedures for handling and storage of
the products.

Be aware of the hazards likely during the use of abrasive products and
observe the recommended precautions to be taken
» Bodily contact with the abrasive product at operating speed

» Injury resulting from product breakage during use

» Grinding debris, sparks, fumes and dust generated by the grinding process »

Noise / vibration

Please refer to the relevant EN standard for detailled information.
» EN12413 for Bonded Abrasives

» EN13236 for Superabrasives

» EN13743 for Specific Coated Abrasives

Never use a machine that is not in good working condition or one with defective parts.

Employers should carry out a risk assessment on all individual abrasive processes to determine the necessary protective measures. They should ensure that their employees are suitably trained to carry out their duties.

WORK SAFE!

- Wear eye protection (ISO 7010)
- Wear a mask (ISO 7010)
- Wear hearing protection (ISO 7010)
- Wear gloves and necessary protective clothing.
- Always take into consideration the correct provided working indications as wet, dry or hybrid tools.

USAGE

RESPECT THE MAXIMUM SPEED

Find the wheel's maximum speed rating, and don't surpass that speed. Exceeding the rated speed by even a small amount can result in considerable added stress on the wheel, putting operator safety at risk.

Reference speed conversion table

Maximim operating speed m/s

Speed of Rotation 1/m

Ø in mm

	16	20	25	32	35	40	45	50	63	80
6	51000	64000	80000	102000	112000	128000	143240	160000	201000	-
8	38200	48000	60000	76500	84000	95500	107430	120000	150500	191000
10	30600	38200	48000	61200	67000	76500	86000	95500	120500	153000
13	23550	29500	35600	47100	51500	58800	66500	73500	92600	118000
16	19100	23900	29850	38200	41800	47800	54000	59700	75200	95500
20	15300	19100	23900	30600	33500	38200	43000	47800	60200	76500
25	12300	15300	19100	24500	26800	30600	34400	38200	48200	61200
32	9550	11950	14950	19100	20900	23900	26900	30000	37600	48000
40	7650	9550	11950	15300	16750	19100	21500	23900	30100	38200
50	6150	7650	9550	12250	13400	15300	17200	19100	24100	30600
63	4850	6100	7600	9750	10650	12150	13650	15200	19100	24300
80	3850	4800	6000	7650	8400	9550	10750	12000	15100	19100
100	3100	3850	4800	6150	6700	7650	8600	9550	12100	15300
115	2700	3350	4200	5350	5850	6650	7500	8350	10500	13300
125	2450	3100	3850	4900	5350	6150	6900	7650	9650	12250
150	2050	2250	3200	4100	4500	5100	5750	6400	8050	10200
180	1700	2150	2700	3400	3750	4250	4800	5350	6700	8500
200	1550	1950	2400	3100	3350	3850	4300	4800	6050	7650
230	1350	1700	2100	2700	2950	3350	3750	4200	5250	6650
250	1250	1550	1950	2450	2700	3100	3450	3850	4850	3150
300	1050	1300	1600	2050	2250	2550	2870	3200	4050	5100
350/356	875	1100	1400	1750	1950	2200	2450	2750	3450	4400
400/406	765	960	1200	1550	1700	1950	2150	2400	3050	3850
450/457	680	850	1100	1400	1500	1700	1950	2150	2700	3400
500/508	615	765	960	1250	1350	1550	1750	1950	2450	3100
600/610	510	640	800	1050	1150	1300	1450	1600	2050	2550

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